RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1A-STAFF-1

Reference: N/A

Preamble:

Updated Revenue Requirement Work Form (RRWF) and Models

QUESTION (A):

a) Upon completing all interrogatories from Ontario Energy Board (OEB) staff and intervenors, please provide an updated RRWF in working Microsoft Excel format with any corrections or adjustments that the Applicant wishes to make to the amounts in the populated version of the RRWF filed in the initial applications. Entries for changes and adjustments should be included in the middle column on sheet 3 Data_Input_Sheet. Sheets 10 (Load Forecast), 11 (Cost Allocation), and 13 (Rate Design) should be updated, as necessary. Please include documentation of the corrections and adjustments, such as a reference to an interrogatory response or an explanatory note. Such notes should be documented on Sheet 14 Tracking Sheet and may also be included on other sheets in the RRWF to assist understanding of changes.

RESPONSE (A):

Toronto Hydro notes that it is not possible to complete this work within the timelines for responding to interrogatories. This information will be provided in advance of the Technical Conference,[1] along with the updated 2025-2029 revenue requirement and rates, as well as DVA balances and rate riders, related to the following:

(i) the 2023 financial actuals and updated 2024 forecast along with any material downstream impacts to 2025-2029 forecasts;[2]

[1] EB-2023-0195, Evidence Update Cover Letter (January 29,2024)
[2] Pleas see 2A-Staff-104 and 1B-SEC-01

(ii) the 2023 load and customer actuals and updated 2024-2029 forecast;

(iii) the January 29, 2024 evidence update as noted in the accompanying cover letter;

(iv) any other material updates or corrections identified in interrogatory responses;

As noted in the January 29, 2024 cover letter, in advance of the Technical Conference, the utility also intends to update the value of the Performance Incentive Mechanism (PIM) in Exhibit 1B, as the PIM is a function of the utility's 2025-2029 total revenue requirement. In addition, Toronto Hydro will file the 2023 actual results related to performance measures identified in Exhibit 1B, Tab 3, Schedule 1 (Performance Outcomes Framework) and Schedule 3 (Historical Performance Results).

QUESTION (B):

b) In addition, please file an updated set of models that reflects the interrogatory responses. Please ensure the models used are the latest available models on the OEB's 2024 Electricity Distributor Rate Applications webpage.

RESPONSE (B):

The OEB models filed as part of this rate application and subsequent updates include a number of modifications made to reflect the utility's specific considerations. Updating these models to the latest version would require a significant effort, which would not provide commensurate value at this stage of the proceeding based on Toronto Hydro's understanding that there are have only been minor changes from the previous version that the utility used when the application was filed. Where applicable, Toronto Hydro proposes to update the models at the time of the Draft Rate Order.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1A-STAFF-2

Reference: Chapter 2 Filing Requirements, Page 3 (update for 2024 FRs)

QUESTION:

As required in the Chapter 2 Filing Requirements, please provide a summary of any updates or amendments to an OEB model to accommodate Toronto Hydro's circumstance, if applicable.

RESPONSE:

Please see Toronto Hydro's response to interrogatory 1A-Staff-1.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1A-CCC-1

Reference: Exhibit 1A

Please file all materials provided to Toronto Hydro's Board of Directors with respect to this Application, the underlying budgets and THESL's most recent Business Plan.

RESPONSE:

Please refer to the appendices to this response for the following materials:

- Appendix A – Toronto Hydro's 2023-2025 Business Plan
- Appendix B – Toronto Hydro's 2024-2026 Business Plan
- Appendix C – 2025 Rate Application Strategy & Update
- Appendix D – Customer Engagement & Rate Application Update

Please note that some parts of these documents have been redacted for confidentiality purposes. Also, certain information in these documents is subject to solicitor-client privilege, or is not relevant to answering the question above, and has been permanently redacted in both the public and confidential versions of these documents.

Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
1A-CCC-1
FILED: March 11, 2024
85 Pages

2025-2029 REGULATORY STRATEGY AND 2023-2025 BUSINESS PLAN



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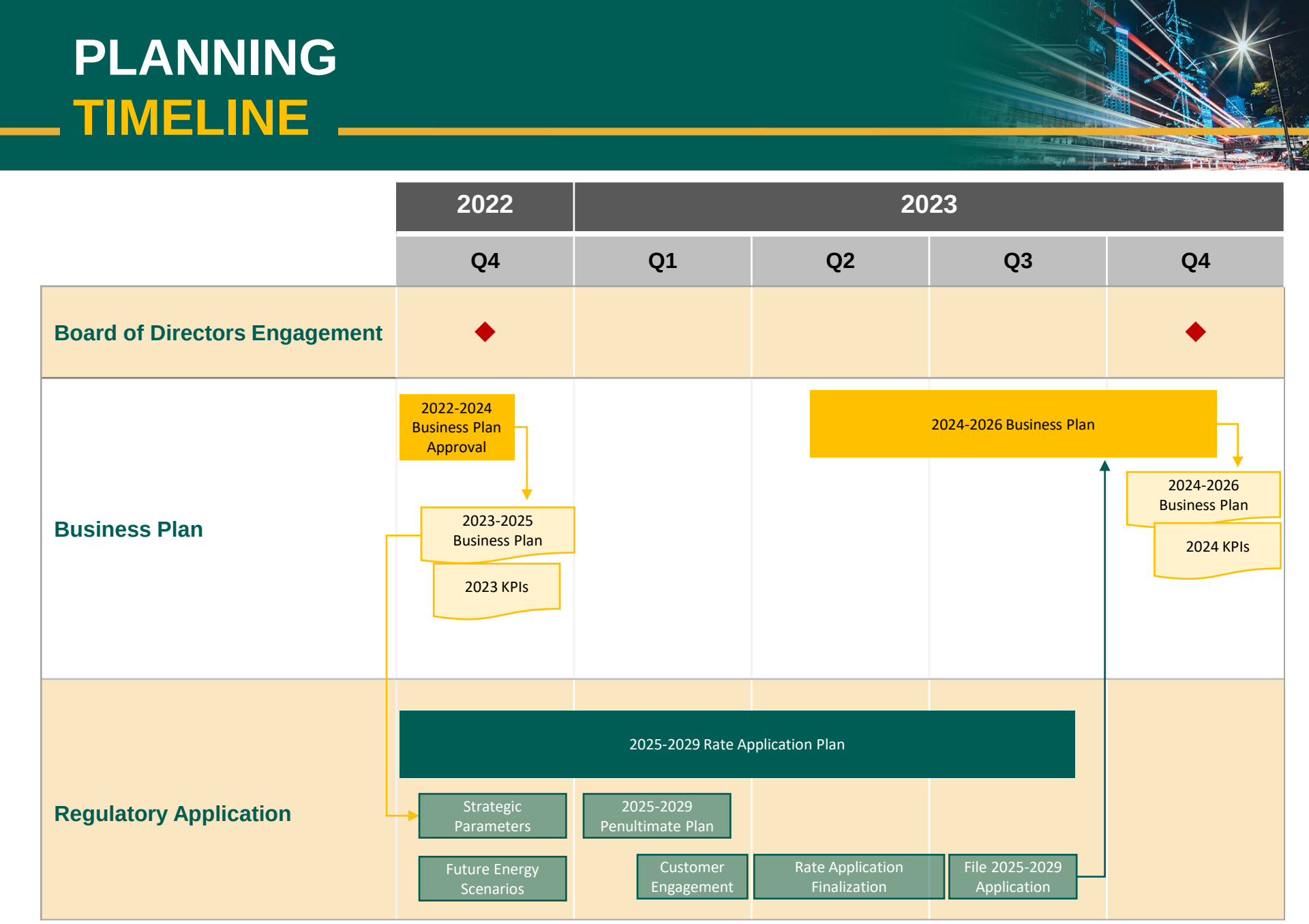
PLANNING TIMELINE



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AGENDA

1. 2025-2029 Regulatory Strategy
2. 2023-2025 Business Plan
3. Regulatory, Compliance and Risk Assessment for 2023-2025 Business Plan
4. 2023 Corporate Performance Scorecard



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2025-2029 REGULATORY STRATEGY

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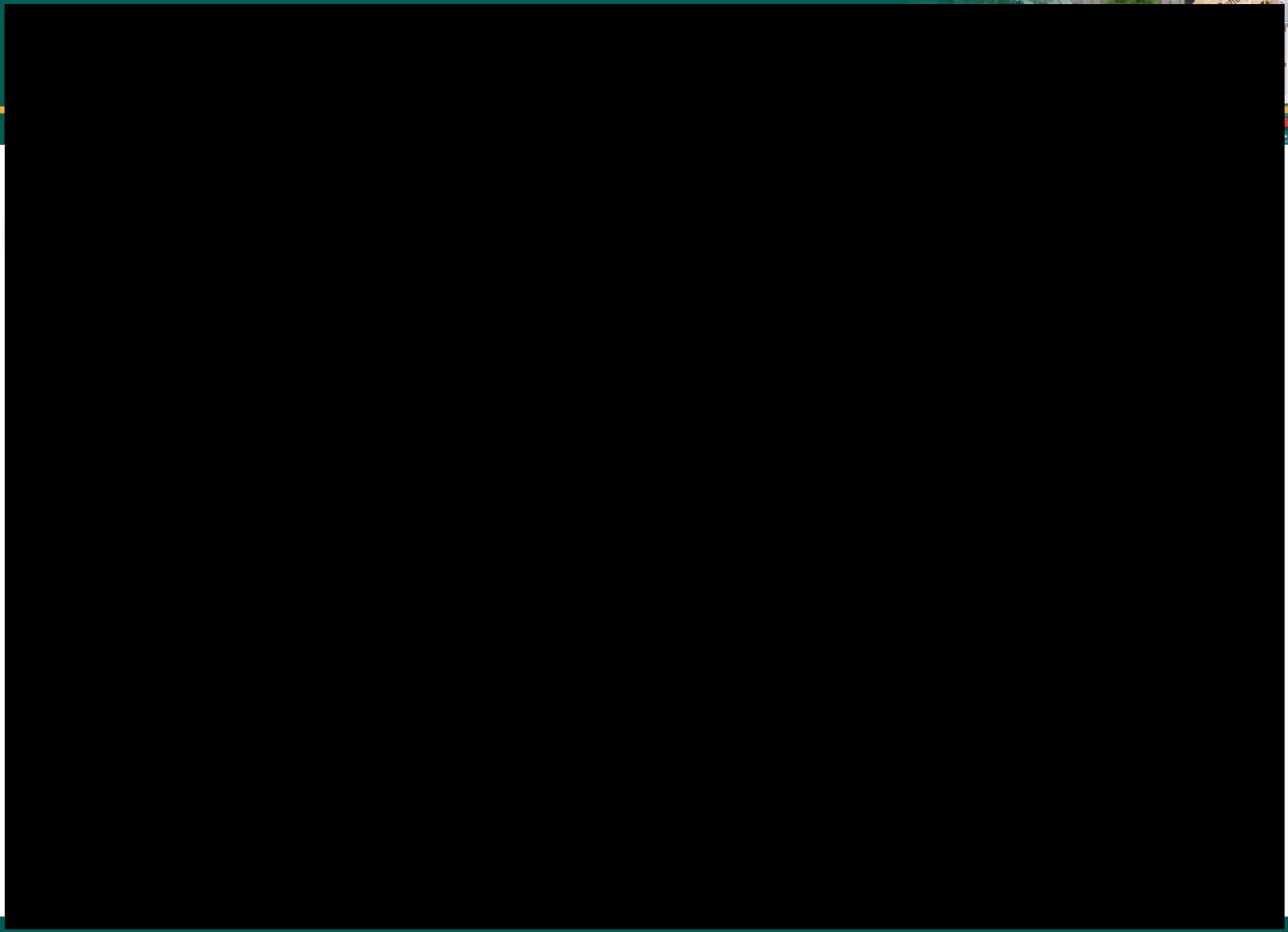

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GRID & OPERATIONS PLANS

2025-2029 INVESTMENT DRIVERS



System Stewardship: Grid & Operational Performance	Modernization	City Growth & Electrification
Continue to deliver safe and reliable/resilient service	Adopt technology to modernize our grid and operations	Connect and serve growing demand

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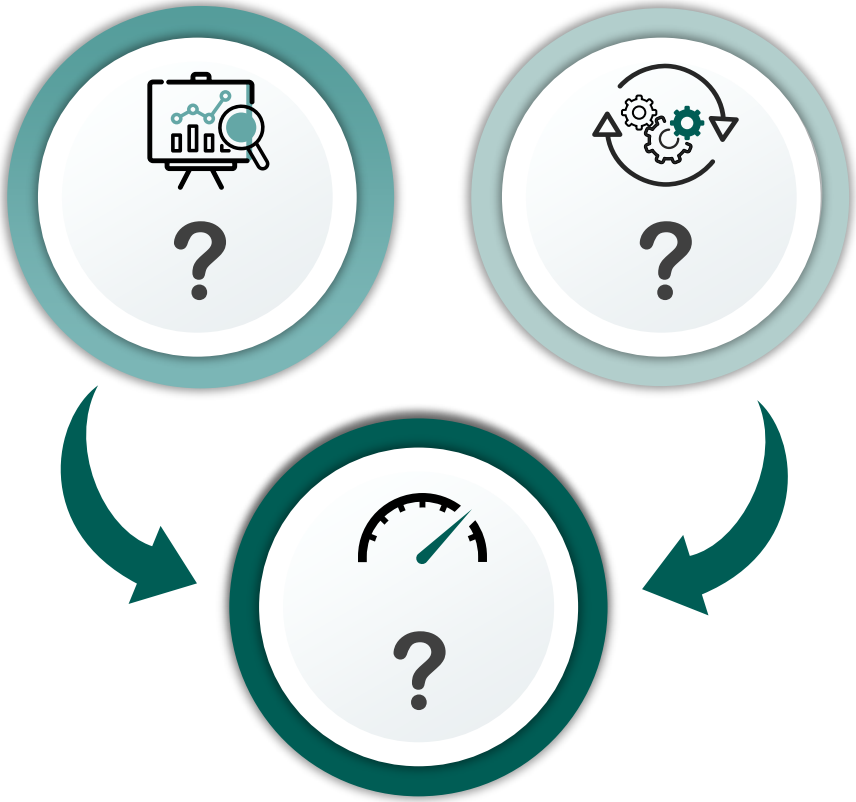
RATE APPLICATION

STRATEGIC PARAMETERS



Capital Plan

2025-2029 Capital Expenditures



Operations Plan

2025-2029 OM&A Expenses

Distribution Rates

Average Annual Residential Rate Increase (2025-2029)

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STRATEGIC PARAMETER:
CAPITAL PROGRAM (CAPEX)



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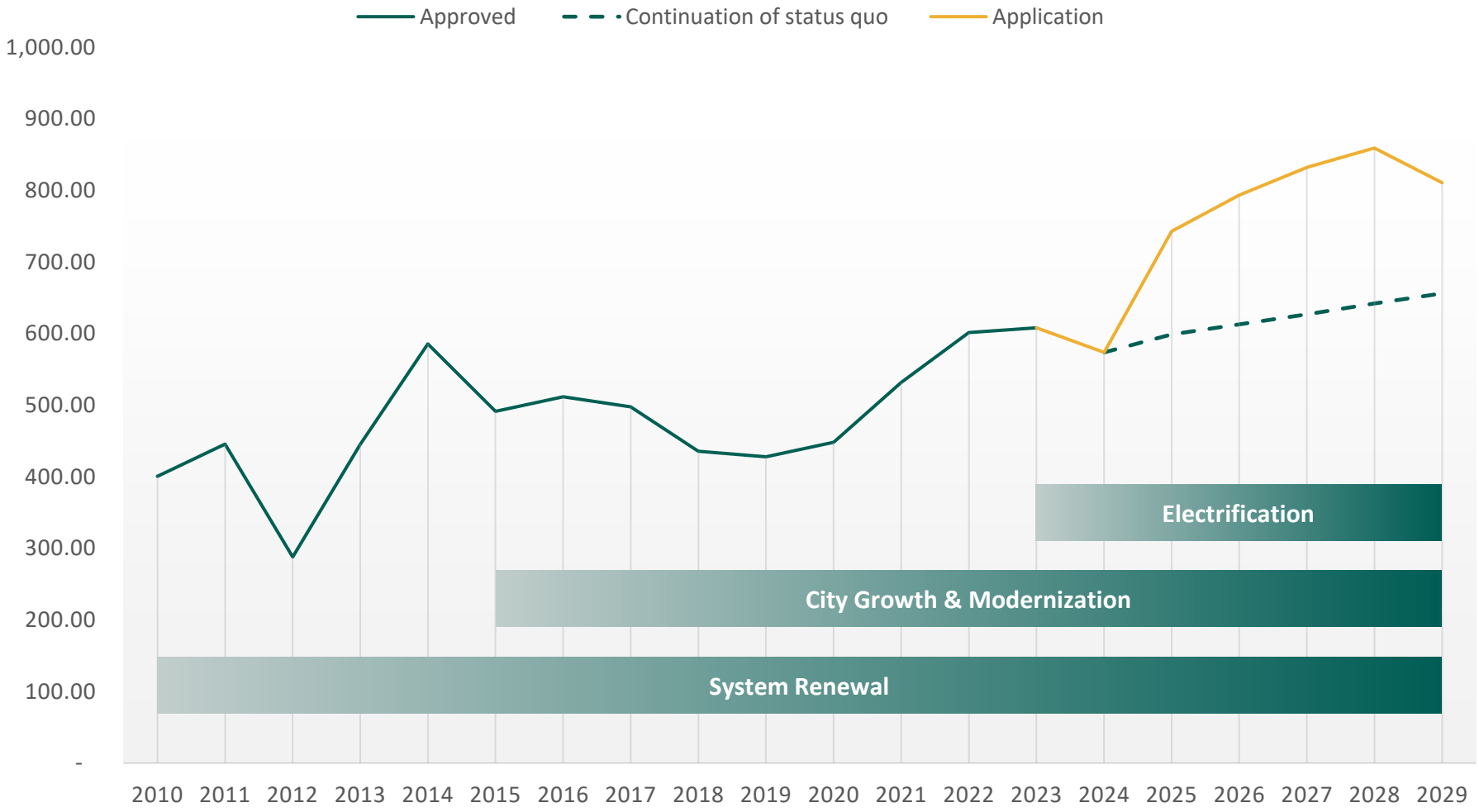
STRATEGIC PARAMETERS

CAPITAL FUNDING





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SUSTAINMENT

• OBJECTIVES



PLAN OBJECTIVES & HIGHLIGHTS

- Maintain **overall health demographics** of the asset population in 2025-2029
- Ensure investment pacing contributes to **stable long-term investment profiles** (2030+) for all assets
- Adhere to previous commitments for **safety and environmental compliance activities** (e.g. PCBs by 2025; Box Conversion by 2026)
- Maintain recent historical **system reliability.**
- **Optimize the pace of renewal investment** from year-to-year (cost control) using improved **risk-based** decision-making tools.

Outcome.	Goal	2025-2029 Status Quo Option	2025-2029 Business Plan	2025-2029 Enhanced Option
Total Expenditures*		$1,269.2	**$1,577.9**	$1,976.1
SAIFI	▶	🟡	🟢	🔵
SAIDI	▶	🟡	🟢	🔵
Assets Past Useful Life	▶	🔴	🟢	🔵
Asset Health	▶	🔴	🟢	🔵
Oil Spills cont. PCBs	▲	🟢	🟢	🟢
System Safety Risk	▲	🔴	🟢	🟢

**Total expenditures exclude allocations such as EAR & AFUDC*

- 🔵 *Exceed (improved)*
- 🟢 *Achieve (stable)*
- 🟡 *At Risk (caution)*
- 🔴 *Risk Realized*

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GROWTH

• OBJECTIVES



PLAN OBJECTIVES & HIGHLIGHTS

- **Connect customers** efficiently and with consideration for a likely increase in connections volumes due to electrification
- **Expand stations capacity** to alleviate future load constraints, with consideration for increased EV uptake, decarbonization drivers, and other growth factors (digitization and redevelopment).
- **Optimize near-term system capacity** through load transfers, bus balancing, cable upgrades and the targeted use of non-wires alternatives such as demand response and energy efficiency.
- Alleviate constraints on restricted feeders to accommodate **increasing DER connections.**
- Install **control and monitoring capabilities** for all generators > 50kW
- Accommodate relocations for committed **third-party developments**, including priority transit projects

Outcome	Goal	2025-2029 Status Quo Option	2025-2029 Business Plan	2025-2029 Enhanced Option
Total Expenditures*		$861.3	**$940.5**	$1,109.5
Load Capacity	▲	🔴	🟢	🟢
Hosting Capacity	▲	🟡	🟢	🟢
Obligation to Serve	▶	🟢	🟢	🔵
Operational Flexibility	▲	🟡	🟢	🟢

**Total expenditures exclude allocations such as EAR & AFUDC*

- 🔵 *Exceed (improved)*
- 🟢 *Achieve (stable)*
- 🟡 *At Risk (caution)*
- 🔴 *Risk Realized*

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MODERNIZATION

• OBJECTIVES



PLAN OBJECTIVES & HIGHLIGHTS

- Prioritize investments that will deliver demonstrable benefits to customers, especially enhancements that will **enhance value-for-money** in the long-term (i.e. efficiency)
- **Improve system reliability** through enhanced fault management, leveraging automation and advanced metering (AMI2.0)
- Enhance **system observability** across the system, enabling better asset management and operational decision making
- Leverage technology to **improve customer experience** (e.q. reliability, power quality, customer tools, DER integration)
- Enhance **resiliency** and **security** of the system through advanced grids, targeted undergrounding of critical overhead assets, and enhancements to distribution schemes for critical loads downtown.

Outcome	Goal	2025-2029 Status Quo Option	2025-2029 Business Plan	2025-2029 Enhanced Option
Total Expenditures*		$427.3	**$518.6**	$715.5
SAIFI	▲	🟡	🟢	🔵
SAIDI	▲	🟢	🔵	🔵
Customer Experience	▲	🟡	🟢	🔵
System Observability	▲	🟡	🟢	🔵
Operational Flexibility	▲	🟡	🟢	🔵
System Resiliency	▲	🟡	🟢	🔵
Operational Efficiency	▲	🟢	🔵	🔵

**Total expenditures exclude allocations such as EAR & AFUDC*

- 🔵 *Exceed (improved)*
- 🟢 *Achieve (stable)*
- 🟡 *At Risk (caution)*
- 🔴 *Risk Realized*

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GENERAL PLANT

• OBJECTIVES



PLAN OBJECTIVES & HIGHLIGHTS

Fleet & Facilities:

- Implement **Toronto Hydro's NZ40** strategy:
  - Achieve 80% buildings emissions reductions by 2040
  - Expand fleet electric vehicle charging infrastructure and electrify 40% of fleet by 2029
- Improve **stations site conditions and physical security** to meet legislative requirements (OBC, OHSA, CSF, etc.)
- Replace **critical** facilities assets in **poor** condition

IT/OT:

- Support Utility of the Future objectives re Grid Modernization, Process Automation & Customer Experience objectives
- **Minimize reliability and cybersecurity risks**
- Ensure IT **infrastructure is available and reliable** with minimal service disruption

Outcome	Goal	2025-2029 Status Quo Option	2025-2029 Business Plan	2025-2029 Enhanced Option
Total Expenditures*		$480.8	**$613.4**	$665.3
Asset Condition & Reliability	▶	🔴	🟢	🔵
Emissions Reductions	▲	🟡	🟢	🔵
Security & Resiliency	▲	🔴	🟢	🟢
Grid Modernization	▲	🟡	🟢	🔵
Process Automation	▲	🟡	🟢	🔵
Customer Experience	▲	🟡	🟢	🔵

**Total expenditures exclude allocations such as EAR & AFUDC*

- 🔵 *Exceed (improved)*
- 🟢 *Achieve (stable)*
- 🟡 *At Risk (caution)*
- 🔴 *Risk Realized*

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STRATEGIC PARAMETER:
OPERATIONS PROGRAM (OM&A)



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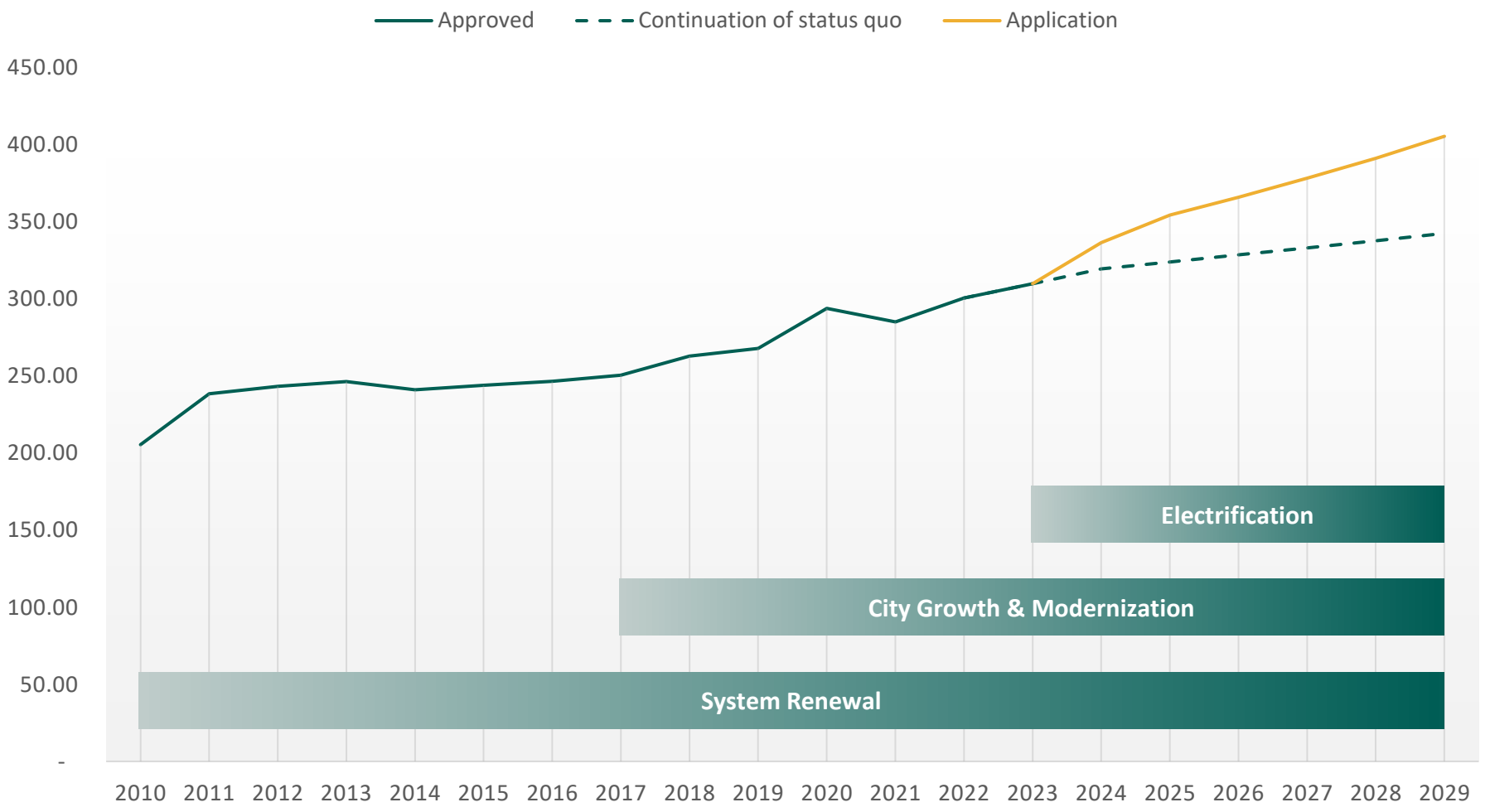
REGULATORY APPROVALS

OPERATIONAL FUNDING





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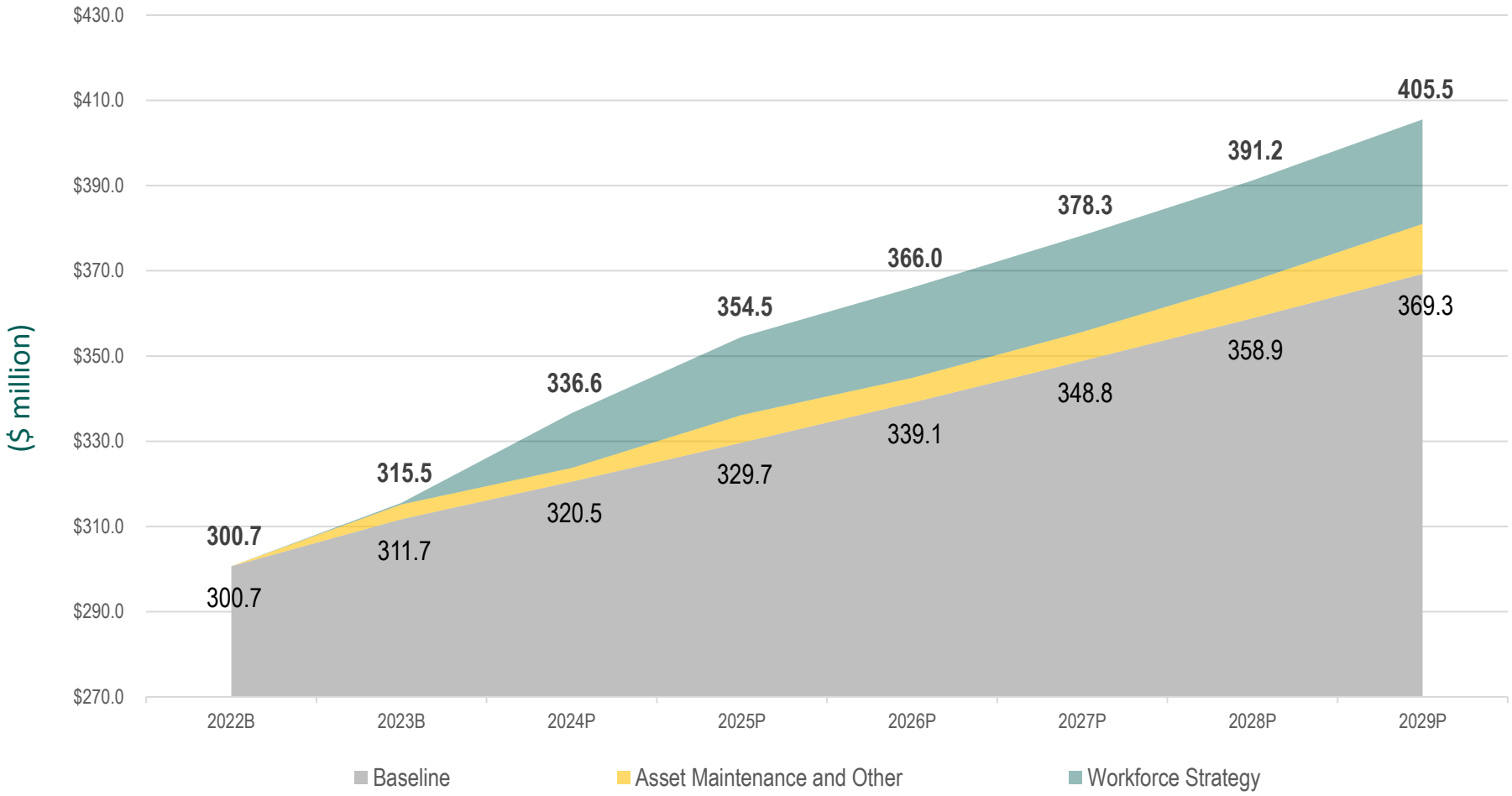
STRATEGIC PARAMETERS

OPERATIONAL PLAN





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STRATEGIC PARAMETER: RATES



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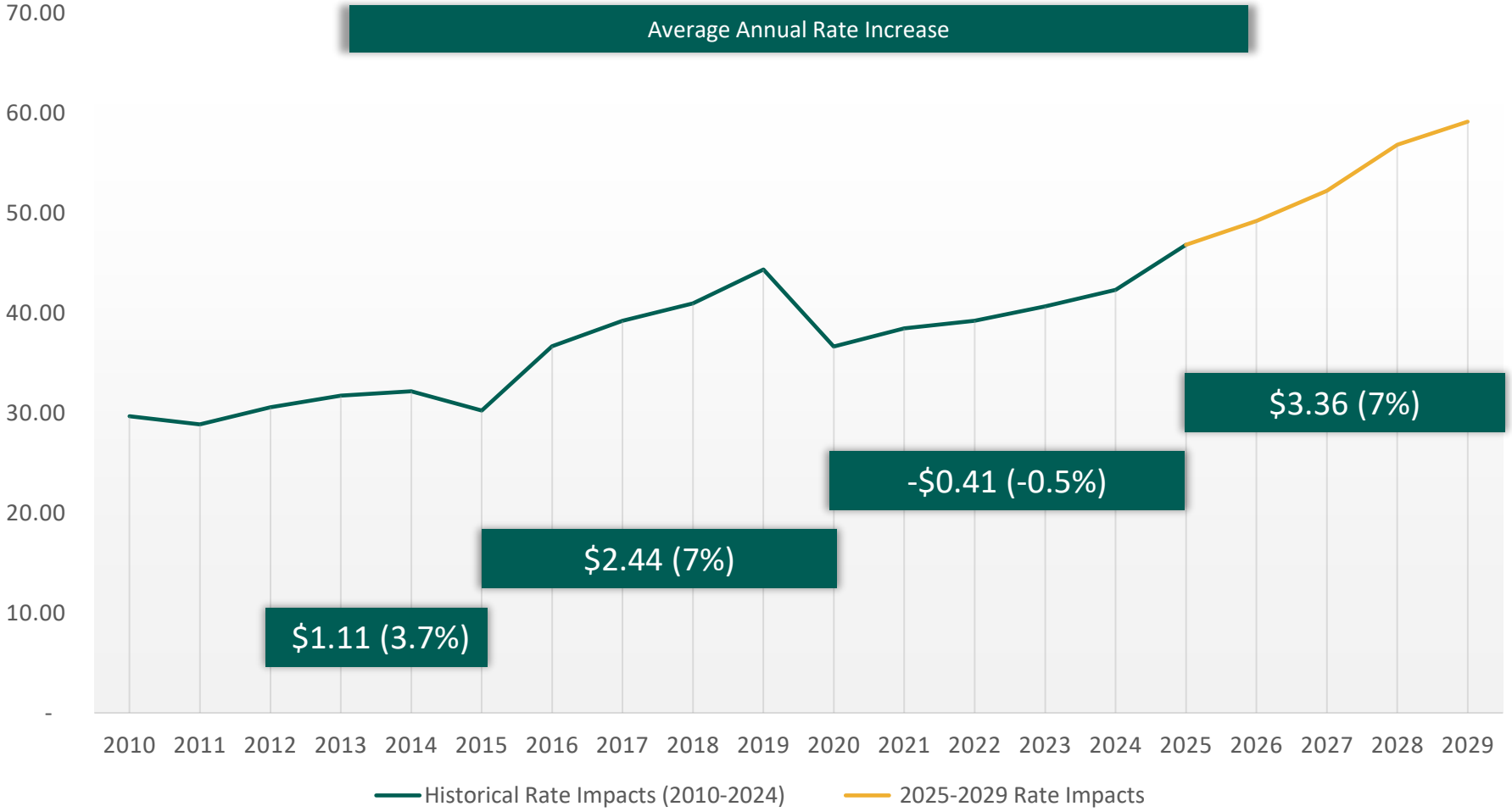
RATE APPLICATION

RESIDENTIAL RATE IMPACTS





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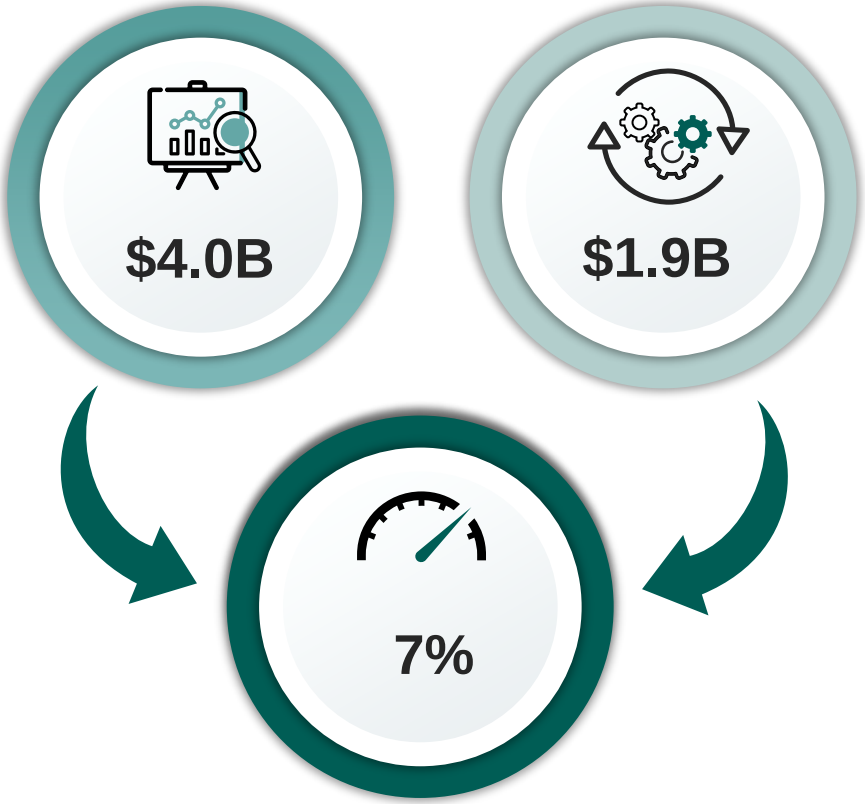
RATE APPLICATION
STRATEGIC PARAMETERS WITH RATE FRAMEWORK



Capital Plan

2025-2029 Capital Expenditures
+
Performance Incentive
0.5% ROE



Operations Plan

2025-2029 OM&A Expenses
+
Performance Incentive
0.3% Stretch Factor

Distribution Rates

Average Annual Residential Rate Increase
(2025-2029)

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2023-2025
BUSINESS PLAN



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INTEGRATED BUSINESS PLAN



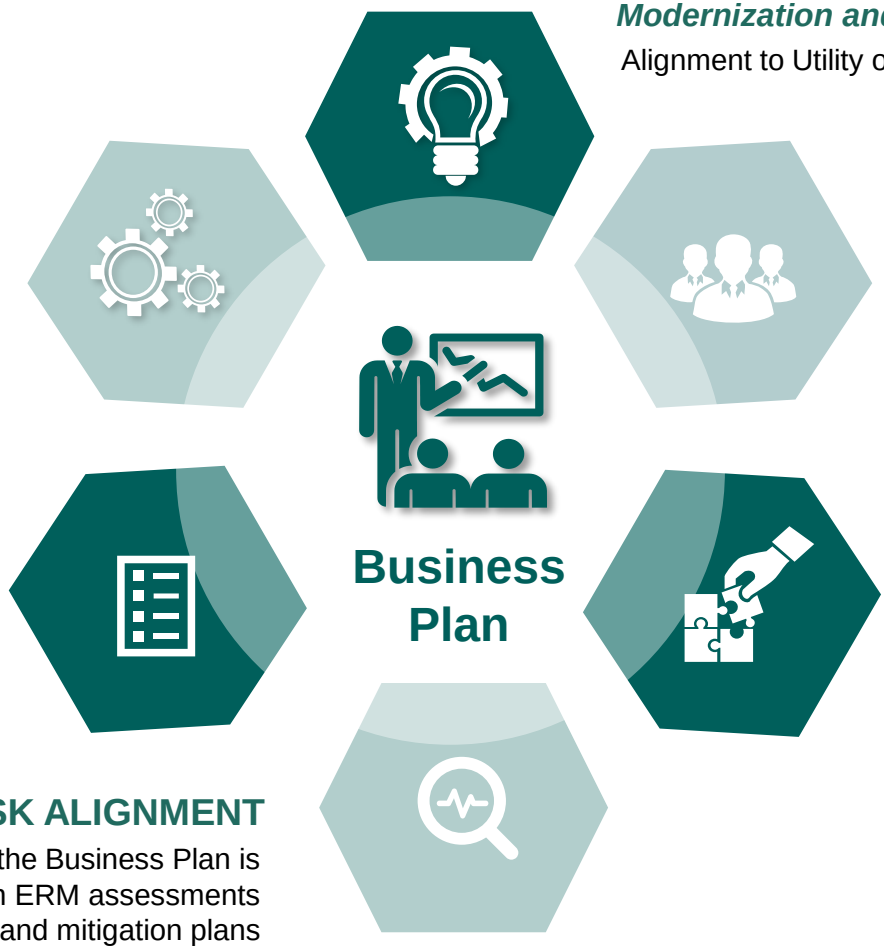
CORPORATE STRATEGY
Modernization and Electrification

Alignment to Utility of the Future and Climate Action

BUSINESS NEEDS
Identification of Capital Investment and Operational needs that underpin the Corporate Pillars

PEOPLE STRATEGY
Workforce of Tomorrow

Build a culture of safety, sustainment and innovation that propels TH into the future



COMPLIANCE REVIEW
Consideration of compliance requirements and related mitigating actions

REGULATORY ALIGNMENT
- 2023-2024: Alignment to 2020-2024 OEB decision and inclusion of new emerging issues (e.g.: customer connections, inflation)
- 2025: Alignment to 2025-2029 rate application strategy

RISK ALIGNMENT
Ensure the Business Plan is grounded in ERM assessments and mitigation plans

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BUSINESS PLAN
ASSUMPTIONS



The 2023-2025 Business Plan incorporates the following:

- Alignment to the 10-year Utility of the Future strategy and strategic priorities including Climate Action;
- 2020-2024 CIR decision and inclusion of new emerging issues (e.g.: increase in customer connections and incremental inflationary costs);
- 2025 aligned to 2025-2029 rate application strategy;
- Long-term economic impact resulting from COVID-19;

[redacted]

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LEGAL ENTITIES



THC

- Corporate

THESL

- Regulated
- Electricity Distribution

THESL

- Unregulated
- Climate Advisory Services and Energy Solutions

THESI

- Unregulated
- Street Lighting

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CONSOLIDATED FINANCIALS



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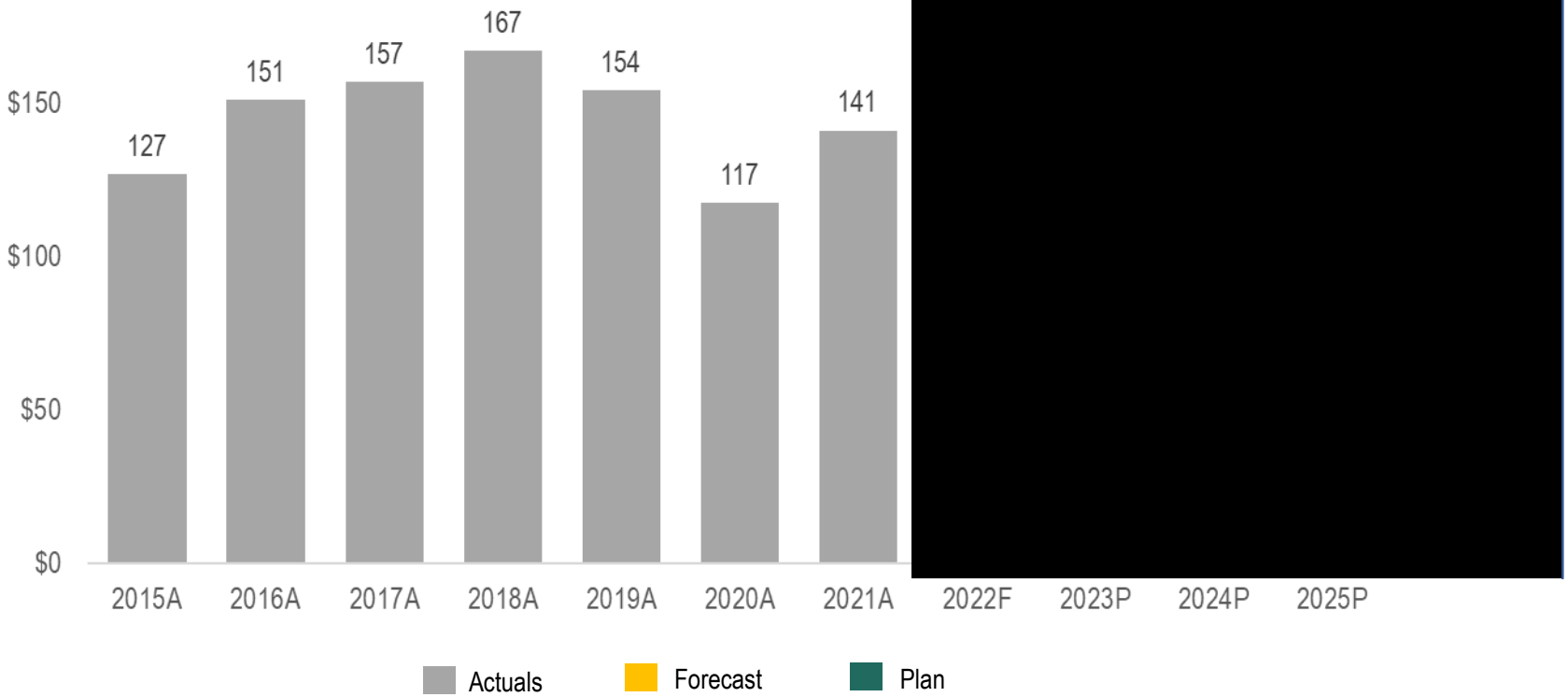
NET INCOME
COMPOUNDED ANNUAL GROWTH RATE

[redacted]



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2023 STATEMENTS OF INCOME

CONSOLIDATED



Statements of Income In millions of Canadian dollars For the year ending December 31, 2023	Corporate	Regulated	Unregulated	Consolidated
Energy sales		2,988		
Distribution revenue		827		
Other revenues		87		
Total revenues		**3,902**		
Energy purchases		2,988		
Operating expenses		331		
Depreciation and amortization		267		
Total expenses		**3,586**		
Finance costs		99		
Gain on disposals of property, plant and equipment		1		
Income/(loss) before income taxes		**218**		
Income tax (expense)/recovery		45		
Net movements in regulatory balances		(71		
Net movements in regulatory balances arising from deferred taxes		50		
Net income after net movements in regulatory balances		**152**		

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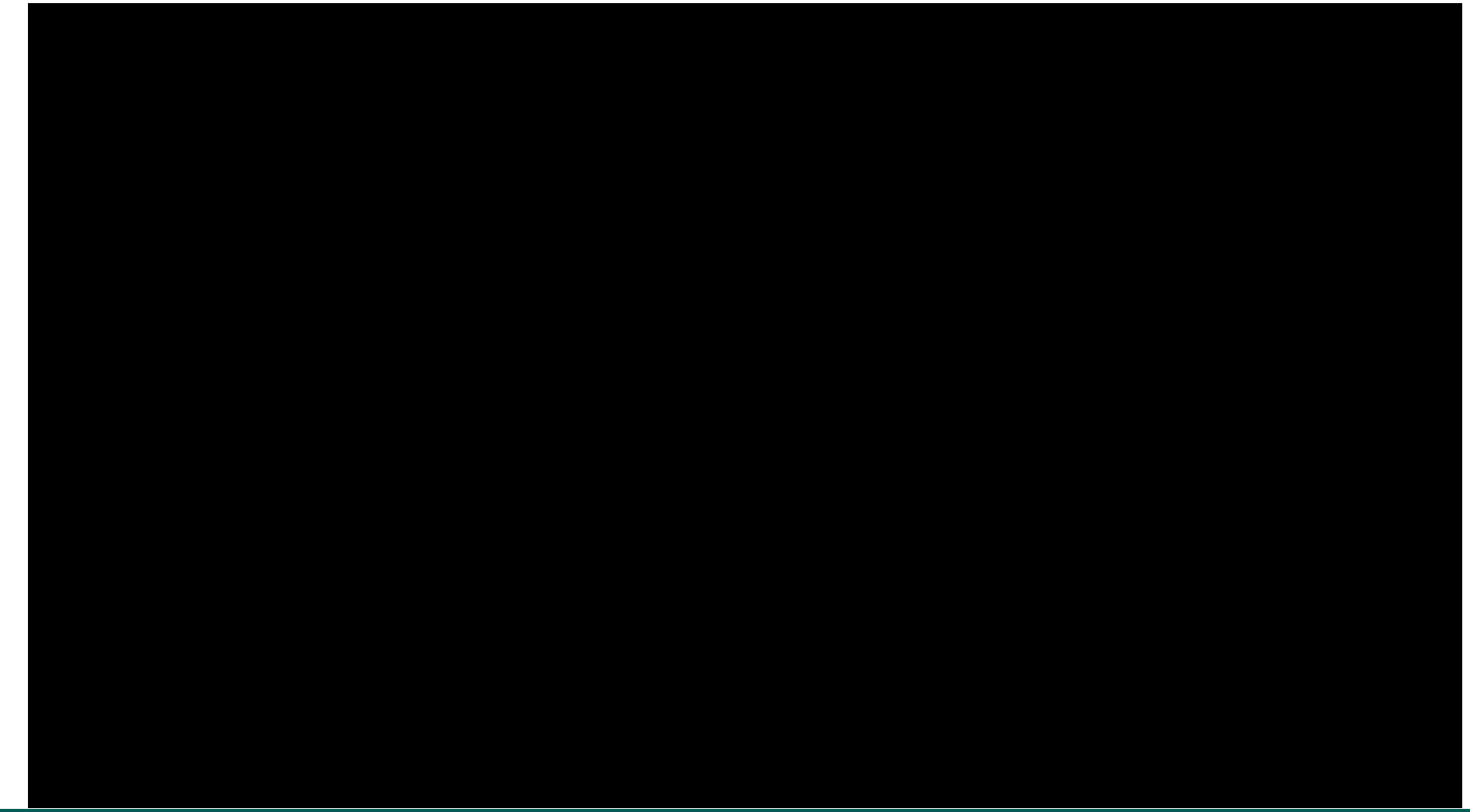
NET INCOME
2023 BUDGET



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CORPORATE



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2023 STATEMENTS OF INCOME

CORPORATE



Statements of Income In millions of Canadian dollars For the year ending December 31, 2023	Corporate	Regulated	Unregulated	Consolidated
Energy sales		2,988		
Distribution revenue		827		
Other revenues		87		
Total revenues		**3,902**		
Energy purchases		2,988		
Operating expenses		331		
Depreciation and amortization		267		
Total expenses		**3,586**		
Finance costs		99		
Gain on disposals of property, plant and equipment		1		
Income/(loss) before income taxes		**218**		
Income tax (expense)/recovery		45		
Net movements in regulatory balances		(71)		
Net movements in regulatory balances arising from deferred taxes		50		
Net income after net movements in regulatory balances		**152**		

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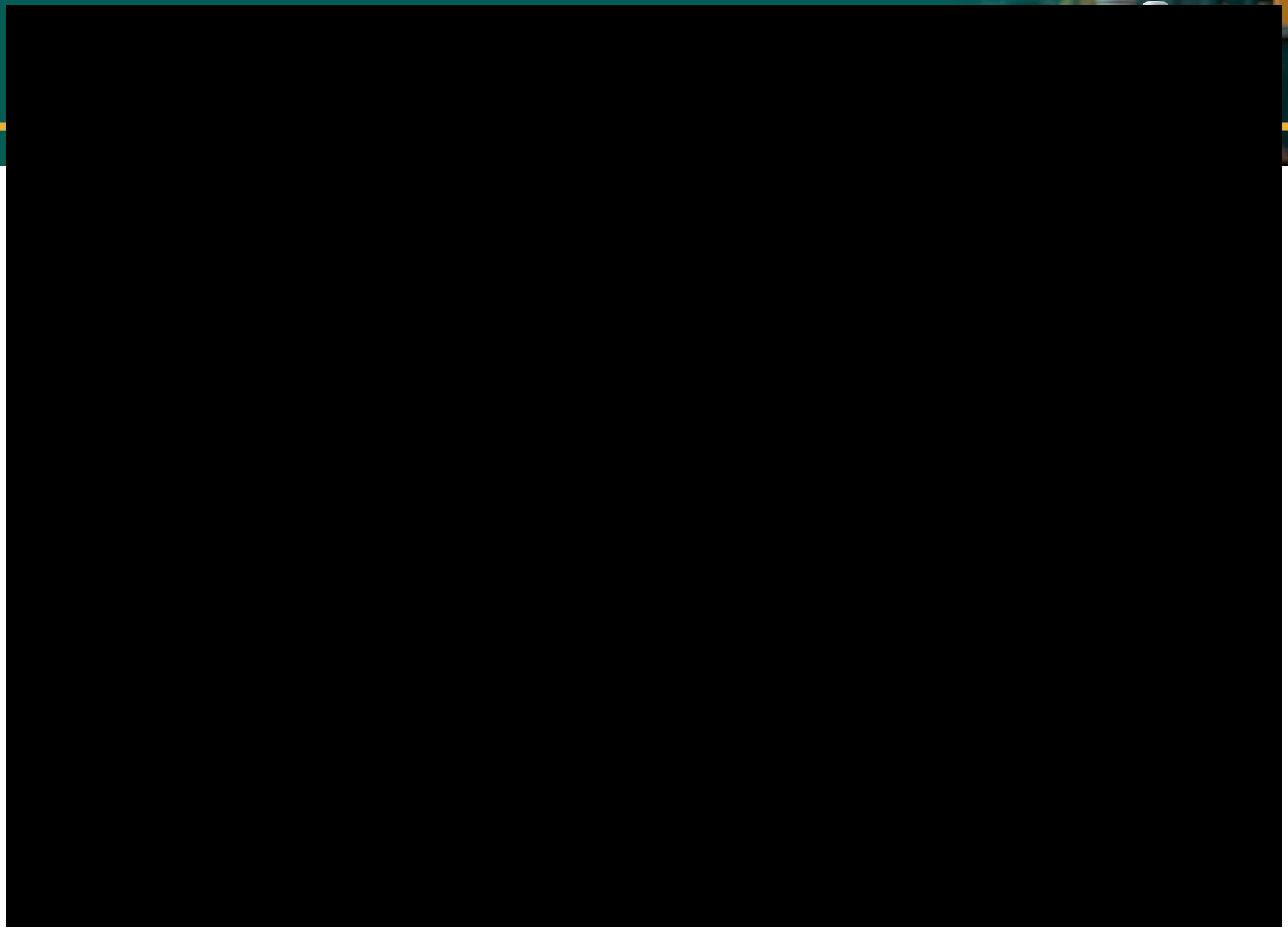

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REGULATED



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2023 STATEMENT OF INCOME

REGULATED



Statements of Income In millions of Canadian dollars For the year ending December 31, 2023	Corporate	Regulated	Unregulated	Consolidated
Energy sales		2,988		
Distribution revenue		827		
Other revenues		87		
Total revenues		**3,902**		
Energy purchases		2,988		
Operating expenses		331		
Depreciation and amortization		267		
Total expenses		**3,586**		
Finance costs		99		
Gain on disposals of property, plant and equipment		1		
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Net movements in regulatory balances		(71)		
Net movements in regulatory balances arising from deferred taxes		50		
Net income after net movements in regulatory balances		**152**		

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REVENUES



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	Variance
Distribution Revenue	759	750	750	827	77
Other Revenues	86	84	85	87	2
Total Revenues	**845**	**834**	**835**	**914**	**79**

- Higher Distribution Revenue due to the recovery of regulatory settlement variances, which are offset in net movement line, and increase in distribution rates in 2023 resulting from the 2020-2024 regulatory decision
- Increase in Other Revenues primarily due to higher late payment fees and customer demand work

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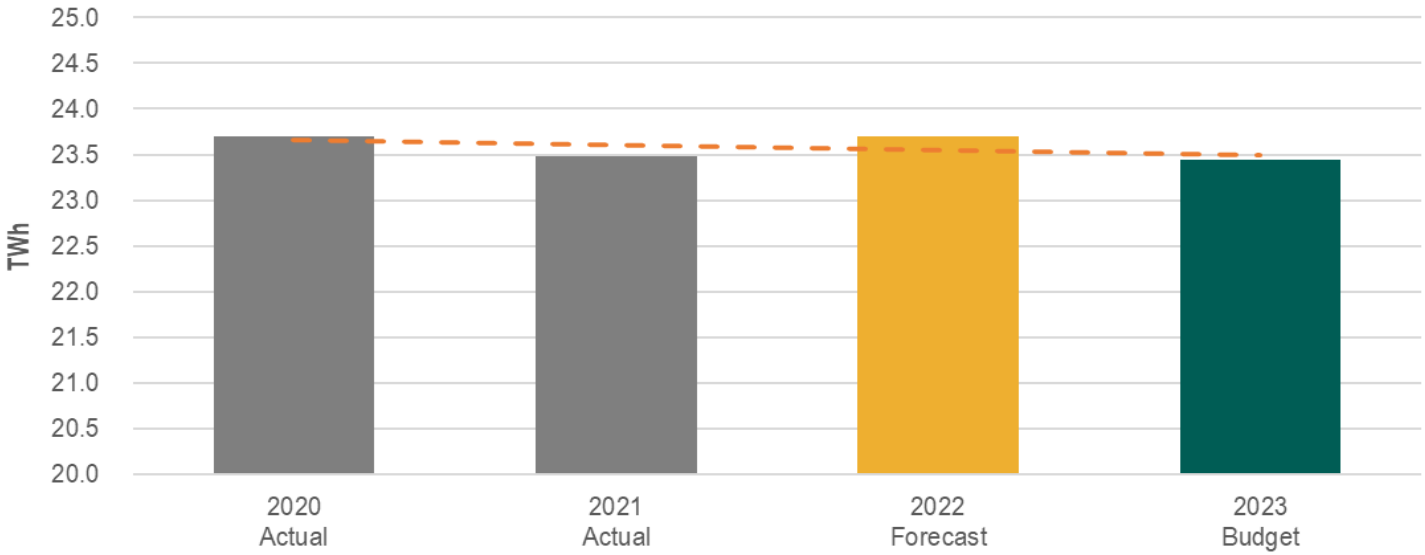
LOAD FORECAST

	2021 Actual	2022 Budget	2022 Forecast	2023 Budget
Load (TWh)[1]	23.5	23.7	23.7	23.4
Year over Year % Change	(1%)	0%	1%	(1%)



- Loads over the 2018-2022 period exhibit an overall declining trend as customer growth is offset by declining average use per customer primarily driven by conservation activities

[1] Wholesale Purchase Load

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ENERGY PURCHASES



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget
Commodity Charges	2,333	2,496	2,429	2,424
Transmission Charges	335	363	378	391
Wholesale Service Charges	96	80	162	161
Rural Rate Assistance	12	12	12	12
Total Energy Purchases	**2,776**	**2,951**	**2,981**	**2,988**
Total $/kWh	**0.1182**	**0.1245**	**0.1236**	**0.1275**

- Energy Purchases are a pass-through and are collected through Revenue as Energy Sales

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OTHER REVENUES



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	Variance
Pole, Ducts and Other Rentals	18	21	21	21	-
Customer Demand Work	18	16	16	17	1
Reclaimed Materials	15	8	12	12	-
Street Lighting	9	10	9	9	-
Subtotal Customer Demand Work	**60**	**55**	**58**	**59**	**1**
Customer Charges	7	6	7	7	-
Late Payment Charges	2	3	3	4	1
Capital Contribution	12	17	16	16	-
Regulatory Deferral Accounts	4	1	-	-	-
Other	1	2	1	1	-
Total Revenues	**86**	**84**	**85**	**87**	**2**

- Increase in Other Revenues primarily due to higher late payment fees and customer demand work

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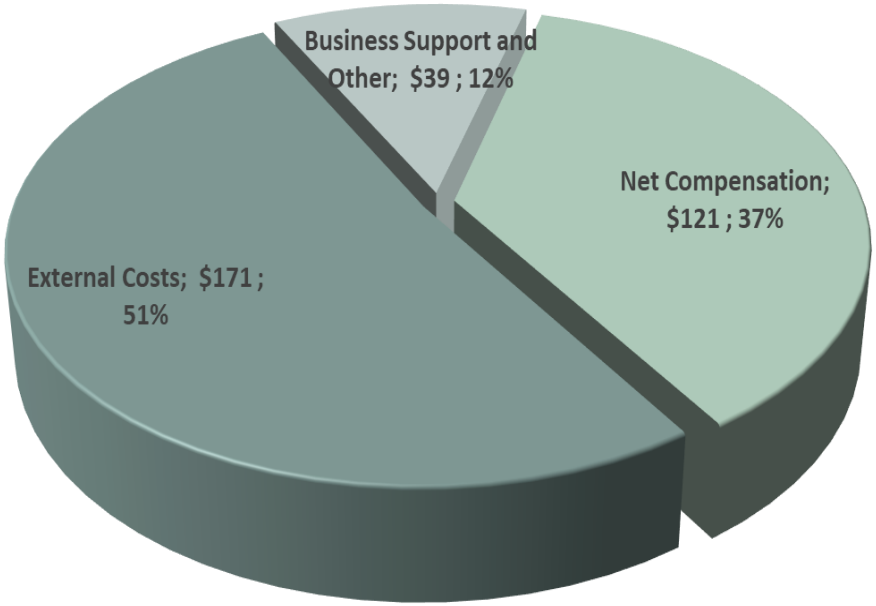
OPERATING EXPENSES



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	Variance
Net Compensation	108	118	106	121	15
External Costs	152	157	162	171	9
Business Support and Other	48	41	35	39	4
Total Operating Expenses	**308**	**316**	**303**	**331**	**28**

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NET COMPENSATION



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	Variance
Payroll	165	178	171	192	21
Benefits	41	47	42	49	7
Capitalization	(98)	(107)	(107)	(120)	(13)
Net Compensation	**108**	**118**	**106**	**121**	**15**

- Increase in net compensation costs due to increase in number of headcount

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EXTERNAL COSTS



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	Variance
Maintenance of Facilities	13	10	12	14	2
IT External Consultants	7	7	7	7	-
IT Maintenance Contracts	27	29	30	32	2
Call Centre (Outsourced)	6	6	8	9	1
Distribution System Maintenance & Materials	74	75	78	81	3
Professional Services	9	12	8	8	-
Administrative and General Expenses	12	13	13	13	-
Collections Services & Processing	3	3	4	5	1
Miscellaneous	1	2	2	2	-
Total External Costs	**152**	**157**	**162**	**171**	**9**

- Increase in External Costs due to ramp-up of the distribution system maintenance program, Cyber and Physical security programs.

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BUSINESS SUPPORT & OTHER COSTS



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	Variance
Utilities and Communication	6	7	8	8	-
Office Supplies and Postage	6	7	7	7	-
Employee Expenses	1	2	2	2	-
Rental and Leases	1	1	1	1	-
Bad Debt	7	5	2	5	3
OEB Fees	3	4	4	4	-
Insurance	5	6	6	6	-
Property Taxes and Other	5	5	5	5	-
Ancillary Services Costs	33	23	24	25	1
Capitalization, Allocation and Other	(19)	(19)	(24)	(24)	-
Total Business Support Costs	**48**	**41**	**35**	**39**	**4**

- Higher Business support and other costs due to increase in bad debt expense. 2022 Forecast reflects the reversal of $3.0M of COVID related bad debt expense.

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DEPRECIATION & AMORTIZATION



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	Variance
Total Depreciation and Amortization	288	300	303	267	(36)

- Decrease in depreciation and amortization expenses due to change in assets useful life as a result of new depreciation study

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FINANCE

COSTS



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	Variance
Interest on Short and Long Term Debt	86	88	89	108	19
Capitalized Interest	(5)	(7)	(7)	(8)	(1)
Financing Costs and Other	2	3	2	(1)	(3)
Total Finance Costs	**83**	**84**	**84**	**99**	**15**

- 2022 Forecast updated for 30 year debenture issued October 13, 2022 for $300M at 4.95%
- 2023 Budget includes a $250M debt replacement and $200M new debenture to be issued on July 1st, 2023 at 5.45%

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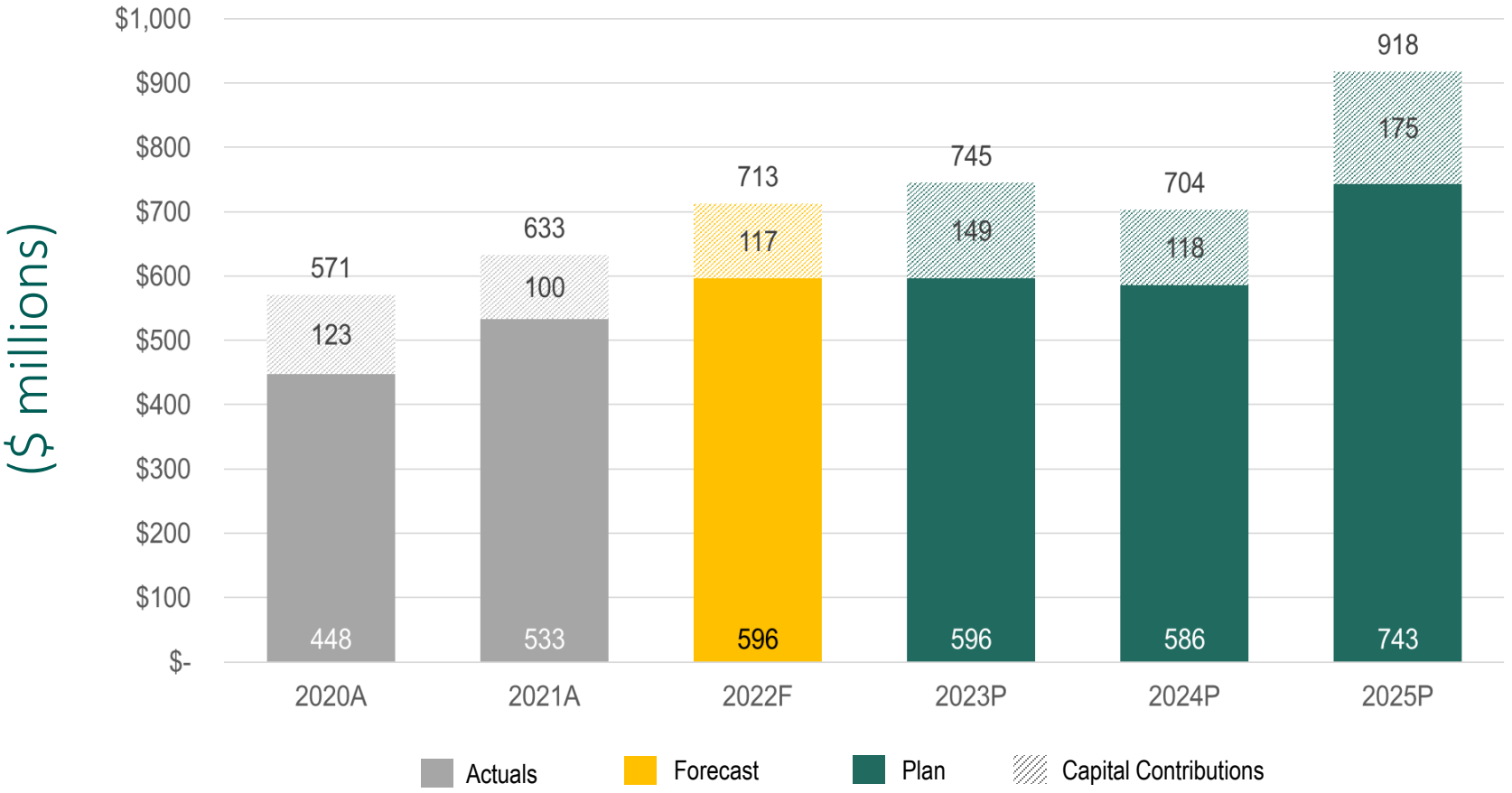
CAPITAL EXPENDITURES (GROSS vs NET*)





*Net of capital contributions received

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CAPITAL EXPENDITURES



In millions of Canadian dollars	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	Variance
Infrastructure Renewal	268	319	334	347	13
Reactive Capital	43	46	40	43	3
Customer Connections	125	98	117	140	23
Hydro One Contributions	20	26	22	17	(5)
Copeland Transformer Station	35	25	25	11	(14)
IT, Fleet and Facilities	73	101	104	94	(10)
Externally Initiated Plant Relocations & Expansions	68	94	67	84	17
Provincial Allocations and Other	1	7	4	9	5
Gross Capital Expenditures	**633**	**716**	**713**	**745**	**32**
Capital Contributions	(100)	(142)	(117)	(149)	(32)
Net Capital Expenditures	**533**	**574**	**596**	**596**	**-**

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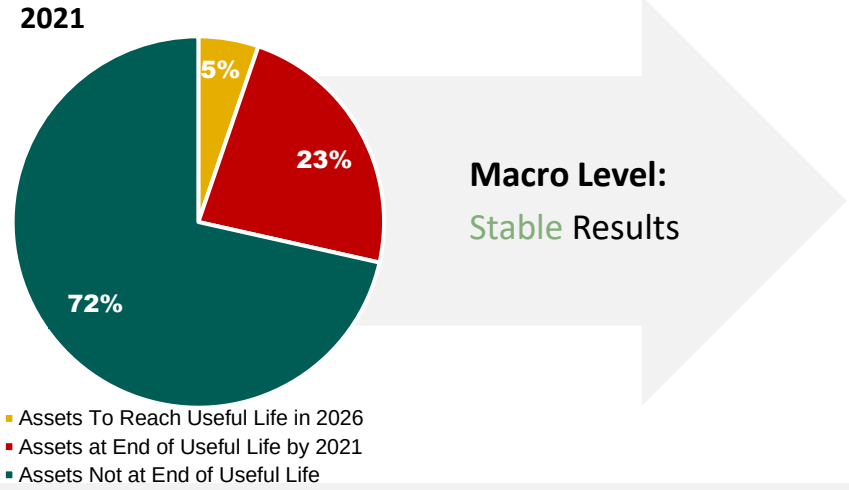
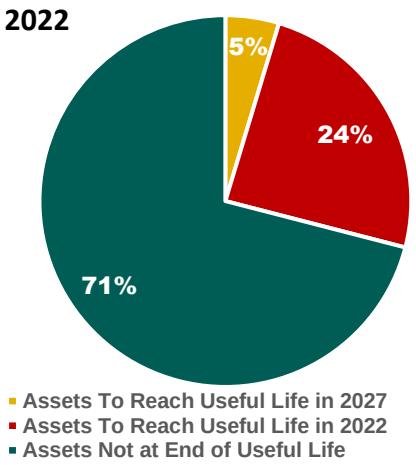
SYSTEM RENEWAL



Leading Indicator: Assets Past Useful Life (Age)

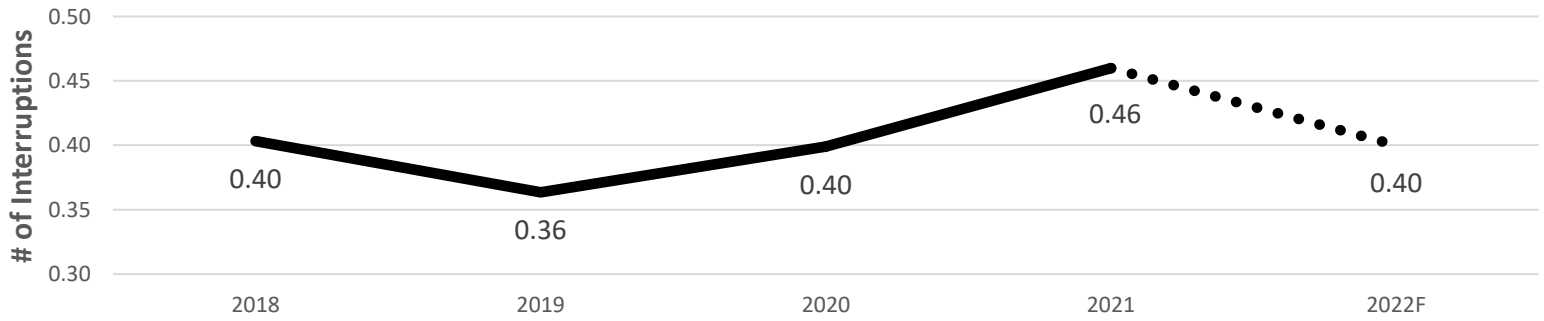


Macro Level:
Stable Results



Micro Level:
Slight deterioration for some asset types (e.g. underground cable). Similar deterioration for some asset condition results.

Lagging Indicator: System Average Interruption Frequency Index (SAIFI-Defective)



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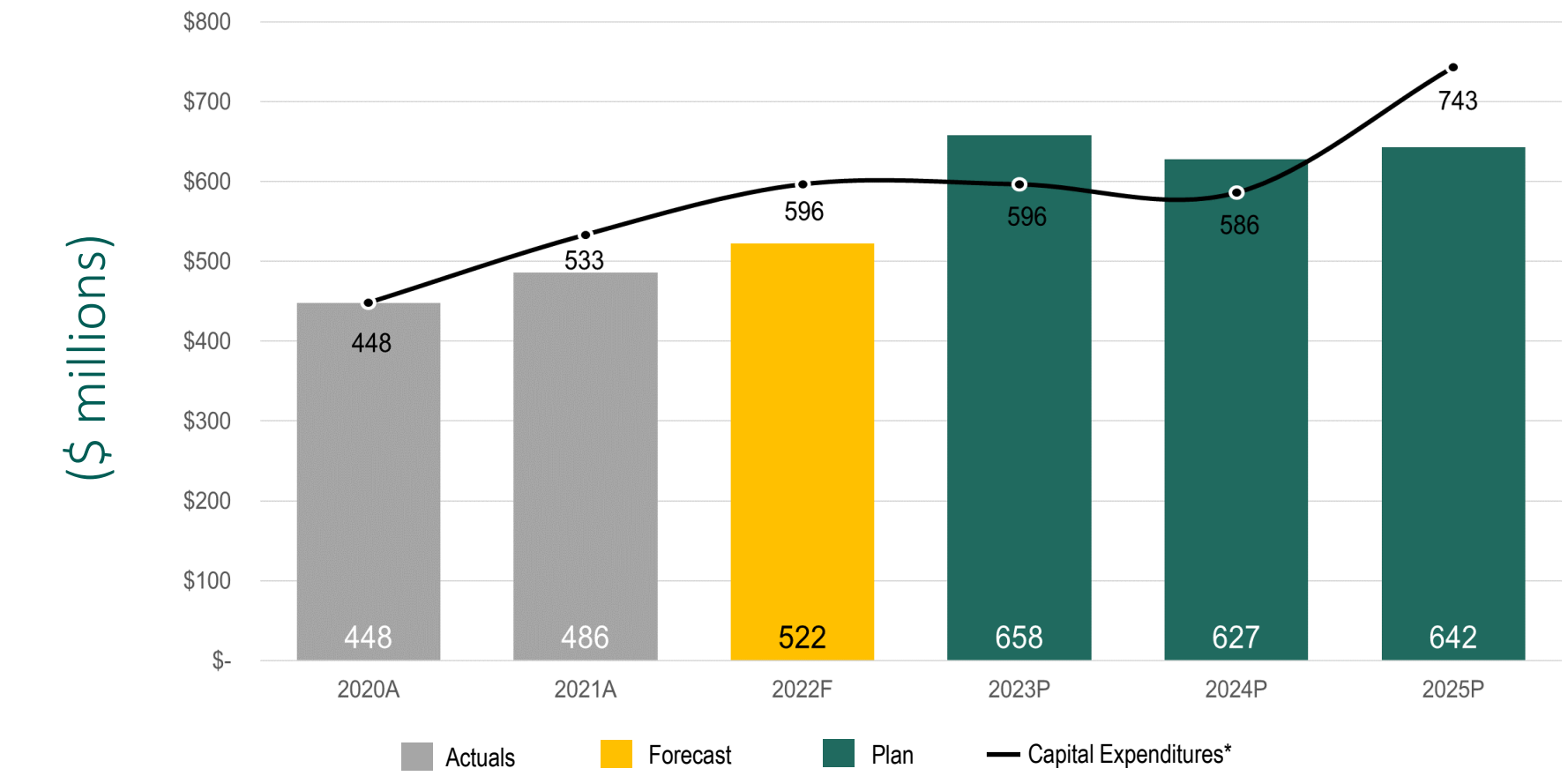
IN-SERVICE ADDTIONS* AND CAPITAL EXPENDITURES



* Net of capital contributions received

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UNREGULATED



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2023 STATEMENT OF INCOME

UNREGULATED



Statements of Income In millions of Canadian dollars For the year ending December 31, 2023	[redacted]	Regulated	[redacted]
Energy sales		2,988	
Distribution revenue		827	
Other revenues		87	
Total revenues		**3,902**	
Energy purchases		2,988	
Operating expenses		331	
Depreciation and amortization		267	
Total expenses		**3,586**	
Finance costs		99	
Gain on disposals of property, plant and equipment		1	
Income/(loss) before income taxes		**218**	
Income tax (expense)/recovery		45	
Net movements in regulatory balances		(71)	
Net movements in regulatory balances arising from deferred taxes		50	
Net income after net movements in regulatory balances		**152**	

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OTHER REVENUES



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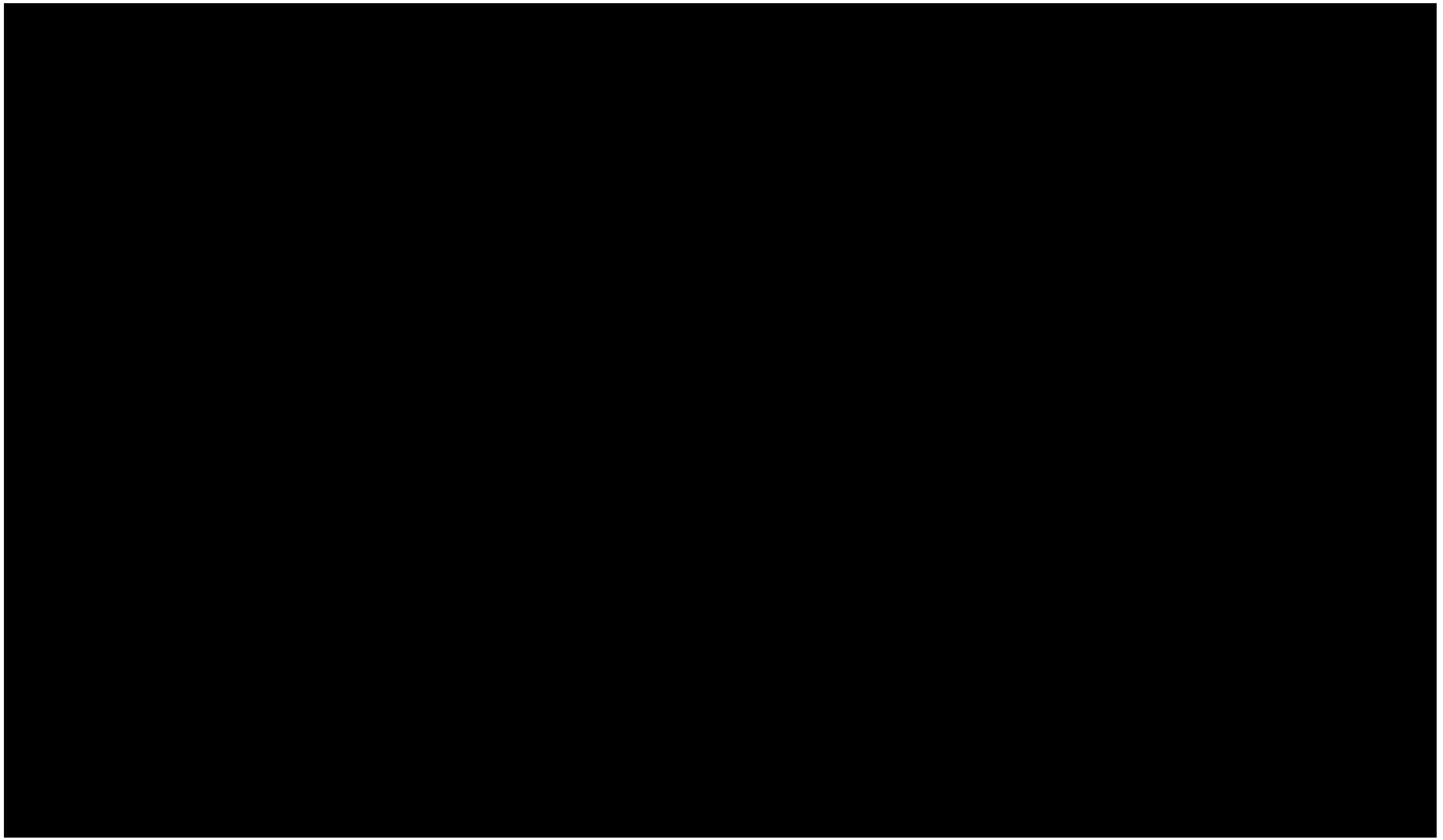
OPERATING EXPENSES



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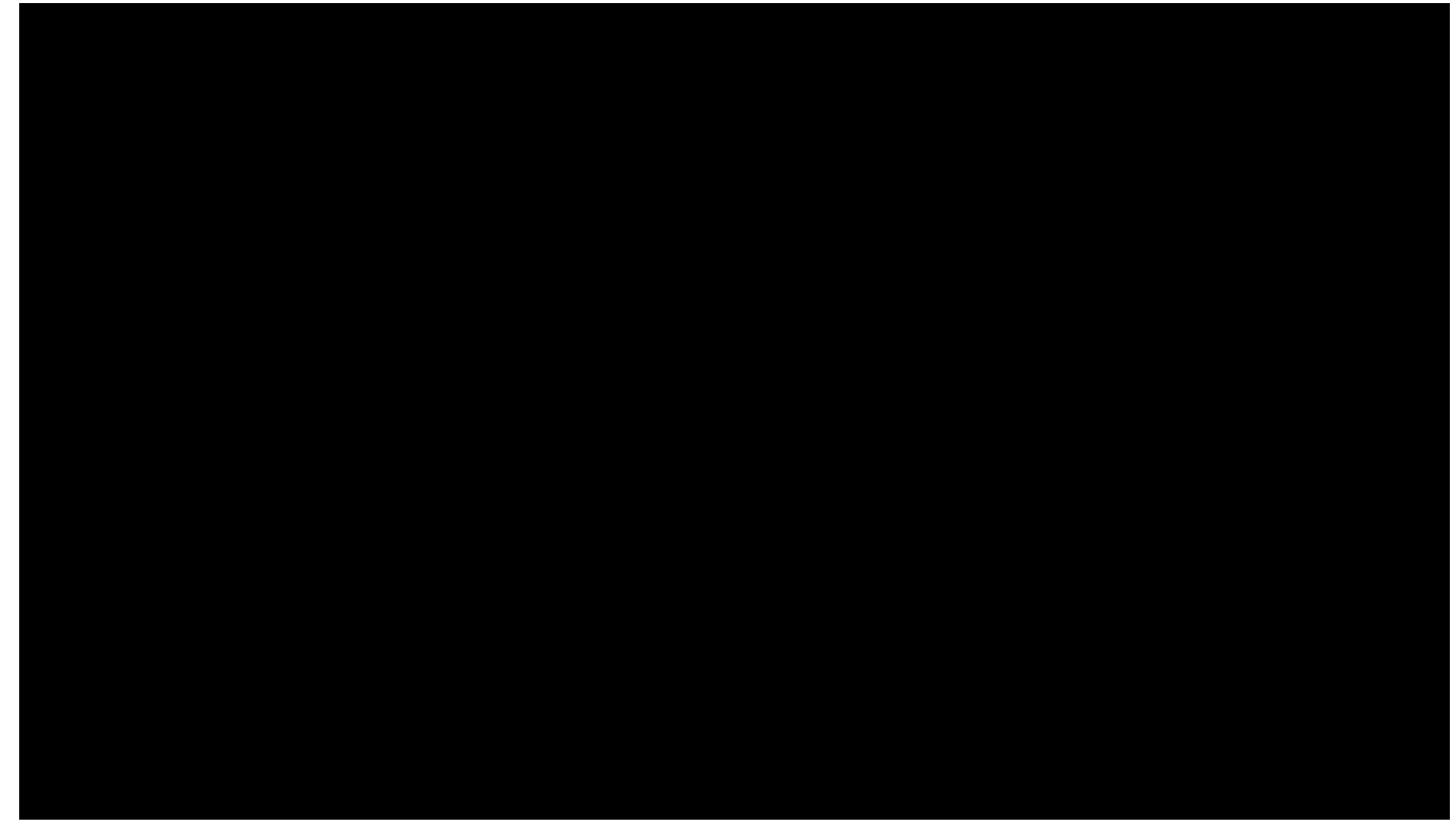
CAPITAL EXPENDITURES



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FINANCIAL STATEMENTS PROFORMAS



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CONSOLIDATED
STATEMENTS OF INCOME



Consolidated Statements of Income In millions of Canadian dollars For the years ended December 31	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	2024 Budget	2025 Budget
Energy sales	2,702	2,951	2,888	2,988	3,066	3,136
Distribution revenue	759	750	750	827	913	891
Other revenues	106	101				
Total revenues	**3,567**	**3,802**				
Energy purchases	2,775	2,951	2,981	2,988	3,066	3,136
Operating expenses	323	333				
Depreciation and amortization	293	306				
Total expenses	**3,391**	**3,590**				
Finance costs	79	81				
Gain on disposals of property, plant and equipment	3	1	1	1	1	1
Income/(loss) before income taxes	**100**	**132**				
Income tax (expense)/recovery	22	40				
Net movements in regulatory balances	54	32	121	(71)	(120)	23
Net movements in regulatory balances arising from deferred taxes	9	32	6	50	50	50
Net income after net movements in regulatory balances	**141**	**156**				

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CONSOLIDATED
BALANCE SHEETS



Consolidated Balance Sheets In millions of Canadian dollars As at December 31	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	2024 Budget	2025 Budget
Assets						
Current						
Accounts receivable	219	281				
Unbilled revenue	240	330				
Other assets	31	36				
Total current assets	**490**	**647**				
Property, plant, equipment and intangible assets	5,735	6,179				
Other assets	7	5				
Total assets	**6,232**	**6,831**				
Regulatory balances	181	189	267	271	226	272
Total Assets and regulatory balances	**6,413**	**7,020**				
Liabilities and Equity						
Current						
Working capital facility and commercial paper	284	269				
Debentures	-	250				
Other liabilities	524	656				
Total current liabilities	**808**	**1,175**				
Debentures	2,430	2,380				
Deferred tax liabilities	64	111				
Other liabilities	977	1,144				
Total liabilities	**4,279**	**4,810**				
Equity						
Share capital	818	818				
Retained earnings	1,165	1,233				
Total equity	**1,983**	**2,051**				
Total liabilities and equity	**6,262**	**6,861**				
Regulatory balances	151	159	218	243	268	241
Total liabilities, equity and regulatory balances	**6,413**	**7,020**				

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CONSOLIDATED
STATEMENTS OF CASH FLOWS



Consolidated Statements of Cashflows in millions of Canadian dollars Year ended December 31	2021 Actual	2022 Budget	2022 Forecast	2023 Budget	2024 Budget	2025 Budget
Operating Activities						
Net income after net movements in regulatory balances	141	156	[redacted]			
Net movements in regulatory balances	(54)	(32)	(121)	71	120	(23)
Net movements in regulatory balances arising from deferred taxes	(9)	(32)	(6)	(50)	(50)	(50)
Depreciation, amortization and other changes	400	416	[redacted]			
Capital contribution received	101	147	119	149	118	175
Changes in non-cash operating working capital balances	8	67	[redacted]			
Net cash provided by operating activities	**587**	**722**				
Investing Activities						
Purchase of property, plant, equipment and intangible assets	(603)	(722)	[redacted]			
Proceeds on disposal of property, plant, and equipment	3	1	1	1	1	1
Net cash used in investing activities	**(600)**	**(721)**	[redacted]			
Financing Activities						
Increase (decrease) in commercial paper, net	115	(40)	[redacted]			
Dividends paid	(70)	(79)				
Proceeds from issuance of debentures net of debt issuance costs paid	348	199				
Repayment of debentures	(300)	-				
Interest paid	(82)	(81)				
Net cash provided by (used in) financing activities	**11**	**(1)**				
Net change in cash and cash equivalents during the year	**(2)**	**-**				
Working capital facility, beginning of year	(6)	-				
Working capital facility, end of year	**(8)**	**-**				

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2023 CORPORATE PERFORMANCE SCORECARD

SUBJECT TO APPROVAL AND CHANGES BY THE HUMAN RESOURCES AND ENVIRONMENT COMMITTEE FOR RECOMMENDATION TO THE BOARD



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CORPORATE
2022-2023 SCORECARD



Pillar	KPI	2022 Weight	2023 Weight	Pillar Weight
Customer	New Services Connected on Time	5%	5%	Customer 15%
	Estimated Time of Restoration	5%	5%	
	First Contact Resolution	5%	5%	
People	Total Recordable Injury Frequency	10%	10%	People 15%
	Employee Engagement	5%	5%	
Env.	Building Emissions Reduction	5%	5%	Environment 10%
	Fleet Electrification	5%	5%	
Operations	SAIFI	10%	10%	Operations 20%
	SAIDI	10%	10%	
Financial	In-Service Assets	10%	10%	Finance 40%
	Cash Flow Management	5%	-	
	Consolidated Net Income	25%	30%	
		100%	100%	

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CONTINUOUS IMPROVEMENT FRAMEWORK





CUSTOMER



PEOPLE



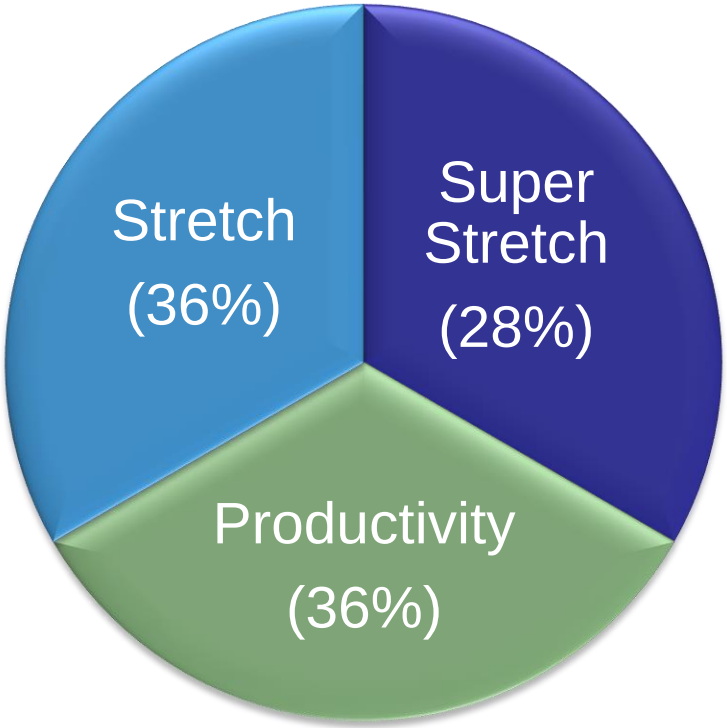
ENVIRONMENT



OPERATIONS



FINANCIAL



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Customer (15%)

- **New Services Connected on Time: 5%**
- **Estimated Time of Restoration (ETOR): 5%**
- **First Contact Resolution: 5%**

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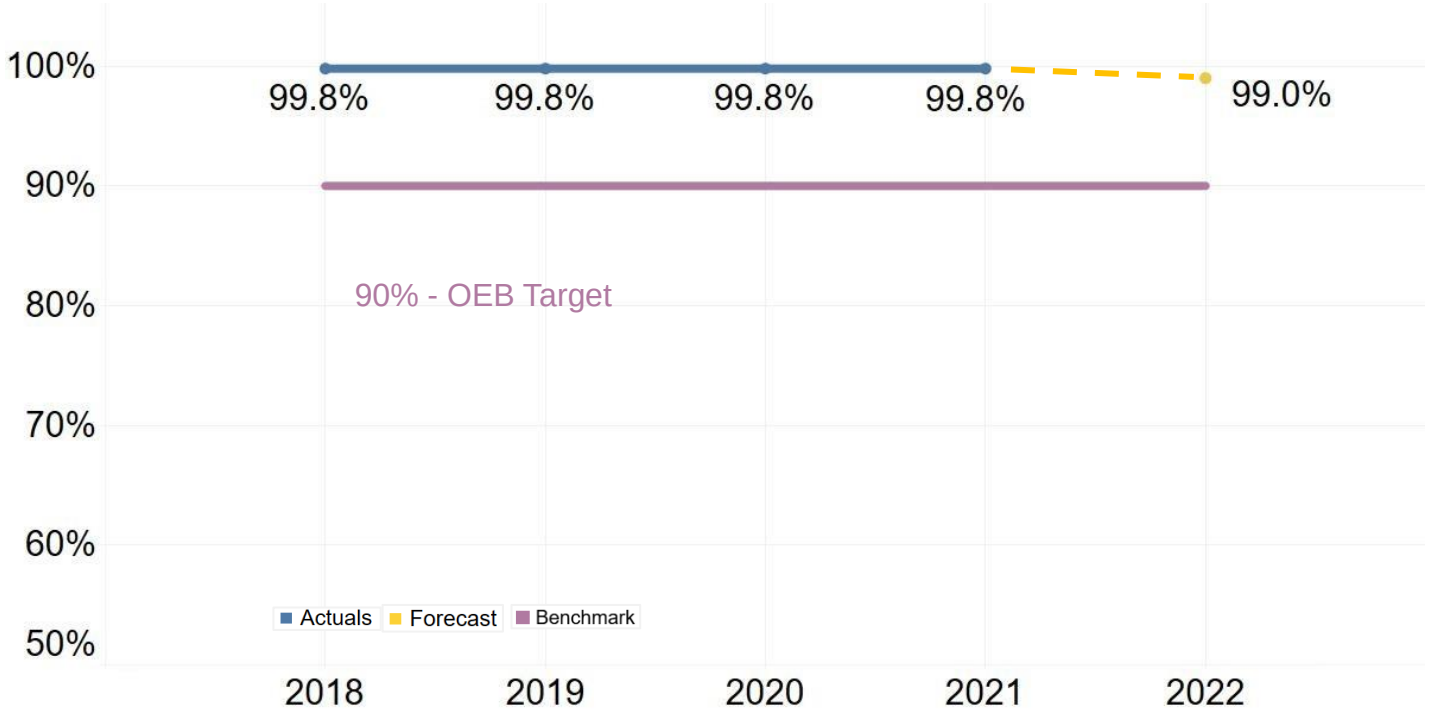
NEW SERVICES CONNECTED ON TIME (5%)

Continuous Improvement



Stretch





CUSTOMER

Percentage of new service requests (high voltage, low voltage and upgrades) connected on time.*

%	2022	2023
Threshold	93%	93%
Target	98%	98%
Stretch	99%	99%

**High Voltage Connections added to the scope in 2023*

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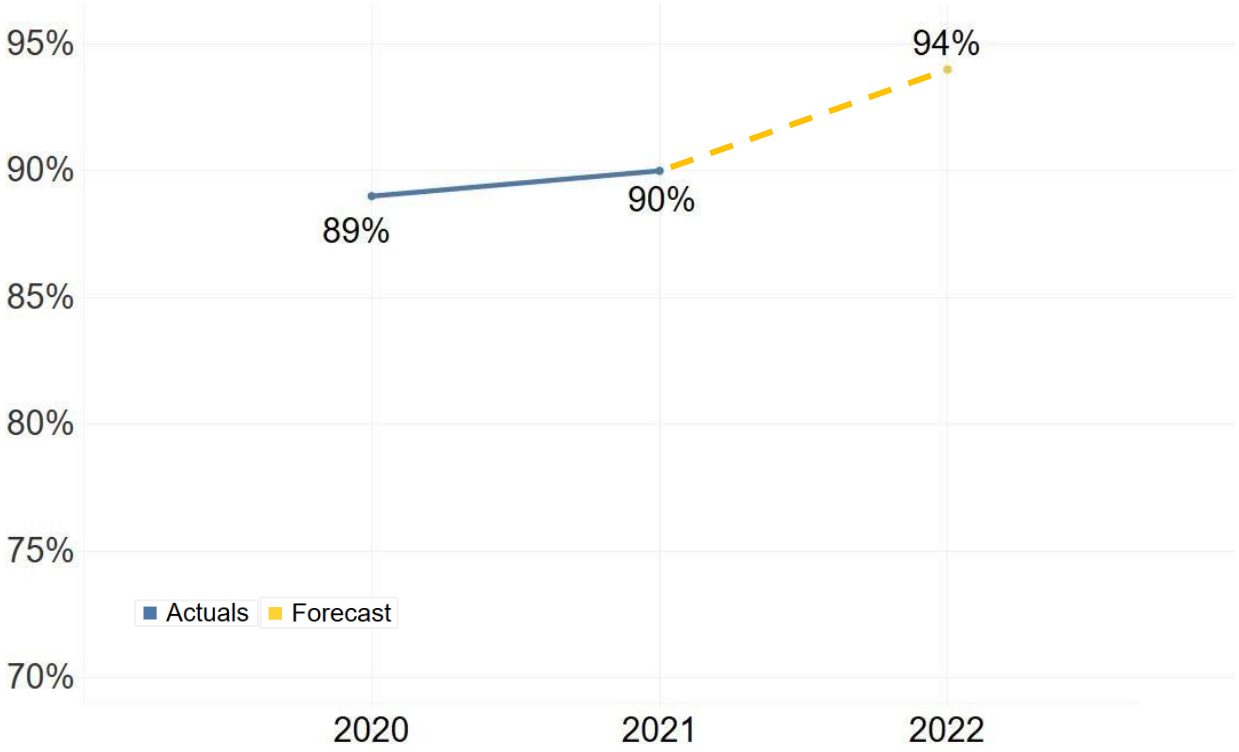
ESTIMATED TIME OF RESTORATION (ETOR) (5%)

Continuous Improvement



Stretch





CUSTOMER

A composite measure of the percentage of power outages that are assigned an Estimated Time of Restoration (ETOR) within 60 minutes and the accuracy of ETORs within +/- 120 minutes*

%	2022	2023
Threshold	80%	80%
Target	85%	85%
Stretch	90%	90%

**Scope expanded to provide accurate and timely ETORs for all events on Outage Map.*

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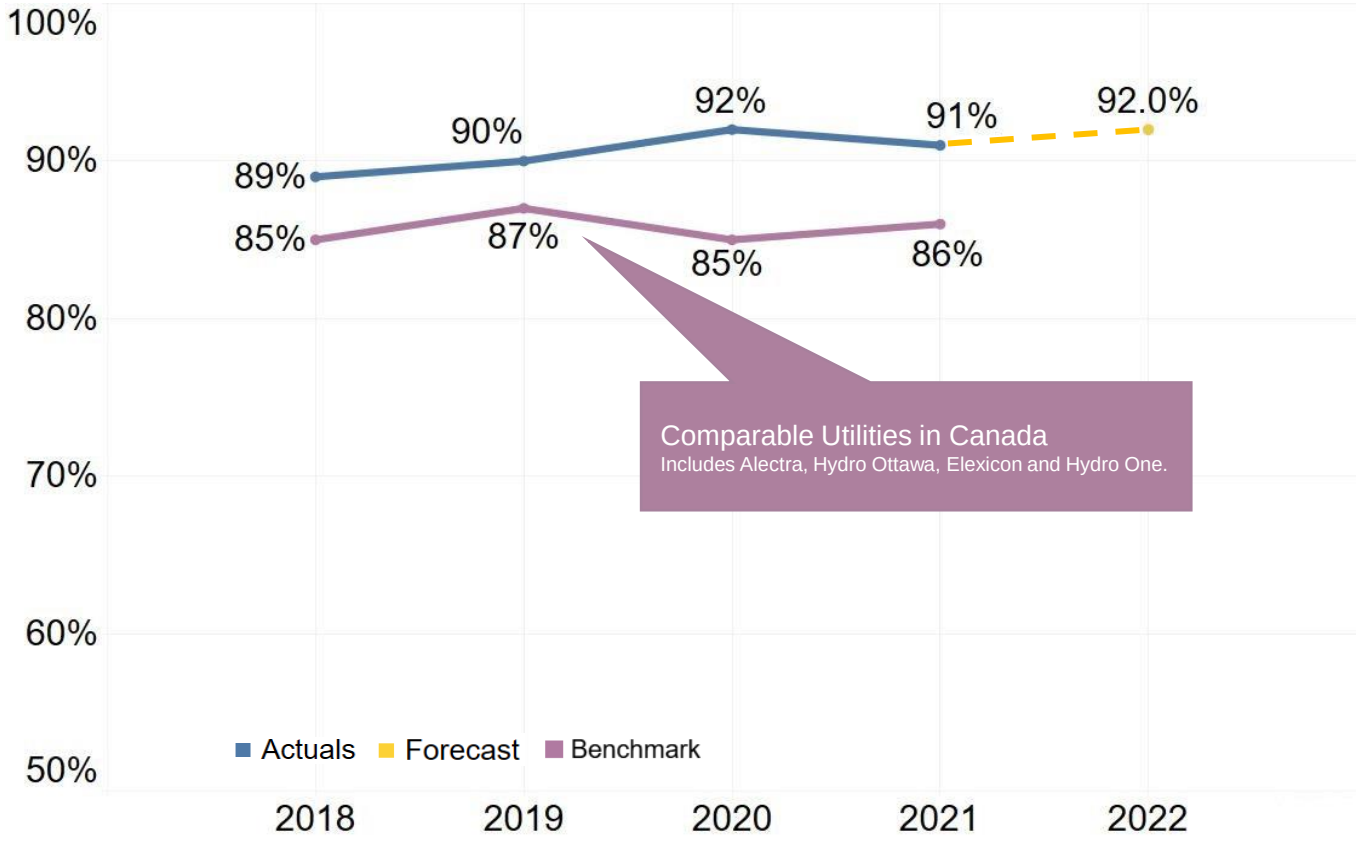
FIRST CONTACT RESOLUTION (5%)

Continuous Improvement

Productivity



CUSTOMER

Percentage of telephone and email enquiries resolved in one contact, within a 21 day time period.

%	2022	2023
Threshold	82%	82%
Target	86%	86%
Stretch	88%	88%

Anticipated higher volume of disconnects and collections required in 2023

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People (15%)

- **Total Recordable Injury Frequency: 10%**
- **Employee Engagement: 5%**

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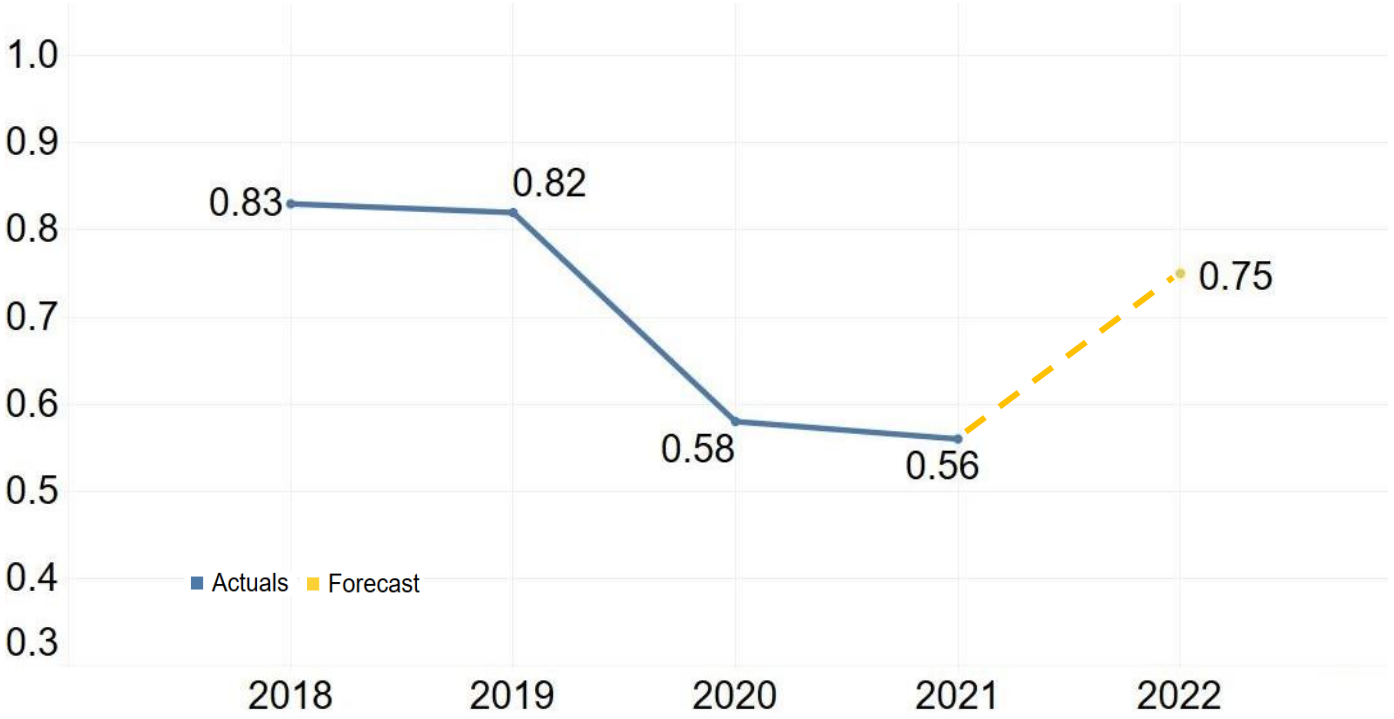
TOTAL RECORDABLE INJURY FREQUENCY (10%)

Continuous Improvement

Super Stretch



PEOPLE

Total Recordable Injury Frequency Rate, as per Electricity Canada Standard.

#	2022	2023
Threshold	1.15	1.05
Target	1.10	1.00
Stretch	1.05	0.95

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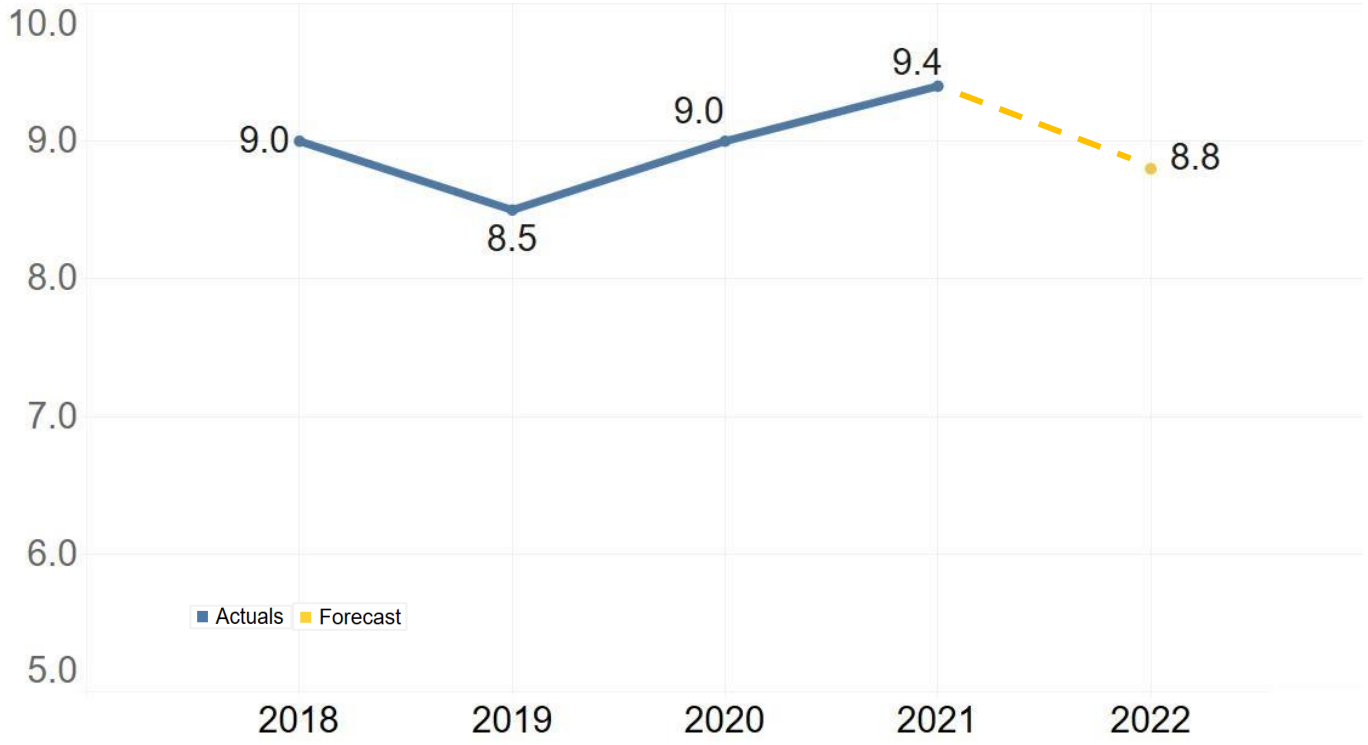
EMPLOYEE ENGAGEMENT (5%)

Continuous Improvement

Stretch



PEOPLE

Average number of engagement sessions attended per employee per year

#	2022	2023
Threshold	7.0	7.5
Target	7.5	8.0
Stretch	8.0	8.5

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Environment (10%)

- **Building Emissions Reduction: 5%**
- **Fleet Electrification: 5%**

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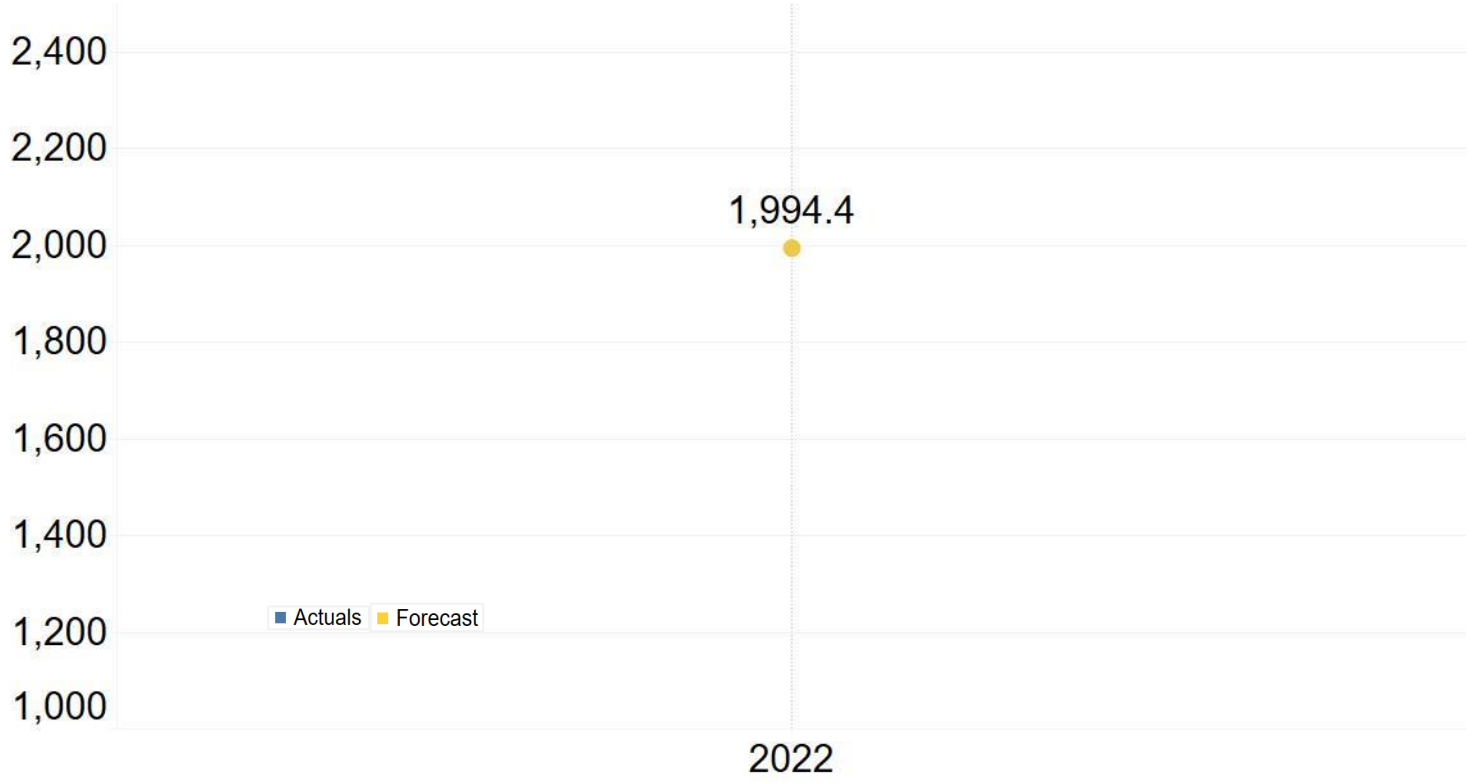
BUILDING EMISSIONS REDUCTION (5%)

Continuous Improvement



Stretch





ENVIRONMENT

Emissions from Toronto Hydro occupied work centres

tCO2e	2022	2023
Threshold	2235.7	2213.6
Target	2213.6	2191.5
Stretch	2191.5	2145.8

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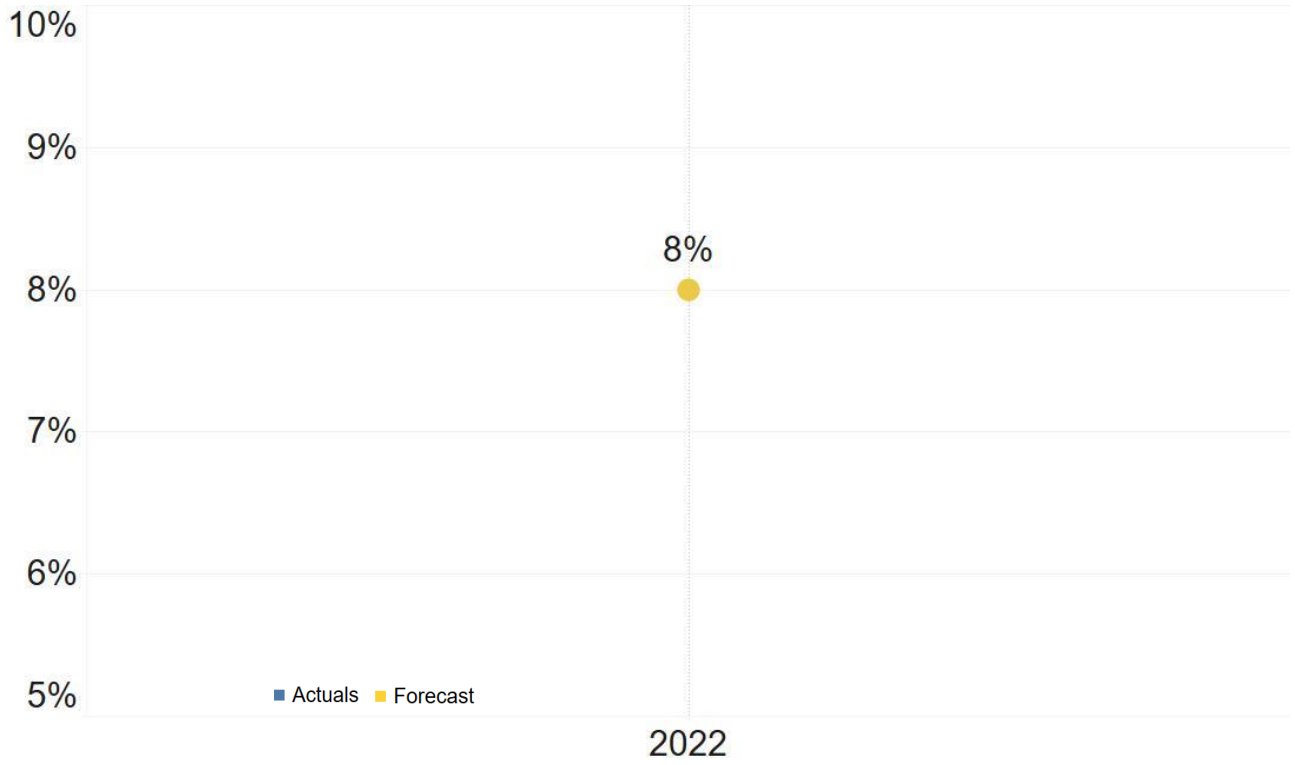
FLEET ELECTRIFICATION (5%)

Continuous Improvement

Super Stretch



ENVIRONMENT

Percentage of fleet (driving vehicles) that is either EV/hybrid.

%	2022	2023
Threshold	3%	11%
Target	5%	13%
Stretch	8%	15%

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Operations (20%)

- **Outage Frequency (SAIFI): 10%**
- **Outage Duration (SAIDI) : 10%**

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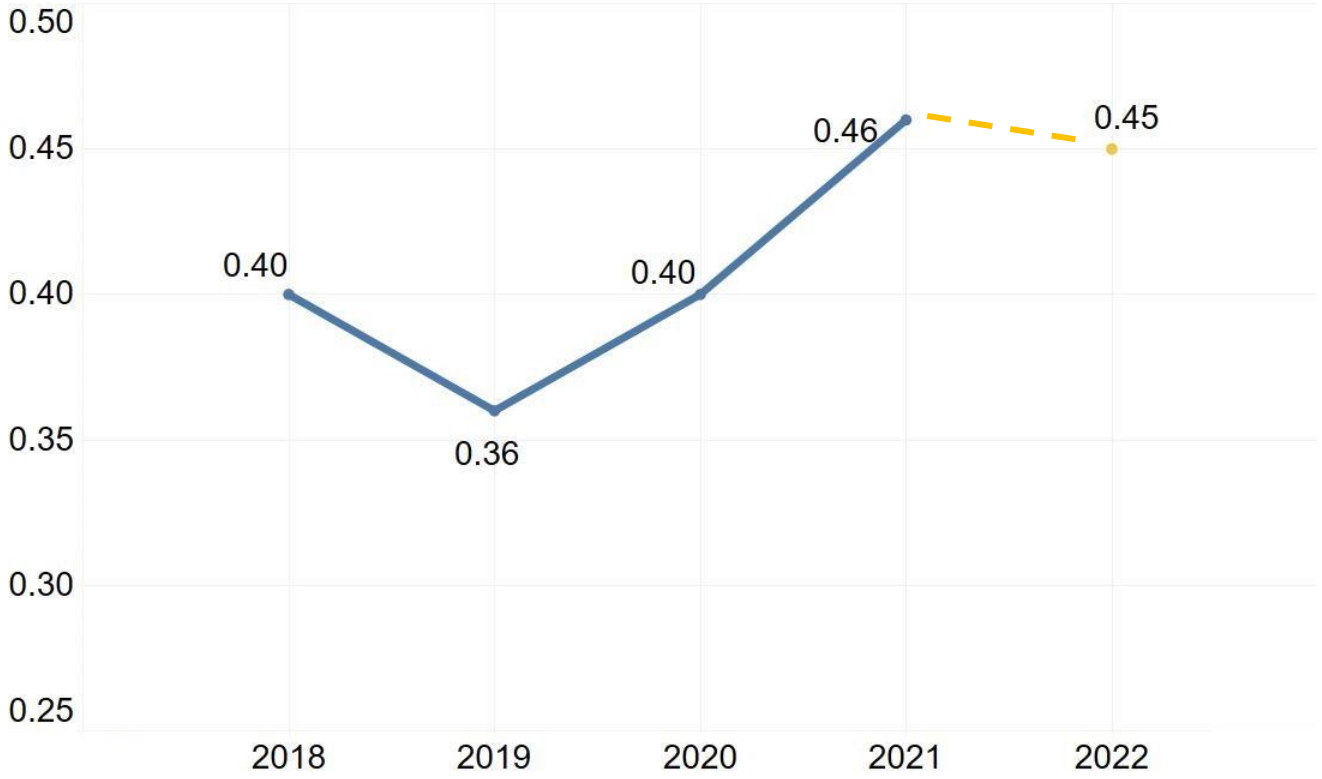
OUTAGE FREQUENCY – DEFECTIVE EQUIPMENT (10%)



OPERATIONS

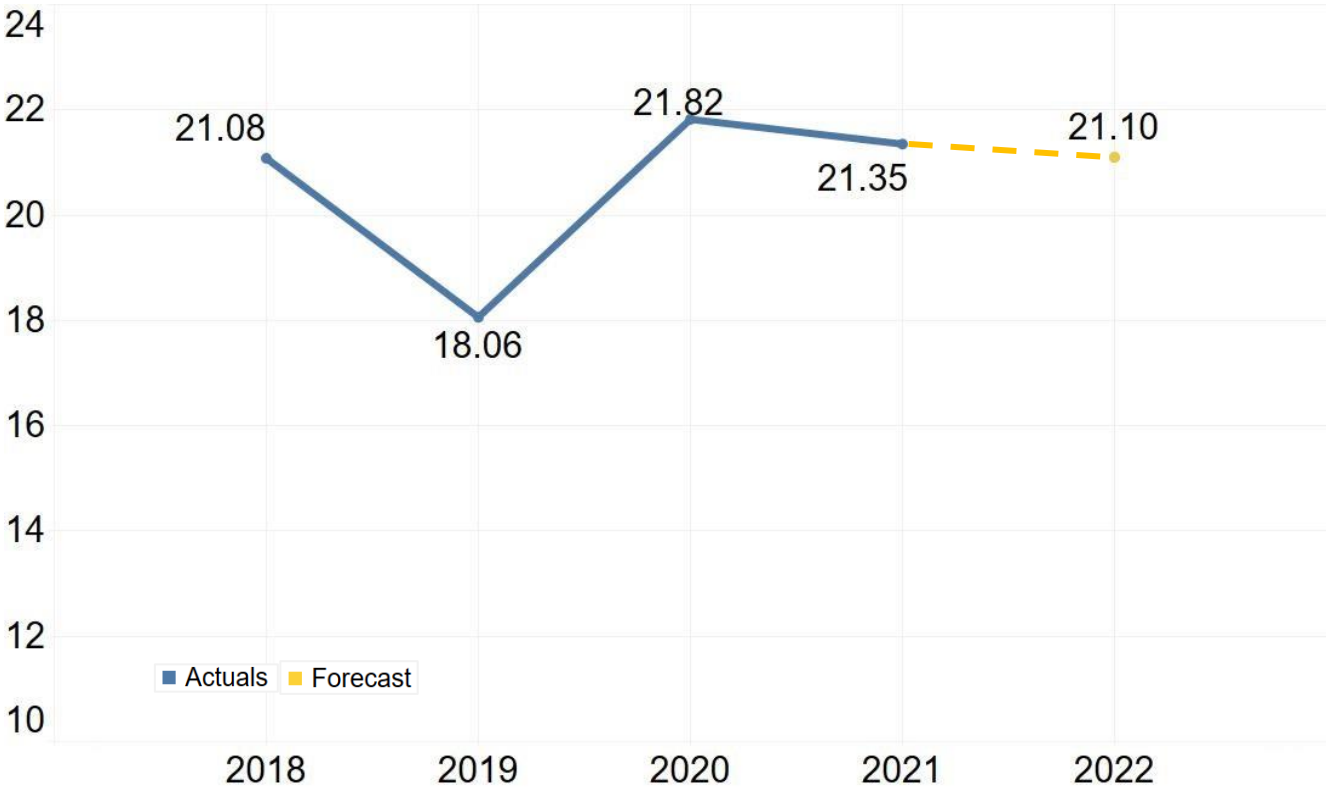
Average number of interruptions per customer; tracked using only the Defective Equipment cause code

#	2022	2023
Threshold	0.61	0.61
Target	0.50	0.50
Stretch	0.48	0.48

OUTAGE DURATION – DEFECTIVE EQUIPMENT (10%)

Continuous Improvement

Productivity



OPERATIONS

Average outage duration for each customer served; tracked using only the Defective Equipment cause code

Min	2022	2023
Threshold	32.20	32.20
Target	26.47	26.47
Stretch	25.23	25.23

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Financial (40%)

- **In-Service Assets: 10%**
- **Consolidated Net Income: 30%**

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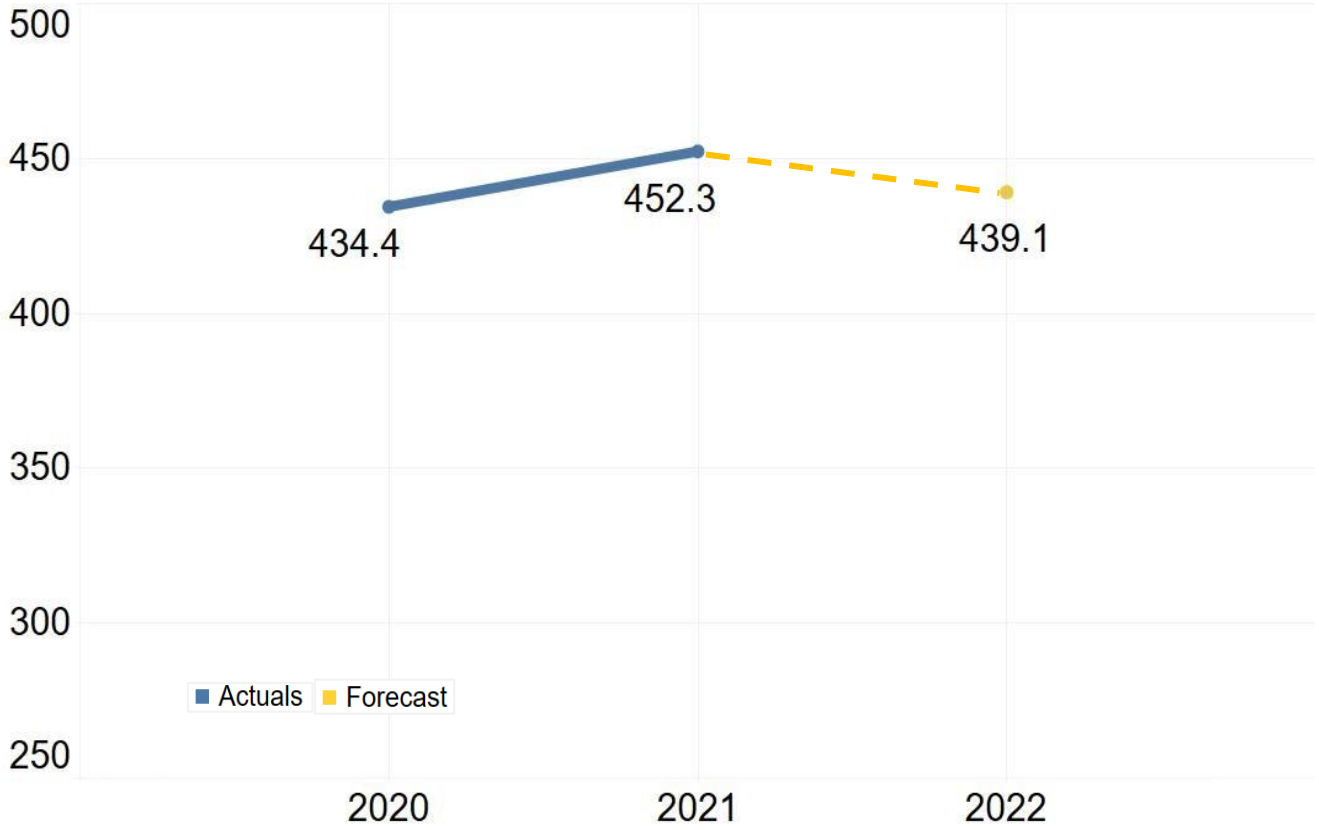
IN-SERVICE ASSETS (10%)

Continuous Improvement

Super Stretch



OPERATIONS

Measures the actual In-Service Asset amounts recognized in 2023 (net of capital contributions)

$M	2022	2023
Threshold	429.1	504.4
Target	434.1	509.4
Stretch	439.1	514.4

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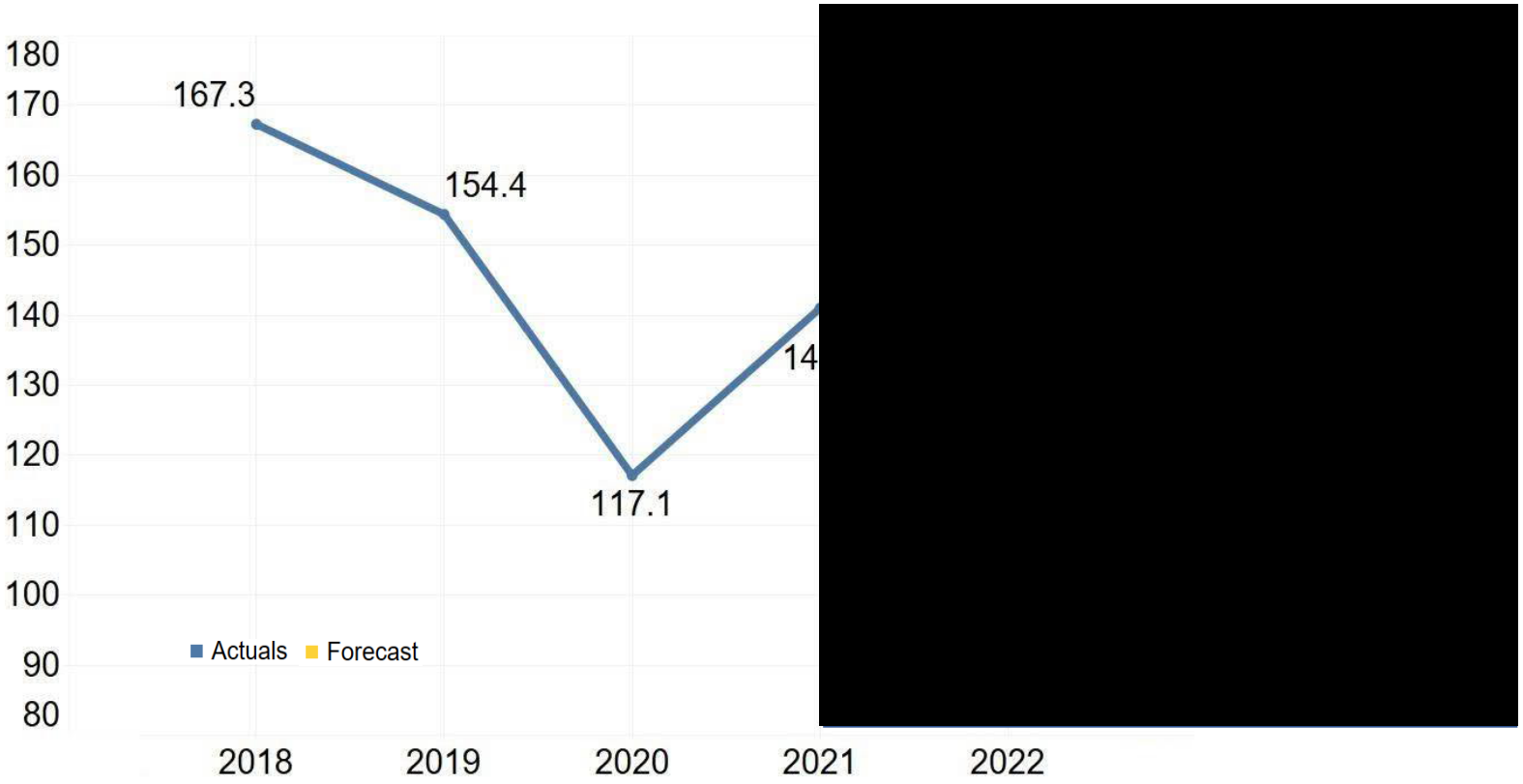
CONSOLIDATED NET INCOME (30%)

Continuous Improvement

Productivity



FINANCIAL

As per the audited financial statements for the 2023 fiscal year

$M	2022	2023
Threshold		
Target		
Stretch		

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2023 CORPORATE SCORECARD

Review and recommend for approval to the THC Board via HREC

Pillar	KPI	2023 Weight	2023 Threshold	2023 Target	2023 Stretch	2023 Continuous Improvement
Customer	New Services Connected on Time	5%	93%	98%	99%	
	Estimated Time of Restoration	5%	80%	85%	90%	
	First Contact Resolution	5%	82%	86%	88%	
People	Total Recordable Injury Frequency	10%	1.05	1.00	0.95	
	Employee Engagement	5%	7.5	8.0	8.5	
Env.	Building Emissions Reduction	5%	2213.6	2191.5	2145.8	
	Fleet Electrification	5%	11%	13%	15%	
Operations	SAIFI	10%	0.61	0.50	0.48	
	SAIDI	10%	32.20	26.47	25.23	
Financial	In-Service Assets	10%	504.4	509.4	514.4	
	Consolidated Net Income	30%	128	133	138	
		100%	25%	100%	150%	

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REGULATORY, COMPLIANCE, & RISK ASSESSMENT



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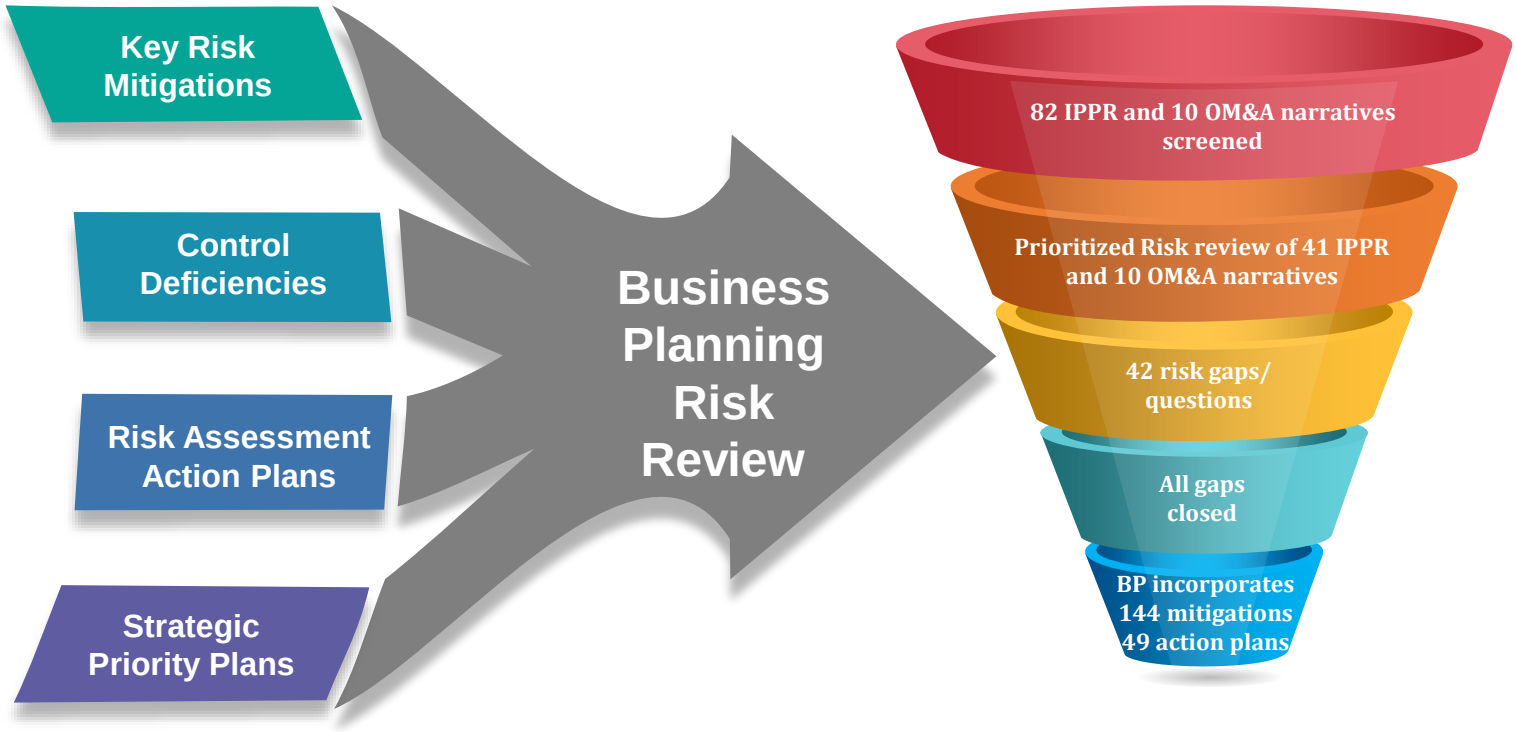
BUSINESS PLAN RISK REVIEW
INPUTS & FINDINGS



The Business Plan should support Toronto Hydro's strategic priorities and address the key risk mitigations and action plans identified during the risk assessment.

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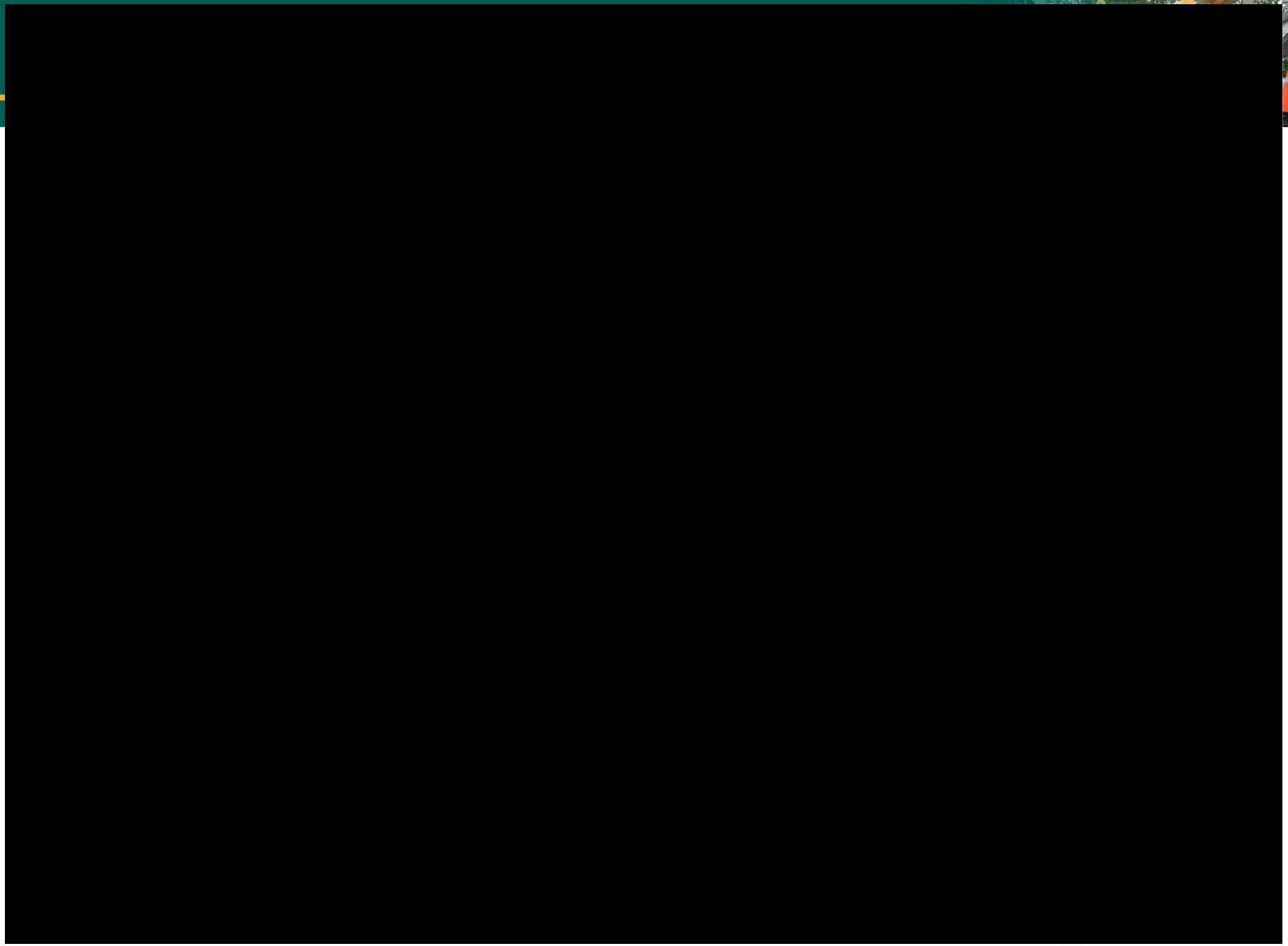

REGULATORY ALIGNMENT

2020-2024 DECISION



Distribution Capital	Alignment
Customer Connections	Improved
Externally Initiated Relocations	Stable
Load Demand	Stable
Metering	Stable
Generation Protection Monitoring & Control	Stable
Rear Lot Conversions	Stable
Box Construction	Improved
Underground Renewal Horseshoe	Caution
Underground Renewal Downtown	Stable
Overhead System Renewal	Caution
Network System Renewal	Improved
Stations Renewal	Stable
Reactive Capital	Stable
Energy Storage Systems	Stable
Stations Expansion	Improved
Copeland Phase 2	Stable
System Enhancements	Stable
Network Condition Monitoring & Control	Stable

General Plant Capital	Alignment
Fleet	Stable
Facilities	Stable
Information Technology	Stable
Control Center	Improved
ERP Phase 2	Improved
CIS Upgrade	Stable

Operational Plan	Alignment
Distribution Operations	Stable
System Maintenance	Stable
Corporate Services	Stable
Information Technology	Stable
Customer Operations	Stable

Improved

Stable

Caution

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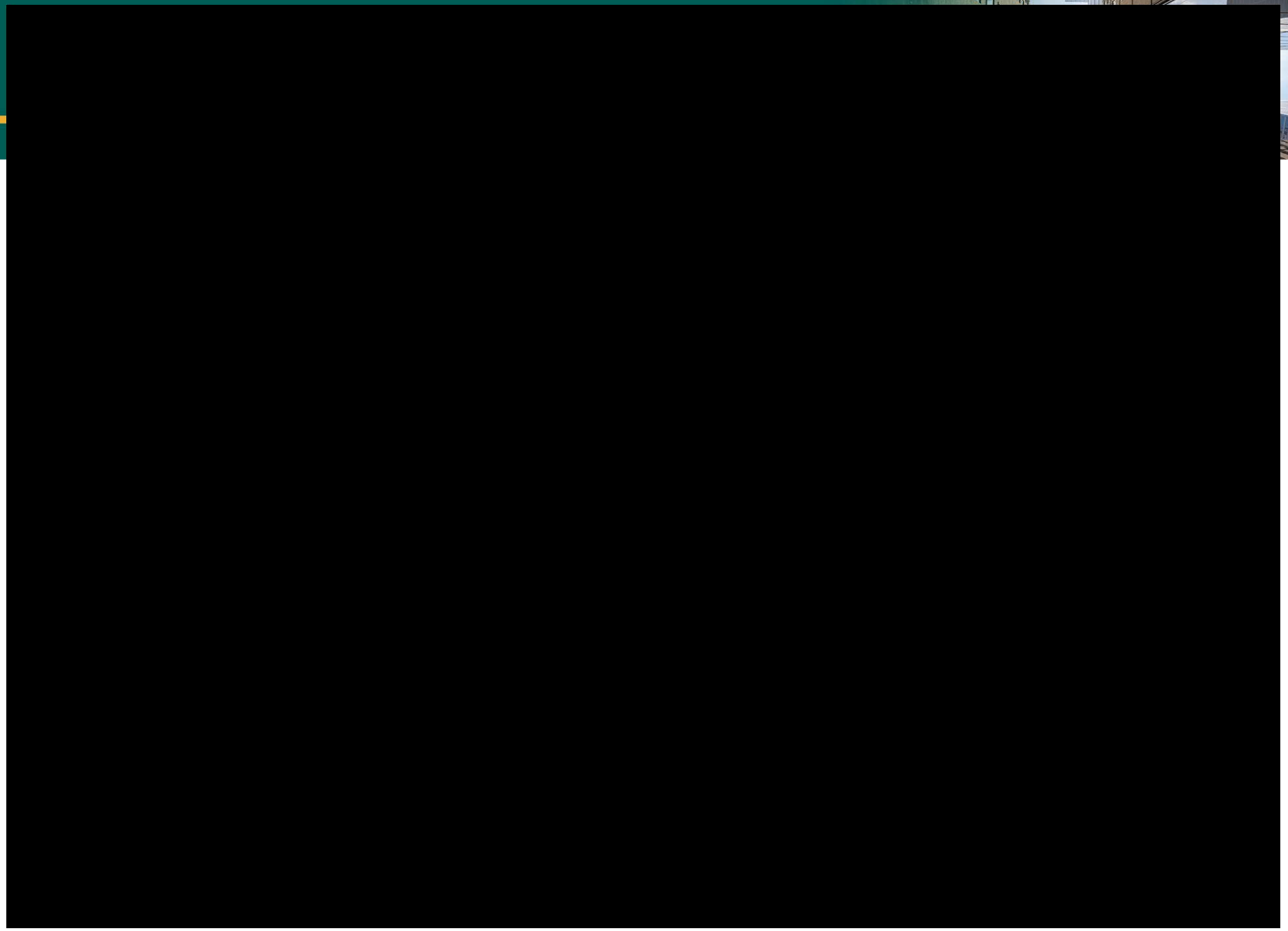

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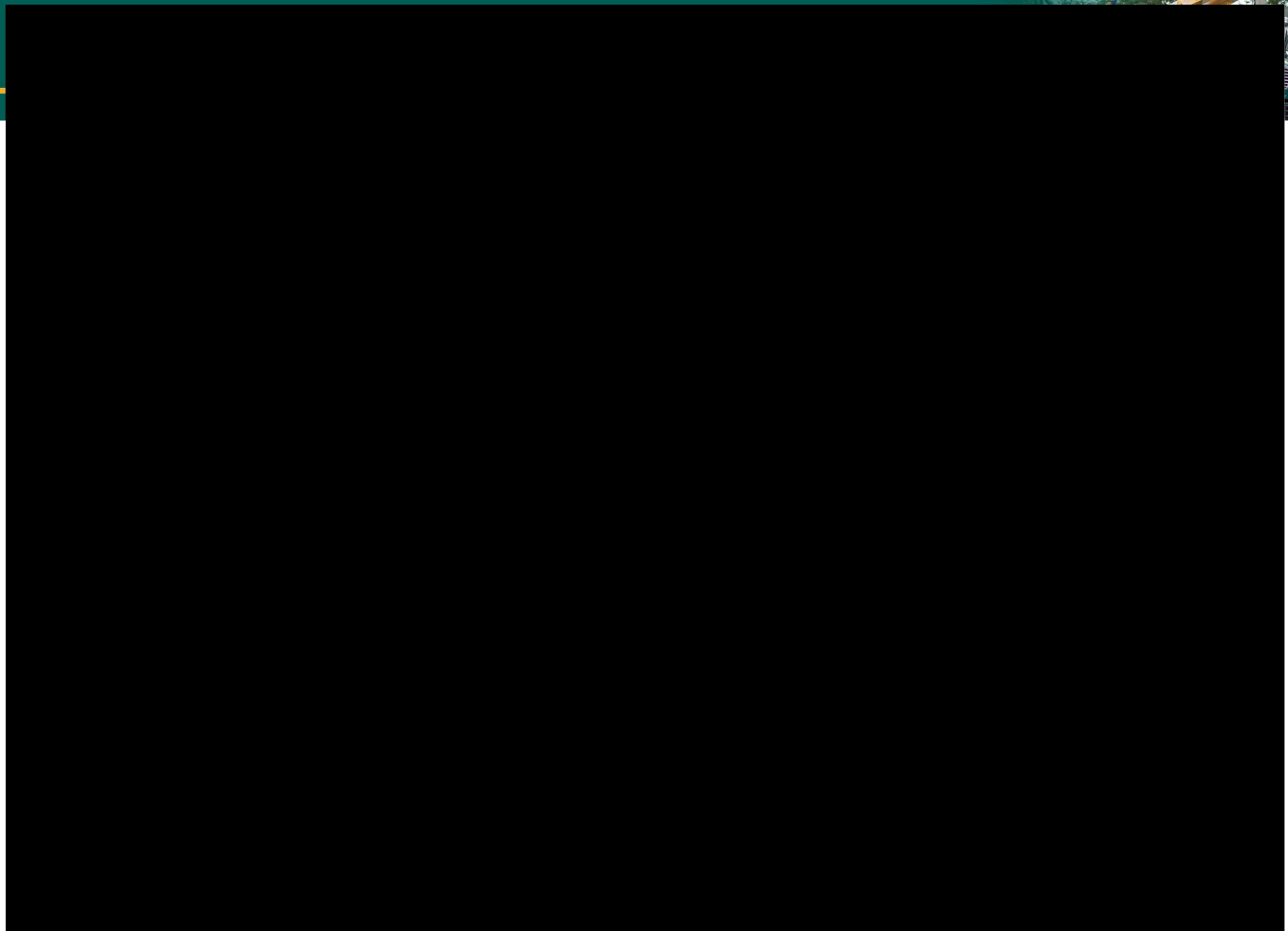
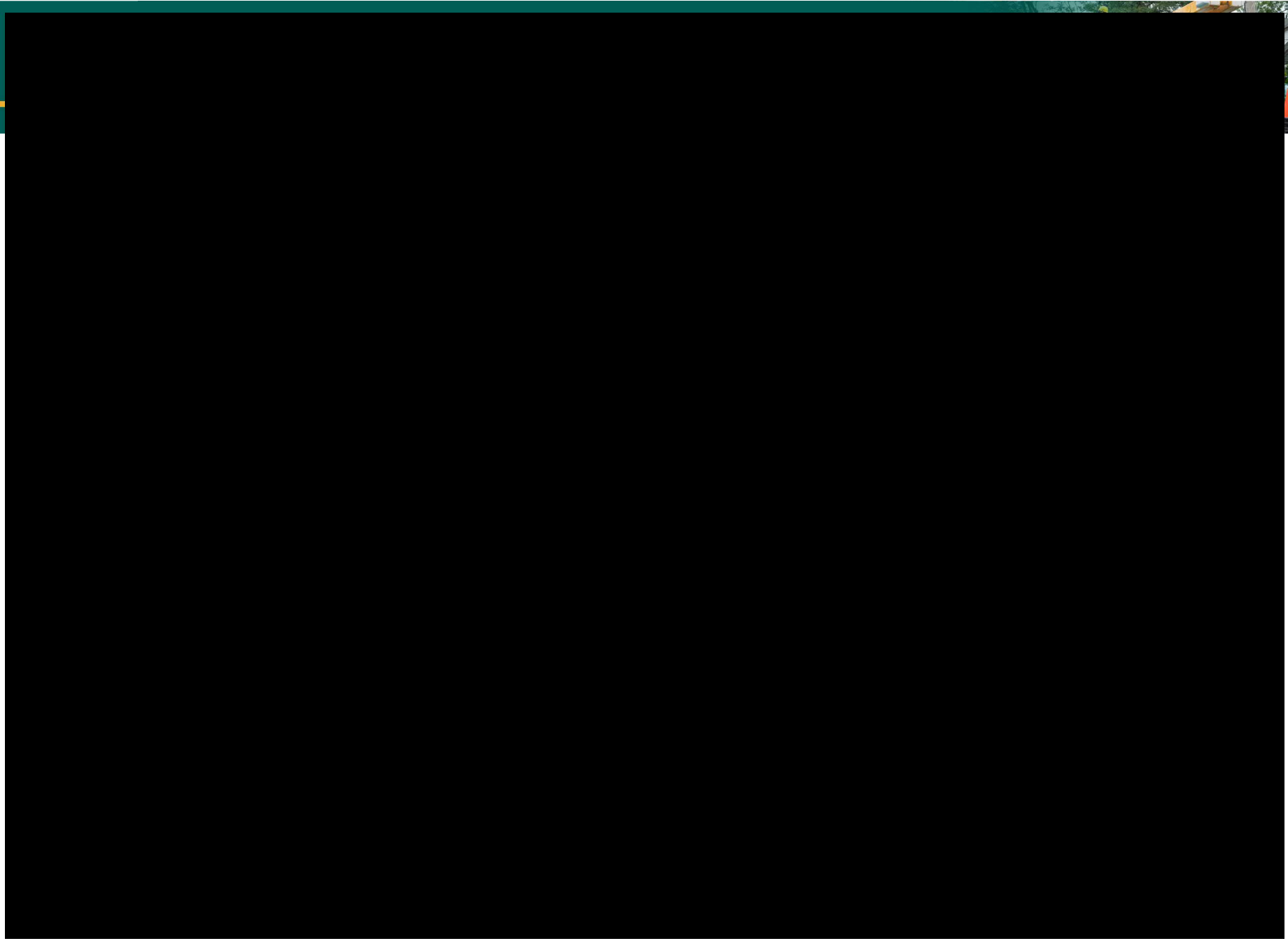
APPENDIX









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Interrogatory Responses
1A-CCC-1
FILED: March 11, 2024
64 Pages

2024-2026 BUSINESS PLAN

November 15th, 2023



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AGENDA

1. 2024-2026 Business Plan
2. Consolidated Financials
3. 2024 Budget by Entity
4. Regulatory, Compliance and Risk Assessment for 2024-2026 Business Plan
5. 2024 Corporate Performance Scorecard

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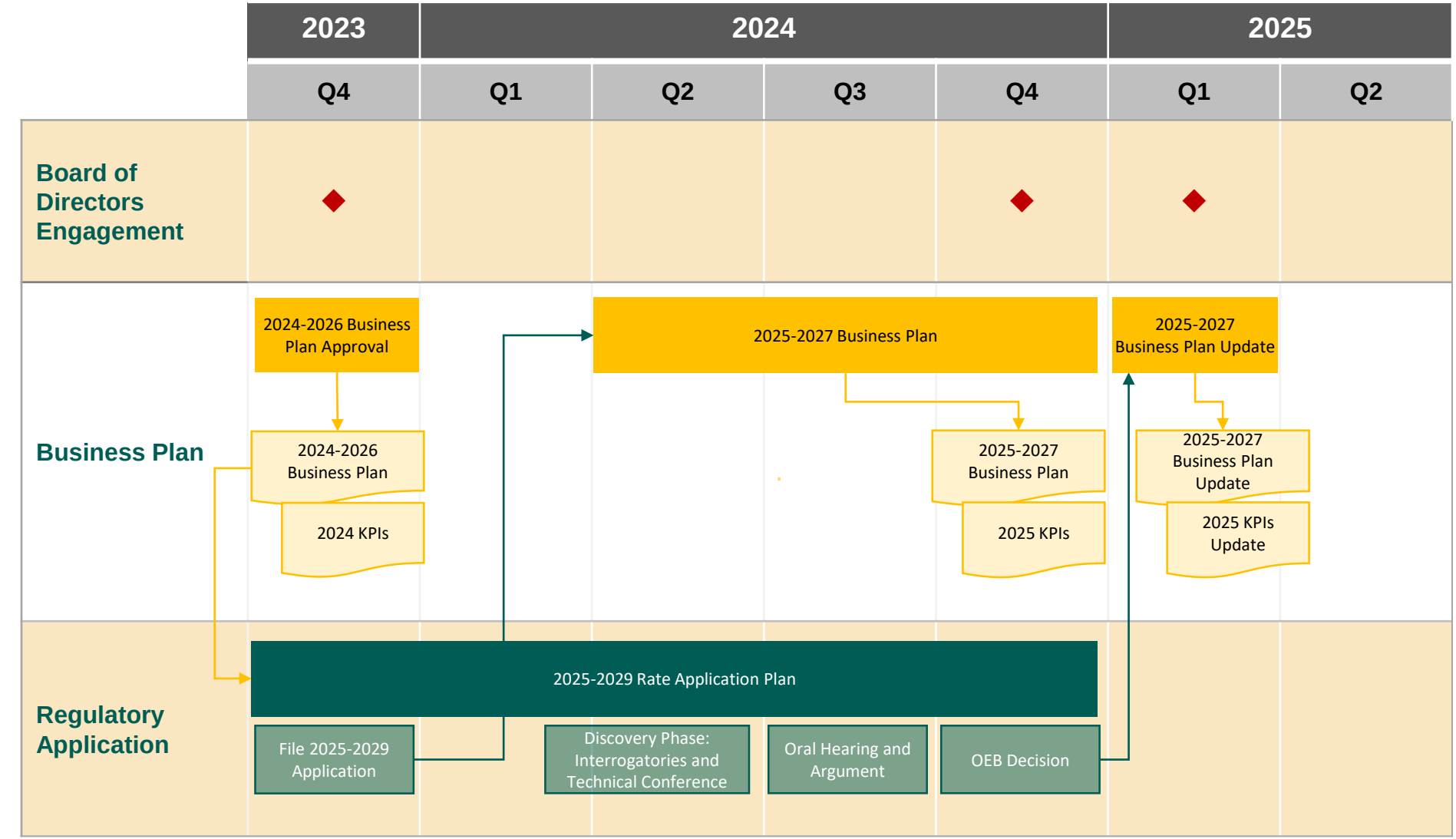
PLANNING TIMELINE



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INTEGRATED BUSINESS PLAN



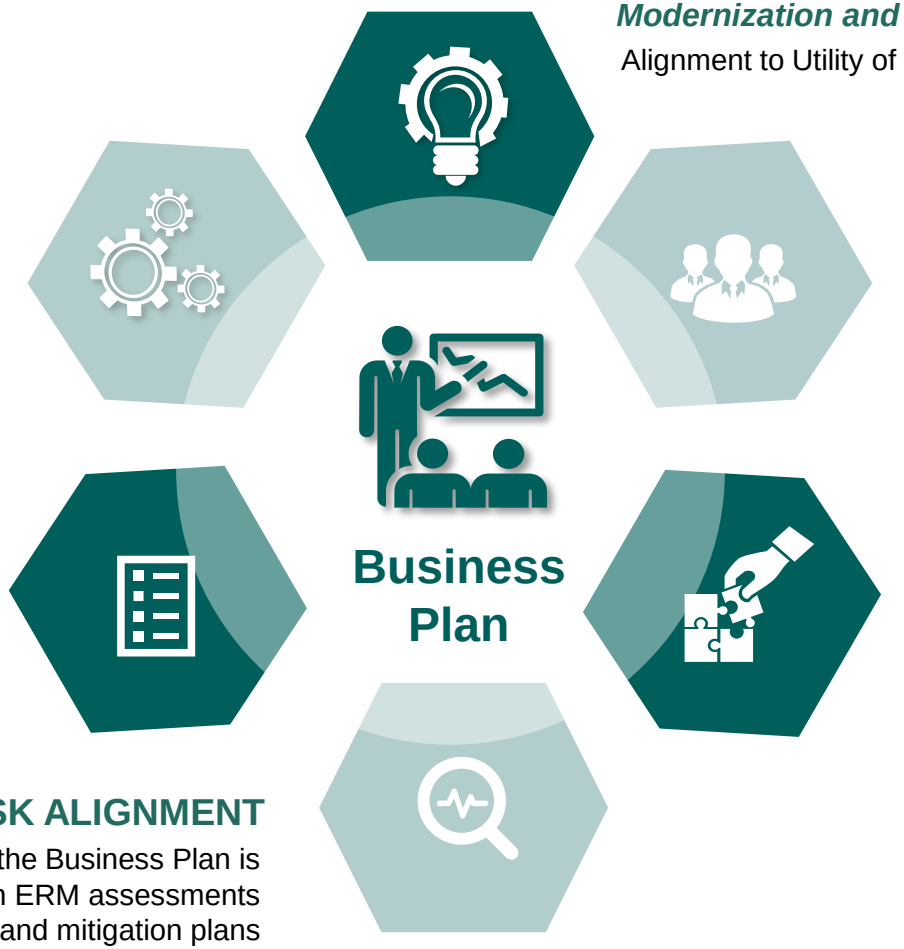
CORPORATE STRATEGY
Modernization and Electrification

Alignment to Utility of the Future and Climate Action

BUSINESS NEEDS
Identification of Capital Investment and Operational needs that underpin the Corporate Pillars

PEOPLE STRATEGY
Workforce of Tomorrow

Build a culture of safety, sustainment and innovation that propels TH into the future



COMPLIANCE REVIEW
Consideration of compliance requirements and related mitigating actions

REGULATORY ALIGNMENT
- 2024: Alignment to 2020-2024 OEB decision and inclusion of new emerging issues (e.g.: customer connections, inflation)
- 2025-2026: Alignment to 2025-2029 rate application strategy

RISK ALIGNMENT
Ensure the Business Plan is grounded in ERM assessments and mitigation plans

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BUSINESS PLAN
ASSUMPTIONS



The 2024-2026 Business Plan incorporates the following:

- Alignment to the 10-year Utility of the Future strategy and strategic priorities including Climate Action;
- 2020-2024 CIR decision and inclusion of new emerging issues (e.g. increase in customer connections, inflationary costs, ramp-up to support electrification);
- Regulated Operations Plan aligned to 2025-2029 rate application strategy and strategic parameters approved by the Board;

[redacted]

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RATE APPLICATION
STRATEGIC PARAMETERS



Capital Program

2025-2029 Capital Expenditures

$3.9B

Operational Plan

2025-2029 Operational Expenditures

$1.9B

Distribution Rates

2024-2029 Average Annual Residential Rate Increase (smoothed)

7% CAGR

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LEGAL ENTITIES



THC

- Corporate

THESL

- Regulated
- Electricity Distribution

THESL

- Unregulated
- Climate Advisory Services and Energy Solutions

THESI

- Unregulated
- Street Lighting

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CONSOLIDATED FINANCIALS



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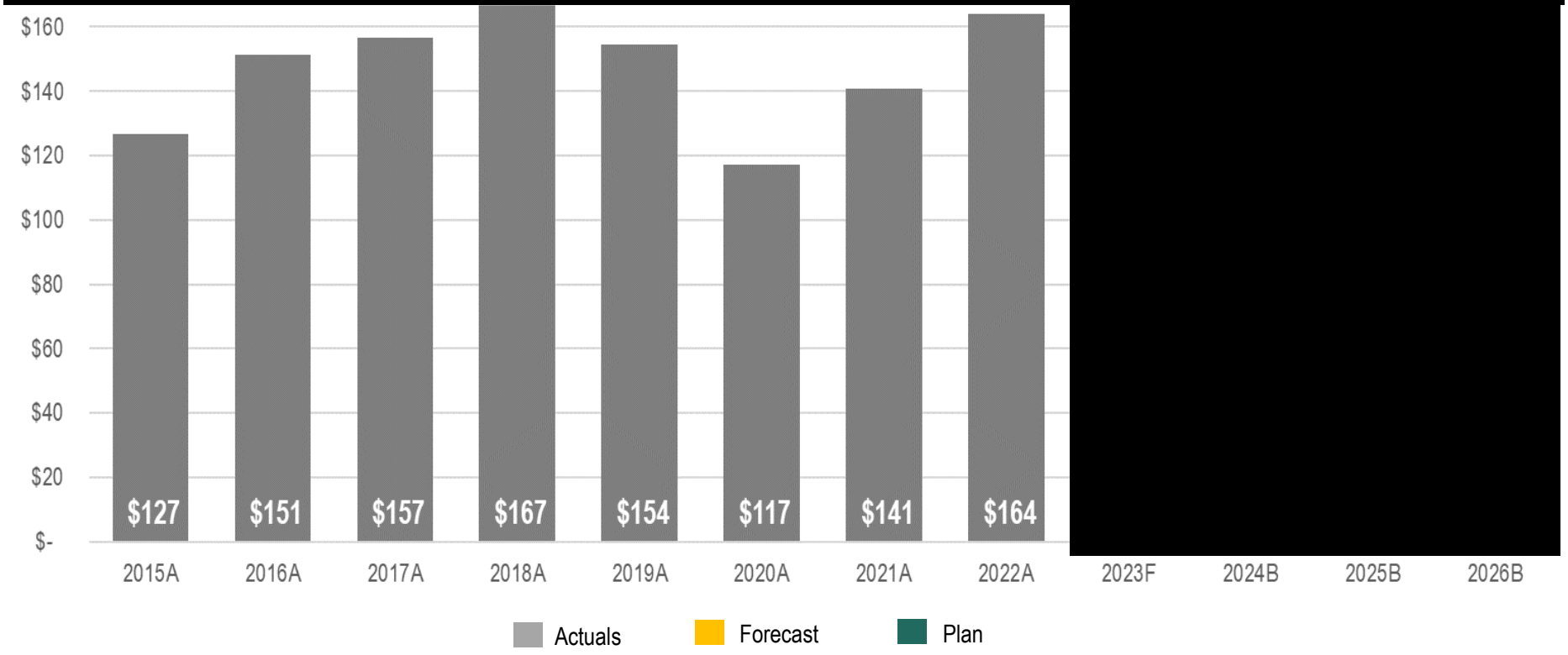
NET INCOME
COMPOUNDED ANNUAL GROWTH RATE

[redacted]



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2024 STATEMENTS OF INCOME

CONSOLIDATED



Statements of Income In millions of Canadian dollars For the year ending December 31, 2024	Corporate	Regulated	Unregulated	Consolidated
Energy sales		2,960		
Distribution revenue		931		
Other revenues		87		
Total revenues		**3,978**		
Energy purchases		3,004		
Operating expenses		349		
Depreciation and amortization		289		
Total expenses		**3,642**		
Finance costs		108		
Gain on disposals of property, plant and equipment		2		
Income/(loss) before income taxes		**230**		
Income tax expense/(recovery)		36		
Net movements in regulatory balances		(80)		
Net movements in regulatory balances arising from deferred taxes		33		
Net income after net movements in regulatory balances		**147**		

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CORPORATE



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2024 STATEMENTS OF INCOME

CORPORATE



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OPERATING EXPENSES



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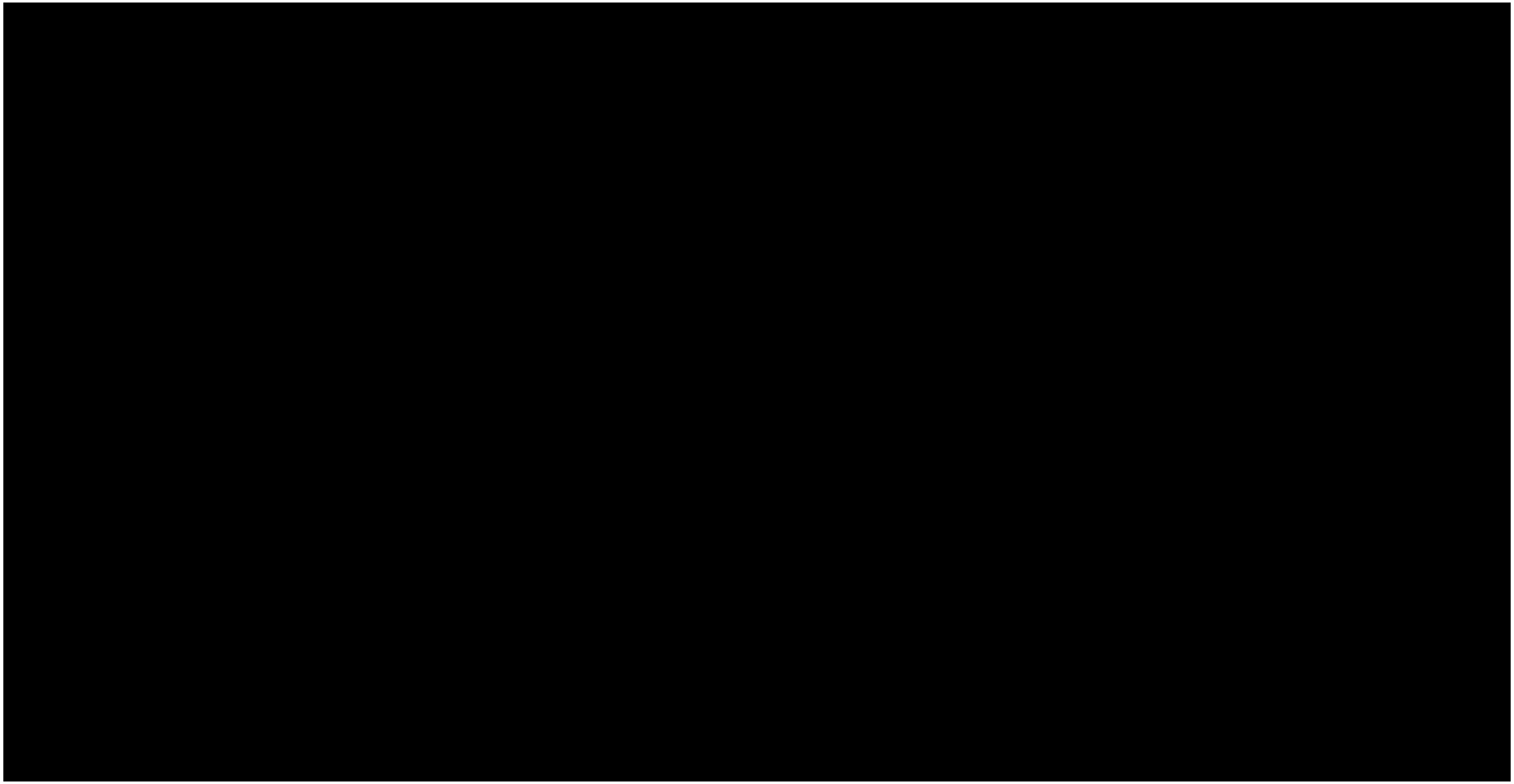
FINANCE

COSTS



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REGULATED



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2024 STATEMENT OF INCOME

REGULATED



Statements of Income In millions of Canadian dollars For the year ending December 31, 2024	Corporate	Regulated	Unregulated	Consolidated
Energy sales		2,960		
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REVENUES



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	Variance
Distribution Revenue	754	827	833	931	98
Other Revenues	93	87	86	87	1
Total Revenues	**847**	**914**	**919**	**1,018**	**99**

- Higher Distribution Revenue due to the recovery of regulatory settlement variances, which are offset in net movement line, and increase in distribution rates in 2024 resulting from the 2020-2024 regulatory decision
- Increase in Other Revenues primarily due to higher capital contributions

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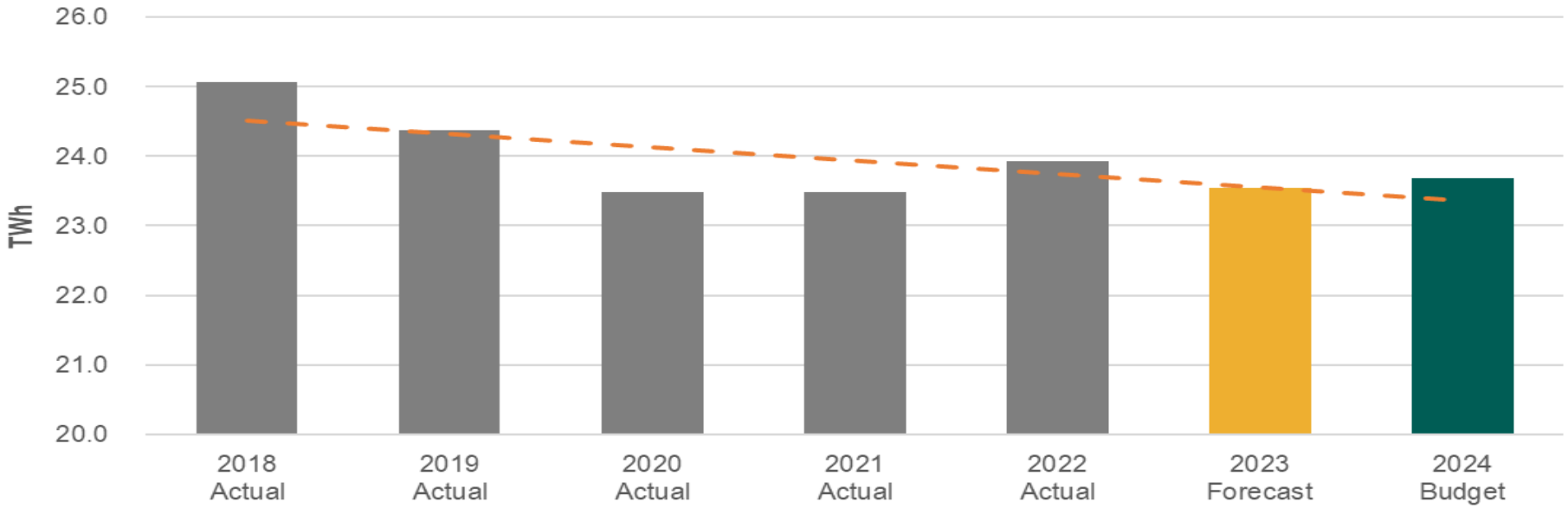
LOAD FORECAST

	2022 Actual	2023 Budget	2023 Forecast	2024 Budget
Load (TWh)[1]	23.9	23.4	23.5	23.7
Year over Year % Change	1.9%	(0.2%)	(1.6%)	0.6%



- Loads over the 2018-2022 period exhibit an overall declining trend as customer growth is offset by declining average use per customer primarily driven by conservation activities

[1] Wholesale Purchase Load

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ENERGY PURCHASES



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget
Commodity Charges	2,320	2,424	2,374	2,461
Transmission Charges	385	391	400	419
Wholesale Service Charges	130	161	109	107
Rural Rate Assistance	12	12	15	17
Total Energy Purchases	**2,847**	**2,988**	**2,898**	**3,004**
Total $/kWh	**0.1190**	**0.1275**	**0.1230**	**0.1269**

- Energy Purchases are a pass-through and are collected through Revenue as Energy Sales

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OTHER REVENUES



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	Variance
Pole, Ducts and Other Rentals	18	21	19	19	-
Customer Demand Work	26	17	17	17	-
Reclaimed Materials	10	12	12	12	-
Street Lighting	10	9	9	9	-
Subtotal Customer Demand Work	**64**	**59**	**57**	**57**	**-**
Customer Charges	6	7	6	6	-
Late Payment Charges	3	4	5	5	-
Capital Contributions	17	16	16	17	1
Regulatory Deferral Accounts	2	-	-	-	-
Other	1	1	2	2	-
Total Revenues	**93**	**87**	**86**	**87**	**1**

- Increase in Other Revenues primarily due to increase in capital contributions

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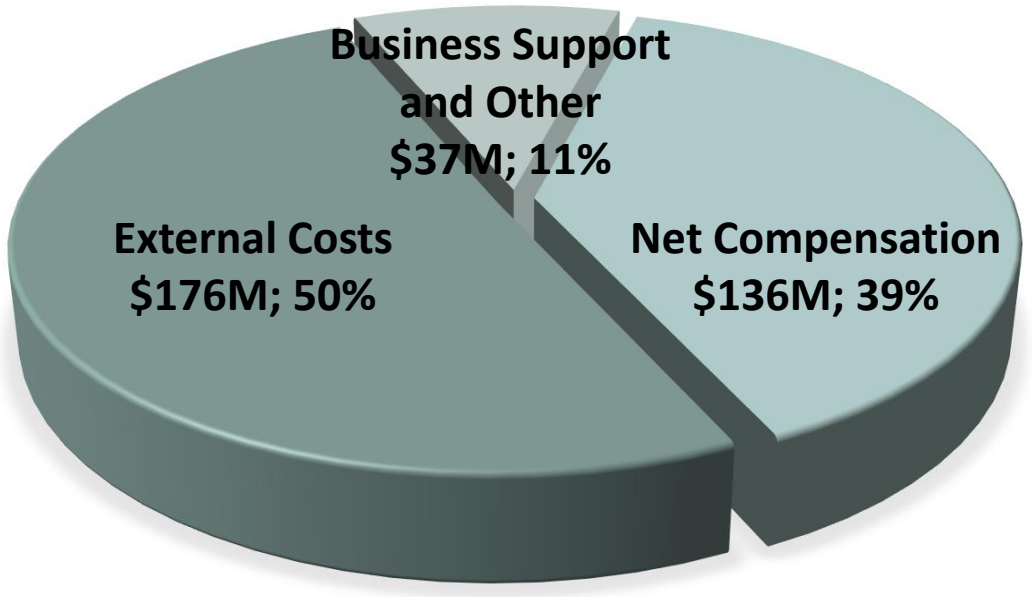
OPERATING EXPENSES



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	Variance
Net Compensation	104	121	115	136	21
External Costs	159	171	168	176	8
Business Support and Other	43	39	40	37	(3)
Total Operating Expenses	**306**	**331**	**323**	**349**	**26**

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NET COMPENSATION



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	Variance
Payroll	170	192	192	216	24
Benefits	41	49	44	57	13
Capitalization	(107)	(120)	(121)	(137)	(16)
Net Compensation	**104**	**121**	**115**	**136**	**21**

- Increase in net compensation costs due to increase in number of headcount

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EXTERNAL COSTS



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	Variance
Maintenance of Facilities	18	14	16	16	-
IT External Consultants	8	7	7	7	-
IT Maintenance Contracts	29	32	31	33	2
Call Centre (Outsourced)	9	9	8	9	1
Distribution System Maintenance & Materials	77	81	83	86	3
Professional Services	6	8	8	9	1
Administrative and General Expenses	8	13	11	11	-
Collections Services & Processing	4	5	4	5	1
Miscellaneous	-	2	-	-	-
Total External Costs	**159**	**171**	**168**	**176**	**8**

- Increase in External Costs due to ramp-up of the distribution system maintenance programs and IT maintenance and subscription costs.

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BUSINESS SUPPORT & OTHER COSTS



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	Variance
Utilities and Communication	7	7	7	7	-
Office Supplies and Postage	7	7	7	7	-
Employee Expenses	1	2	2	2	-
Rental and Leases	1	1	1	1	-
Bad Debt	5	5	8	5	(3)
OEB Fees	4	4	5	5	-
Insurance	5	6	6	6	-
Property Taxes and Other	5	5	5	5	-
Ancillary Services Costs	27	25	25	25	-
Capitalization, Allocation and Other	(19)	(23)	(26)	(26)	-
Total Business Support and Other Costs	**43**	**39**	**40**	**37**	**(3)**

- Lower Business support and other costs due to decrease in bad debt expense. 2023 Forecast reflects the increase in bad debt provision for non-electricity receivables.

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DEPRECIATION & AMORTIZATION



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	Variance
Total Depreciation and Amortization	305	267	278	289	11

- Decrease in 2023 Forecast vs 2022 Actuals is a result of the revised useful lives based on a depreciation study
- Increase in depreciation from 2023 Forecast vs 2024 Budget is due to higher capital investments for distribution infrastructure

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FINANCE
COSTS



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	Variance
Interest on Short and Long Term Debt	88	108	105	112	7
Capitalized Interest	(7)	(8)	(7)	(7)	-
Customer Deposits	1	-	-	-	-
Financing Costs and Other	3	(1)	3	3	-
Total Finance Costs	**85**	**99**	**101**	**108**	**7**

- 2023 Forecast includes 10 year $250M debt replacement issued on June 14th, 2023 at 4.66% and 5 year $200M new debenture issued on October 12th, 2023 at 5.18%.
- 2024 Budget includes a $200M debt issuance on November 1st, 2024 at 5.85%

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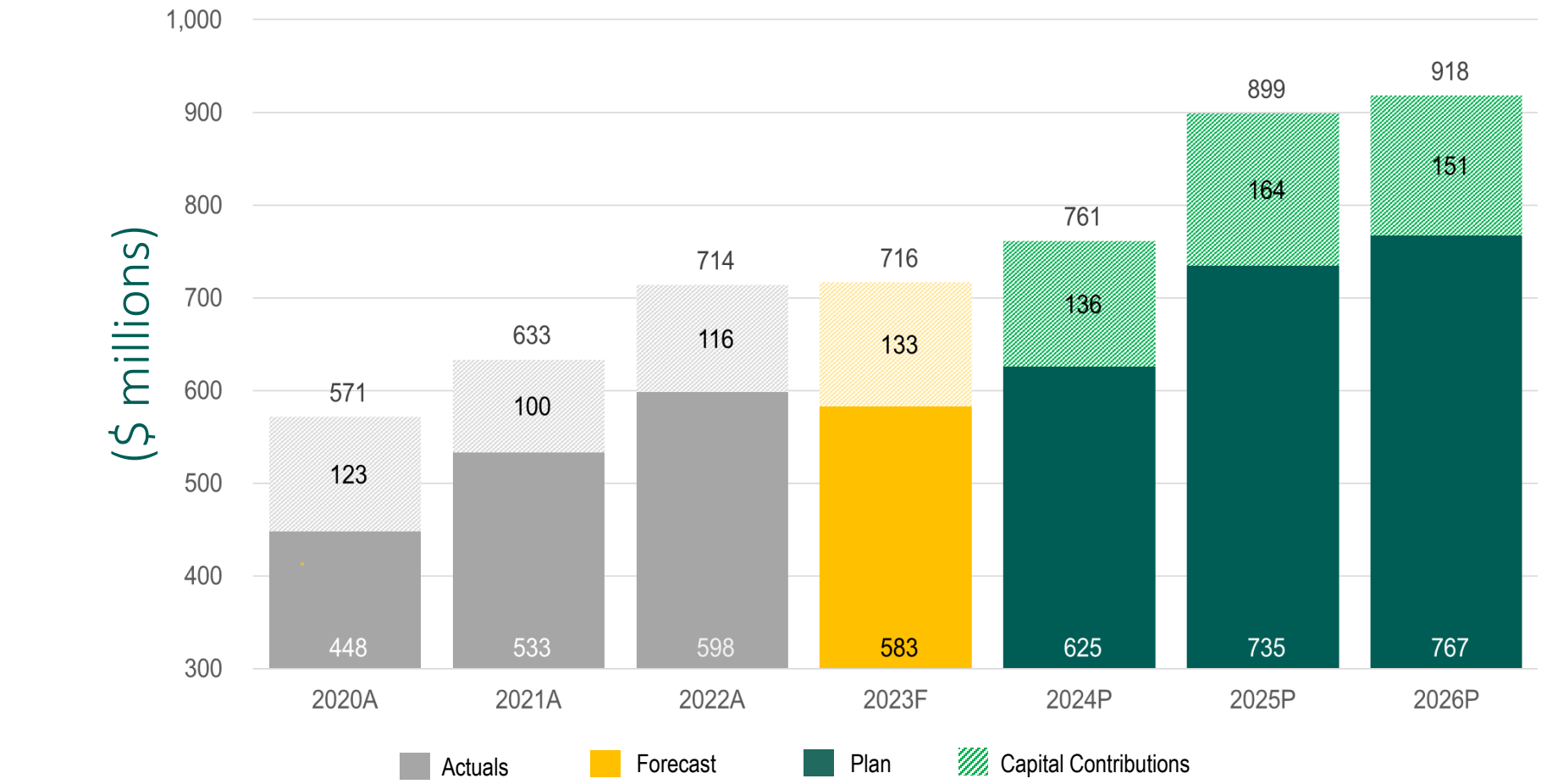
CAPITAL EXPENDITURES (GROSS vs NET*)



*Net of capital contributions received

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CAPITAL EXPENDITURES



In millions of Canadian dollars	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	Variance
Infrastructure Renewal	312	347	342	414	72
Reactive Capital	48	43	46	45	(1)
Customer Connections	126	140	124	138	14
Hydro One Contributions	24	17	13	10	(3)
Copeland Transformer Station	27	11	6	4	(2)
IT, Fleet and Facilities	112	94	96	81	(15)
Externally Initiated Plant Relocations & Expansions	65	84	85	64	(21)
Provincial Allocations and Other	-	9	4	5	1
Gross Capital Program	**714**	**745**	**716**	**761**	**45**
Capital Contributions	(116)	(149)	(133)	(136)	(3)
Net Total Capital	**598**	**596**	**583**	**625**	**42**

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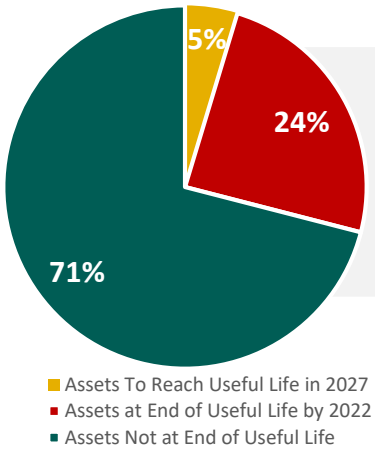
SYSTEM RENEWAL

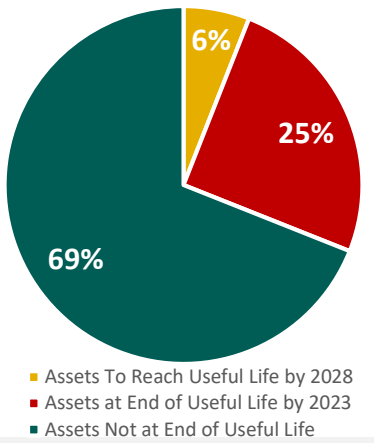
Leading Indicator: Assets Past Useful Life (Age)

2022



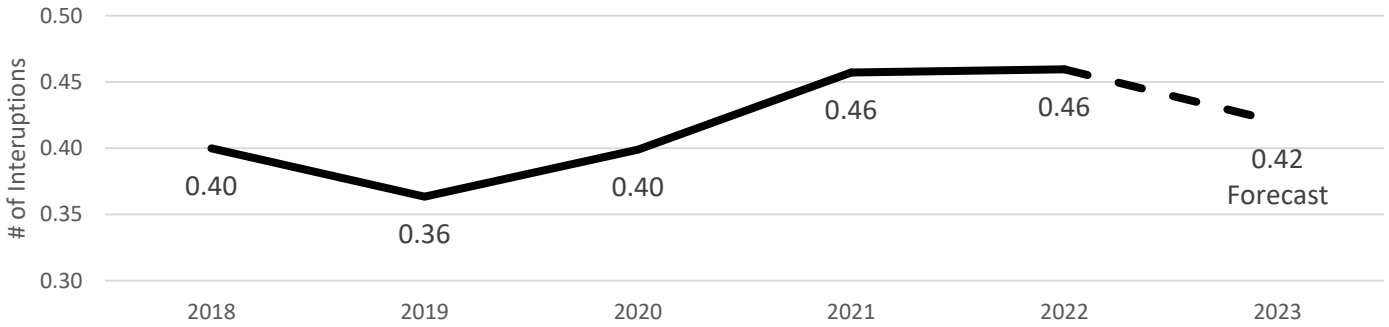
Macro Level:
Stable Results

2023



Micro Level:
Slight deterioration for some asset types (e.g. underground cable). Similar deterioration for some asset condition results.

Lagging Indicator: System Average Interruption Frequency Index (SAIFI - Defective Equipment)



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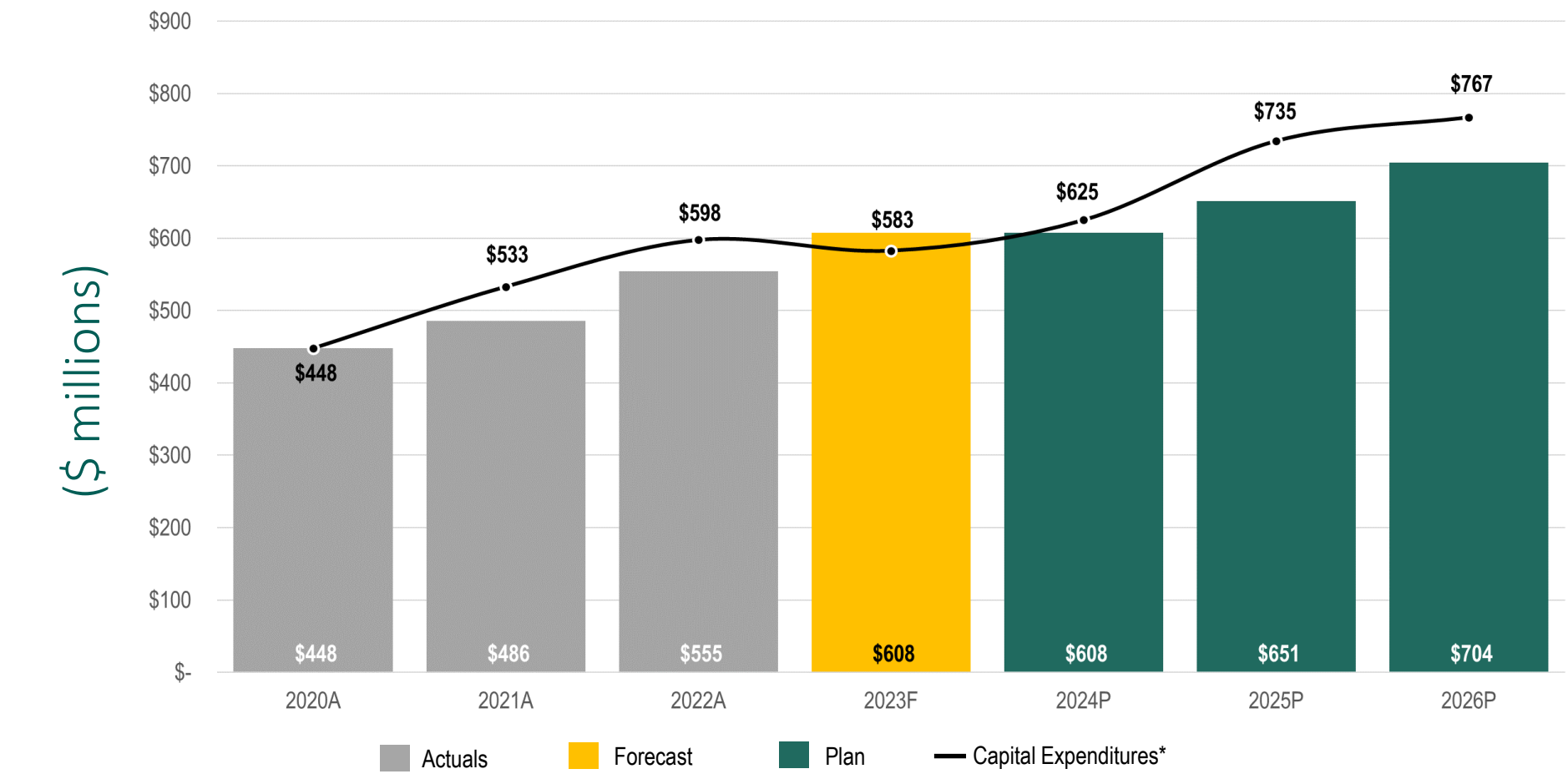
IN-SERVICE ADDTIONS* AND CAPITAL EXPENDITURES



* Net of capital contributions received

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UNREGULATED



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2024 STATEMENT OF INCOME

UNREGULATED



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Net income after net movements in regulatory balances		**147**		

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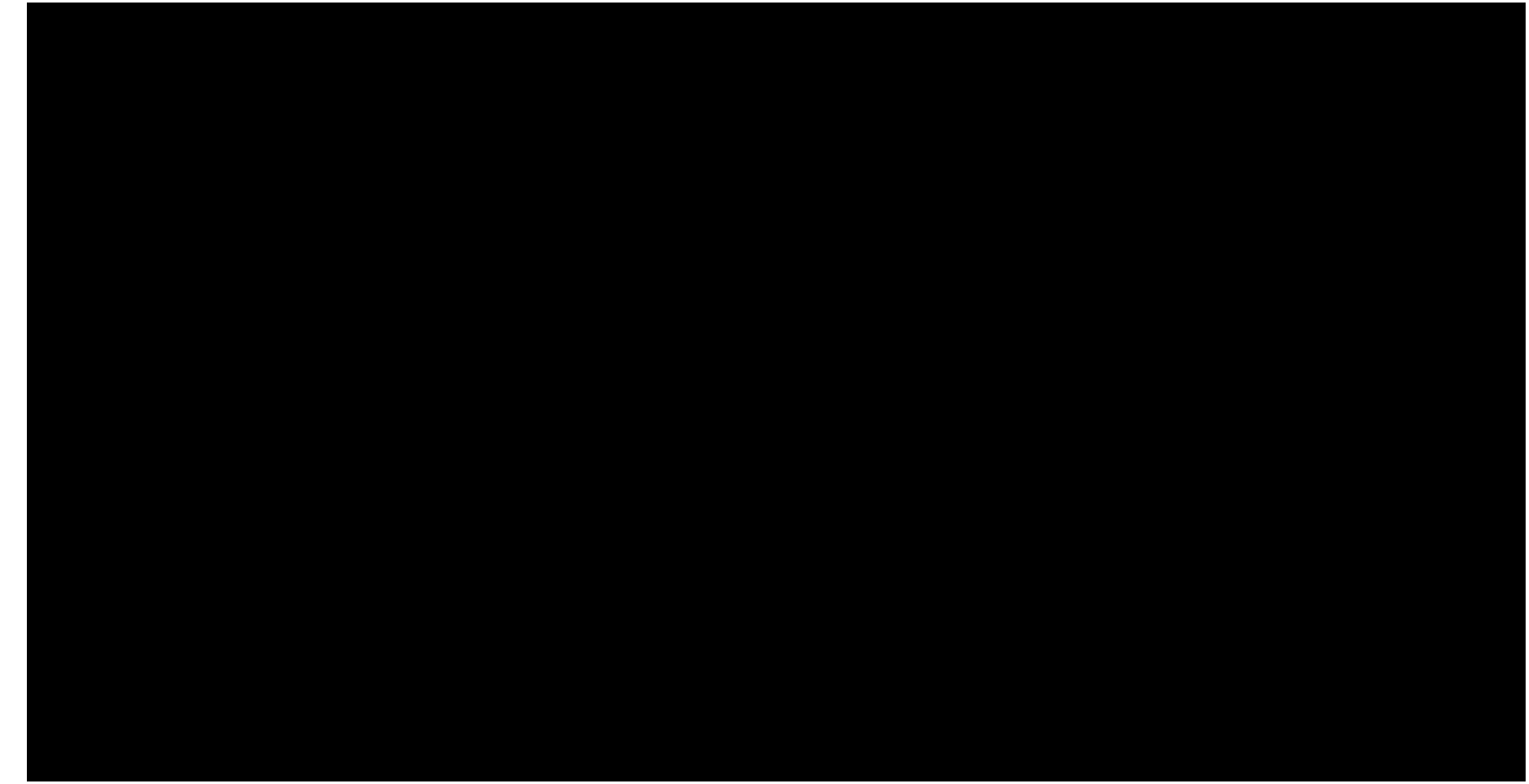
OTHER REVENUES



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OPERATING EXPENSES



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CAPITAL EXPENDITURES



*Includes contributions received related to energy storage

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FINANCIAL STATEMENTS PROFORMAS



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CONSOLIDATED
STATEMENTS OF INCOME



Consolidated Statements of Income In millions of Canadian dollars For the years ended December 31	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	2025 Budget	2026 Budget
Energy sales	2,738	2,988	2,811	2,960	3,060	3,128
Distribution revenue	754	827	833	931	1,035	1,023
Other revenues	110	105				
Total revenues	**3,602**	**3,920**				
Energy purchases	2,847	2,988	2,898	3,004	3,060	3,128
Operating expenses	323	359				
Depreciation and amortization	311	274				
Total expenses	**3,481**	**3,621**				
Finance costs	88	104				
Gain on disposals of property, plant and equipment	-	1	36	2	2	2
Income/(loss) before income taxes	**33**	**196**				
Income tax (expense)/recovery	8	42				
Net movements in regulatory balances	137	(71)	(1)	(80)	(68)	(11)
Net movements in regulatory balances arising from deferred taxes	2	50	20	33	33	33
Net income after net movements in regulatory balances	**164**	**133**				

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CONSOLIDATED
BALANCE SHEETS



Consolidated Balance Sheets In millions of Canadian dollars As at December 31	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	2025 Budget	2026 Budget
Assets						
Current						
Accounts receivable	224	228				
Unbilled revenue	277	270				
Other assets	25	31				
Total current assets	**526**	**529**				
Property, plant, equipment and intangible assets	6,144	6,612				
Other assets	14	8				
Total assets	**6,684**	**7,149**				
Regulatory balances	263	271	391	387	333	333
Total assets and regulatory balances	**6,947**	**7,420**				
Liabilities and Equity						
Current						
Working capital facility and commercial paper	368	407				
Debentures	250	-				
Other liabilities	565	544				
Total current liabilities	**1,183**	**951**				
Debentures	2,479	2,927				
Deferred tax liabilities	85	141				
Other liabilities	988	1,063				
Total liabilities	**4,735**	**5,082**				
Equity						
Share capital	818	818				
Retained earnings	1,244	1,277				
Total equity	**2,062**	**2,095**				
Total liabilities and equity	**6,797**	**7,177**				
Regulatory balances	150	243	252	295	276	254
Total liabilities, equity and regulatory balances	**6,947**	**7,420**				

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CONSOLIDATED
STATEMENTS OF CASH FLOWS



Consolidated Statements of Cashflows in millions of Canadian dollars Year ended December 31	2022 Actual	2023 Budget	2023 Forecast	2024 Budget	2025 Budget	2026 Budget
Operating Activities						
Net income after net movements in regulatory balances	164	133				
Net movements in regulatory balances	(137)	71	1	80	68	11
Net movements in regulatory balances arising from deferred taxes	(2)	(50)	(20)	(33)	(33)	(33)
Depreciation, amortization and other changes	364	414				
Capital contribution received	86	149	133	104	164	151
Changes in non-cash operating working capital balances	(6)	(29)				
Net cash provided by operating activities	**469**	**688**				
Investing Activities						
Purchase of property, plant, equipment and intangible assets	(675)	(754)				
Proceeds on disposal of property, plant, and equipment	-	1	36	2	2	2
Net cash used in investing activities	**(675)**	**(753)**				
Financing Activities						
Increase (decrease) in commercial paper, net	80	67				
Dividends paid	(85)	(95)				
Proceeds from issuance of debentures net of debt issuance costs paid	299	448				
Repayment of debentures	-	(250)				
Interest paid	(92)	(105)				
Common Shares Issued	-	-				
Net cash provided by (used in) financing activities	**202**	**65**				
Net change in cash and cash equivalents during the year	**(4)**	**-**				
Working capital facility, beginning of year	(9)	-				
Working capital facility, end of year	**(13)**	**-**				

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REGULATORY, COMPLIANCE, & RISK ASSESSMENT



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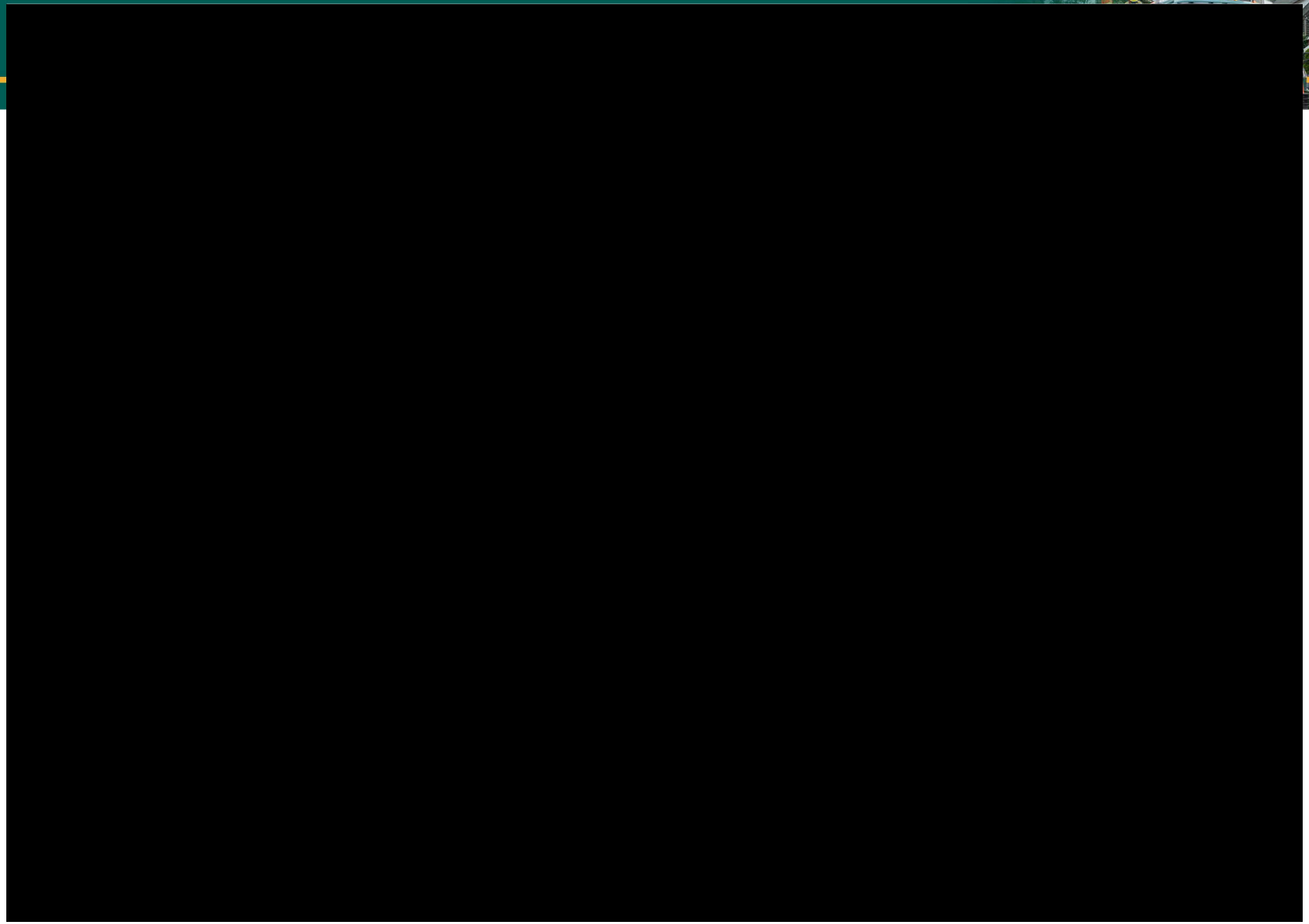

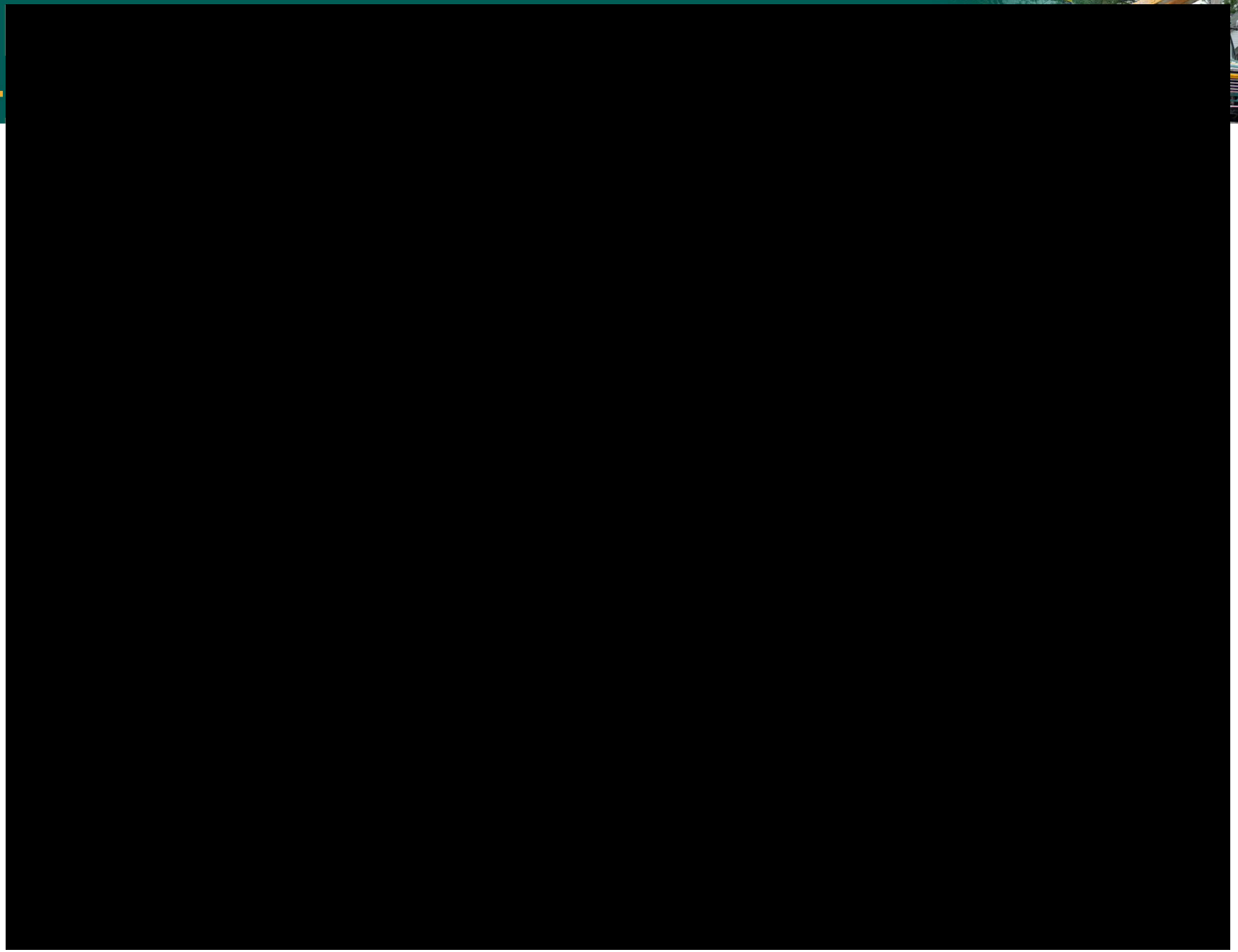

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REGULATORY ALIGNMENT

2020-2024 DECISION



Distribution Capital	Alignment
Customer Connections	Improved
Externally Initiated Relocations	Stable
Load Demand	Stable
Metering	Stable
Generation Protection Monitoring & Control	Stable
Rear Lot Conversions	Stable
Box Construction	Improved
Underground Renewal Horseshoe	Caution
Underground Renewal Downtown	Stable
Overhead System Renewal	Caution
Network System Renewal	Improved
Stations Renewal	Stable
Reactive Capital	Stable
Energy Storage Systems	Stable
Stations Expansion	Improved
Copeland Phase 2	Improved
System Enhancements	Stable
Network Condition Monitoring & Control	Stable

General Plant Capital	Alignment
Fleet	Stable
Facilities	Stable
Information Technology	Stable
Control Center	Improved
ERP Phase 2	Improved
CIS Upgrade	Stable

Operational Plan	Alignment
Distribution Operations	Stable
System Maintenance	Stable
Corporate Services	Stable
Information Technology	Stable
Customer Operations	Stable

Improved

Stable

Caution

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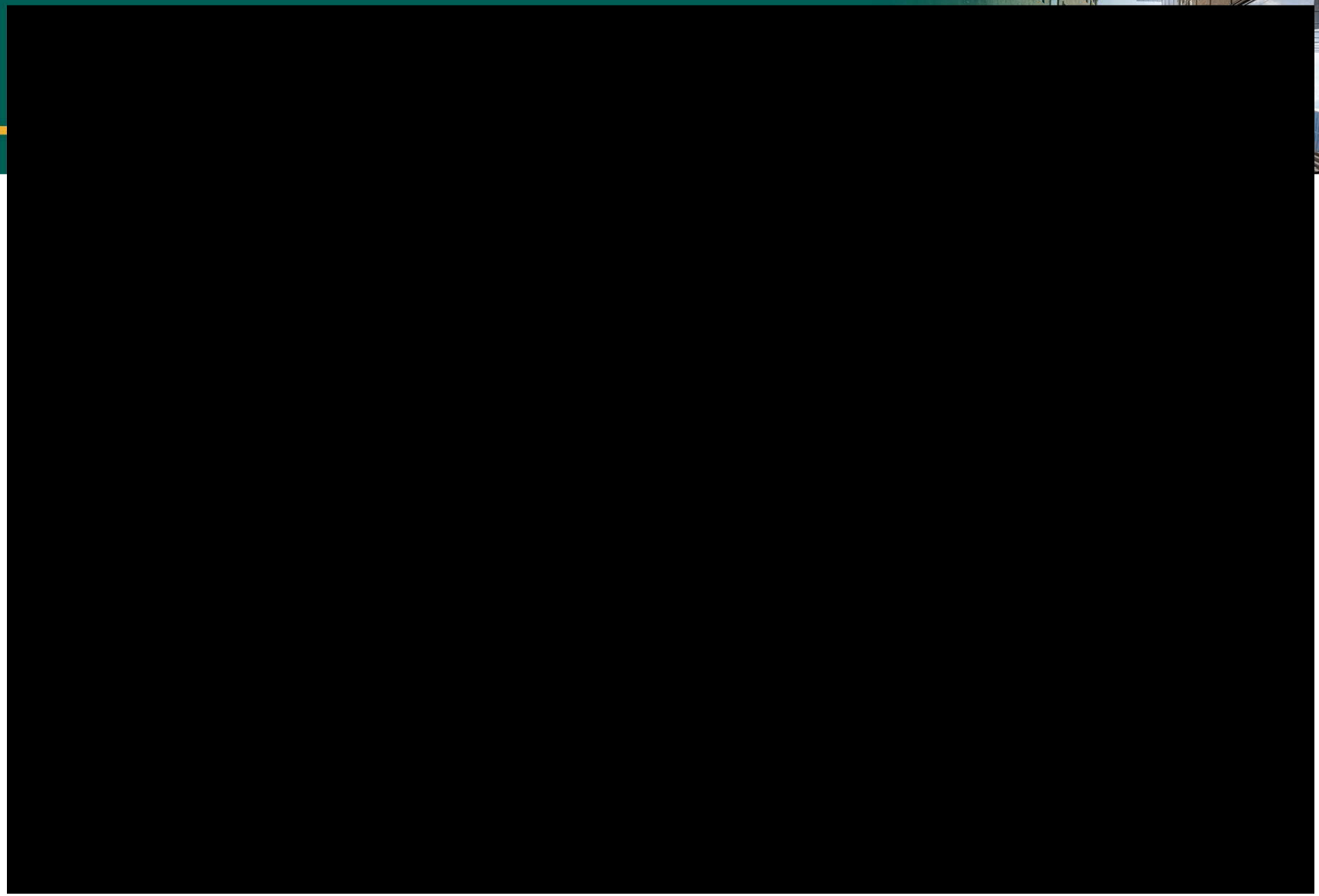

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2024 CORPORATE PERFORMANCE SCORECARD

SUBJECT TO APPROVAL AND CHANGES BY THE HUMAN RESOURCES AND ENVIRONMENT COMMITTEE FOR RECOMMENDATION TO THE BOARD



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CORPORATE
2023-2024 SCORECARD



Pillar	KPI	2023 Weight	2024 Weight	Pillar Weight
Customer	New Services Connected on Time	5%	10%	Customer 25%
	Estimated Time of Restoration	5%	5%	
	First Contact Resolution	5%	10%	
People	Total Recordable Injury Frequency	10%	10%	People 15%
	Employee Engagement	5%	5%	
Environment	Building Emissions Reduction	5%	-	
	Fleet Electrification	5%	-	
Operations	SAIFI (Defective Equipment Only)	10%	10%	Operations 20%
	SAIDI (Defective Equipment Only)	10%	10%	
Financial	In-Service Assets	10%	10%	Finance 40%
	Consolidated Net Income	30%	30%	
		100%	100%	100%

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CONTINUOUS IMPROVEMENT FRAMEWORK



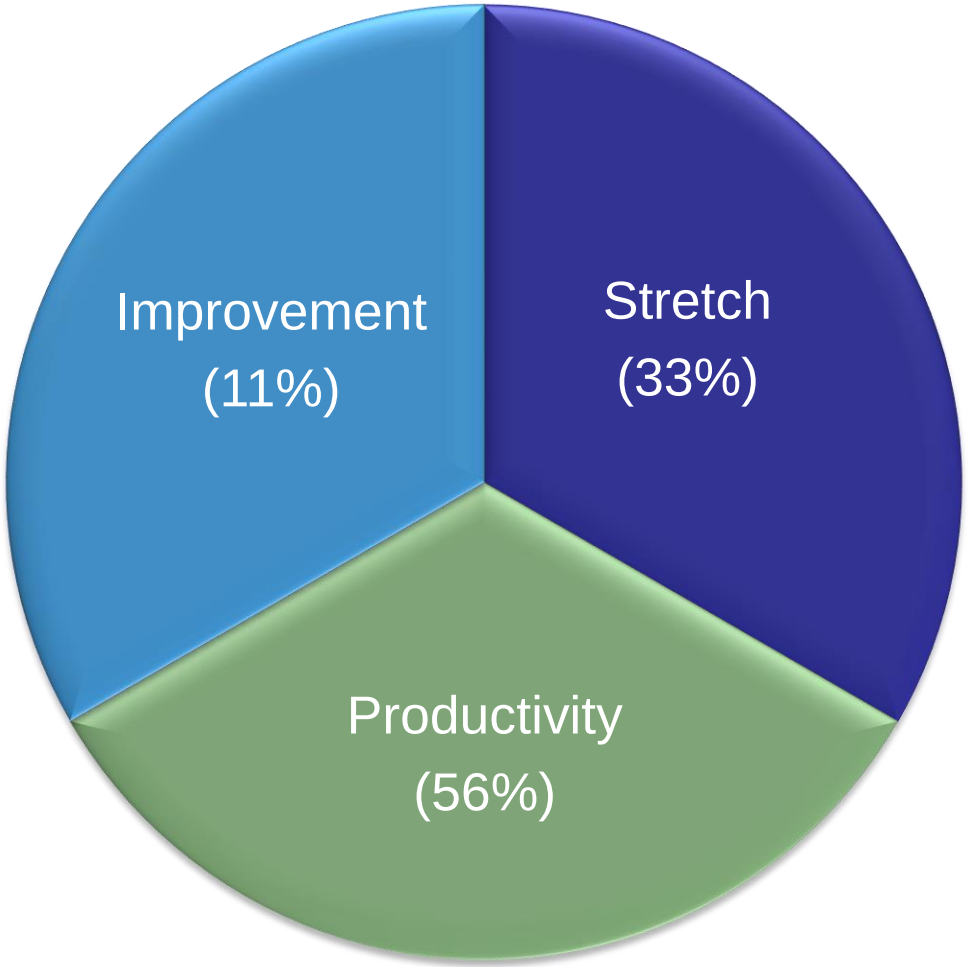
CUSTOMER

PEOPLE

ENVIRONMENT

OPERATIONS

FINANCIAL



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2024 CORPORATE SCORECARD

ANALYSIS



9 KPIs in 2024 (11 in 2023)

Pillar	KPI	2024 Weight	2024 Threshold	2024 Target	2024 Stretch	2024 Continuous Improvement
Customer	New Services Connected on Time →	10%	93%	98%	99%	
	Estimated Time of Restoration →	5%	80%	85%	90%	
	First Contact Resolution →	10%	82%	86%	88%	
People	Total Recordable Injury Frequency ↑	10%	1.00	0.95	0.90	
	Employee Engagement ↑	5%	8.0	8.5	9.0	
Operations	SAIFI (Defective Equipment Only) →	10%	0.61	0.50	0.48	
	SAIDI (Defective Equipment Only) ↑	10%	30.69	25.23	24.19	
Financial	In-Service Assets ↑	10%	496.0	501.0	506.0	
	Consolidated Net Income ↓	30%	100.0	105.0	110.0	
		100%	25%	100%	150%	

↑ **4 are harder - 44.5%** → **4 are the same – 44.5%** ↓ **1 is lower - 11%**

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Customer (25%)

- **New Services Connected on Time: 10%**
- **Estimated Time of Restoration (ETOR): 5%**
- **First Contact Resolution: 10%**

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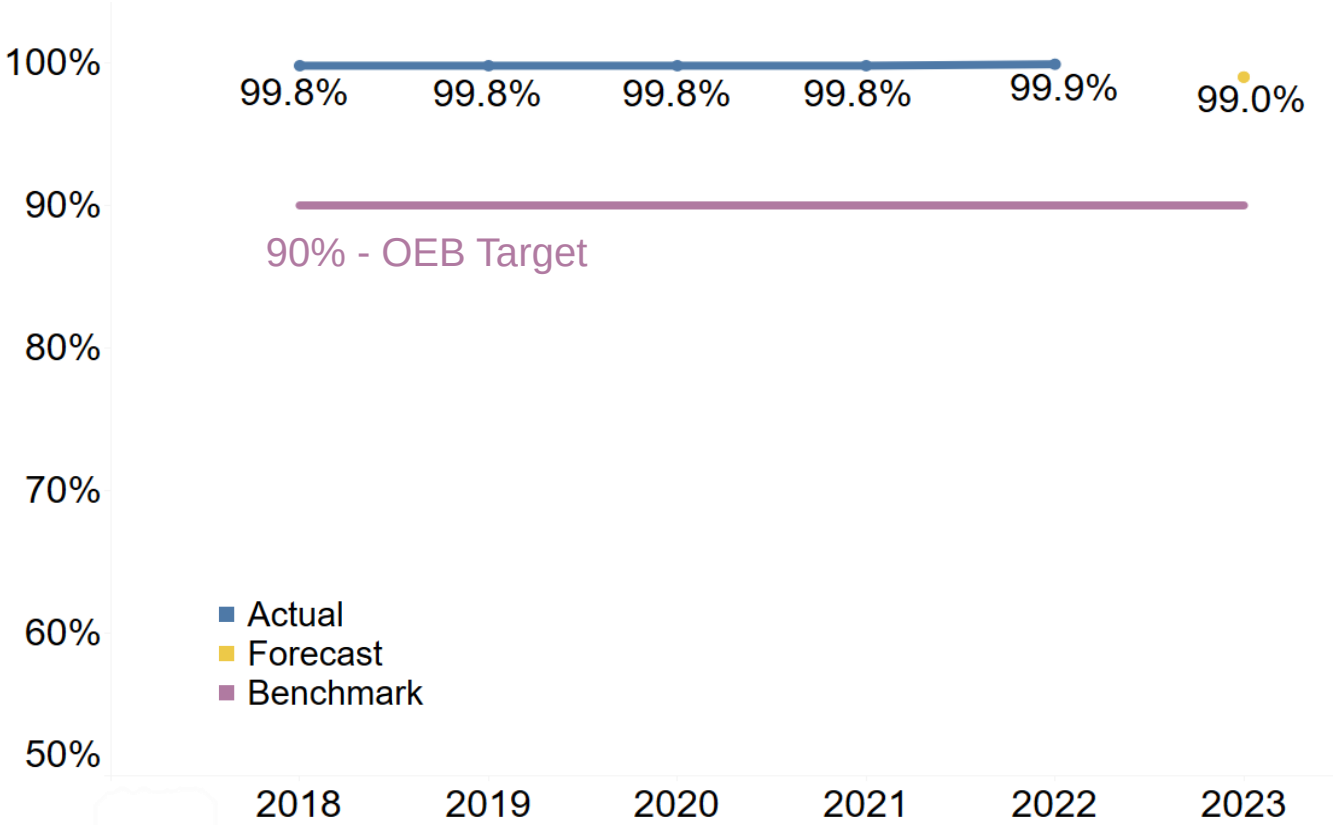
NEW SERVICES CONNECTED ON TIME (10%)

Continuous Improvement



Productivity





CUSTOMER

Percentage of new service requests (high voltage, low voltage and upgrades) connected on time.

%	2023	2024
Threshold	93%	93%
Target	98%	98%
Stretch	99%	99%

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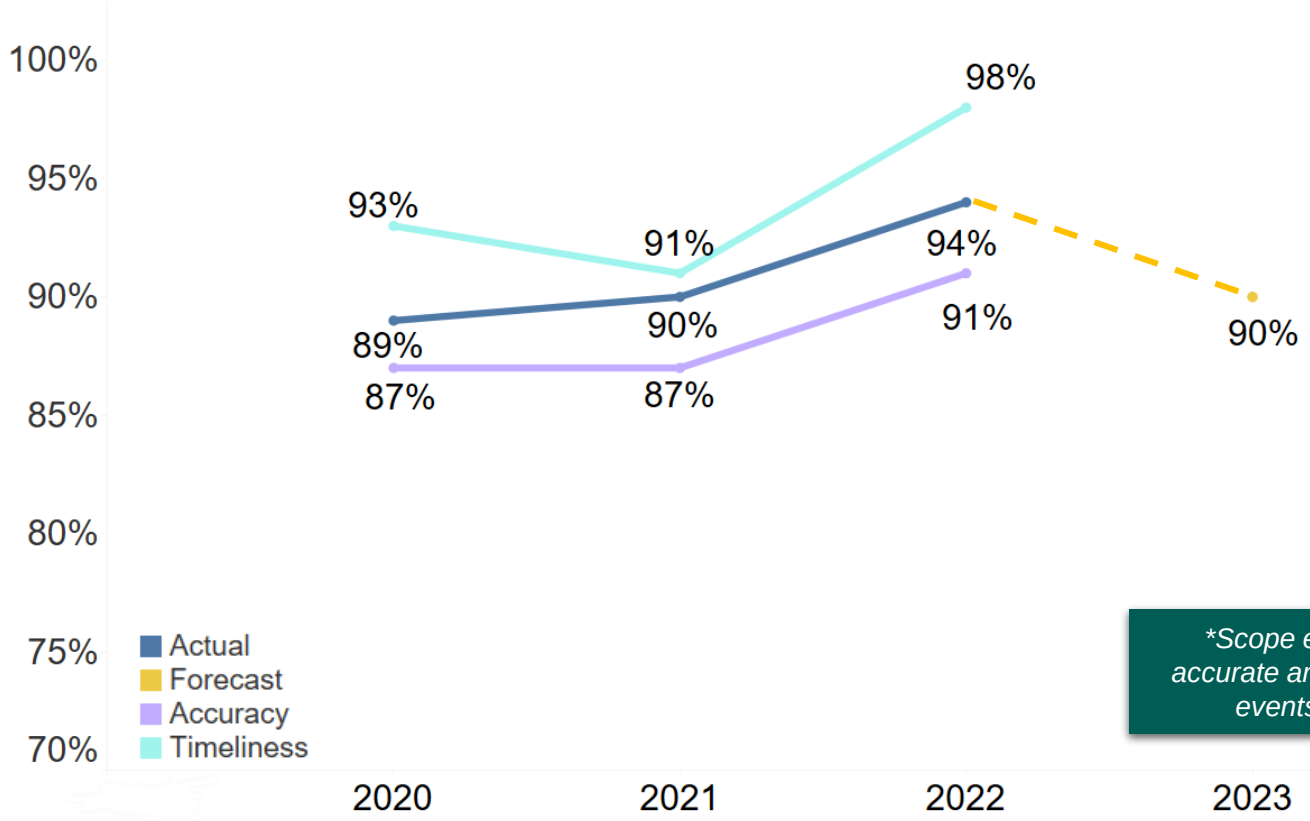
ESTIMATED TIME OF RESTORATION (ETOR) (5%)

Continuous Improvement

Productivity



**Scope expanded to provide accurate and timely ETORs for all events on Outage Map.*

CUSTOMER

A composite measure of the percentage of power outages that are assigned an Estimated Time of Restoration (ETOR) within 60 minutes and the accuracy of ETORs within +/- 120 minutes*

%	2023	2024
Threshold	80%	80%
Target	85%	85%
Stretch	90%	90%

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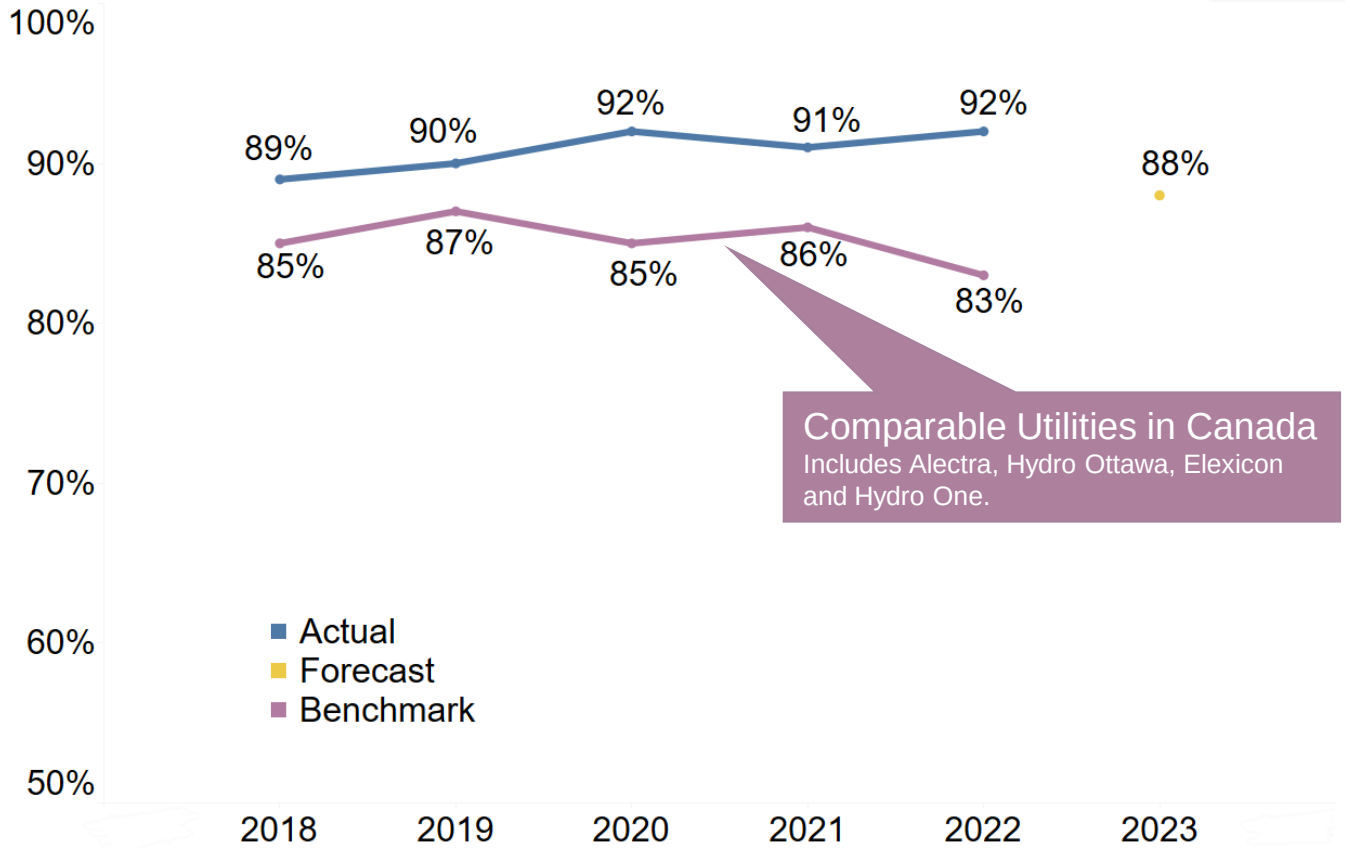
FIRST CONTACT RESOLUTION (10%)

Continuous Improvement



Productivity



CUSTOMER

Percentage of telephone and email enquiries resolved in one contact, within a 21 day time period.

%	2023	2024
Threshold	82%	82%
Target	86%	86%
Stretch	88%	88%

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People (15%)

- **Total Recordable Injury Frequency: 10%**
- **Employee Engagement: 5%**

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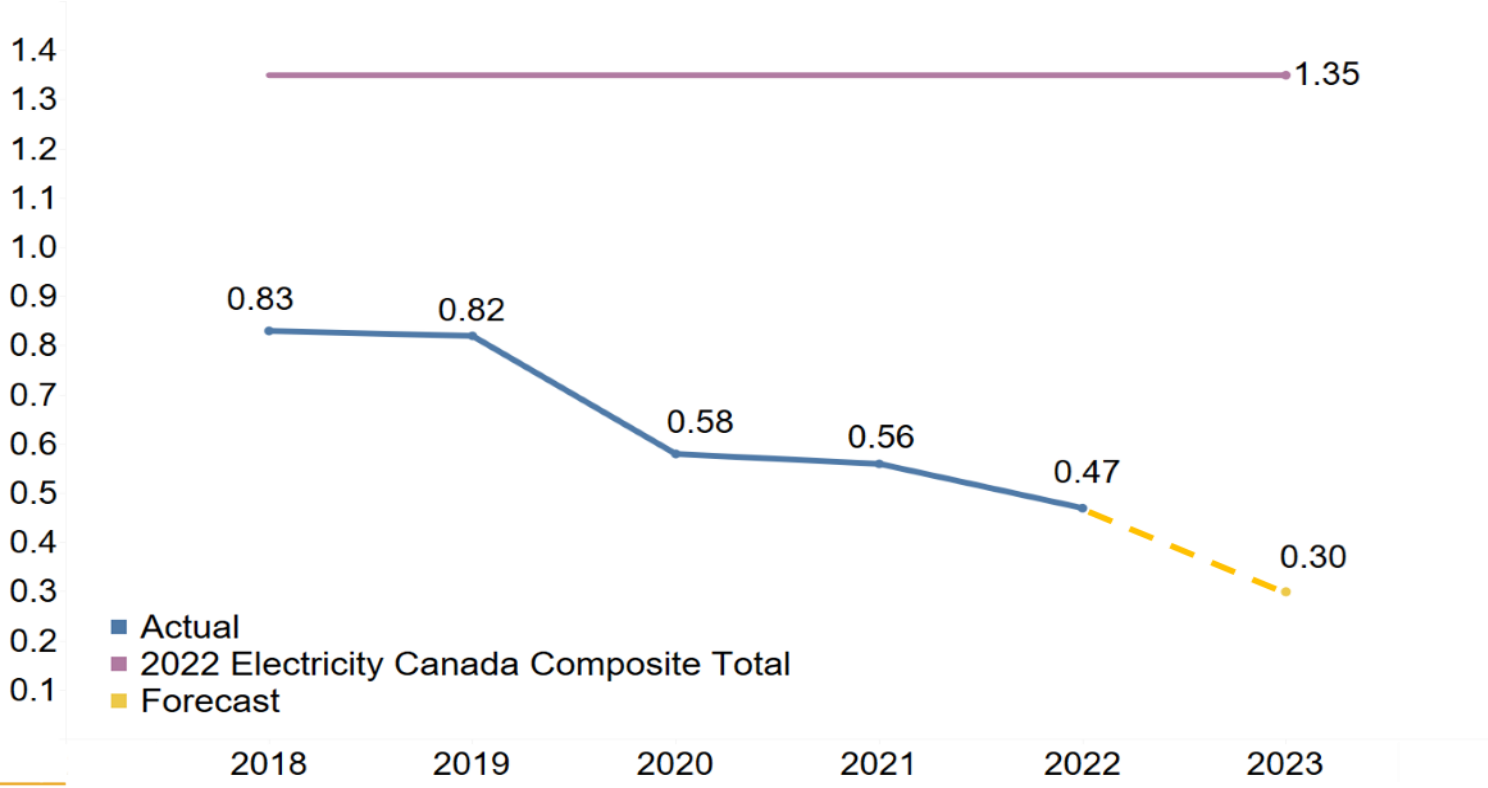
TOTAL RECORDABLE INJURY FREQUENCY (10%)

Continuous Improvement



Stretch





PEOPLE

Total Recordable Injury Frequency Rate, as per Electricity Canada Standard.

#	2023	2024
Threshold	1.05	1.00
Target	1.00	0.95
Stretch	0.95	0.90

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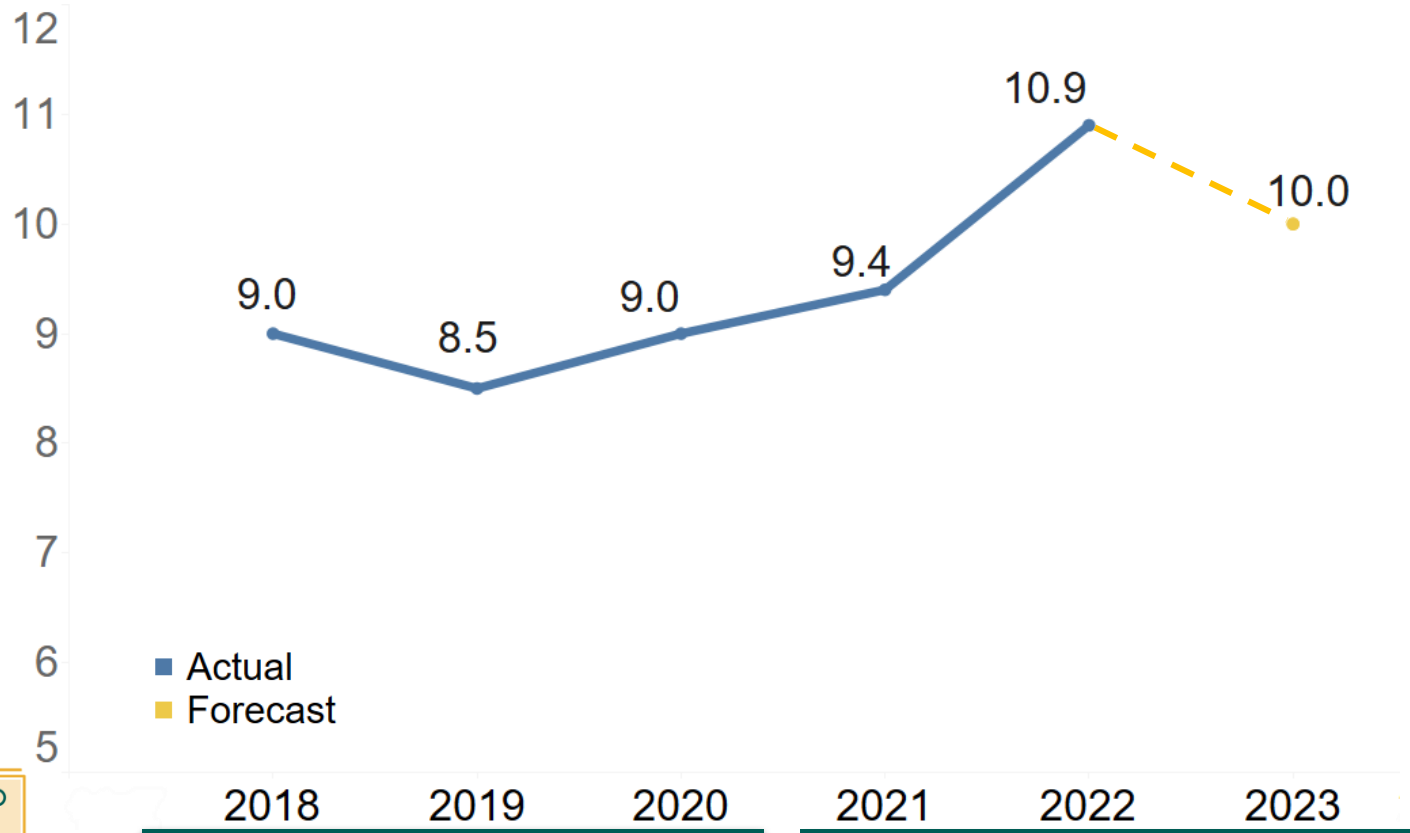
EMPLOYEE ENGAGEMENT (5%)

Continuous Improvement



Stretch





PEOPLE

Average number of engagement sessions attended per employee per year

#	2023	2024
Threshold	7.5	8.0
Target	8.0	8.5
Stretch	8.5	9.0

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Operations (20%)

- **Outage Frequency (SAIFI – Defective Equipment): 10%**
- **Outage Duration (SAIDI – Defective Equipment) : 10%**

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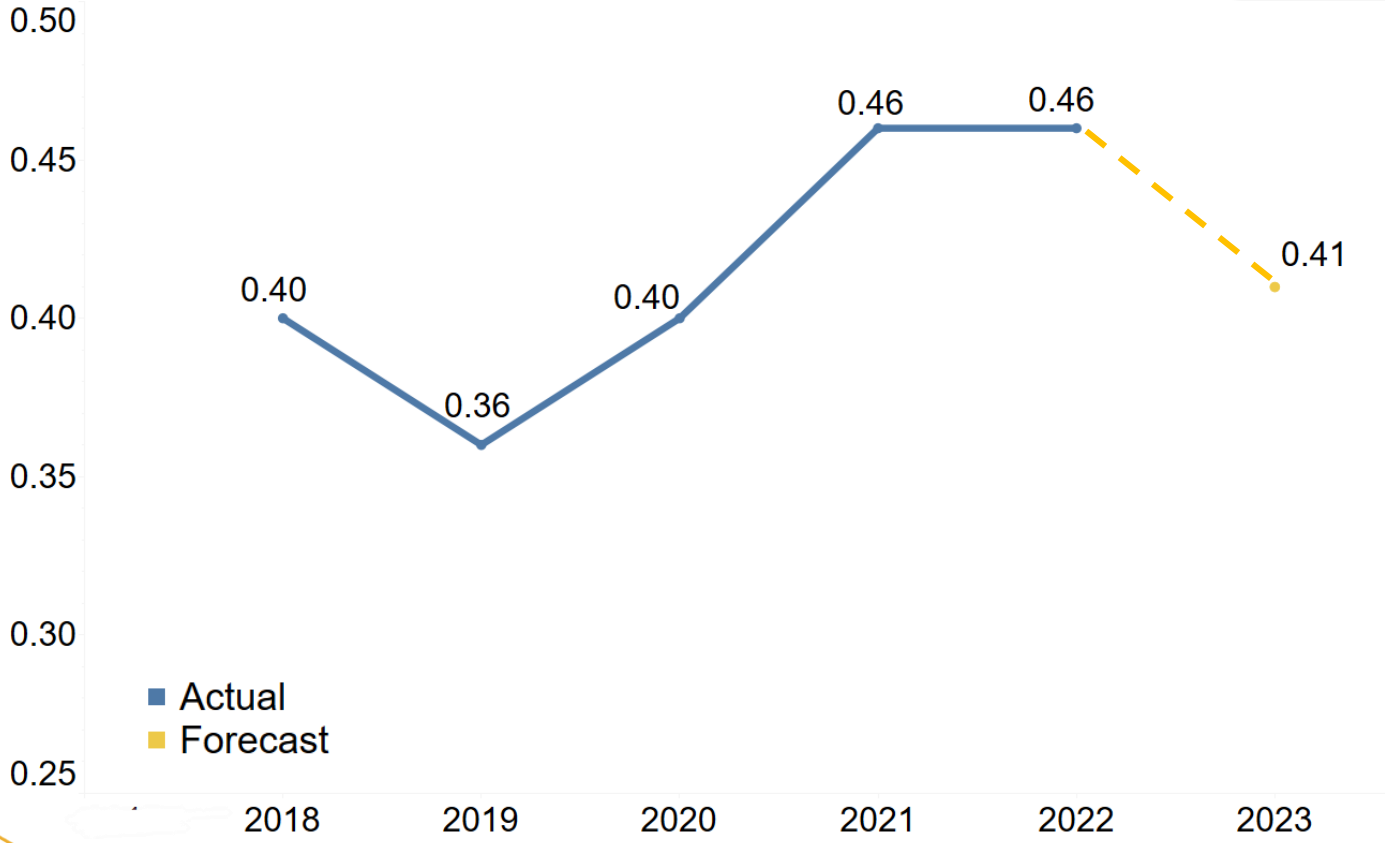
OUTAGE FREQUENCY – DEFECTIVE EQUIPMENT (10%)

Continuous Improvement



Productivity





OPERATIONS

Average number of interruptions per customer; tracked using only the Defective Equipment cause code

#	2023	2024
Threshold	0.61	0.61
Target	0.50	0.50
Stretch	0.48	0.48

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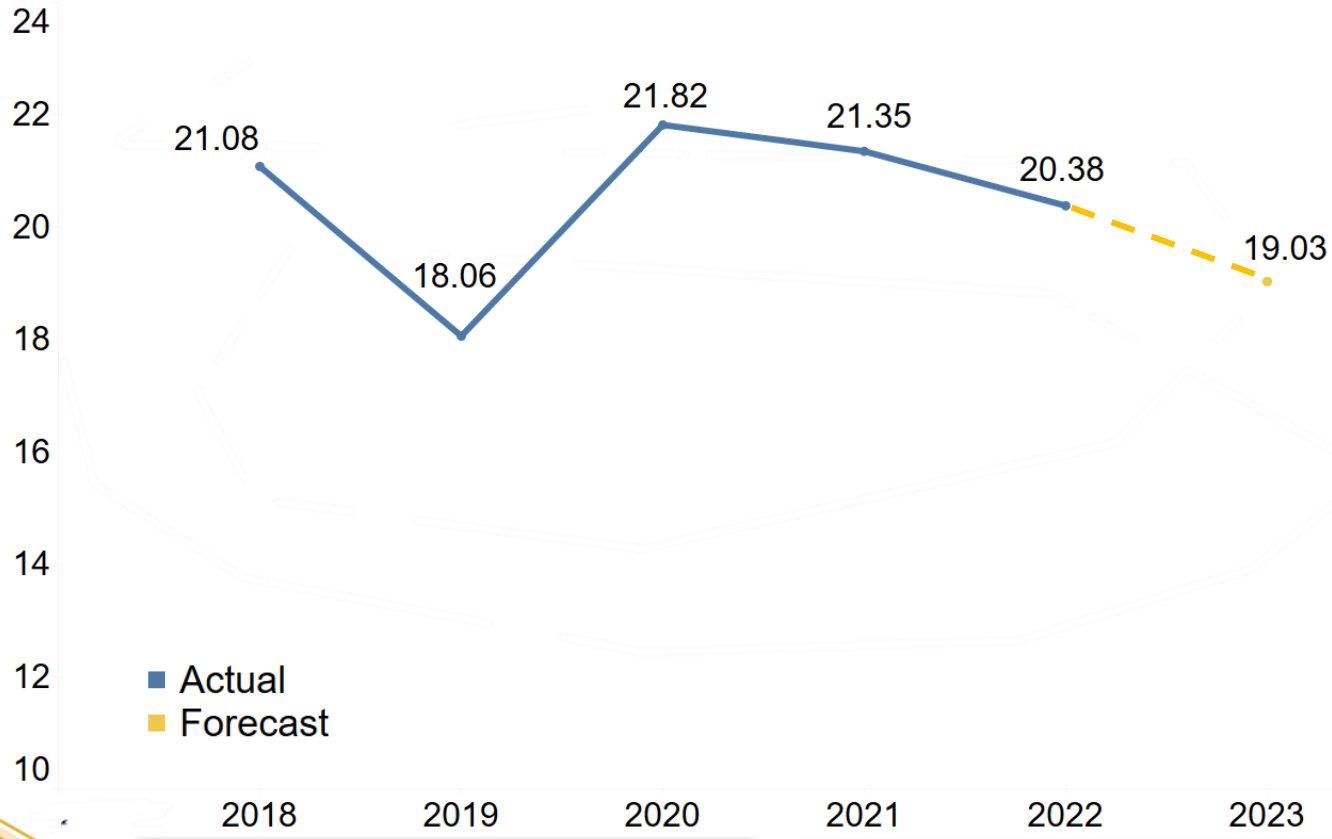
OUTAGE DURATION – DEFECTIVE EQUIPMENT (10%)

Continuous Improvement



Stretch





OPERATIONS

Average outage duration for each customer served; tracked using only the Defective Equipment cause code

Min	2023	2024
Threshold	32.20	30.69
Target	26.47	25.23
Stretch	25.23	24.19

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Financial (40%)

- **In-Service Assets: 10%**
- **Consolidated Net Income: 30%**

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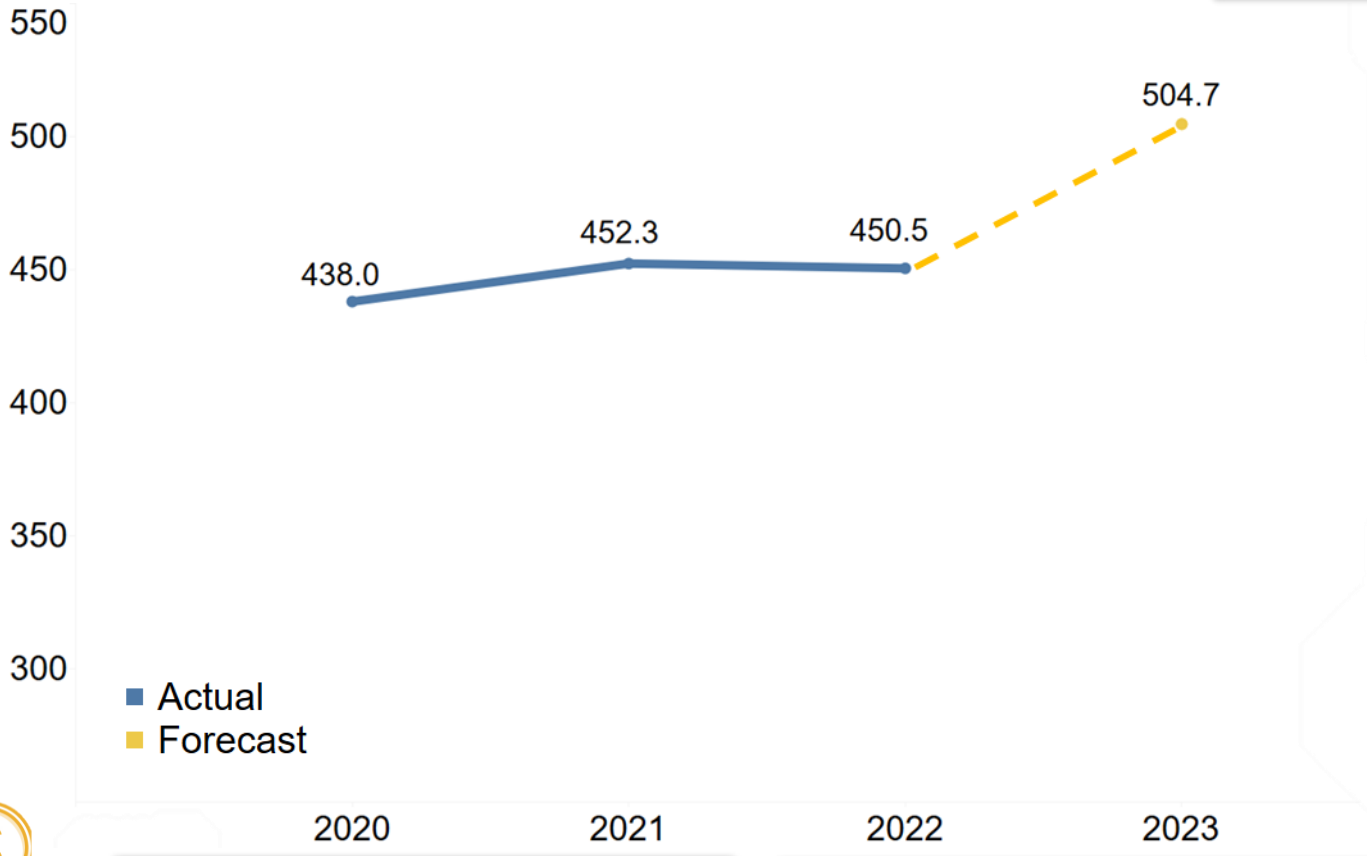
IN-SERVICE ASSETS (10%)

Continuous Improvement



Improvement





FINANCIAL

Measures the actual In-Service Asset amounts recognized in 2024 (net of capital contributions)

$M	2023	2024
Threshold	494.7	496.0
Target	499.7	501.0
Stretch	504.7	506.0

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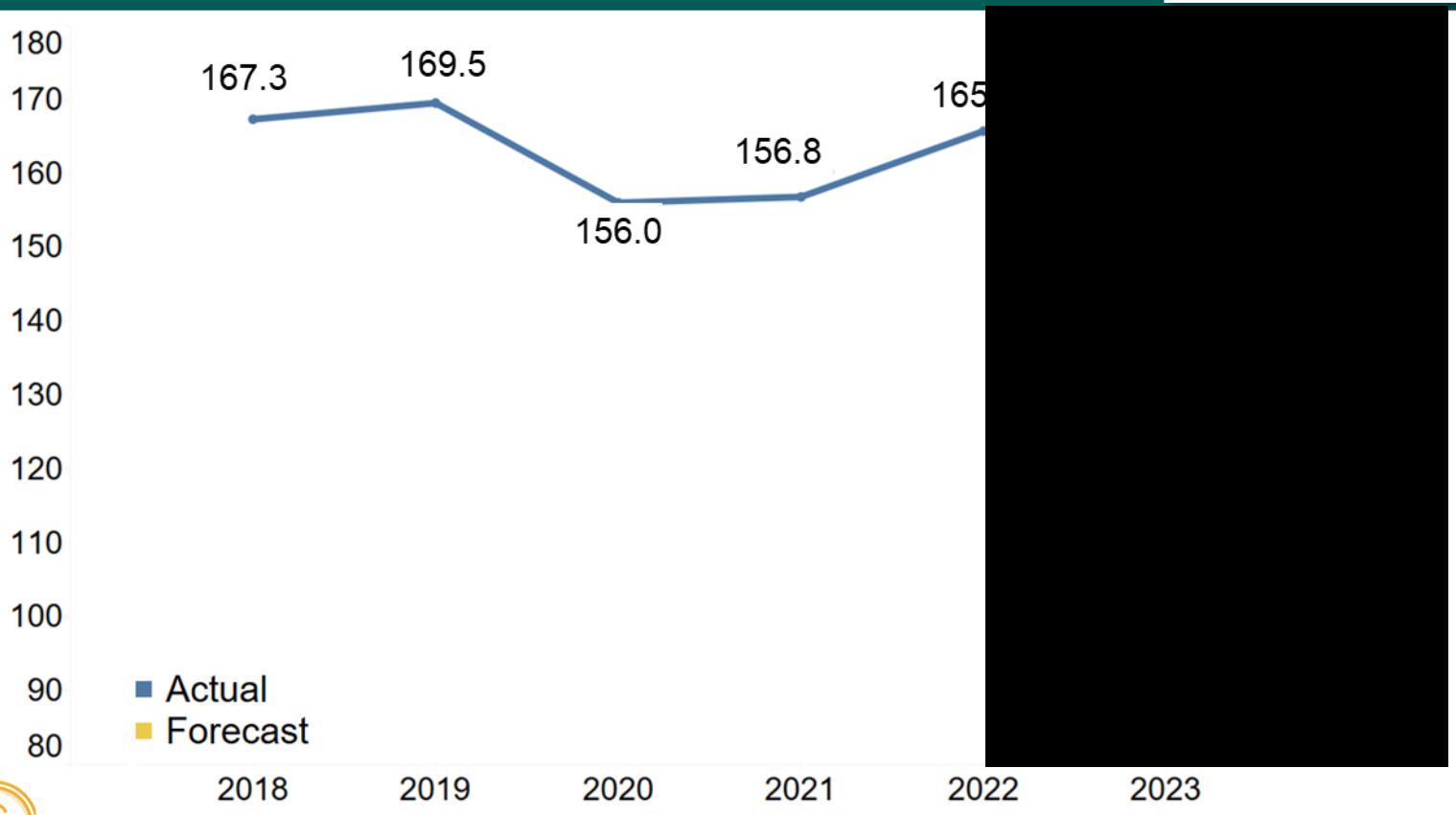
CONSOLIDATED NET INCOME (30%)

Continuous Improvement



Productivity





FINANCIAL

As per the audited financial statements for the 2024 fiscal year

$M	2023	2024
Threshold		
Target		
Stretch		

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2024 CORPORATE SCORECARD



Review and recommend for approval to the THC Board via HREC

Pillar	KPI	2024 Weight	2024 Threshold	2024 Target	2024 Stretch	Continuous Improvement
Customer	New Services Connected on Time	10%	93%	98%	99%	
	Estimated Time of Restoration	5%	80%	85%	90%	
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	Consolidated Net Income	30%	100.0	105.0	110.0	
		100%	25%	100%	150%	

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Toronto Hydro-Electric System Limited EB-2023-0195
Interrogatory Responses
1A-CCC-1
Filed: March 11, 2024
26 Pages

2025 RATE APPLICATION
STRATEGY & UPDATE

August 14, 2023

Amanda Klein
EVP, External Affairs, Corporate Development & Chief Legal Officer

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2025-2029 REGULATORY STRATEGY

Note for new independent directors: the THC board received this strategy (slides 3-8 plus appendix slides) as part of the November 2022 business plan meeting. We are bringing this forward here for your information.





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GRID & OPERATIONS PLANS
2025-2029 INVESTMENT DRIVERS



System Stewardship: Grid & Operational Performance

Continue to deliver safe and reliable/resilient service

Modernization

Adopt technology to modernize our grid and operations

City Growth & Electrification

Connect and serve growing demand

RATE APPLICATION
STRATEGIC PARAMETERS



Capital Program

2025-2029 Capital Expenditures

$4.0B

Operational Plan

2025-2029 Operational Expenditures

$1.9B

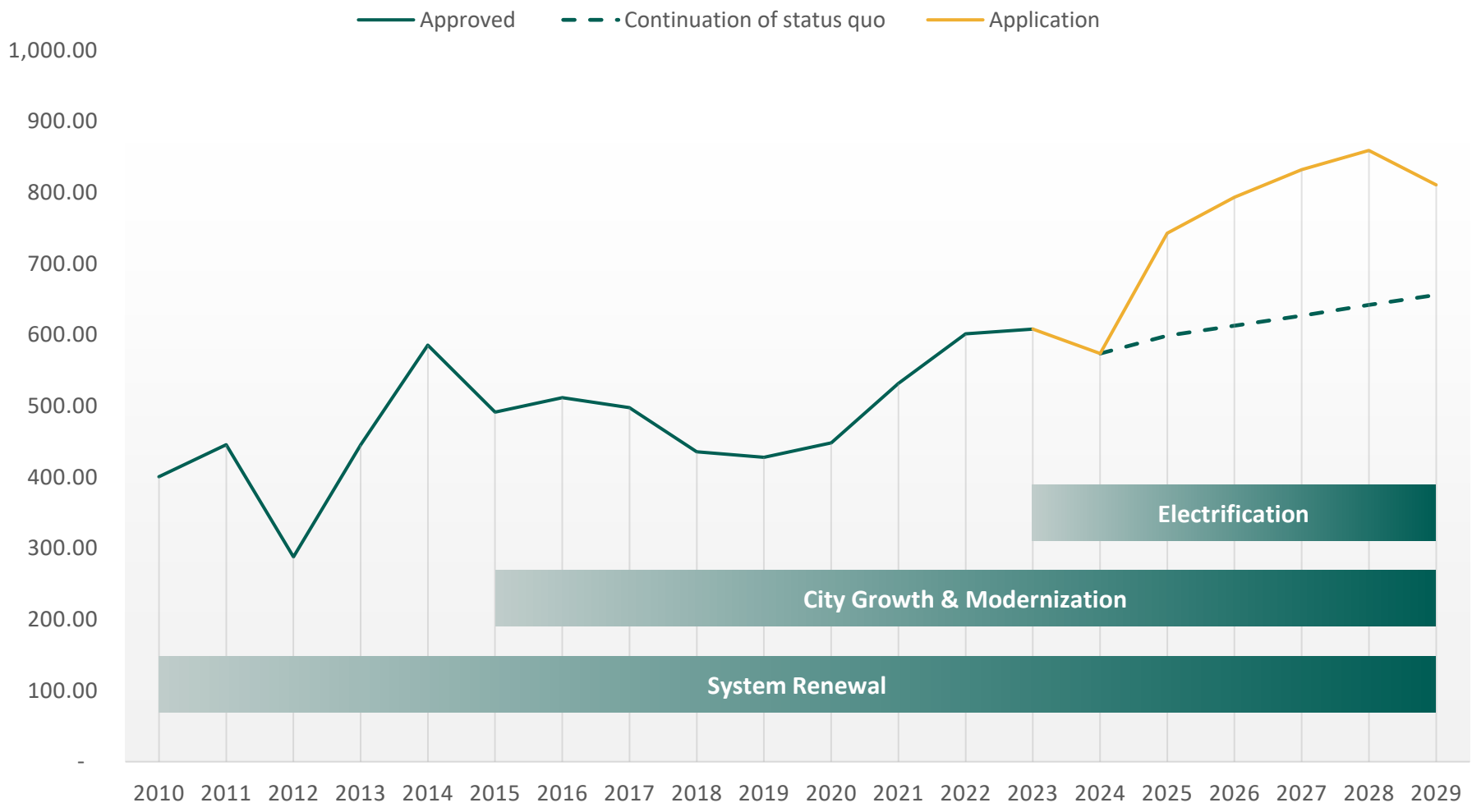
7%
CAGR

Distribution Rates

2024-2029 Average Annual Residential Rate Increase (without rate smoothing)

STRATEGIC PARAMETERS
CAPITAL FUNDING





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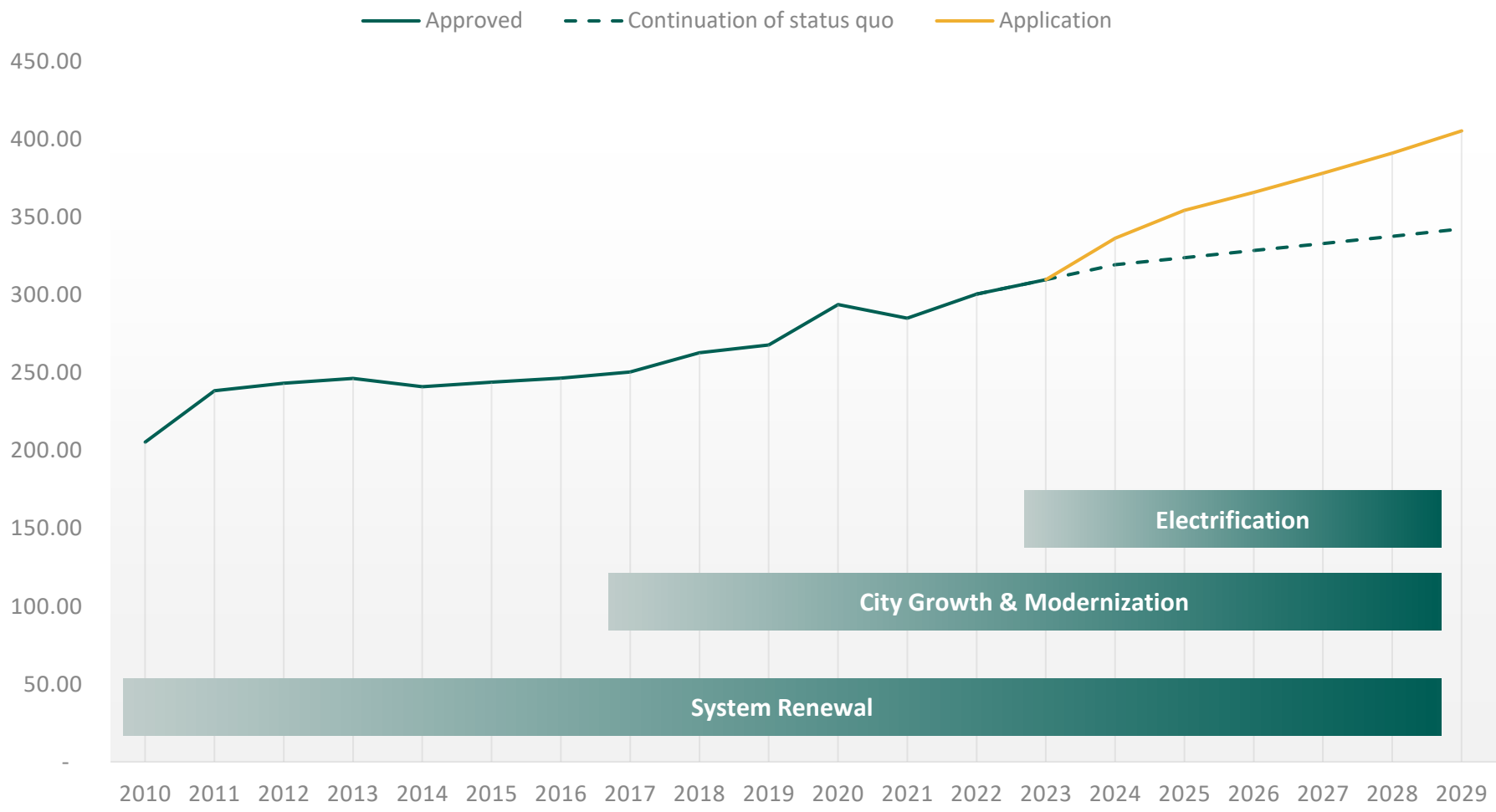
STRATEGIC PARAMETERS

OPERATIONAL FUNDING





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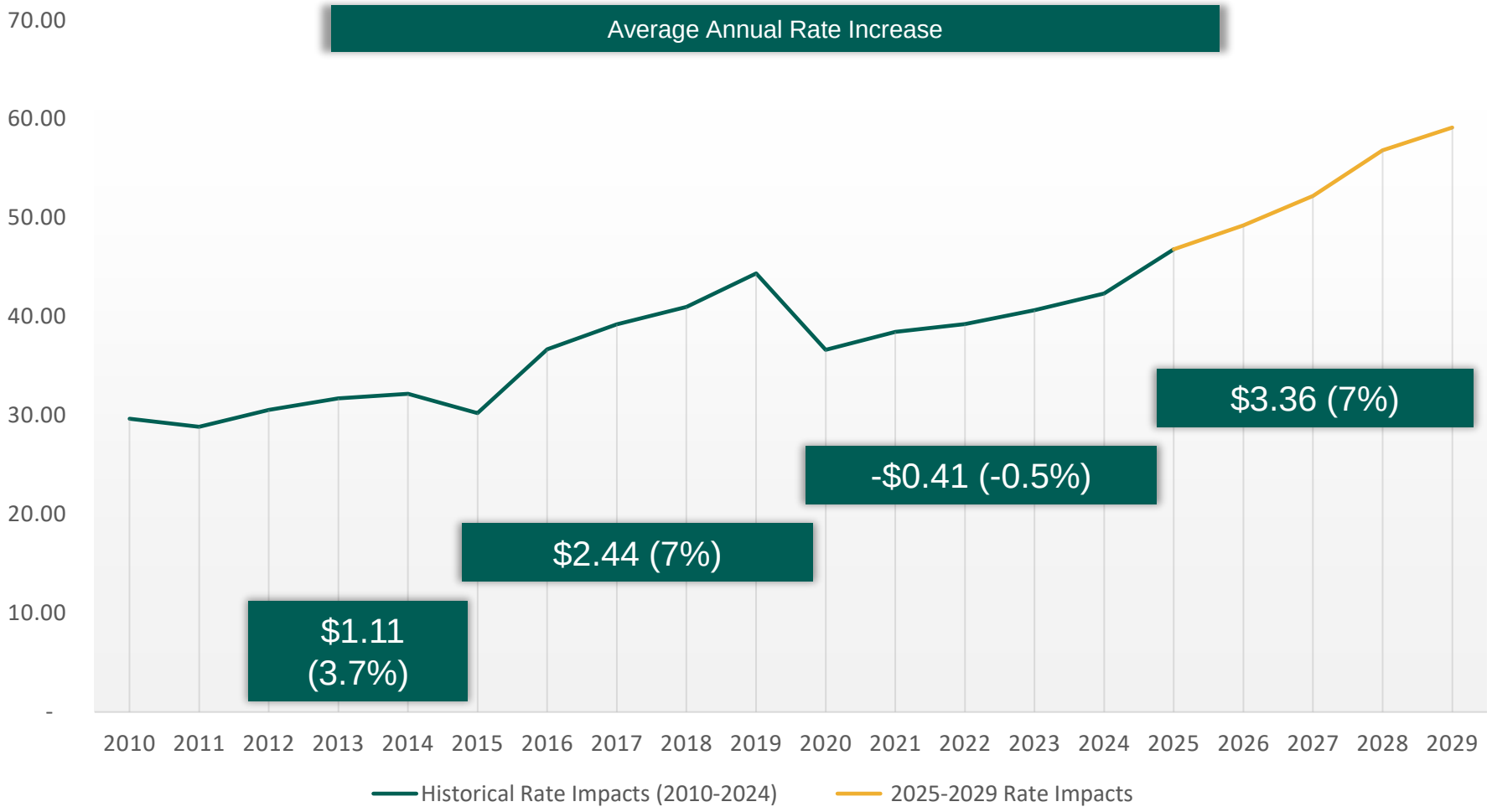
STRATEGIC PARAMETERS

RESIDENTIAL RATE IMPACTS





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RATE APPLICATION UPDATE



RATE APPLICATION
JOURNEY TO FILING



Utility of the Future

Strategic plan for the organization

Climate Action Plan

Enabling electrification as the expanded distributor

Customer Engagement Phase 1 (Needs & Priorities)

Customer needs and priorities for the 2025-2029 planning period

Regulatory Strategy

Funding and flexibility to execute the 2025-2029 investment plan

Integrated Business & Investment Planning

2023-2029 Investment Plans (Workforce, OM&A, Capital)

Regulatory Landscape

Emerging OEB expectations and requirements for LDC performance (Activity & Program Based Benchmarking, Framework for Energy Innovation, Reliability & Power Quality Benchmarking, Distribution Sector Resilience, Responsiveness & Cost Efficiency)

Customer Engagement Phase 2 (Draft Plan)

Customer feedback on key trade-offs and social permission for the draft plan

2025-2029 Custom Incentive Rate Application

Performance incentives provide upfront benefits to customers (rate mitigation) and place the risk/reward emphasis on the delivery of performance outcomes.

We are here

GRID & OPERATIONS PLANS

KEY INVESTMENT CATEGORIES

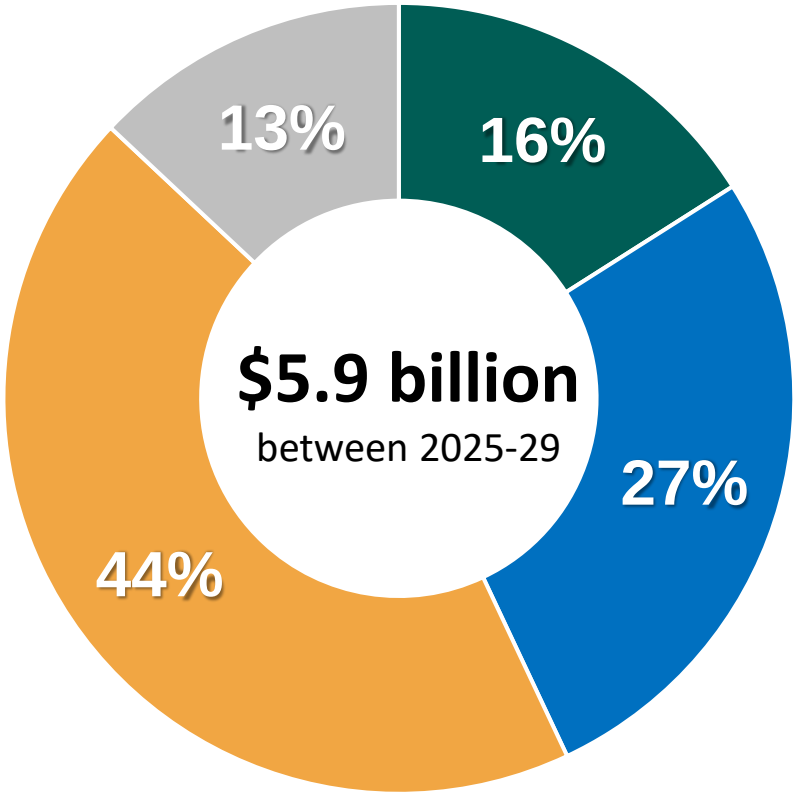


General Plant

Investments in vehicles, work centers and IT to keep the business running and reduce Toronto Hydro's emissions.

Modernization

Investments in technology to get more use out of existing equipment, and build a smarter, more efficient and reliable grid.



Sustainment & System Stewardship

Investments to upkeep old equipment that is in poor condition and replace outdated equipment.

City Growth & Electrification

Investments in capacity to power the growing city and serve customers' growing and changing needs for electricity.

CUSTOMER ENGAGEMENT RESULTS



Rate Class	2018 Participation Numbers	2018 Social Permission	2023 Participation Numbers	2023 Social Permission	2018 vs. 2023 Participation Numbers	2018 vs. 2023 Social Permission
Residential	10,765	71%	32,187	80%	199%	+9%
Small Business	396	55%	695	77%	76%	+22%
C&I	202	73%	264	82%	31%	+9%
Key Accounts	37	78%	52	96%	41%	+18%
Total	11,400	69%	33,198	84%	191%	+15%

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STRATEGIC PARAMETERS



Capital Program

2025-2029 Capital Expenditures

$3.9B

Operational Plan

2025-2029 Operational Expenditures

$1.9B

Distribution Rates

2024-2029 Average Annual Residential Rate Increase (without rate smoothing)
~7.2% smoothed

~7% CAGR

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RATE FUNDING FORMULA

HOW IT WORKS



Regulated Rate of Return

Value of Assets

Interest Expenses

Cost of Capital

Depreciation & Taxes (PILS)

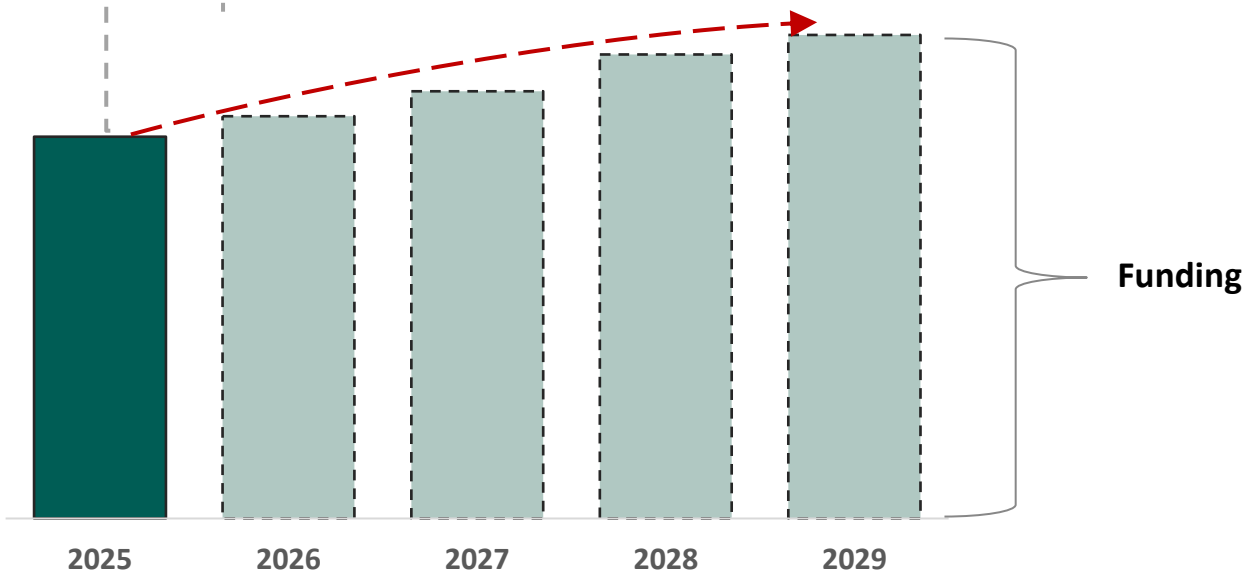
Operating Expenses

Revenue Offsets

Recoverable Revenues

Customer Rates

Prior Year Revenue × (Inflation Factor − X-Factor (Incentive) + Revenue Growth Factor ~~C-Factor~~)



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REGULATORY STRATEGY

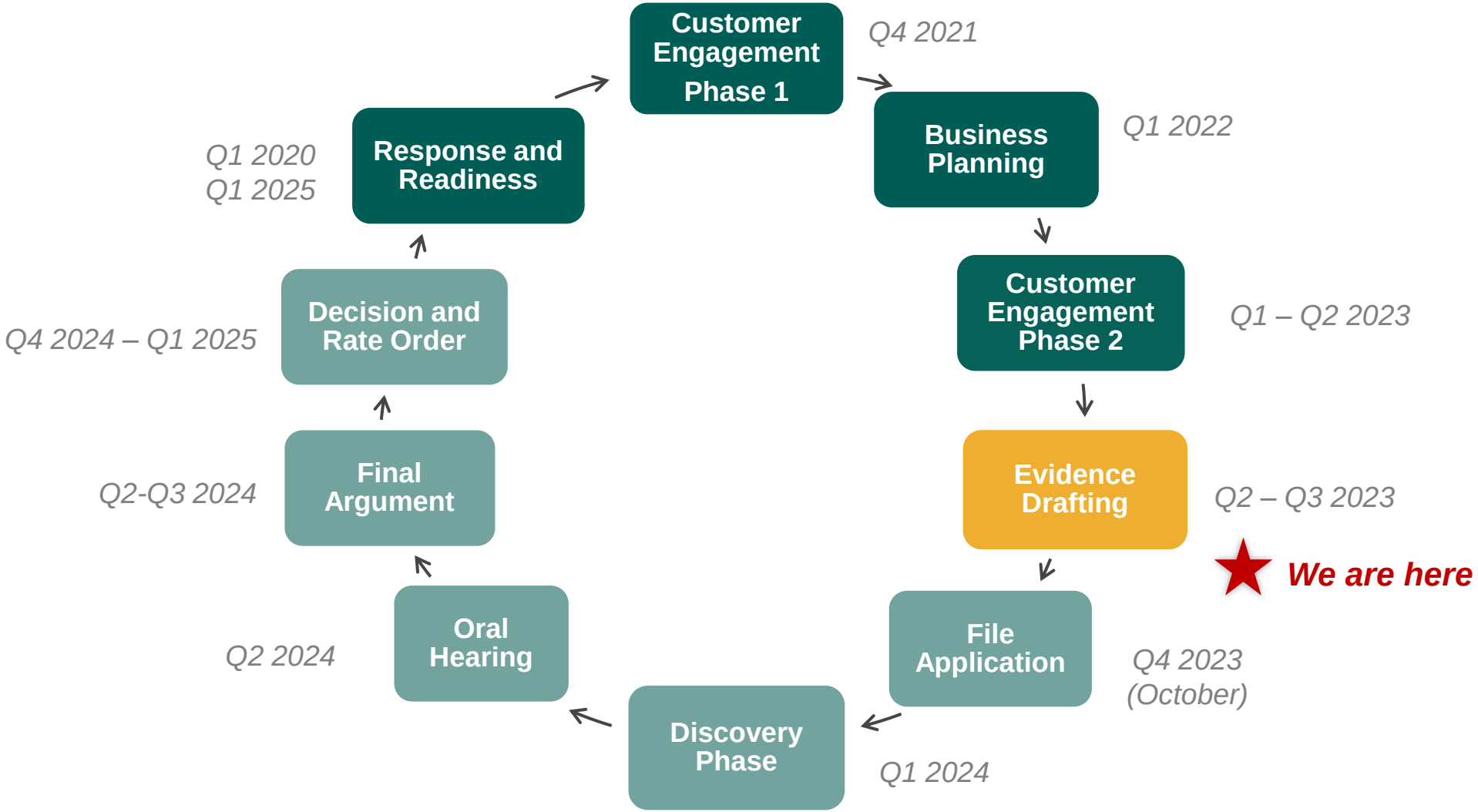
CUSTOM RATE FRAMEWORK



Element	2025-2029 Custom IR Application
Custom Revenue Cap Index (CRCI)	Prior Year Revenue escalated by *Inflation (I-factor) - Incentive (X-factor) + Revenue Growth Factor*
Revenue Growth Factor	Escalates revenue annually to increase Toronto Hydro's financial capacity to invest in capital and operations programs over the outer years of the rate period (i.e. 2026-29)
Inflation (I-Factor)	OEB methodology with a custom index for labour (*Conference Board of Canada Toronto Salary and Wages Index*)
Incentive (X-Factor)	Provides upfront benefits to customers (rate reduction) and the utility an opportunity to earn an incentive by achieving outcomes tied to metrics and targets on the 2025-2029 custom scorecard.
New Deferral and Variance Accounts	Growth Variance Account (*reconciles cost and revenue variances related to changes in demand*); Locates Variance Account (*reconciles cost variances related to Bill 93*)

RATE APPLICATION

PROJECT LIFECYCLE



APPENDIX



STRATEGIC PARAMETER: CAPITAL PROGRAM (CAPEX)

Note: the slides that follow are taken from the draft plan that underpinned the Customer Engagement survey.



SUSTAINMENT OBJECTIVES



PLAN OBJECTIVES & HIGHLIGHTS

- Maintain **overall health demographics** of the asset population in 2025-2029
- Ensure investment pacing contributes to **stable long-term investment profiles** (2030+) for all assets
- Adhere to previous commitments for **safety and environmental compliance activities** (e.g. PCBs by 2025; Box Conversion by 2026)
- Maintain recent historical **system reliability.**
- **Optimize the pace of renewal investment** from year-to-year (cost control) using improved **risk-based** decision-making tools.

Outcome.	Goal	2025-2029 Status Quo Option	2025-2029 Draft Plan	2025-2029 Enhanced Option
Total Expenditures*		$1,269.2	**$1,577.9**	$1,976.1
SAIFI	▶	🟡	🟢	🔵
SAIDI	▶	🟡	🟢	🔵
Assets Past Useful Life	▶	🔴	🟢	🔵
Asset Health	▶	🔴	🟢	🔵
Oil Spills cont. PCBs	▲	🟢	🟢	🟢
System Safety Risk	▲	🔴	🟢	🟢

**Total expenditures exclude allocations such as EAR & AFUDC*

- 🔵 *Exceed (improved)*
- 🟢 *Achieve (stable)*
- 🟡 *At Risk (caution)*
- 🔴 *Risk Realized*

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GROWTH OBJECTIVES



PLAN OBJECTIVES & HIGHLIGHTS

- **Connect customers** efficiently and with consideration for a likely increase in connections volumes due to electrification
- **Expand stations capacity** to alleviate future load constraints, with consideration for increased EV uptake, decarbonization drivers, and other growth factors (digitization and redevelopment).
- **Optimize near-term system capacity** through load transfers, bus balancing, cable upgrades and the targeted use of non-wires alternatives such as demand response and energy efficiency.
- Alleviate constraints on restricted feeders to accommodate **increasing DER connections.**
- Install **control and monitoring capabilities** for all generators > 50kW
- Accommodate relocations for committed **third-party developments**, including priority transit projects

Outcome	Goal	2025-2029 Status Quo Option	2025-2029 Draft Plan	2025-2029 Enhanced Option
Total Expenditures*		$861.3	**$940.5**	$1,109.5
Load Capacity	▲	🔴	🟢	🟢
Hosting Capacity	▲	🟡	🟢	🟢
Obligation to Serve	▶	🟢	🟢	🔵
Operational Flexibility	▲	🟡	🟢	🟢

**Total expenditures exclude allocations such as EAR & AFUDC*

- 🔵 *Exceed (improved)*
- 🟢 *Achieve (stable)*
- 🟡 *At Risk (caution)*
- 🔴 *Risk Realized*

MODERNIZATION
OBJECTIVES



PLAN OBJECTIVES & HIGHLIGHTS

- Prioritize investments that will deliver demonstrable benefits to customers, especially enhancements that will **enhance value-for-money** in the long-term (i.e. efficiency)
- **Improve system reliability** through enhanced fault management, leveraging automation and advanced metering (AMI2.0)
- Enhance **system observability** across the system, enabling better asset management and operational decision making
- Leverage technology to **improve customer experience** (e.q. reliability, power quality, customer tools, DER integration)
- Enhance **resiliency** and **security** of the system through advanced grids, targeted undergrounding of critical overhead assets, and enhancements to distribution schemes for critical loads downtown.

Outcome	Goal	2025-2029 Status Quo Option	2025-2029 Draft Plan	2025-2029 Enhanced Option
Total Expenditures*		$427.3	**$518.6**	$715.5
SAIFI	▲	🟡	🟢	🔵
SAIDI	▲	🟢	🔵	🔵
Customer Experience	▲	🟡	🟢	🔵
System Observability	▲	🟡	🟢	🔵
Operational Flexibility	▲	🟡	🟢	🔵
System Resiliency	▲	🟡	🟢	🔵
Operational Efficiency	▲	🟢	🔵	🔵

**Total expenditures exclude allocations such as EAR & AFUDC*

- 🔵 *Exceed (improved)*
- 🟢 *Achieve (stable)*
- 🟡 *At Risk (caution)*
- 🔴 *Risk Realized*

GENERAL PLANT OBJECTIVES



PLAN OBJECTIVES & HIGHLIGHTS

Fleet & Facilities:

- Implement **Toronto Hydro's NZ40** strategy:
  - Achieve 80% buildings emissions reductions by 2040
  - Expand fleet electric vehicle charging infrastructure and electrify 40% of fleet by 2029
- Improve **stations site conditions and physical security** to meet legislative requirements (OBC, OHSA, CSF, etc.)
- Replace **critical** facilities assets in **poor** condition

IT/OT:

- Support Utility of the Future objectives re Grid Modernization, Process Automation & Customer Experience objectives
- **Minimize reliability and cybersecurity risks**
- Ensure IT **infrastructure is available and reliable** with minimal service disruption

Outcome	Goal	2025-2029 Status Quo Option	2025-2029 Draft Plan	2025-2029 Enhanced Option
Total Expenditures*		$480.8	**$613.4**	$665.3
Asset Condition & Reliability	▶	🔴	🟢	🔵
Emissions Reductions	▲	🟡	🟢	🔵
Security & Resiliency	▲	🔴	🟢	🟢
Grid Modernization	▲	🟡	🟢	🔵
Process Automation	▲	🟡	🟢	🔵
Customer Experience	▲	🟡	🟢	🔵

**Total expenditures exclude allocations such as EAR & AFUDC*

- 🔵 *Exceed (improved)*
- 🟢 *Achieve (stable)*
- 🟡 *At Risk (caution)*
- 🔴 *Risk Realized*

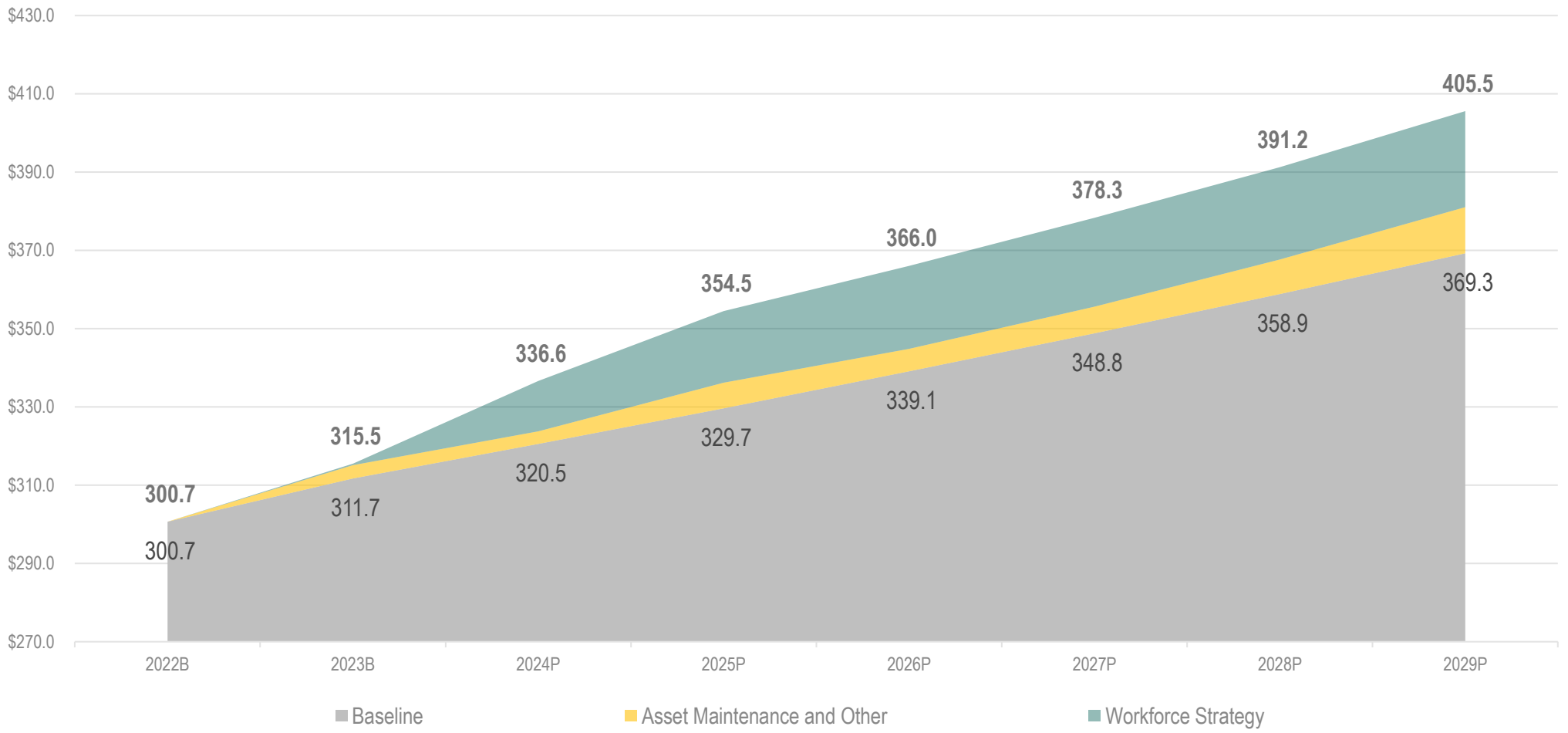
STRATEGIC PARAMETER:
OPERATIONS PROGRAM (OM&A)

Note: the slide that follow are taken from the draft plan that underpinned the Customer Engagement survey.



STRATEGIC PARAMETERS
OPERATIONAL PLAN





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CUSTOMER ENGAGEMENT:

QUALITATIVE FEEDBACK (PHASE 1: NEEDS AND PRIORITIES)

Note: the slides that follows is the feedback that customer provided Toronto Hydro before it developed its draft plan (Toronto Hydro later went back to customer with the draft plan to solicit customer feedback on it – see slide 14)

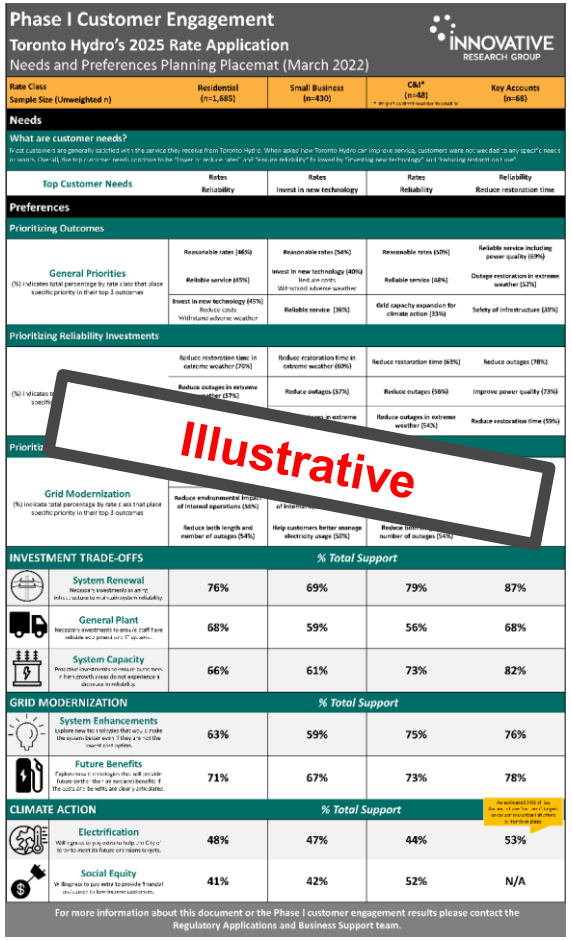


2025-2029 INVESTMENT PLAN

PHASE 1: NEEDS & PRIORITIES

Outcome		Customer Feedback
	Price & Reliability	Price and reliability are top priorities. Despite a continued emphasis on price, reliability is becoming more important to low-volume customers.
	New Technology	Support for investments in new technology even if the benefits aren't immediate, as long as the benefits and costs are clear.
	System Capacity	Support for proactive investments in system capacity infrastructure to ensure customers in high growth areas do not experience a decrease in reliability.

Customer Placemat


Phase I Customer Engagement
Toronto Hydro's 2025 Rate Application
Needs and Preferences Planning Placemat (March 2022)
INNOVATIVE RESEARCH GROUP
Illustrative
INVESTMENT TRADE-OFFS
% Total Support
System Renewal 76% 69% 79% 87%
General Plant 68% 59% 56% 68%
System Capacity 66% 61% 73% 82%
GRID MODERNIZATION
% Total Support
System Enhancements 63% 59% 75% 76%
Future Benefits 71% 67% 73% 78%
CLIMATE ACTION
% Total Support
Electrification 48% 47% 44% 53%
Social Equity 41% 42% 52% N/A
For more information about this document or the Phase I customer engagement results please contact the Regulatory Applications and Business Support team.

Toronto Hydro-Electric System Limited EB-2023-0195
Interrogatory Responses
1A-CCC-1
Filed: March 11, 2024
32 Pages

CUSTOMER ENGAGEMENT & RATE APPLICATION UPDATE

August 16, 2023

Amanda Klein
EVP, External Affairs, Corporate Development & Chief Legal Officer

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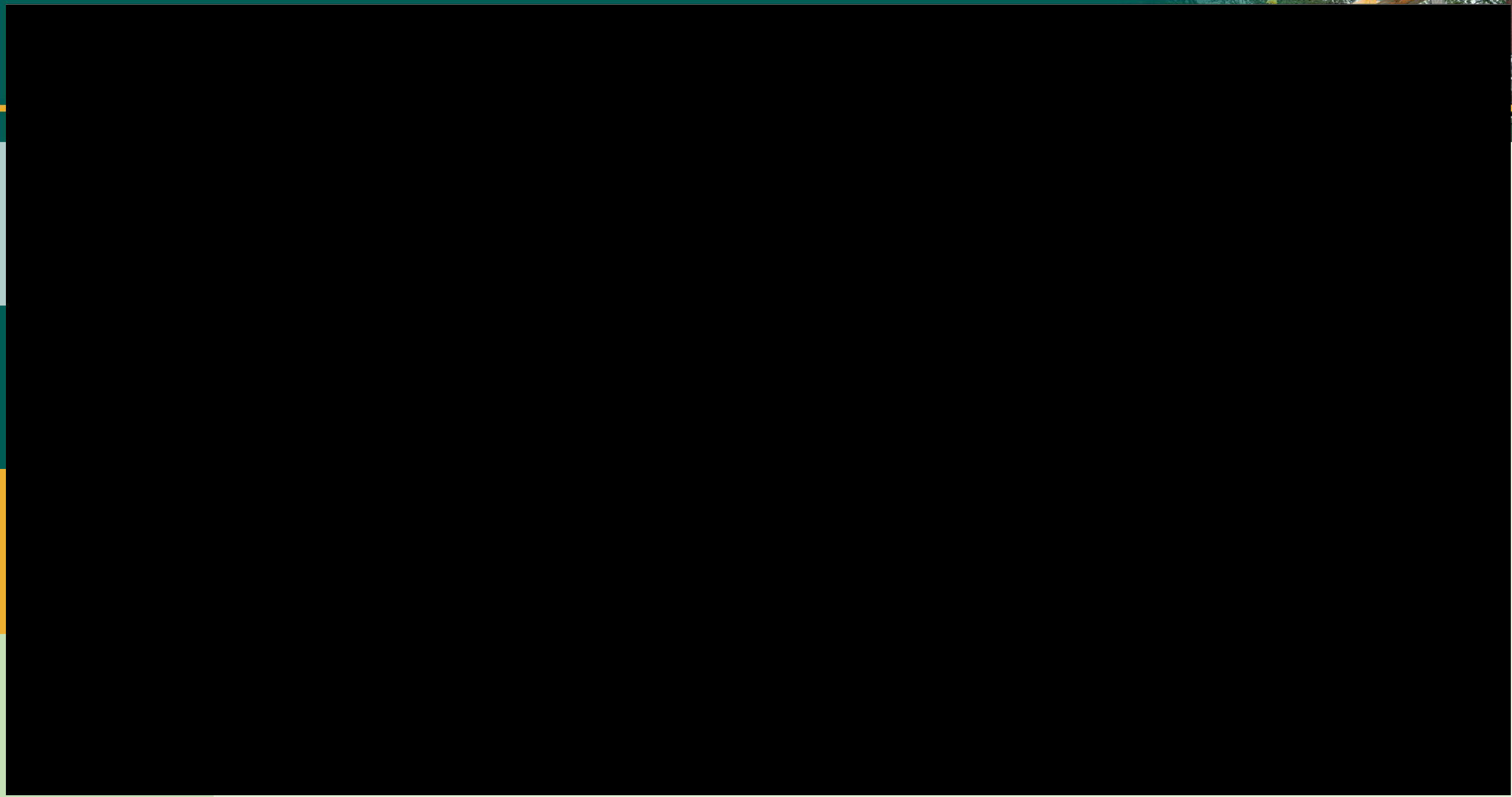



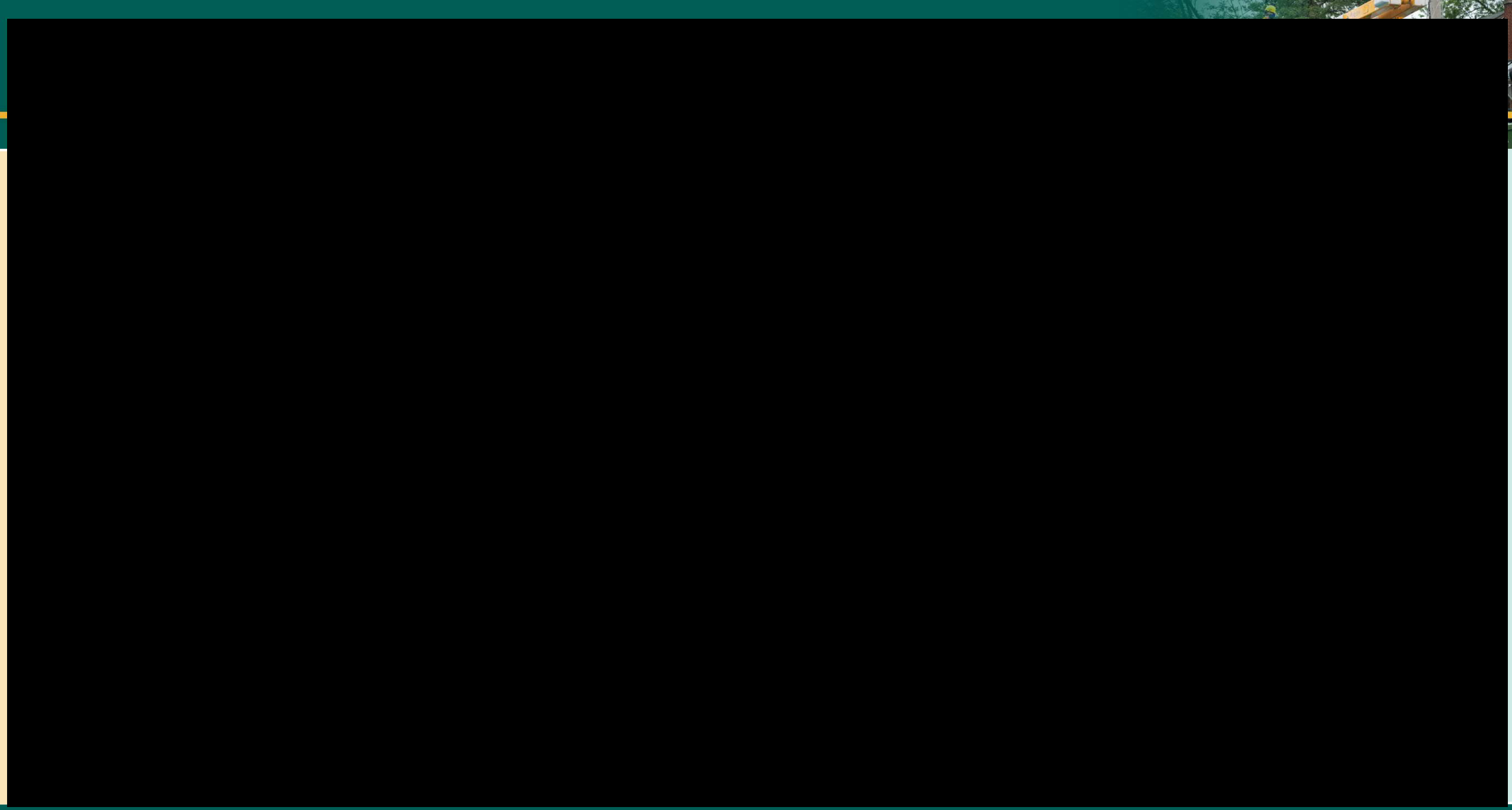

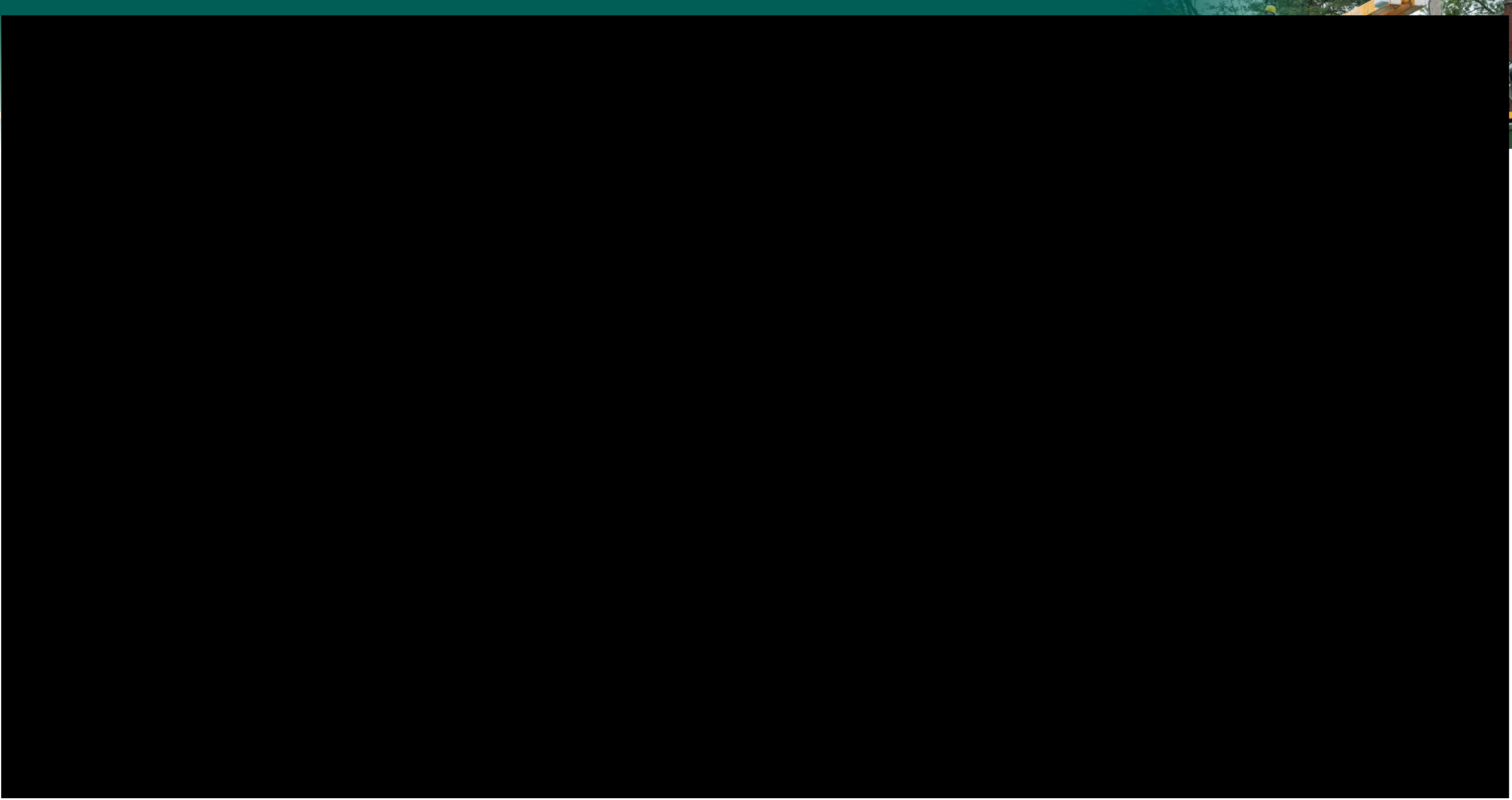

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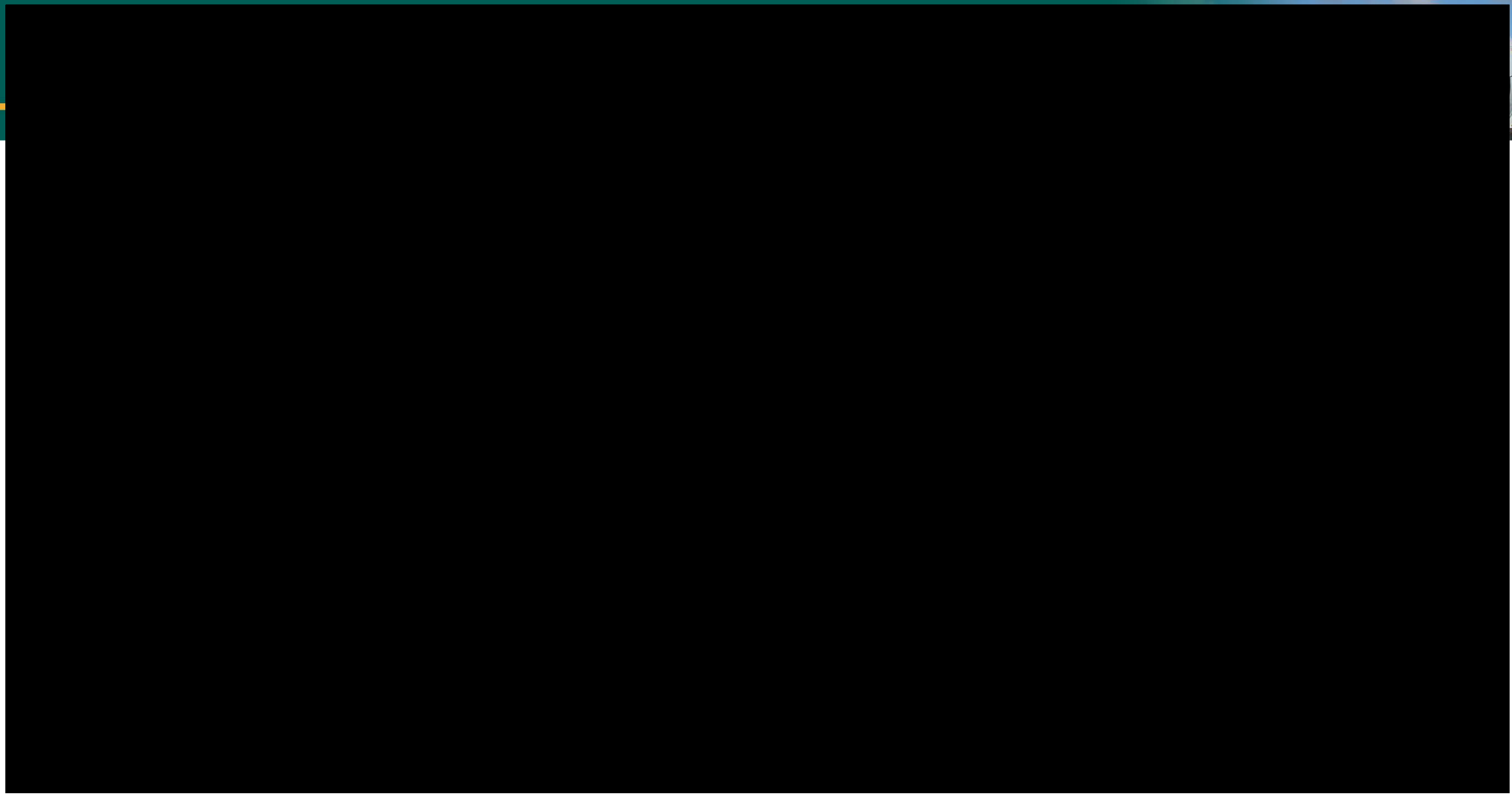

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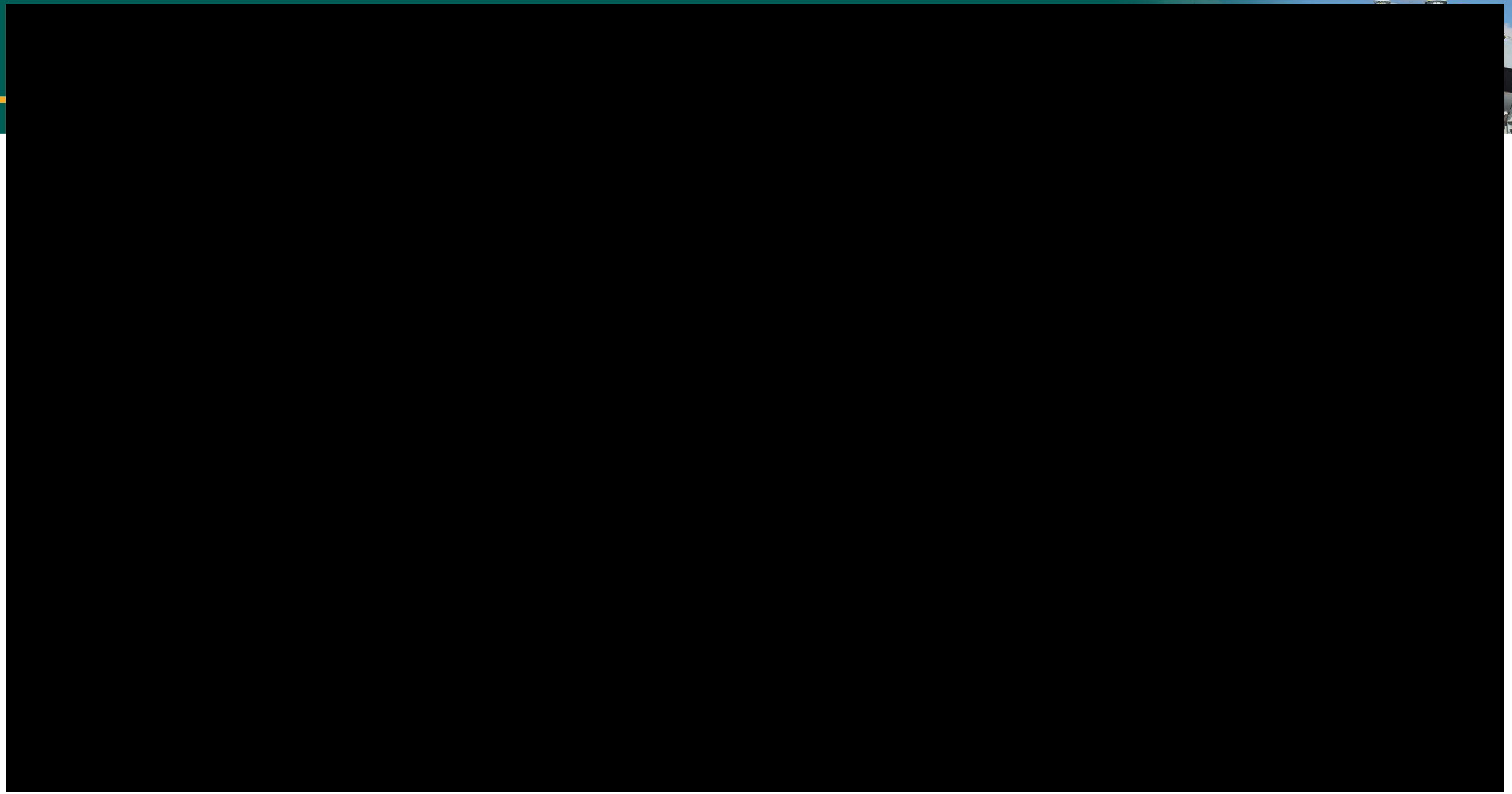

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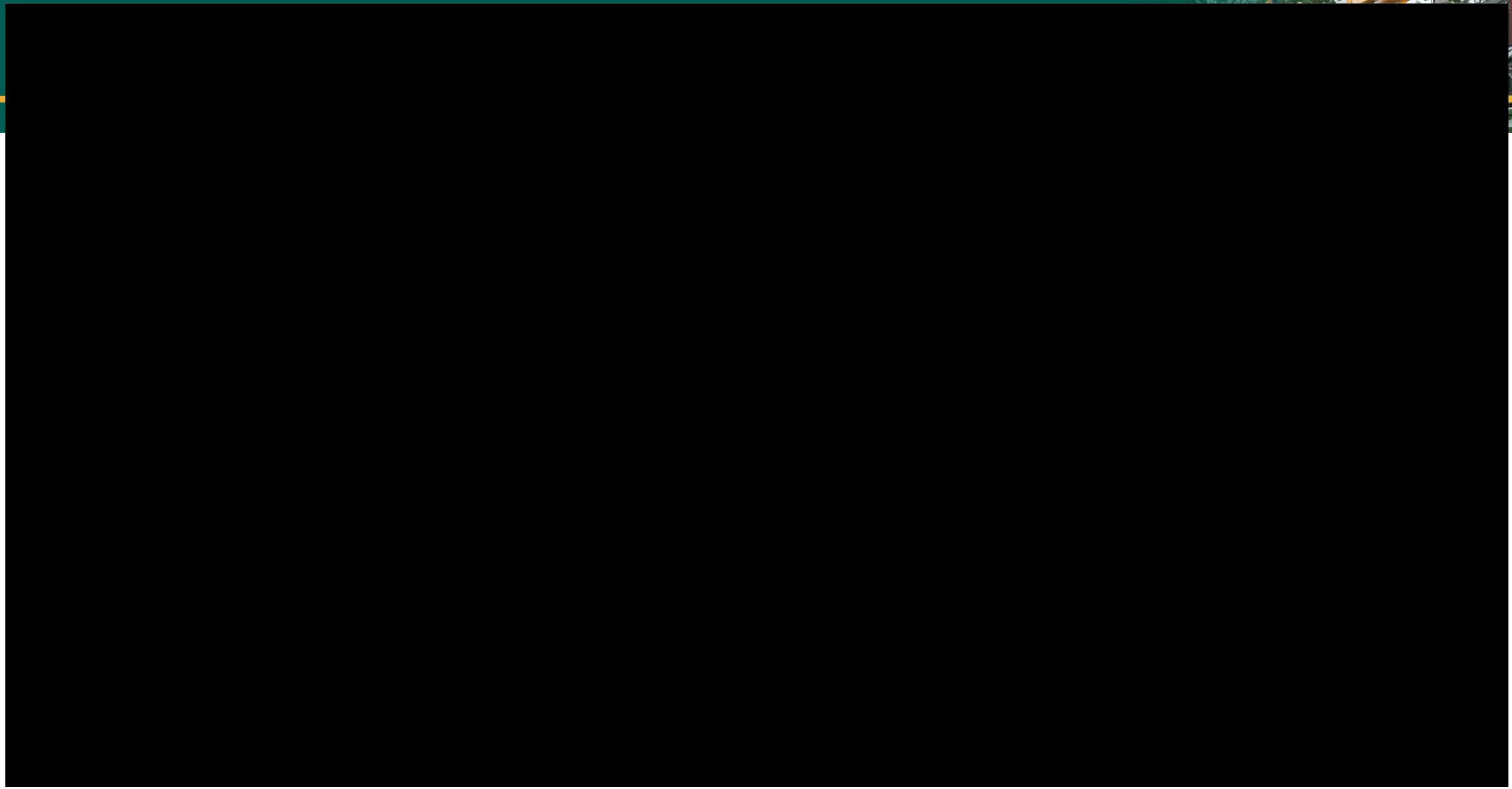

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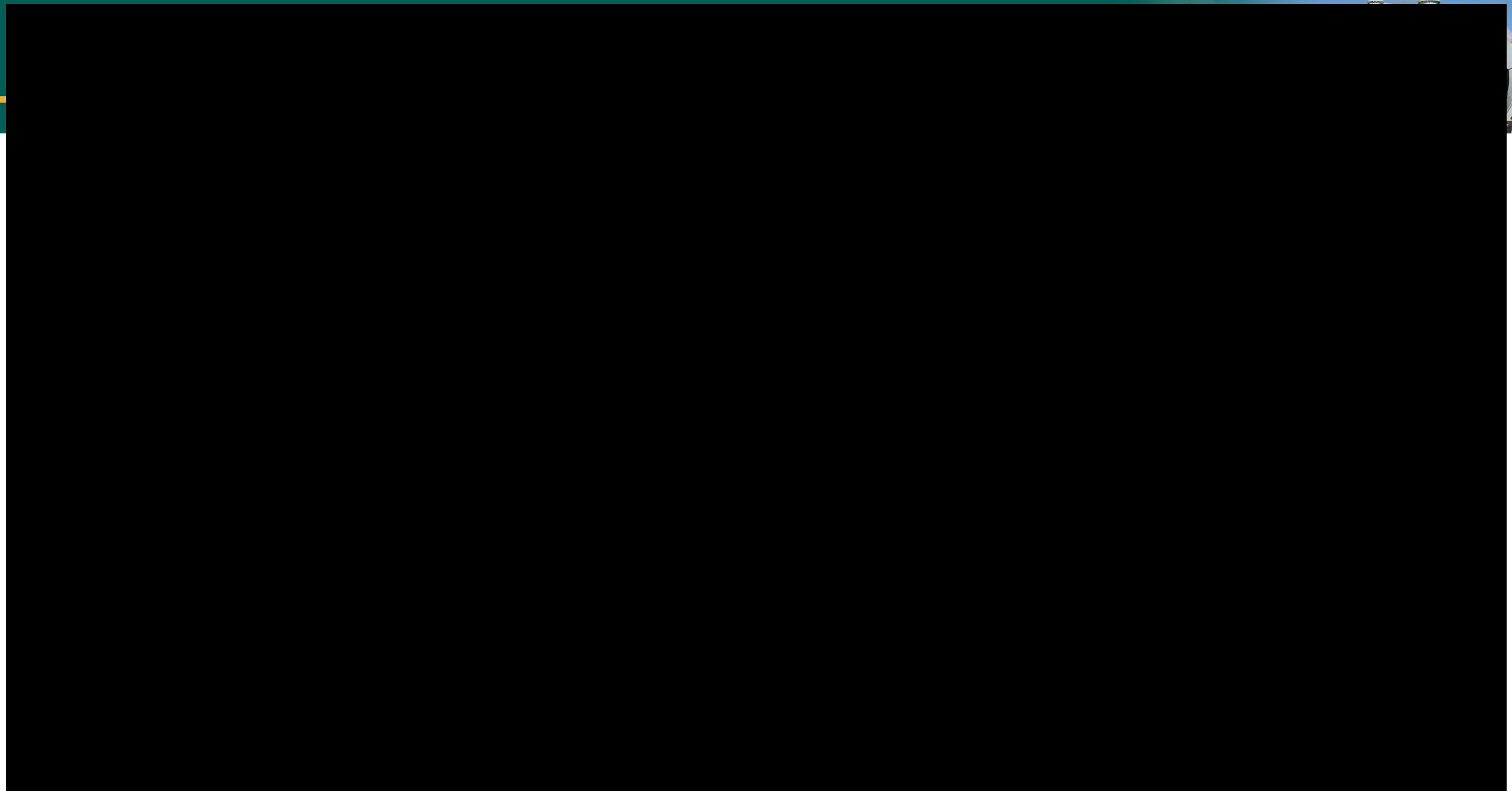

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2025-2029 INVESTMENT PLAN

ENGAGEMENT PROCESS



1. Identify Customer Needs and Priorities

In 2021 and 2022, Toronto Hydro asked many types of customers from across the city about their priorities for electricity distribution service.

2. Use Customer Feedback to Guide Development of Plan

Toronto Hydro planners were given summaries of key findings from the initial customer engagement to consider as they began building their plans.

3. Collect Customer Feedback on the Draft Plan

Toronto Hydro is returning to customers to get feedback on aspects of their preliminary forecasted plan and ask customers how it's plan could better meet their needs and preferences.

4. Re-Examine Plan

Make appropriate changes to the Plan based on customer feedback.

5. Submit the Plan to the Ontario Energy Board

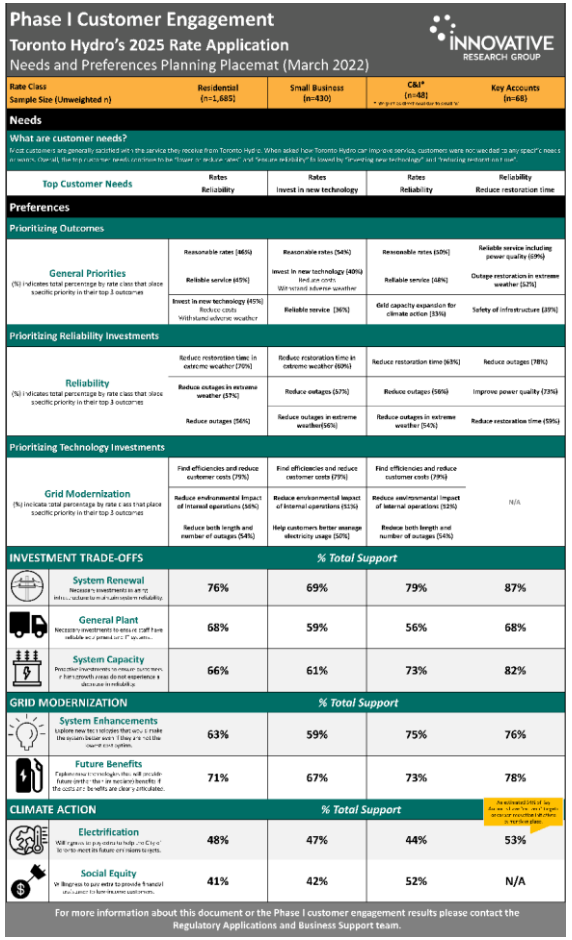
File the Plan, this workbook, and a summary report with the OEB where it will be examined by the OEB, consumer advocates, and other independent parties in a public hearing.

2025-2029 INVESTMENT PLAN

PHASE 1 ENGAGEMENT: NEEDS & PRIORITIES

Outcome	Customer Feedback
Price & Reliability	Price and reliability are top priorities. Despite a continued emphasis on price, reliability is becoming more important to low-volume customers.
Modernization & Automation	Support for investments in new technology even if the benefits aren't immediate, as long as the benefits and costs are clear.
Growth & Electrification	Support for proactive investments in system capacity infrastructure to ensure customers in high growth areas do not experience a decrease in reliability.

Customer Placemat



Phase I Customer Engagement
Toronto Hydro's 2025 Rate Application
Needs and Preferences Planning Placemat (March 2022)
INNOVATIVE RESEARCH GROUP

Rate Class / Sample Size (Unweighted n)	Residential (n=1,685)	Small Business (n=430)	C&I* (n=48)	Key Accounts (n=68)
Needs				
What are customer needs?				
Top Customer Needs	Rates Reliability	Rates Invest in new technology	Rates Reliability	Reliability Reduce restoration time
Preferences				
Prioritizing Outcomes				
General Priorities	Reasonable rates (86%) Reliable service (65%) Invest in new technology (45%) Reduce costs Withstand adverse weather	Reasonable rates (54%) Invest in new technology (40%) Reduce costs Withstand adverse weather Reliable service (36%)	Reasonable rates (50%) Reliable service (48%) Grid capacity expansion for climate action (33%)	Reliable service including power quality (69%) Outage restoration in extreme weather (52%) Safety of infrastructure (39%)
Prioritizing Reliability Investments				
Reliability	Reduce restoration time in extreme weather (70%) Reduce outages in extreme weather (57%) Reduce outages (56%)	Reduce restoration time in extreme weather (60%) Reduce outages (57%) Reduce outages in extreme weather (56%)	Reduce restoration time (63%) Reduce outages (56%) Reduce outages in extreme weather (54%)	Reduce outages (78%) Improve power quality (73%) Reduce restoration time (59%)
Prioritizing Technology Investments				
Grid Modernization	Find efficiencies and reduce customer costs (79%) Reduce environmental impact of internal operations (66%) Reduce both length and number of outages (54%)	Find efficiencies and reduce customer costs (79%) Reduce environmental impact of internal operations (61%) Help customers better manage electricity usage (50%)	Find efficiencies and reduce customer costs (79%) Reduce environmental impact of internal operations (52%) Reduce both length and number of outages (54%)	N/A
INVESTMENT TRADE-OFFS		*% Total Support*		
System Renewal	76%	69%	79%	87%
General Plant	68%	59%	56%	68%
System Capacity	66%	61%	73%	82%
GRID MODERNIZATION		*% Total Support*		
System Enhancements	63%	59%	75%	76%
Future Benefits	71%	67%	73%	78%
CLIMATE ACTION		*% Total Support*		
Electrification	48%	47%	44%	53%
Social Equity	41%	42%	52%	N/A

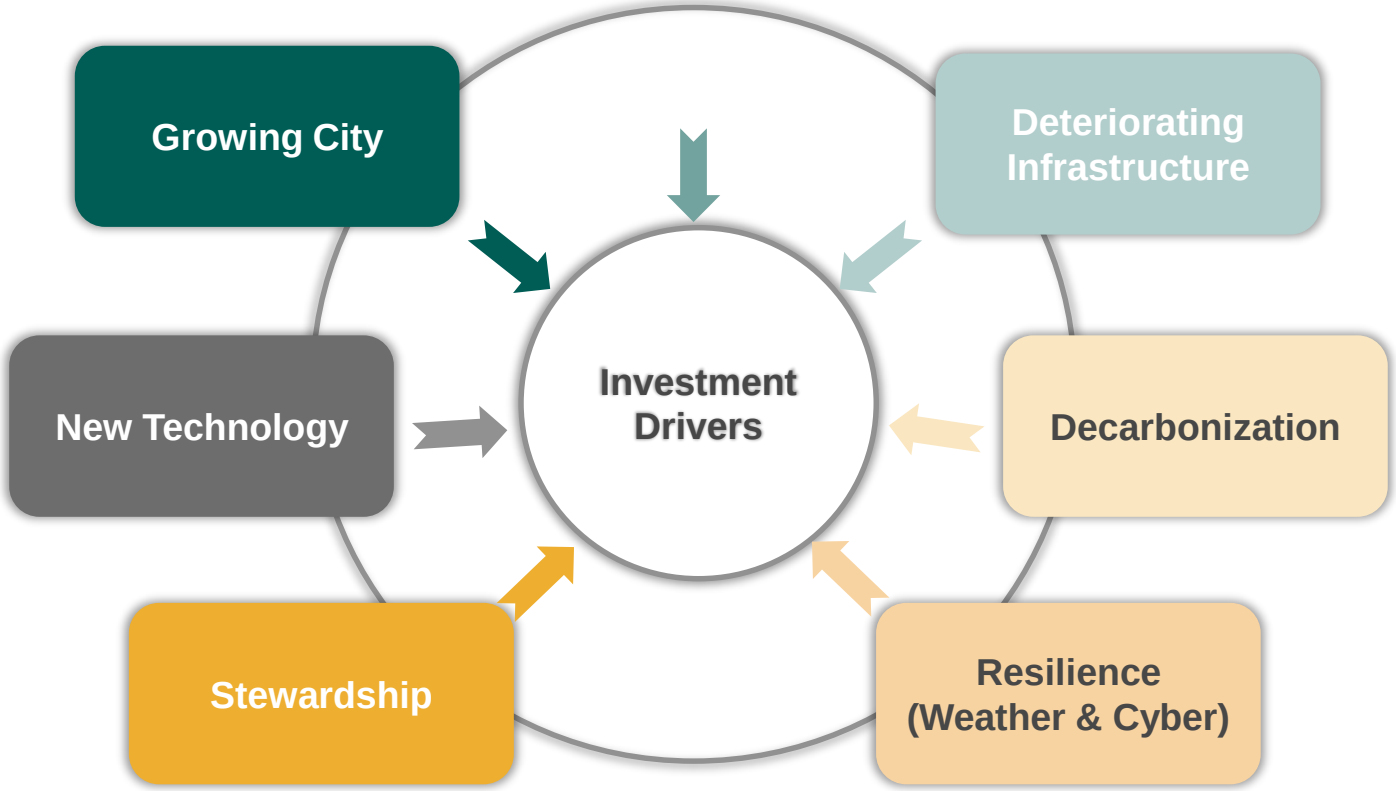
For more information about this document or the Phase I customer engagement results please contact the Regulatory Applications and Business Support team.

2025-2029 INVESTMENT PLAN

PHASE 2 ENGAGEMENT: WORKBOOK



- Introduction and Purpose of the Survey
- Overview of Ontario's Electricity System
- Bill Breakdown and 2025-2029 Rate Impacts
- 2025-2029 Investment Plan Overview
- Investment Needs, Options, Outcomes



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2025-2029 INVESTMENT PLAN

PHASE 2 ENGAGEMNT: INVESTMENT OPTIONS



Draft Modernization Plan (16%)

- Build a Smarter, more Efficient and Resilient Grid

Draft Growth Plan (27%)

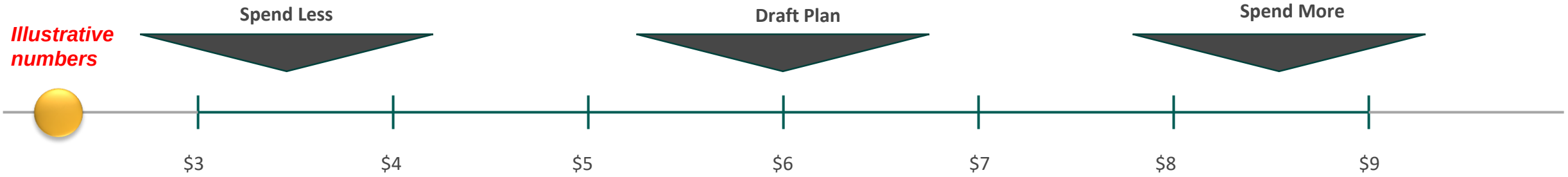
- Increase Capacity to Serve Customers

Draft Sustainment Plan (44%)

- Manage Reliability due to Equipment Failure
- Paced the Upkeep of Equipment at or near EOL
- Standardize Outdated Equipment

Draft General Plant Plan (13%

- Keep the Business Running
- Reduce Toronto Hydro's Building & Vehicle Emissions



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2025-2029 INVESTMENT PLAN

PHASE 2 ENGAGEMENT RESULTS



Rate Class	2018 Participation Numbers	2018 Social Permission	2023 Participation Numbers	2023 Social Permission	2018 vs. 2023 Participation Numbers	2018 vs. 2023 Social Permission
Residential	10,765	71%	32,187	80%	199%	+9%
Small Business	396	55%	695	77%	76%	+22%
C&I	202	73%	264	82%	31%	+9%
Key Accounts	37	78%	52	96%	41%	+18%
Total	11,400	69%	33,198	84%	191%	+15%

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RATE APPLICATION UPDATE



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2025 RATE APPLICATION
JOURNEY TO FILING



Utility of the Future
Strategic plan for the organization

Climate Action Plan
Enabling electrification as the expanded distributor

Customer Engagement Phase 1 (Needs & Priorities)
Customer needs and priorities for the 2025-2029 planning period

Integrated Business & Investment Planning
2023-2029 Investment Plans (Workforce, OM&A, Capital)

Regulatory Strategy
Funding and flexibility to execute the 2025-2029 investment plan

Regulatory Landscape
Emerging OEB expectations and requirements for LDC performance (Activity & Program Based Benchmarking, Framework for Energy Innovation, Reliability & Power Quality Benchmarking, Distribution Sector Resilience, Responsiveness & Cost Efficiency)

Customer Engagement Phase 2 (Draft Plan)
Customer feedback on key trade-offs and social permission for the draft plan

2025-2029 Custom Incentive Rate Application
Performance incentives provide upfront benefits to customers (rate mitigation) and place the risk/reward emphasis on the delivery of performance outcomes.

We are here

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GRID & OPERATIONS PLANS

2025-2029 INVESTMENT DRIVERS



Customer Engagement – Phase 1 Needs and Priorities

Price & Reliability	New Technology	System Capacity
Top priorities. Despite a continued emphasis on price, reliability is becoming more important to low-volume customers.	*Support for investments in new technology that will make the system better and reduce costs even if the benefits aren't immediate*	*Support for investments in system capacity infrastructure to ensure customers in high growth areas do not experience a decrease in reliability.*

System Stewardship: Grid & Operational Performance	Modernization	City Growth & Electrification
Continue to deliver safe and reliable/resilient service	Adopt technology to modernize our grid and operations	Connect and serve growing demand

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GRID & OPERATIONS PLANS
KEY INVESTMENT CATEGORIES

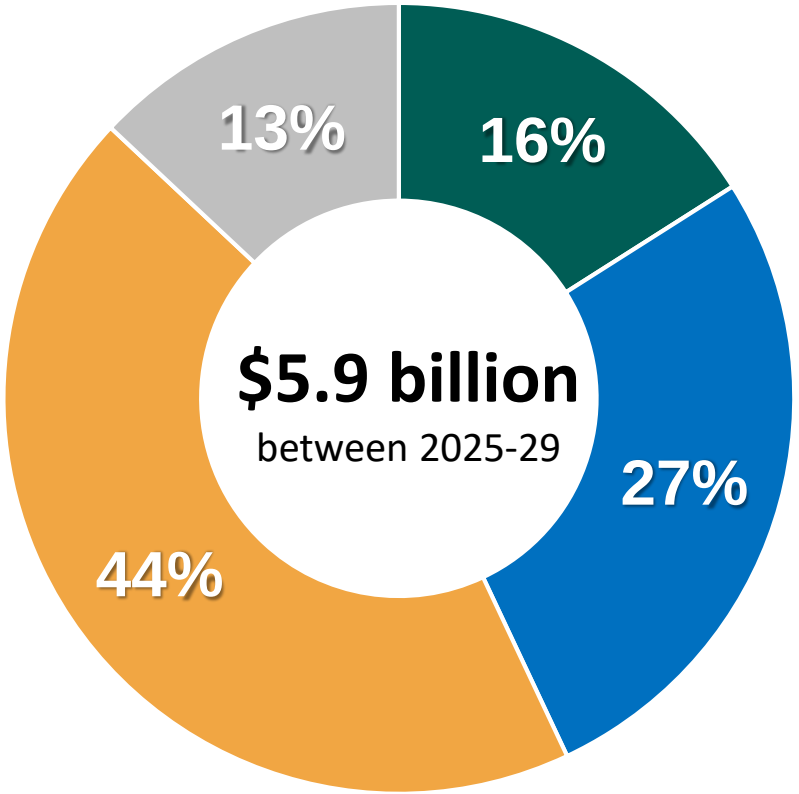


General Plant

Investments in vehicles, work centers and IT to keep the business running and reduce Toronto Hydro's emissions.

Modernization

Investments in technology to get more use out of existing equipment, and build a smarter, more efficient and reliable grid.



Sustainment & System Stewardship

Investments to upkeep old equipment that is in poor condition and replace outdated equipment.

City Growth & Electrification

Investments in capacity to power the growing city and serve customers' growing and changing needs for electricity.

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BUSINESS PLAN & RATE APPLICATION
STRATEGIC PARAMETERS (APPROVED)



Capital Program

2025-2029 Capital Expenditures

$4.0B

Operational Plan

2025-2029 Operational Expenditures

$1.9B

Distribution Rates

2024-2029 Average Annual Residential Rate Increase (without rate smoothing)

7% CAGR

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BUSINESS PLAN & RATE APPLICATION
STRATEGIC PARAMETERS (APPROVED)



Capital Program

2025-2029 Capital Expenditures

$3.9B

Operational Plan

2025-2029 Operational Expenditures

$1.9B

Distribution Rates

2024-2029 Average Annual Residential Rate Increase
(without rate smoothing)
~7.2% smoothed

~7% CAGR

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RATE FUNDING FORMULA
HOW IT WORKS



Regulated Rate of Return

Value of Assets

Interest Expenses

Cost of Capital

Depreciation & Taxes (PILS)

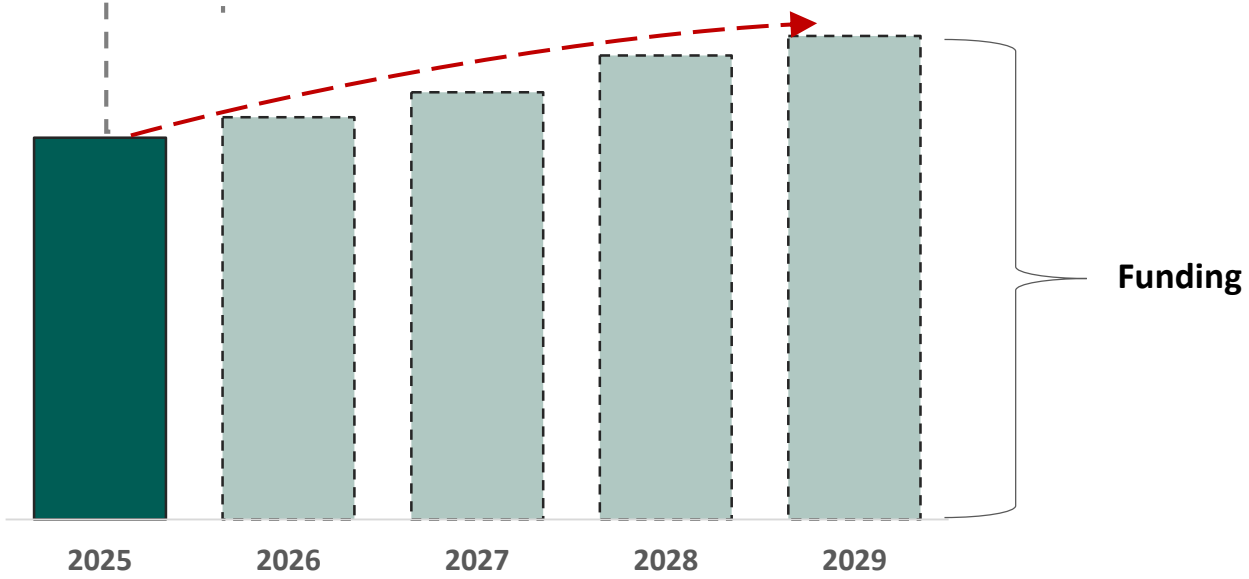
Operating Expenses

Revenue Offsets

Recoverable Revenues

Customer Rates

Prior Year Revenue × (Inflation Factor − X-Factor (Incentive) + Revenue Growth Factor)

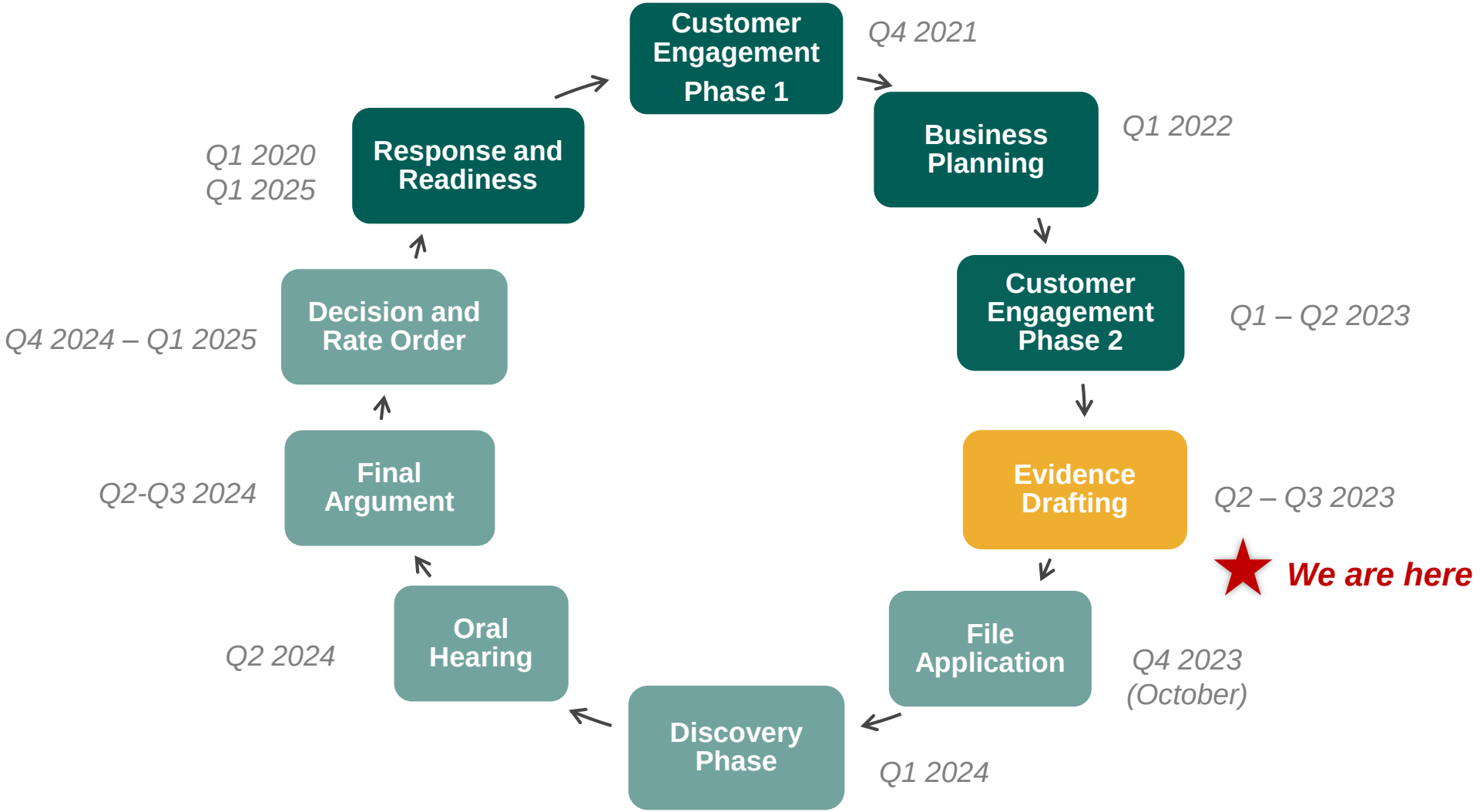


2025-2029 RATE APPLICATION
CUSTOM RATE FRAMEWORK



Element	2025-2029 Custom IR Application
Custom Revenue Cap Index (CRCI)	Prior Year Revenue escalated by *Inflation (I-factor) - Incentive (X-factor) + Revenue Growth Factor (RGF)*
Revenue Growth Factor (RGF)	Escalates revenue annually to enable Toronto Hydro to deliver its capital and operations programs over the outer years of the rate period (i.e. 2026-29)
Inflation (I-Factor)	Based on standard OEB methodology with a custom Toronto-specific index for labour to reflect the cost pressures of attracting and retaining talent in a competitive urban environment.
Incentive (X-Factor)	Provides upfront benefits to customers (rate reduction) and the utility an opportunity to earn an incentive by achieving outcomes tied to metrics and targets on the 2025-2029 custom scorecard.
New Deferral and Variance Accounts	Demand Related Variance Account (*reconciles cost and revenue variances related to changes in customer demand*); Locates Variance Account (*reconciles cost variances related to Bill 93*)

RATE APPLICATION
PROJECT LIFECYCLE



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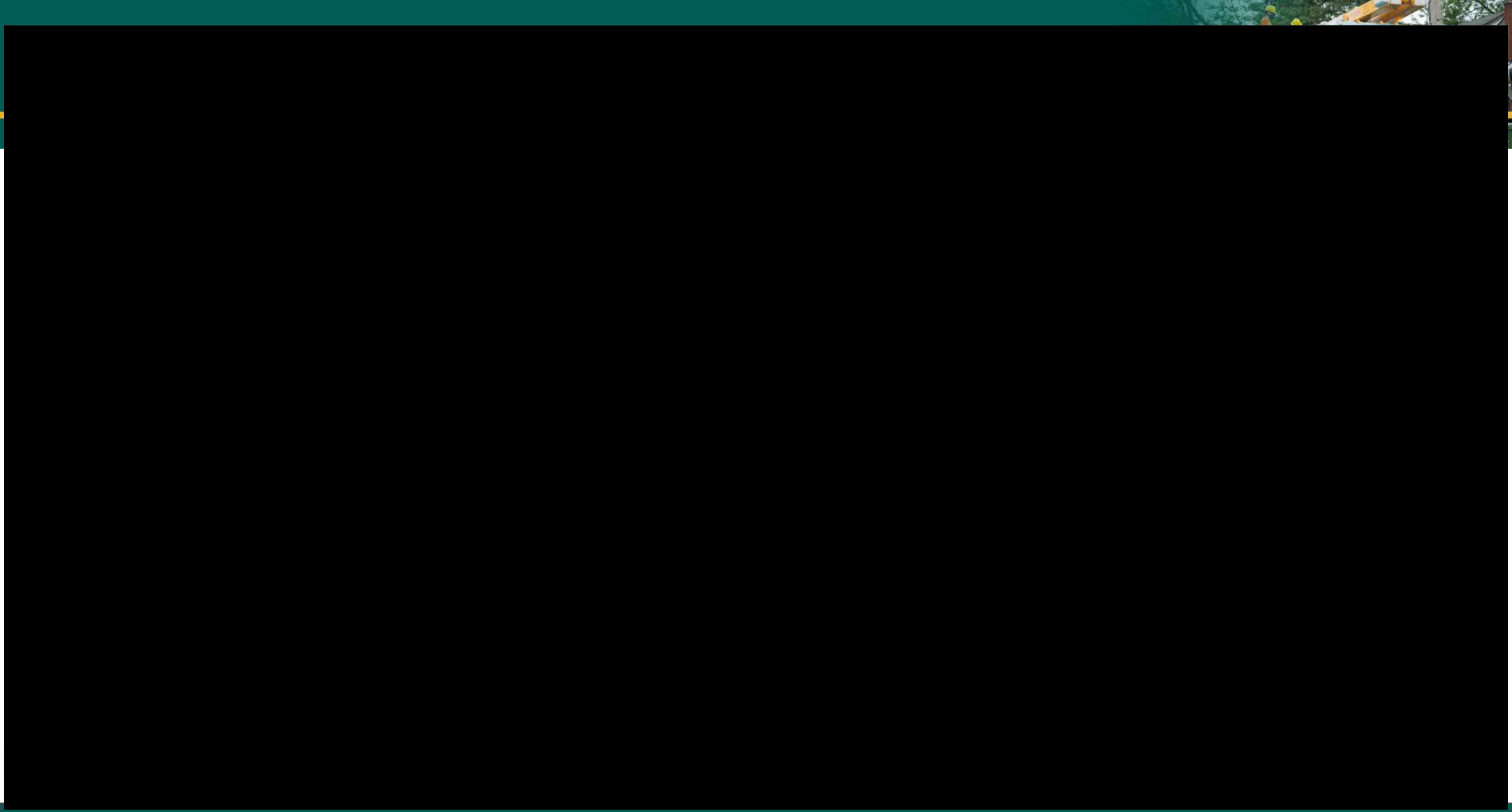

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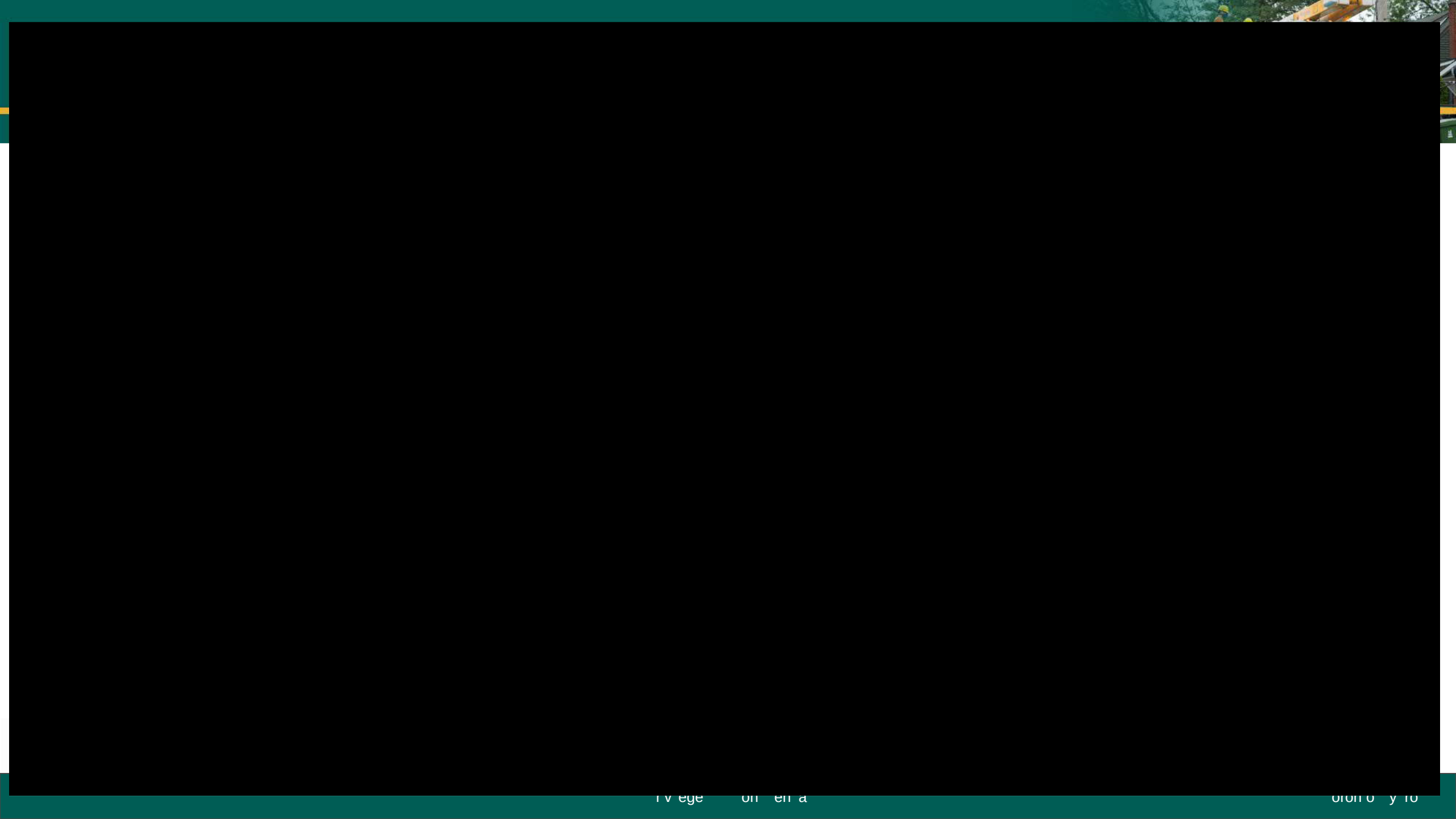

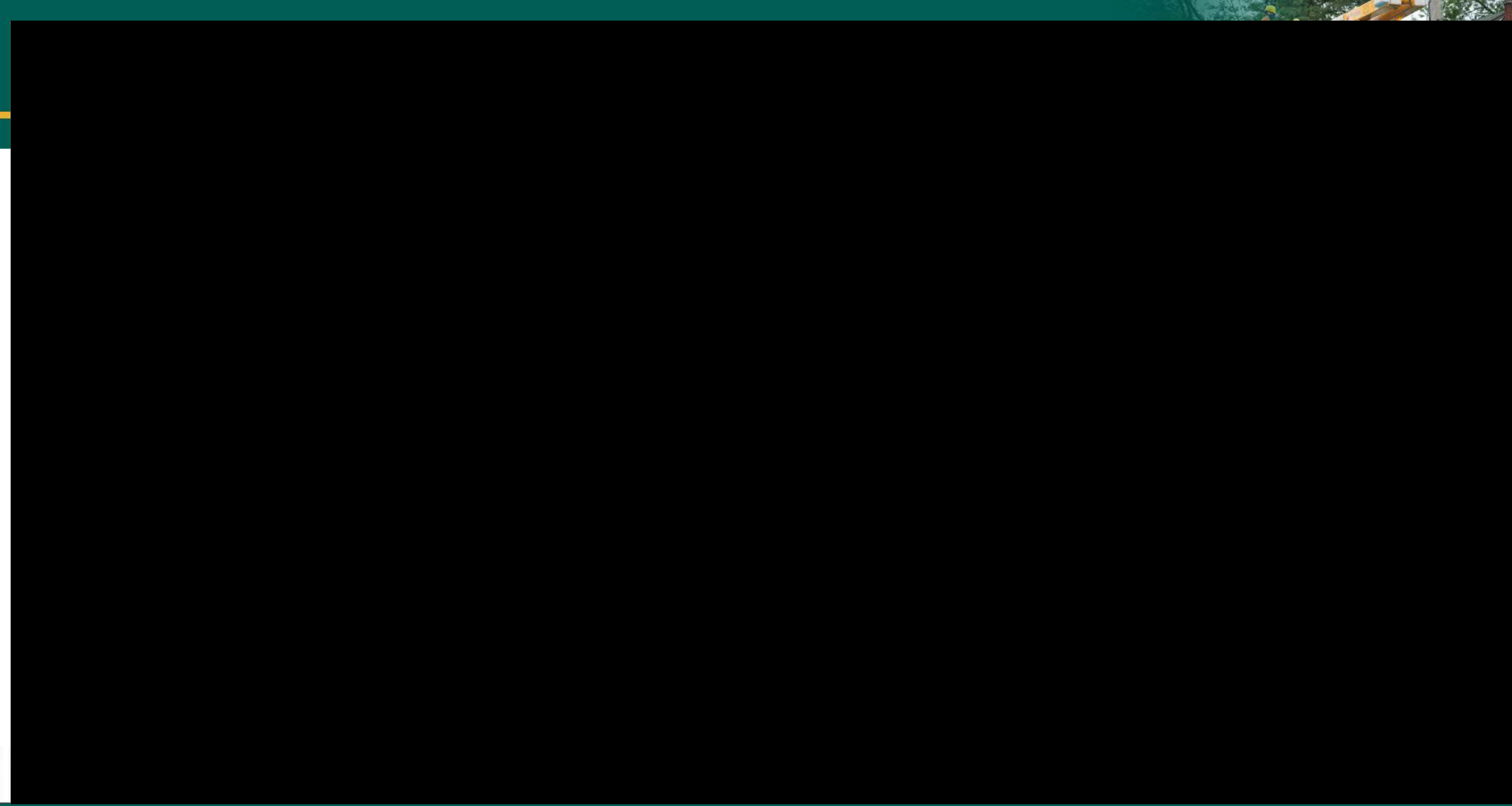

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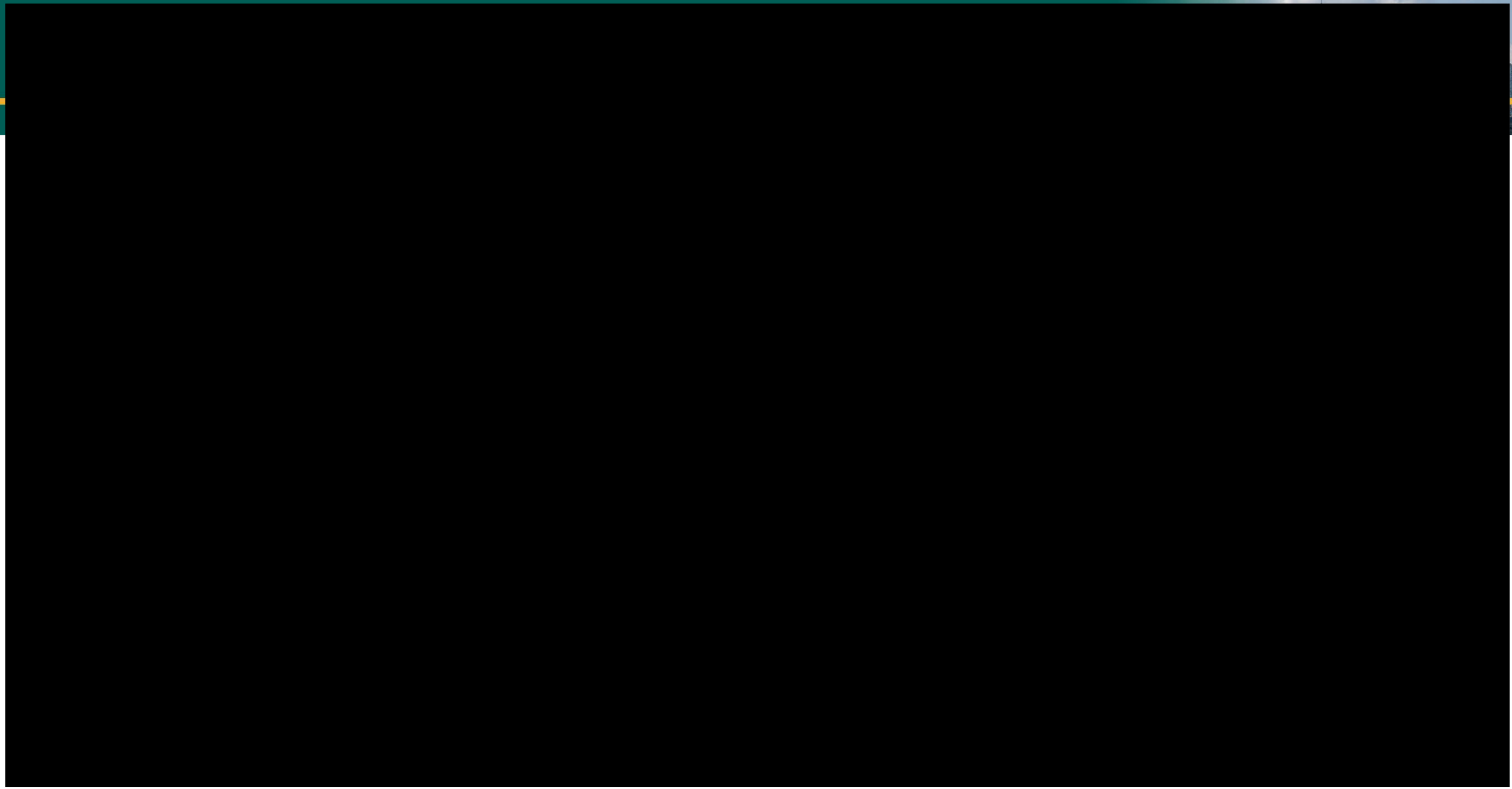

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1A-CCC-2

Reference: Exhibit 1A

QUESTION (A) - (C) :

a) Please provide a complete list of all external consultants/lawyers Toronto engaged to assist it in the development of the Application and pre-filed evidence;

b) For each engagement please provide the nature of the work and the retainer and terms of reference;

c) Please provide the budgeted cost for the work for each engagement and the costs incurred to date. Please indicate how the costs are to be recovered;

RESPONSE (A) - (C):

The table below includes a list of all the consultants Toronto Hydro engaged to prepare expert evidence for this rate application, the costs incurred to date (as of year-end 2023), and notes whether the expert was engaged pursuant to an RFP. The total expected costs of the consultants depends on the work required by these third parties to answer interrogatories, and the extent to which the OEB and intervenors seek to have these third parties attend the hearing and be involved with other procedural steps in this application. With the exception of certain studies undertaken in the normal course of business, the cost of this work is managed through the consulting budget in Appendix 2-M and is to be recovered through the Regulatory Affairs segment of the Public, Legal and Regulatory Affairs program at Exhibit 4, Tab 1, Schedule 18. The budgeted costs for legal expenses are also set out in Appendix 2-M. Please refer to 1B-SEC-11 for retainers for external service providers engaged to prepare expert evidence.

Expert	Nature of Work /Evidence Reference	Evidence Reference	RFP	Actual Costs Incurred to Date (2023)
Innovative Research Group	Customer Engagement Study	Exhibit 1B, Tab 5, Schedule 1, App A	Yes	$760,661
Clearspring Energy Advisors	Total Cost and Reliability Benchmarking	Exhibit 1B, Tab 3, Schedule 3, App A	Yes	$588,536
	Load Forecast EV & DER Integration	Exhibit 3, Tab 1, Schedule 1, Appendix J	Yes	
UMS Group Inc.	Unit Cost Benchmarking	Exhibit 1B, Tab 3, Schedule 3, App C	No	$276,300
Scott Madden Associates	Rate Framework Review	Exhibit 1B, Tab 2, Schedule 1, Appendix A	Yes	$97,780 (USD)
Guidehouse	Lead/Lag Study	Exhibit 2A, Tab 3, Schedule 2	No	$92,000
Concentric Advisors	Financial Useful Lives	Exhibit 2A, Tab 2, Schedule 1, Appendix D	Yes	$225,857
EA Technology	Asset Condition Assessment (ACA) Review	Exhibit 2B, Section D4, Appendix C	No	$53,500 (USD)
Element Energy	Future Energy Scenarios	Exhibit 2B, Section D4, App B	Yes	$125,000[1]
Gartner Consulting	IT Cost & Maturity Benchmarking	Exhibit 2B, Section D8, App A	No	$137,500
Stantec	Climate Change Vulnerability	Exhibit 2B, Section D2, App A	Yes	$29,374
Mercer Canada	Compensation Benchmarking	Exhibit 4, Tab 4, Schedule 5	Yes	$79,999.75

QUESTION (D) :

Please explain, in detail, how Toronto Hydro determined which areas of the Application should be reviewed and validated by external experts;

[1] Toronto Hydro notes that the cost noted here is only for the preparation of the report. For details on the model development and implementation costs, please see Exhibit 2B-Staff-156.

RESPONSE (D):

Toronto Hydro used experience and professional judgment to determine which areas of the application would benefit from review and/or validation from external consultants. Factors included: guidance provided by the OEB in the RRF, the Handbook for Utility Rate Applications and the Filing Requirements; what may be helpful to the OEB in understanding and assessing Toronto Hydro's application; and precedent from prior proceedings. In addition, some studies were undertaken in the normal course of business and not for rate application business such as the Climate Change Vulnerability Assessment.

QUESTION (E) :

Did Toronto Hydro develop an overall budget for this external work. If so, please indicate what that budget was and how it was developed. If not, why not?

RESPONSE (E):

The current budget for this work is included in the updated Appendix 2-M (found at Appendix A to the response to Interrogatory 4-SEC-110). Please note that not all of the third-party studies and reports noted above formed part of this budget; some studies (e.g. Mercer Non-Executive Compensation and Benefits Review and Stantec Climate Change Vulnerability) were done within the normal course of business and are not reflected in the budget.

QUESTION (F) :

Please indicate whether each piece of work was subject to an RFP process. In those cases where there was no RFP please explain why.

RESPONSE (F):

Please refer to the table in the response to Part (a) – (c) above for a summary of which consultants were retained through an RFP Process. In respect of the consultants that were not:

- UMS Group Inc. was engaged due to its depth of experience and understanding of Ontario's regulated electricity sector, and its previous experience working with Toronto Hydro and other large Ontario distributors on unit cost benchmarking.
- Gartner Canada Inc. was engaged due to its previous experience working with Toronto Hydro on IT benchmarking and because the firm offers access to the world's largest data set for organizational IT spending and staffing.
- Guidehouse was engaged due to its depth of experience and understanding of Ontario's regulated electricity sector, and its previous experience performing lead-lag studies for Toronto Hydro in the 2015 and 2020 custom rate applications.
- EA Tech is the industry leader in Asset Condition Assessment (ACA) and has been supporting Distribution Network Operators in UK develop and implement a Common Network Asset Indices Methodology (CNAIM), which Toronto Hydro adopted and continues to implement. EA Tech was engaged due to its previous experience with Toronto Hydro's adoption of CNAIM, and due to their knowledge and expertise in this field.

QUESTION (G):

Did Toronto Hydro retain any external consultants and lawyers to undertake work related to the Application that has not been included with the Application and pre-filed evidence?

RESPONSE (G):

Anything not included in the Application and pre-filed evidence before the OEB does not form the basis of Toronto Hydro's proposal, is irrelevant and provides no probative value.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1A-CCC-3

Reference: Exhibit 1A

QUESTION:

Please provide all documents provided to employees related to the development of the Business Plan and budgets that form part of this Application.

RESPONSE:

Toronto Hydro respectfully declines to provide disclosure of the requested information on the basis that this information is irrelevant and provides no probative value to the OEB in deciding the issues in this proceeding. The information sought is contained throughout the evidence. The strategic direction adopted and provided in preparing the 2025-2029 capital and operational investment plans presented in this application is contained within the integrated business planning sections of Exhibit 2B, Section E2 at page 5 and Exhibit 4, Tab 1, Schedule 1 at page 24. Please also see Toronto Hydro's responses to: (i) 2B-SEC-32 for a chronology of the integrated planning process, (ii) 2B-SEC-33 for a description of the budget and price limits that the utility adopted to guide the planning process; and (iii) 4-CCC-58 for a description of the workforce planning aspects of the process.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1A-CCC-4

Reference: Exhibit 1A

QUESTION:

Please provide Toronto Hydro's most recent Business Plan. Please provide all Business Plans produced during the period 2020-2023.

RESPONSE:

The business plan that underpins this application is filed in the response to 1A-CCC-1. Toronto Hydro declines to provide the historical business plans (i.e. 2020-2022) as they are irrelevant and provide limited to no probative value in deciding the issues in this proceeding.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1A-CCC-5

References: Exhibit 1A, Tab 3, Schedule 1, Pages 4-7

Preamble:

"Toronto Hydro indicated that intervenors are asking the OEB panel to either make changes to generic policy through a particular utility's rate application or to fetter the discretion of a future panel. Toronto Hydro also submitted that its proposed ratemaking formula is structurally the same as the one approved in its 2015-2019 Custom IR proceeding. The OEB notes that the Custom IR approach taken has required extensive evidence and time to consider the details provided. Toronto Hydro is encouraged to consider an alternative approach in the future that might be more efficient in establishing the revenue requirement for the base year and following years as well as meeting OEB RRF objectives, and improving the balance of risk between customers and the utility. Toronto Hydro should not assume that future panels will continue to accept Toronto Hydro's current proposed Custom IR Framework."

QUESTION (A) AND (B):

a) Toronto Hydro sets out OEB directions specified in the 2020-2024 Decision. Does Toronto Hydro not consider the above a Direction from the OEB in the 20202-2024 Decision? If not, why not?

b) Please explain how its proposed plan is more efficient in establishing the revenue requirement for the base year and following years as well as meeting OEB RRF objectives and improving the balance of risk between customers and the utility.

RESPONSE (A) AND (B):

Please see Toronto Hydro's response to interrogatory 1B-SEC-10.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1A-CCC-6

References: Exhibit 1A, Tab 3, Schedule 1, Page 8

Exhibit 2B, Section E5.1

QUESTION:

Toronto Hydro proposes to increase its basic connection allowance for certain customer classes from $1396 to $3059. Please explain to what extent Toronto Hydro undertook customer engagement with respect to this change.

RESPONSE:

The basic connection allowance was not specifically identified in the customer engagement process. The proposal to increase the basic allowance, however, is consistent with customer priorities described in the Customer Engagement Report (Exhibit 1B, Tab 5, Schedule 1, Appendix A), including: ensuring reliable electrical service (e.g. updating the basic connection to current standards), and enabling customers to access electricity services (e.g. making new service connection more affordable). lease see Exhibit 2B, Section E5.1, page 20 for further details.

As per OEB's Distribution System Code ("DSC"), Section 2.4.8, Toronto Hydro will provide public notice of any approved change to the basic connection allowance as part of the implementation of the revision to Toronto Hydro's Conditions of Service.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1A-CCC-7

References: Exhibit 1A, Tab 3, Schedule 1, Appendix A

Toronto Hydro has set out in Appendix A summaries of the revisions to its Conditions of Service since its last rebasing.

QUESTION (A):

a) Please identify which of those changes apply to residential customers;

RESPONSE (A):

Table 1 below highlights changes that apply to residential customers:

Table 1 – Summary of Changes to Conditions of Service Applicable to Residential Customers

Rev.#	Effective Date	Section #	Section Title	Summary of Change/Rationale
Rev. 19	Jan 1, 2020	1.8	Disputes	Revised the website address that refers to the Dispute Resolution process, which is on Toronto Hydro's website.
		2.2	Disconnection	Added a statement that a customer must pay any outstanding arrears prior to the removal of Toronto Hydro equipment.

Rev.#	Effective Date	Section #	Section Title	Summary of Change/Rationale
		2.2.1	Disconnection and Reconnection – Process and Charges	Revised statements: - from "… a disconnect notice has been delivered to the Customer" to "… a disconnect notice has been received by the Customer", - from "… on the third business day after mailing." to "… on the third business day after the date on which the notice was printed.", and - customer must remedy the condition within "seven calendar days" to "a reasonable period". Added a statement not to disconnect an occupied residential property for non-payment during a Disconnection Ban Period.
		2.4.3	Deposits	Added a statement that a security deposit for a residential account may be waived where the customer enrolls in an equal monthly payment, provided that a deposit may otherwise be required as per the Distribution System Code.
		2.4.5	Payments and Overdue Account Interest Charges	Revised statements: - the interest rate used to determine any late payment charges, and - from "Pre-Authorized Payments" to "Pre-Authorized Debits". Added a statement that bills are to be paid in full within 20 days of the statement date.

Rev.#	Effective Date	Section #	Section Title	Summary of Change/Rationale
Rev. 19.1	Mar 1, 2020	2.2.1	Disconnection and Reconnection – Process and Charges	Revised statements: - the minimum payment period was amended as 14 calendar days from the date on which the disconnection notice is received before a customer can be disconnected for non-payment, and - where a disconnection notice was sent by mail, the period is to be revised to the fifth calendar day after the date on which the notice was printed. Added statements: - before issuing a disconnection notice for non-payment, an account overdue notice shall be delivered to the customer, and - the customer responsible for a disconnection may be charged for reconnection costs and reasonable costs for repairs of the distributor's physical assets attached to the property in reconnecting the property.
		2.4.3	Deposits	Revised statements: - the calculation method in determining the amount of an account security deposit, and - the minimum time period from "5 years" to "3 years" for good payment history for non-residential customers that have a demand less than 50 kW.

Rev.#	Effective Date	Section #	Section Title	Summary of Change/Rationale
		2.4.5	Payments and Overdue Account Interest Charges	Revised statements: - payment plans are available to customers, such that equal monthly payment plans are to be offered to residential customers and to general service less than 50 kW customers, and the equal monthly payment plans may not be offered under specified conditions, and - bills are to be paid in full within 24 days of the statement date.
Rev. 20	Jan 1, 2021	2.1.5	Relocation of Plant	Revised to reflect the OEB's new relocation cost recovery standard.
		2.2.1	Disconnection & reconnection	Revised to better align with the new Distribution System Code (DSC) disconnection and reconnection amendment.
		2.3.4.2	Supply Voltage	Revised to reflect the equivalent service sizes of the demand loads offered to Customers when supplied from secondary street circuits on road allowance.
		2.3.7.1	Metering - General	Added conditions in the section to give Toronto Hydro the right to operate on Customer-Owned switches when conducting meter work, and Toronto Hydro is not be liable for any damages or losses sustained resulting from inadequate maintenance of Customer-Owned equipment and infrastructure.
		2.4.3	Deposits	Revised the wording in the Conditions of Service to better align with the Distribution System Code (DSC) and clarify the time period over which a good payment history must be on file for waiving of new or increased deposit amounts.

Rev.#	Effective Date	Section #	Section Title	Summary of Change/Rationale
Rev. 21	Jan 1, 2022	2.2.1	Disconnection & Reconnection	Expanded the wording in the Disconnection & Reconnection – Process and Charges section to describe in greater detail the disconnection process that Toronto Hydro follows in accordance with the applicable regulatory requirements.
		2.3.4.2	Supply Voltage	Modified section 2.3.4.2 Supply Voltage to provide more detail with respect to available supply voltages.
		2.3.4.3	Supply Offerings	Introduced a new section entitled “Supply Offerings” to provide more detail regarding Toronto Hydro’s supply offering in the public road allowance and transformer offerings on private property.
		2.3.4.4	Number of Connections to Toronto Hydro Distribution System	Renumbered and renamed former section 2.3.4.3 to 2.3.4.4 “Number of Connections to Toronto Hydro’s Distribution System” and modified the revision to clarify Toronto Hydro’s policy with customer requests for diversity of supply.
		2.4.3	Deposits	For the purpose of satisfactory credit checks, revised the acceptable Equifax Credit commercial scores for Business customers to align with Equifax scoring for commercial customers. • Revised the wording to further clarify the requirements for a security deposit to be returned to the Customer or Consumer within six weeks of closure of Customer or Consumer’s account and when a Consumer or Customer moves from Standard Supply Service (“SSS”) to a competitive retailer where the retailer is performing the billing function (retailer consolidated billing), for all account types.

Rev.#	Effective Date	Section #	Section Title	Summary of Change/Rationale
		Tables 1 &2	Civil Ownership Demarcation Point	Merged Tables 1.1, 1.2, 1.3, 1.4 and 1.5 as Table 1 for ease of reference. • Specified the ownership demarcation point for civil infrastructure between the Customer and Toronto Hydro based on the customer class and supply method.
Rev. 22	Jan 1, 2023	1.7.3	Tree and Vegetation Management	Clarified Toronto Hydro and Customer's responsibilities with respect to tree trimming and vegetation management on both public road allowance and private property.
		2.2.1	Disconnection and Reconnection	Expanded the wording in the Disconnection & Reconnection – Process and Charges section to reflect Toronto Hydro's new policy of providing eligible low-income customers (ELIC) one free disconnection and reconnection in a rolling 12-month period.
		2.4.4.1	Rate Reclassification	Added a new section outlining Toronto Hydro's rate reclassification policy
		2.4.5	Payments and Overdue Account Interest Changes	Revised the provision to clarify the application of non-sufficient fund fees.
		Ref 6	Metering Requirements 750 Volts of Less – Toronto Hydro meter locations	Clarified Toronto Hydro's meter locations requirements.
Rev.23	Jan 1, 2024	1.4	Amendments and Changes	Updated the method of notifying Customers about Conditions of Service and Rates changes from notice by newspaper to notice by Toronto Hydro's website and social media platforms, as needed.

Rev.#	Effective Date	Section #	Section Title	Summary of Change/Rationale
		1.6	Customer Rights	Expanded wording to clarify Customer's rights when making use of Green Button's "Connect My Data" and "Download My Data" to access and download their usage data.
		1.7.3	Tree and Vegetation Management	Expanded wording to clarify the need for Customers to hire authorized persons, such as utility arborists, to perform the tree trimming on private property for their own safety, the safety of the public, and the safety of the distribution system.
		2.1.5	Relocation of Toronto Hydro-Owned Assets	Expanded wording to clarify the requirements for Toronto Hydro's relocation of Toronto Hydro-owned assets.
		2.3.6	Emergency Backup Generation Facilities	Clarified Toronto Hydro's emergency backup generation facilities requirements.

QUESTION (B):

b) For those that have changed please explain the rationale for the changes;

RESPONSE (B):

Please see response to part (a) of this interrogatory.

QUESTION (C):

c) Please explain the extent to which Toronto Hydro engaged its customers regarding those changes;

RESPONSE (C):

Per Distribution System Code 2.4.8, Toronto Hydro provided advanced public notice for a minimum period of 30 calendar days (typically from the end of October to mid-December, dependent on

customer billing dates) for any changes to its Conditions of Service. Public notice was communicated through bill inserts, the Toronto Hydro website, and social media. During this period, customers are provided the opportunity to ask questions and provide feedback, which is addressed prior to the Conditions of Service being published.

QUESTION (D):

d) Please explain the extent to which Toronto Hydro has communicated those changes to its customers.

RESPONSE (D):

Please see response to part (c) of this interrogatory.

QUESTION (E):

e) What relief in Toronto Hydro seeking with respect to its Conditions of Service through this Application?

RESPONSE (E):

Toronto Hydro does not seek relief with updates to the Conditions of Service. The Conditions of Service are updated to improve accuracy, clarity and to ensure alignment with applicable laws, codes, and regulations.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1A-PP-1

References: Exhibit 1A, Tab 3, Schedule 1, Page 3

Preamble: THESL indicates that relative to the previous plan, this rate plan "Enhanced the capacity planning process consider electrification drivers and municipal energy plans in producing the system peak load forecast that underpins the 2025-2029 Investment Plan."

QUESTION (A):

a) Please describe what THESL has already completed (if anything) to enhance the capacity planning process to consider electrification drivers and municipal energy plans in producing the system peak load forecast that underpins the 2025-2029 Investment Plan.

RESPONSE (A):

Please refer to Exhibit 2B, Section D4 for a detailed description of the enhancements made to Toronto Hydro's capacity planning process to consider electrification drivers and the Municipal Energy Plans.

QUESTION (B):

b) Please explain why efforts over the current (2020-2024) rate term (and in preparation for this application) were not a sufficient foundation to prepare the Investment Plan, requiring incremental focus in the new rate period (2025-2029).

RESPONSE (B):

The statement that Toronto Hydro has not laid a sufficient foundation to prepare for the investment plan is incorrect. In preparation for the 2025-2029 rate application, it became necessary to focus on specific aspects of electrification. For additional details on electrification drivers, please see Exhibit 2B Section D4 "Capacity Planning, Growth & Electrification" pp. 1-2, and

Section D4.1.1 "System Peak Demand Forecast" pp.2-6. For additional details on system needs, please see Exhibit 2B, Section E7.4, Stations Expansion, which discusses needs beyond the 2025-2029 period requiring early action, consideration of short circuit capacity constraints, and alignment with recommendations from Regional Planning.

QUESTION (C):

c) The Investment Plan (and Distribution System Plan) underpin the THESL application for the 2025-2029 term. Please explain how the OEB can approve the application and related budgets at this time if there is incremental information that is not available at this point supporting investments that will be made over the 2025-2029 period?

RESPONSE (C):

Please refer to the evidence in Exhibit 1B, Tab 2, Schedule 1 starting on page 36 for an explanation of (i) the uncertainty factors that Toronto Hydro faces with respect to demand-related expenditures and revenues and (ii) the regulatory mechanism – known as the Demand Relative Variance Account, that Toronto Hydro proposes to manage these uncertainties in the next rate period and protect customers and the utility's ability to deliver the 2025-2029 Investment Plan objectives.

QUESTION (D):

d) Has THESL included opportunities to share (or leverage) investments from other stakeholders (including building owners, City of Toronto, industrial sites, etc.) on Distributed Energy Resources over the 2025-2029 Rate term. If no, please explain why not. If yes, please provide a summary, the process used and what results (cost avoidance and kW/kWh) are forecasted to be achieved.

RESPONSE (D):

Toronto Hydro has not entered into new DER ownership arrangements with third-parties in this rate-period and has not proposed such arrangements for 2025-2029. Toronto Hydro is focused on procuring DER services if and when such services can provide system benefit that is quantifiable

and credible as part of its Local Demand Response investments (Exhibit 2B, Section E7.2). Should an opportunity be identified in the future where such an arrangement would be cost-effective as compared to a conventional distribution system solution, Toronto Hydro will investigate the opportunity.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1A-PP-2

Reference: Exhibit 1A, Tab 3, Schedule 1, Page 4

Preamble:

THESL indicates that it has "Enhanced the load forecast to consider electrification drivers and changes to the availability of conservation and demand management ("CDM") savings in producing the revenue forecast that underpins to 2025-2029 rates"

QUESTION (A):

a) Please provide what CDM results THESL will have achieved by end of the 2024 rate term against the total achievable CDM results and what potential remains, by sector if possible

RESPONSE (A):

Please refer to Exhibit 9, Tab 2, Schedule 3 and 9-Staff-354 which indicates CDM results THESL has achieved as part of LRAMVA by 2024.

QUESTION (B):

b) Please indicate what CDM results (total and incremental to those forecasted to the end of the current rate plan) are forecasted to be achieved by year of the 2025-2029 rate plan. Please indicate what portion of the total potential achievable CDM results that will represent.

RESPONSE (B):

The Province's CDM Framework for 2025-2029 is not yet finalized. Since 2019, the role for LDCs in CDM has reduced significantly relative to prior periods. Accordingly, in this Application, Toronto Hydro is not forecasting LDC-led savings as part of CDM Framework during the 2025-2029 period.

QUESTION (C):

c) Please explain why only CDM is included in the above noted item and not the broader scope of DER.

RESPONSE (C):

The reference to "electrification drivers" includes DERs. Toronto Hydro includes DER impacts in its load forecast. Please refer to Exhibit 3, Tab 1, Schedule 1, Appendix J for a description of the integration of DER impacts into the load forecast.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1A-PP-3

Reference: DER definition from National Standard Practice Manual – NESP (nationalenergyscreeningproject.org)

Distributed Energy Resources (DERs) are resources located on the distribution system that are generally sited close to or at customers' facilities. DERs include EE, DR, DG, DS, EVs, and increased electrification of buildings. DERs can either be on the host customer side of the utility interconnection point (i.e., behind the meter) or on the utility side (i.e., in front of the meter). DERs are mostly associated with the electricity system and can provide all or some of host and/or support the utility system by reducing demand and/or providing supply to meet energy, capacity, or ancillary services (time and locational) needs of the electric grid.

QUESTION (A) :

Please provide the definition of DER that THESL is using.

RESPONSE (A):

Toronto Hydro defines Distributed Energy Resource Requirements under Section 1.1 of the Toronto Hydro Conditions of Service Reference 3, revision #7 January 1, 2024. A distributed energy resource (DER) "is any source of electric power that is connected to the distribution grid of a Local Distribution Company (LDC) that distributes electrical power to Customers and Consumers. A DER operator shall be a Customer, Consumer or Supplier within the Toronto Hydro service area which is generating electricity for exporting power to the Toronto Hydro distribution grid or to displace their own load"[1].

[1] https://www.torontohydro.com/documents/d/guest/reference-3-distributed-energy-resource-requirements

QUESTION (B) :

Regulatory initiatives including the Future for Energy Innovation have leveraged the NSPM for DER best practice information and approach. Please indicate what variance (if any) there is between the NSPM definition for DERs, what THESL is using and the potential impact (e.g. are some categories of DER excluded).

RESPONSE (B):

Toronto Hydro's definition of DERs defined in a) above is consistent with the concept of distributed generation by NESP. Concepts like EV's are currently considered as a load and are excluded from the DER definition (although this can change as applications like vehicle-to-grid mature).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1A-PP-4

Reference: Exhibit 1A, Tab 3, Schedule 1, Appendix A

"Customers having a non-coincident peak demand equal to or greater than 5 MW shall be charged their share of the capital contribution for a new or modified transmitter-owned connection facility."

QUESTION (A):

a) Please explain how the Capital Contribution Policy change would impacts customers (in whole or part) planning to install DERs that could benefit the system.

RESPONSE (A):

The changes to section 2.1.2.2 of Toronto Hydro's Conditions of Service identified in Revision #19 effective January 1, 2020 reflected the enactment of Distribution System Code ("DSC") sections 3.2.4A and 3.6.1 as the result of the EB-2016-0003 consultation. In Toronto Hydro's assessment, the relevant changes do not have any specific impact upon customers planning to install distributed energy resources ("DERs").

QUESTION (B):

b) Please explain if this Capital Contribution Policy change is applied broadly regardless of the whether a customer (in whole or part) is planning to include or add a DER that could benefit the system.

RESPONSE (B):

Toronto Hydro applies the DSC requirements which triggered the Revision #19 updates to the utility's Conditions of Service and capital contribution policy in accordance with the scope set out in those requirements. Toronto Hydro also notes that the DSC prescribes the application of Chapter 3

cost responsibility requirements to all generation facilities, including storage facilities, connecting to a distributor's distribution system.[1]

QUESTION (C):

c) Please explain how this Capital Contribution Policy change aligns with the approach being developed for the OEB BCA Framework.

RESPONSE (C):

As noted in subpart (a), the historical changes to Toronto Hydro's capital contribution policy and associated Conditions of Service provisions in Revision #19 shown in Exhibit 1A, Tab 3, Schedule 1, Appendix A were triggered by DSC amendments resulting from EB-2016-0003 in 2018 and 2019, which precede the OEB's Benefit-Cost Analysis ("BCA") Framework consultation launched on September 20, 2023 by several years. Toronto Hydro is monitoring the BCA Framework consultation for any outcome that may require the utility to make future changes to its policies.

QUESTION (D):

d) Please explain how (if at all) THESL policies and charges encourage customers to include DERs that could provide benefits to the system and how those will be managed during the 20205-2029 rate term to unlock those system benefits.

RESPONSE (D):

Please see the Exhibit 2B, Section E7.2.1 for a description of Toronto Hydro's Flexibility Services segment, including a proposal to procure up to 30 MW of demand response capacity and Toronto Hydro's Benefit Stacking Transmission and Distribution Pilot ("Benefit Stacking Pilot") at pages 12-13. The Benefit Stacking Pilot project explores how customer-owned DERs can provide services to

[1] Distribution System Code (August 2, 2023), s. 6.2.31.

both the distribution grid and transmission/bulk system using an efficient single pathway that works with existing market mechanisms.[2]

[2] The Benefit Stacking Pilot is supported by the IESO's Grid Innovation Fund and the OEB's Innovation Sandbox. Toronto Hydro has partnered with Power Advisory LLC and Toronto Metropolitan University's CUE for the project.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-03

References: Report of the Board, Renewed Regulatory Framework for Electricity, p. 11
Report of the Board, Handbook for Utility Rate Applications, p. 26

Preamble**:**

Reference 1 states the following:

"[Performance-based rate-setting] decouples the price (the distribution rate) that a distributor charges for its service from its cost. This is deliberate and is designed to incent the behaviours described by the Board in 2000. This approach provides the opportunity for distributors to earn, and potentially exceed, the allowed rate of return on equity. It is not necessary, nor would it be appropriate, for rate base to be re-calibrated annually."

Reference 2 states the following:

"If a five-year forecast is provided, it is to be used to inform the derivation of the custom index, not solely to set rates on the basis of multi-year cost of service."

QUESTION (A):

a) Please provide a table showing each element of THESL's revenue requirement resulting from its 2025-2029 investment and spending plans if its rates were established on a cost of service basis, as well as the total for each year.

RESPONSE (A):

Please see Exhibit 6, Tab 1, Schedules 2 – 7 at Tab 9 of the Revenue Requirement Work Form for the full details of the 2025-2029 Revenue Requirement. For ease of reference, a summary table is provided below in Table 1.

Table 1: 2025-2029 Revenue Requirement Related to the Proposed Investment Plan1

	2025	2026	2027	2028	2029
OM&A Expenses (A)	343.0	358.0	370.1	385.5	399.6
Amortization/Depreciation (B)	285.3	299.6	319.9	342.1	354.5
Deemed Interest Expense (C)	143.1	152.4	162.8	174.0	184.5
Return on Equity (D)	220.9	235.3	251.4	268.7	284.8
Payments in Lieu of Taxes (PILs) (E)	27.9	30.5	20.0	56.2	47.7
Service Revenue Requirement [F=SUM(A:E)]	1,020.3	1,075.8	1,124.2	1,226.5	1,271.1
Revenue Offsets (G)	- 47.9	- 48.9	- 49.8	- 50.8	- 51.8
Base Revenue Requirement (H=F-G)	972.4	1,027.0	1,074.4	1,175.7	1,219.2

QUESTION (B):

b) Please provide a table showing each element of THESL's revenue requirement from 2025-2029 as proposed in this application, prior to the application of a Performance Incentive Mechanism (PIM), stretch or productivity factor, as well as the total for each year.

RESPONSE (B):

Toronto Hydro notes that this question seeks the same information requested in question (a) above. As such, Toronto Hydro assumes that the question is asking for the Revenue Requirement after the application of the X-Factor composed of the PIM, the efficiency factor and productivity factor. To that end, Table 2 below show the revenue impact of the Custom Revenue Cap Index (CRCI) when it is applied to the base revenue requirement identified in the table above in part (a).

[1] Based on the pre-filed evidence as of November 17, 2023.

Table 2: 2025-2029 Revenue under the Custom Revenue Cap Index (CRCI)2

	2025	2026	2027	2028	2029	Total
Base Revenue Requirement (A)	**972.4**	**1,027.0**	**1,074.4**	**1,175.7**	**1,219.2**	**5,468.6**
Revenue collected in previous year (B)	n/a	972.4	1,019.6	1,059.1	1,151.0	n/a
X-Factor (PIM): 0.6% (C=B*0.6%)	n/a	- 5.8	- 6.1	- 6.4	- 6.9	n/a
X-Factor (Efficiency): 0.15% (D=B*0.15%)	n/a	- 1.5	- 1.5	- 1.6	- 1.7	n/a
Inflation (E=B*2.0%)	n/a	19.4	20.4	21.2	23.0	n/a
Incremental Revenue via the Revenue Growth Factor (F=B*RGF)	n/a	35.1	26.7	78.7	19.7	n/a
Funded Revenue in current year (G=Sum(B:F))	**972.4**	**1,019.6**	**1,059.1**	**1,151.0**	**1,185.1**	**5,387.1**
Revenue Deficiency (H=A-G)	n/a	7.3	15.3	24.7	34.2	81.5

QUESTION (C):

c) Please explain similarities and differences between the tables in a) and b) and THESL's proposed revenue requirements, by element, while demonstrating how the resulting revenue changes throughout the term accord with the OEB's policy expectations expressed at the references above.

RESPONSE (C):

Table 1 sets out the revenue that Toronto Hydro requires to fund the proposed 2025-2029 Investment Plan based on a cost-of-service review (i.e. the base revenue requirement in row H). This is the starting point for a PBR rate-setting mechanism as outlined on page 11 of the RRF: "*Going into PBR, distribution rates are set based on a cost-of-service review*."

In contrast, Table 2 shows the application of a custom index, which applies a performance and productivity based X-Factor to determine the utility's actual revenue to be collected through rates

[2] Based on the pre-filed evidence as of November 17, 2023.

over the rate term. The difference between the Base Revenue Requirement in Table 1, Row H and the Funded Revenue in Table 2, Row G is the utility's revenue deficiency (column H in Table 2) as a result of the application of the custom index. The total revenue deficiency over the rate period is approximately $81.5 million. This deficiency is further explained in Table 3 below.

Table 3 shows that the $81.5 million revenue deficiency resulting from Toronto Hydro's proposed custom index is made up of two components: (1) efficiency gains that the utility is expected to make consistent with the results of the Total Cost Benchmarking study filed in Exhibit 1B, Tab 3, Schedule 3, Appendix A (row D), and (2) a pro-active performance incentive factor that Toronto Hydro has proposed to balance risk between ratepayers and the utility (row E).

Table 3: 2025-2029 Revenue Deficiency under the Custom Revenue Cap Index (CRCI)

	$ Million	**2025**	**2026**	**2027**	**2028**	**2029**	**Total**
A	Revenue Requirement (Investment Plan)	972.4	1,027.0	1,074.4	1,175.7	1,219.2	5,468.6
B	Funded Revenue (CRCI)	972.4	1,019.6	1,059.1	1,151.0	1,185.1	5,387.1
C = B – A or D + E	Revenue Deficiency	n/a	- 7.3	- 15.3	- 24.7	- 34.2	- 81.5
D[3]	**X-Factor** : 0.15% Efficiency Component of Deficiency	n/a	- 1.5	- 3.1	- 5.0	- 6.9	- 16.4
E[1]	**X-Factor**: 0.6% Performance Component of Deficiency	n/a	- 5.8	- 12.2	- 19.7	- 27.3	- 65.1

[3] Note the annual adjustment yielded by the Efficiency and Performance components of the X-Factor shown in Table 2 at rows C and D, is a different figure than the revenue deficiency shown above in Table 3 at rows D and E. This is because Table 3 shows the *cumulative annual impact* of the Efficiency and Performance components of the X-Factor when comparing funded revenue under the custom index (CRCI) against Toronto Hydro's revenue requirement to fund the 2025-2029 Investment Plan proposed in this application.

QUESTION (D) :

d) Please discuss the extent to which Toronto Hydro's custom index is the result of anything other than a forecast of its annual costs supplemented by a PIM, stretch and productivity factor.

RESPONSE (D):

In accordance with the OEB's requirements and expectations set out in the RRF and the Rate Handbook, the custom index proposed by Toronto Hydro is informed by:[4] (1) the distributor's five-year cost and revenue forecasts which are supported by detailed historical and forecast evidence; (2) the OEB's inflation[5] and productivity analyses with proposed customization to reflect business challenges and conditions that the utility faces; and (3) extensive benchmarking evidence to assess the reasonableness of the distributor's forecasts.[6] This approach to developing a custom index has been relied on by the OEB in numerous Custom IR applications.[7]

The analysis above in part (c) demonstrates that the 2025-2029 custom index does not fund the entirety of the revenue requirement (i.e. costs) that the utility forecasts to deliver its 2025-2029 Investment Plan. As noted in response to 1B-Staff-12(a), there is a $469 million difference between Toronto Hydro's 2025-2029 revenue requirement and the revenue that the utility could collect under a standard Price Cap IR rate-setting approach – this is the difference that gives rise to the need for a multi-year custom rate-setting approach. The $81.5 million revenue deficiency imposed by the custom index (as described above) represents approximately 17.4% of this funding difference. In other words, under the custom index proposed by Toronto Hydro 17.4% of the incremental revenue required remains unfunded in rates, and is placed at risk subject to the achievement of efficiency and performance expectations associated with the proposed X-factor.

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[4] Report of the Board, *Renewed Regulatory Framework for Electricity* (October 18, 2012) at page 17; *Handbook for Utility Rate Applications* (October 13, 2016), at page 28.
[5] Please see response to 1B-Staff-93
[6] Exhibit 1B, Tab 3, Schedule 3, at Section 4 (page 27).
[7] E.g. EB-2014-0116, EB-2017-0049, EB-2018-0165, and EB-2019-0261.

The X-Factor thus effectively decouples the price (the distribution rate) that a distributor charges for its services from the utility's actual costs (i.e. the revenue requirement), specifically to incent the behaviours that underpin the RRF: continuous improvement in efficiency and productivity (through the efficiency factor) and performance outcomes (through the incentive factor and PIM). The PIM earn-back proposal provides the utility the opportunity (*not guarantee*) to earn its OEB-approved rate of return on equity in accordance with the quoted statement in the RRF.[8]

Unlike a cost-of-service rate-setting approach where the utility comes in annually or every two years to recalibrate its rate base and establish rates which reflect actual costs, under the proposed custom rate framework Toronto Hydro forecasts its rate base, costs (and revenues) prospectively for five years, and subject to specific adjustments as proposed, the utility must manage within the funding envelope provided even though actual costs may vary from the forecast. Managing actual costs over the five-year period while continuing to achieve performance outcomes and provide high-quality services to customers is another important way in which the proposed rate framework decouples the rates (price) that customers pay over the rate term from costs the utility incurs over the forecast period to serve customers.

[8] Exhibit 1B, Tab 2, Schedule 1 at s. 3.3.1 starting on page 47.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-4

Reference: Exhibit 1B, Tab 1, Schedule 1

Preamble:

Of the four strategic priorities for Toronto Hydro's integrated planning, sustainment and stewardship, modernization, growth and electrification and general plant, Toronto Hydro aligns performance objectives with customer feedback. Such feedback is to "prioritize investments in technology…", and to "invest proactively in system capacity…".

QUESTION (A):

a) Please confirm that this objective applies exclusively to new technology investments that will reduce Toronto Hydro's costs (i.e., revenue requirement), as noted in section 3.1. If not confirmed please explain why not.

RESPONSE (A):

Through Phase 1 of its Customer Engagement study, Toronto Hydro learned that customers support investments in new technologies that would make the system better (even if it could increase customer rates, and even if the benefits are not immediate) as long as the Toronto Hydro is clear about the cost to customers and the potential benefit. Please see Exhibit 1B, Tab 5, Schedule 1, Appendix A – Executive Summary at page 10.

QUESTION (B):

b) Confirm that all new technology investments planned for the test period have been evaluated to reduce Toronto Hydro's costs. If not confirmed, please list all such investments that will not reduce Toronto Hydro's costs in the planning period and explain why they are being proposed.

RESPONSE (B):

Toronto Hydro confirms that new technology investments are aligned with the objective to reduce costs (i.e., cost reductions or avoidance) and/or make the system better with respect to outcomes such as safety, reliability, customer service, security. For more information about how Toronto Hydro intends to leverage new technology to reduce cost and make the system better over time, please refer to (i) the Grid Modernization Strategy at Exhibit 2B, Section D5, (ii) the IT Investment Planning process in Exhibit 2B, Section D8.5, (ii) the Facilitating Innovation evidence in Exhibit 1B, Tab 4, Schedule 1, and the (iii) the Innovation Fund proposal in Exhibit 1B, Tab 4, Schedule 2. For more information on how Toronto Hydro considers value for modernization investments in planning, please refer to the response in interrogatory 2B-Staff-170.

QUESTION (C):

c) Confirm that all proactive system capacity investments have been evaluated using the "least regrets" principle described in section 2.2. d) Please identify Toronto Hydro's marginal system capacity investment, i.e., the project demonstrated to have just made the threshold of an acceptable probability of creating unacceptable regrets by applying Toronto Hydro's "least regrets" investment principle.

RESPONSE (C):

Confirmed as outlined in the evidence in Exhibit 2B, Section D4. One example of a least regrets project that can be found within the plan is the Downsview TS. While it is theoretically possible to defer this expansion investment into the next rate period, this project is being advanced as a least regrets investment because the capacity outlook for this area in the next decade shows an expected increase in peak demand due to the Municipal Energy Plan for Downsview TS along with other drivers of growth. In these circumstances, Toronto Hydro believes that the risk of not having sufficient lead-time to build a new station that is required to connect and serve customers in this area should the pace of growth accelerate over the rate period, is a far more regrettable choice than pulling forward this investment by a few years.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

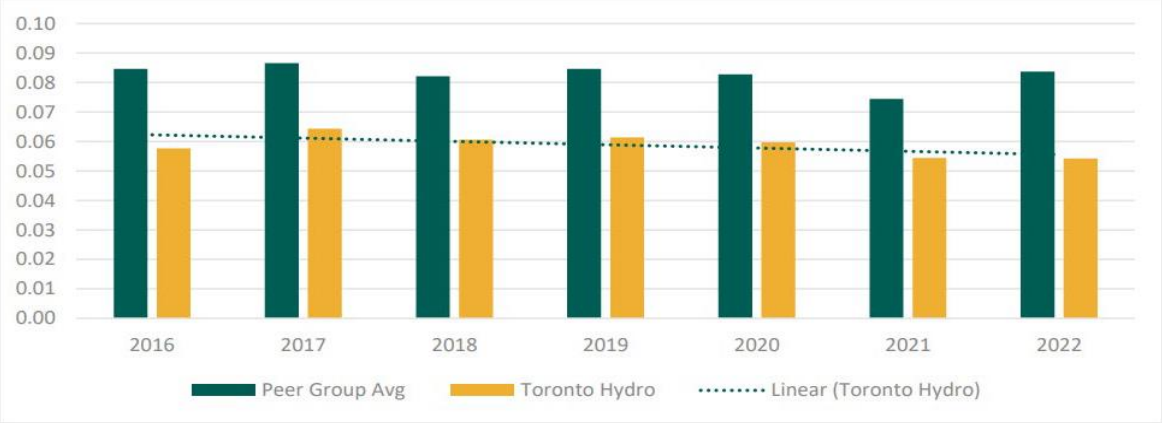
INTERROGATORY 1B-STAFF-5

Reference: Exhibit 1B, Tab 1, Schedule 1

Preamble:

Figure 6 is reproduced below.

Figure 6: FTE per GWh of Load Served



QUESTION (A) - (B):

a) Why was GWh of load chosen as the normalization parameter to compare against other utilities?

b) Why does Toronto Hydro believe GWh of load is a more appropriate parameter to utilize versus one of the following:

   i. Service area

   ii. Customer count

RESPONSE (A) - (B):

Toronto Hydro applied various normalization parameters to compare FTE and OM&A trends to other utilities (i.e. GWh, customer count, circuit-km and net fixed assets). Please refer to the OM&A Overview evidence in Exhibit 4, Tab 1, Schedule 1 at pages 14 to 19 for the full analysis.

Gigawatt-hour ("GWh") per load was chosen to normalize FTEs based on electricity consumption by customers served. As indicated in the text right above the graph, this measure was chosen to show "*the utility's past efforts to increase resource throughput and utilization.*"

QUESTION (C):

c) Provide FTE per each of the following parameters for each year inclusive of 2016-2022 for Toronto Hydro and the peer group:

   i. Service area
   ii. Customer count
   iii. Km of line

RESPONSE (C):

Please see Exhibit 4, Tab 1, Schedule 1 at Figures 7 and 8, pages 17 and 18, respectively for FTE per Circuit-km and FTE per customer count. Please see Figure 1 below for an analysis of FTE per service area. The comparative results observed below are logically consistent with the Ontario Cities Population Density analysis presented in Table 1 of Exhibit 1B, Tab 3, Schedule 3 at page 3, which is reproduced in Figure 2 below in a bar graph format for ease of reference.

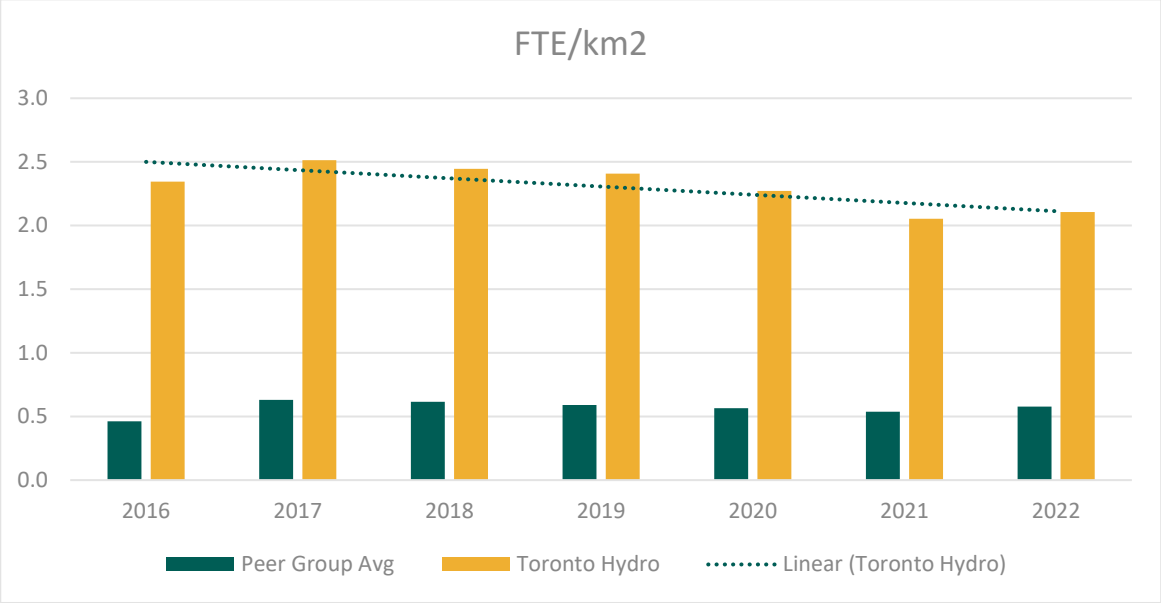


Figure 1 – FTE per Service Area

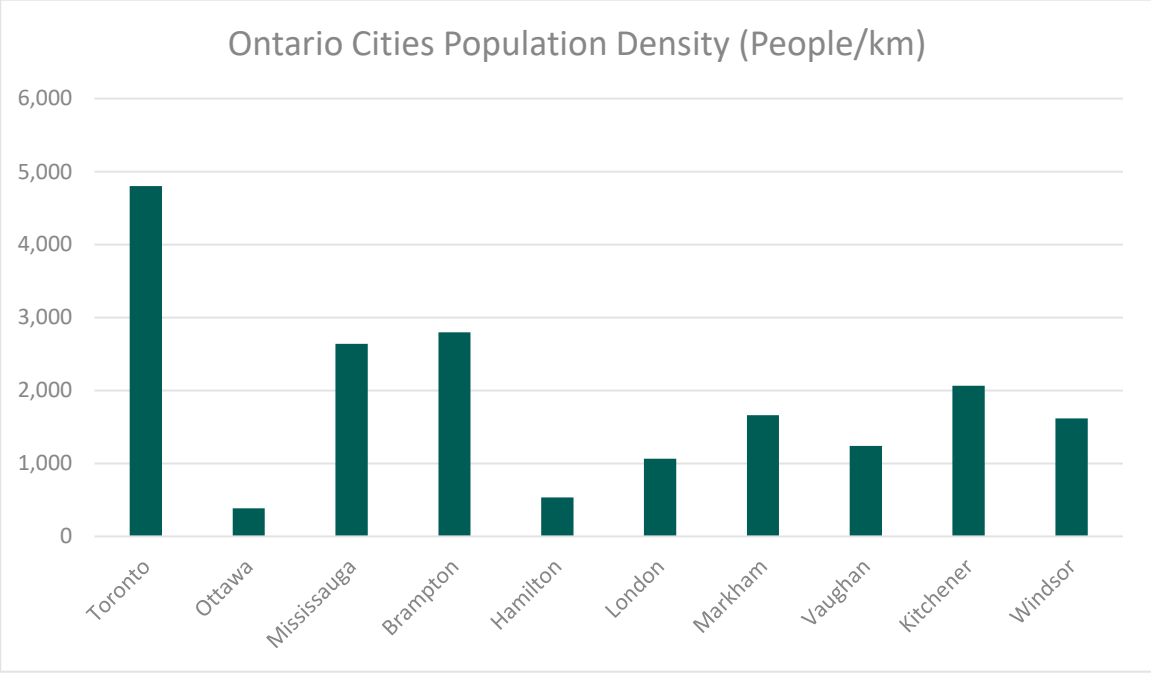


Figure 2 – Ontario Cities Population Density

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-6

Reference: Exhibit 1B, Tab 1, Schedule 1

Preamble:

Toronto Hydro makes multiple references to the "Horseshoe area" within its service area.

QUESTION (A):

a) Of Toronto Hydro's service area, what percentage is made up of the horseshoe?

RESPONSE (A):

Approximately 85 percent of Toronto's service area is made up of the horseshoe region.

QUESTION (B):

b) Of Toronto Hydro's customer count, what percentage are within the horseshoe?

RESPONSE (B):

Please see Toronto Hydro's response to interrogatory 2B-AMPCO-24, part (i).

QUESTION (C):

c) What is Toronto Hydro's calculated building density for:

i. the service area as a whole,

ii. within the horseshoe,

iii. outside the horseshoe?

RESPONSE (C):

Based on the latest City Landbase information acquired from the City of Toronto:

i. The building density for the service area as a whole is approximately 700 per square kilometers.

ii. Within the horseshoe, the calculated building density is 560 per square kilometers.

iii. Within the core, the calculated building density is 1,520 per square kilometer.

Please note that building density does not take into account the large variation of building or customer types within Toronto Hydro's service area. For example, a greater proportion of buildings can be multi-residential high rises and office towers within the downtown core compared to the horseshoe area.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-7

Reference: Exhibit 1B, Tab 1, Schedule 1

Preamble:

The material challenges outlined in section 3, along with customer feedback and the principle of least regrets investments established investment priorities for Toronto Hydro's capital plan. Specifically, Toronto Hydro notes the importance of investments including Distributed Energy Resources to support "Growth & City Electrification".

Question (A):

a) Does Toronto Hydro evaluate proposed DERs to determine if they will increase or decrease system reliability during summer peak demand, winter peak demand, or during peak generation periods of the proposed DER technology?

RESPONSE (A):

Yes. Toronto Hydro performs connection impact assessments (CIA) to assess the impact of connecting DERs on the system and evaluates criteria required to be met to maintain the stability of the grid including during peak demand periods. This assessment takes into consideration the Minimum-Load-to-Generation Ratio, a key determinant of grid stability.

QUESTION (B):

b) How does Toronto Hydro allocate the costs of system investments needed to mitigate any negative reliability impacts that may be associated with implementation of specific DER technologies in specific parts of its system?

RESPONSE (B):

Please see Toronto Hydro's response to 2B-Staff-160 part (c).

QUESTION (C):

c) Please identify the incremental investments in this application that are required to enable Toronto Hydro to integrate new energy storage batteries into its system.

   i. Please explain why such investments would be needed in the planning period.

RESPONSE (C):

Please see 2B-Staff-250 for a response to Toronto Hydro's ESS investments in 2025-2029 and an explanation for why such investments are needed.

QUESTION (D):

Considering that energy storage batteries have been utilized by other utilities as a non-wires alternative technology to help defer or eliminate the need for wires investments, please explain why this would not also apply to Toronto Hydro.

RESPONSE (D):

Please refer to Toronto Hydro's responses to 1B-Staff-88 and 1B-Staff-89 for information about the utility's non-wires strategy, investments and proposed incentives. Toronto Hydro is agnostic to the technology (type of DER) or approach (load curtailment) utilized by aggregators or customers to deliver dispatchable demand response capacity. As such, participants relying on energy storage batteries are welcome to offer capacity into Toronto Hydro's Local Demand Response market, if they are able to provide the required service. Please see the evidence in Exhibit 2B Section E7.2 for more information about the Non-Wires Solutions program.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-8

References: **Exhibit 1B, Tab 1, Schedule 3, Page 5, Table 5**
Exhibit 1B, Tab 1, Schedule 1, Page 2
"Toronto Metropolitan University, Toronto Second Fastest Growing Metropolitan Area, City of Toronto the Fastest Growing Central City, in the United States/Canada in 2022" (May 23, 2023) <https://www.torontomu.ca/centre-urban-research-land-development/blog/blogentry7311/>
Ontario Ministry of Finance "Ontario Population Projections Update, 2022-2046" (July 19, 2023) https://www.ontario.ca/page/ontario-population-projections

Preamble:

In Reference 1, Toronto Hydro shows that Toronto Hydro's customer count has been slowing and is projected to average 0.3% annually in the last three years of the rate period. The same reference shows a downward trend in normalized MVA that is forecast to continue.

In Reference 2, Toronto Hydro states that "Toronto Hydro distributes electricity to Canada's largest - and North America's second fastest growing city."

Reference 4 indicates the City of Toronto's population growth rate will slow.

QUESTION (A):

a) Please explain Toronto Hydro's view of the importance of absolute increase in population as compared to the growth rate of a population in the context of planning a distribution system. Please confirm that in the context of Toronto Hydro's distribution system planning, absolute growth is a more important consideration than the rate of growth. If not, please explain.

RESPONSE (A):

Reference 1 above relates to customer and load growth changes from 2018 to 2029 for the purpose of establishing a customer and load growth forecast to determine revenue to be collected through rates, as fully described in Exhibit 3.

Reference 2 above contextualizes the size and characteristics of Toronto Hydro's system and customer base. Similar information is relied upon in the productivity evidence at Exhibit 1B, Tab 3, Schedule 3 at pages 2 to 4, wherein Toronto Hydro describes its unique characteristics as a dense urban distributor and the resulting operational challenges that it must manage in connecting and serving its customers and carrying out prudent and necessary work to keep the system safe and reliable in accordance with good utility practice.

Neither of the above references relate to growth for the purposes of distribution system planning, which is articulated in full in Exhibit 2B, and summarized in Section A of that Exhibit at page 10: "*The growth is concentrated in certain pockets, namely the downtown core and along the transit corridors, and is oriented vertically with a continuing trend of high-rise developments. This has resulted is a marked need for new housing, transit solutions, and infrastructure, all of which needs to be serviced by Toronto Hydro in the years to come*."

As outlined throughout the evidence in Exhibit 2B, distribution system planning is complex and relies on a long list of varied inputs and planning considerations. There is no single metric of growth relied upon to inform system planning.

QUESTION (B) :

b) Please reconcile the apparent discrepancy between the statement that the City of Toronto's population is growing, in absolute terms, more than other cities with Toronto Hydro's forecasts showing slowing system load growth rates and the Ontario Ministry of Finance's projections that population growth is slowing for the City of Toronto.

RESPONSE (B):

Based on the response in part (a) above, Toronto Hydro submits there is no discrepancy, as absolute growth and growth rates are referenced for different purposes in different contexts.

Both Reference 3 and Reference 4 are based on Statistics Canada data released in January 2023. Reference 3 looks at growth over the preceding 12-month period and concludes that Toronto's population grew by 138,240 people, which is second only to Dallas-Fort Worth-Arlington in the cities compared. Reference 4, on the other hand, is prospective and looks at population projections from 2022-2046. Reference 4 notes that Toronto's population is projected to rise from 3.03 million in 2022 to 4.20 million in 2046, which is the largest population gain among the census divisions, but that the rate growth of 37.7 percent is slightly slower than the provincial rate of growth of 43.6 percent.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-9

Reference: Exhibit 1B / Tab 1 / Schedule 1 /
Exhibit 1B / Tab 3 / Schedule 1 / pp. 8-21

Preamble:

Requesting clarification of components of individual PIM measures.

QUESTION (A):

a) Does the Total Recordable Injury Frequency PIM measure include subcontracted field resources or only Toronto Hydro employees?

RESPONSE (A):

Total Recordable Injury Frequency measure does not include subcontracted field resources. Only Toronto Hydro employees are included.

QUESTION (B):

b) Does the Emissions Reduction PIM measure include emission reductions (ex. Fleet reductions or building square footage reductions) resulting from the contracting out of work or business activities?

RESPONSE (B):

Toronto Hydro's Scope 1 emissions do not include emissions by its contractors. Similarly, Toronto Hydro's Net Zero 2040 Strategy,[1] which will contribute to the achievement of the Emissions Reduction PIM, does not include reducing Scope 1 emissions through the contracting out of work or business activities.

[1] Exhibit 2B, Section D7.

QUESTION (C):

c) Regarding Ref 2 please provide the data and calculations used to create Figure 1 and Figure 2. For Figure 1 provide the data by cause code and year including and excluding MEDs. Also include the calculation for the standard deviation.

RESPONSE (C):

Please refer to the Excel spreadsheet entitled "*1B-Staff-9 Appendix A.xlxs*" for tabular data used to prepare Figures 1 and 2, as filed, in addition to a breakdown of Figure 1 by major cause code (excluding MEDs), on a 5-year rolling average basis. The inclusion of MEDs was not considered for the reliability projections. For a detailed explanation of Toronto Hydro's Reliability Projection Methodology, see response to interrogatory 2B-SEC-42.

QUESTION (D):

d) Regarding Ref 2 Provide the detailed calculation for the 5 yr projected values of Figure 1 and Figure 2. Was each individual cause code projected? Please provide the projection per cause code? If a projection was not completed by cause code how were random failures (such as weather) versus non-random failures (such as aging defective equipment) incorporated into a single projection model? Did these projections incorporate the submitted investment plans as per the application?

RESPONSE (D):

See response to 2B-SEC-42 for more information regarding Toronto Hydro's reliability projections.

Refer to part (c) (above) for the projections broken down by Major Cause Code and supporting tabular data for the figures.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-10

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 33

Preamble:

Toronto Hydro has proposed funding for an Innovation Fund to support work that is exploratory and development in nature, where outcome is uncertain, but benefits could be significant.

QUESTION (A):

a) Please list grant funding that Toronto Hydro has applied for from different government agencies over the past 5 years, along with a list of what was granted.
   i. If Toronto Hydro has not applied, please explain why not?

RESPONSE (A):

The table below lists grant funding that Toronto Hydro has applied for from different government agencies over the past 5 years.

Table 1: Grant funding that Toronto Hydro has applied for from government agencies (5-years)

Agency	Grant/Fund	Project Name	Submitted	Granted
NRCan	Electric Vehicle Infrastructure Demonstration	MURB Parking Lot Charging Pilot	October 2019	No
NRCan	Electric Vehicle Infrastructure Demonstration	MS Fleet EV Charge Hub	October 2019	No
NRCan	Electric Vehicle Infrastructure Demonstration	Pantograph Demonstration Project	October 2019	No

Agency	Grant/Fund	Project Name	Submitted	Granted
NRCan	Zero Emission Vehicle Infrastructure Program	MURB/Workplace Chargers	June 2020	Yes $250,000
NRCan	Zero Emission Vehicle Infrastructure Program	Curbside and Fleet EV	June 2021	Yes $350,000
NRCan	Zero Emission Vehicle Infrastructure Program	Toronto Curbside EV Chargers	September 2021	No
NRCan	Zero Emission Vehicle Infrastructure Program	Customer Fleet Charging	September 2021	No
TAF	ZEVIP - SUB	CF-025 – Curbside EV	May 2022	Yes $103,000
IESO & OEB	Grid Innovation Fund & Innovation Sandbox (Joint Call)	Benefit Stacking Transmission & Distribution Non-Wires Alternatives Pilot	November 2021	Yes $2 million
IESO	Grid Innovation Fund	LSE Demonstration	November 2020	No
NRcan	Deep Retrofit Accelerator Initiative	n/a	April 2023	No
NRCan	Smart Grid Demonstration	Hosting Capacity Analysis Standardization	January 2024	In Progress
NRCan	Smart Grid Demonstration	EV Load Management Project	January 2024	In Progress

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-11

Reference: Exhibit 1B / Tab 2 / Schedule 1 / p. 34

Preamble:

Toronto Hydro states that it "decided to allocate 0.3 percent of the proposed revenue requirement to the Innovation Fund, which amounts to approximately $16 million over the 2025-2029 rate period."

QUESTION (A):

a) Please provide examples of the other jurisdictions that have this type of funding, describe their programs and with their rationale for their proposed funding levels.

RESPONSE (A):

Please refer to Toronto Hydro's response to interrogatory 1B-DRC-06 part (d).

QUESTION (B):

b) What was Toronto Hydro's rationale to conclude that 0.3% was appropriate?

RESPONSE (B):

Toronto Hydro's research revealed that utility investments across comparable innovation initiatives and research and development activities range from 0.3 to 1 percent of revenues. Recognizing the novelty of this proposal in the Ontario electricity distribution sector context, Toronto Hydro decided to adopt the low-end of this range.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-12

References: **Exhibit 1B / Tab 2 / Schedule 1, Figure 1**

Exhibit 1B / Tab 2 / Schedule 1

EB-2014-0219: Report of the Board: New Policy Options for the Funding of Capital Investments: The Advanced Capital Module, September 2014

Preamble:

Reference 1 is reproduced below:

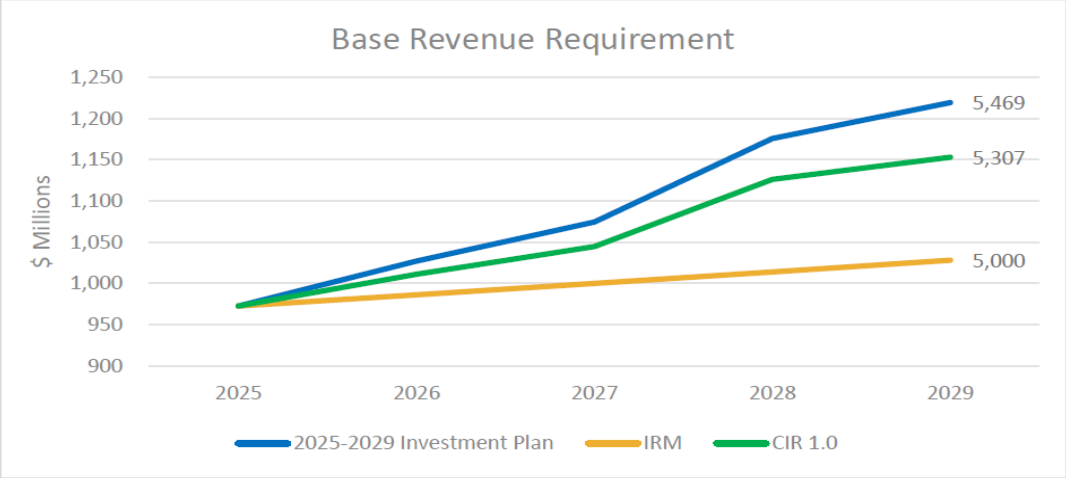


Figure 1: Cumulative 2025-2029 Base Revenue Requirement

QUESTION (A):

a) Please populate the following table, adding the proposed Custom Revenue Cap Index (CRCI):

Revenue Requirement ($ million, two decimal places)	**2025**	**2026**	**2027**	**2028**	**2029**
2025-2029 Investment Plan					
IRM					
Current Custom IR formula (Custom Price Cap Index (CPCI) / CIR 1.0)					
Proposed CRCI					

RESPONSE (A): Table 1: 2025-2029 Revenue Projection Scenarios ($ Millions)[1]

		2025	2026	2027	2028	2029	Total
A	2025-2029 Investment Plan	972	1,027	1,074	1,176	1,219	**5,469**
B	Revenue under IRM	972	986	1,000	1,014	1,028	**5,000**
C	Revenue under CIR1.0 with Custom Price Cap Index (CPCI)	972	1,011	1,044	1,126	1,153	**5,307**
D	Revenue under proposed Custom Revenue Cap Index (CRCI)	972	1,020	1,059	1,151	1,185	**5,387**
A-B	Revenue Deficiency under IRM	0	41	75	162	191	**469**
A-C	Revenue Deficiency under CIR1.0 with Custom Price Cap Index (CPCI)	0	16	30	50	66	**162**
A-D	Revenue Deficiency under the proposed CRCI	0	7	15	25	34	**81**

QUESTION (B) :

b) Please populate the following table with the values that correspond with developing Reference 1:

CPCI Components	2026	2027	2028	2029
I				
X – productivity				
X – stretch				
Xcap				
Cn				
Scap				
g				
CPCI				

RESPONSE (B):

Table 2: 2025-2029 Custom Price Cap Index (CPCI) Scenario

CIR 1.0	2026	2027	2028	2029
I - Inflation	2.00%	2.00%	2.00%	2.00%
X - Productivity	0.00%	0.00%	0.00%	0.00%
X - Stretch	-0.60%	-0.60%	-0.60%	-0.60%

[2] https://www.oeb.ca/sites/default/files/uploads/Board_ACM_ICM_Report_20140918.pdf at pp. 13-14

CIR 1.0	2026	2027	2028	2029
Xcap* Scap	-0.21%	-0.21%	-0.21%	-0.21%
Cn - Cn factor	4.17%	3.53%	8.09%	2.59%
I x Scap	-1.40%	-1.40%	-1.43%	-1.43%
G - Growth	-0.20%	-0.20%	-0.20%	-0.20%
Custom Price Cap Index (CPCI)	**3.76%**	**3.12%**	**7.64%**	**2.15%**

CIR 1.0	2026	2027	2028	2029
I - Inflation	2.00%	2.00%	2.00%	2.00%
X - Productivity	0.00%	0.00%	0.00%	0.00%
X – Stretch (Non-CRRR)	-0.18%	-0.18%	-0.17%	-0.17%
Cn - Cn factor (including 0.9% Stretch)	3.54%	2.90%	7.45%	1.95%
I x Scap	-1.40%	-1.40%	-1.43%	-1.43%
G - Growth	-0.20%	-0.20%	-0.20%	-0.20%
Custom Price Cap Index (CPCI)	**3.76%**	**3.12%**	**7.64%**	**2.15%**

QUESTION (C) :

c) To what extent did Toronto Hydro consider other, non-Custom IR regulatory tools, such as, but not limited to, options discussed in Reference 3, to solve the funding gap identified throughout Reference 2. Please explain why Toronto Hydro rejected these other regulatory options.

RESPONSE (C):

Toronto Hydro considered all the non-custom regulatory mechanisms available under existing OEB policy. Toronto Hydro did not pursue the ICM or ACM options because the OEB policy is clear that: "*projects proposed for incremental capital funding during the IR term must be discrete projects, and not part of typical annual capital programs*."[2] The OEB Report goes on to say that "*[t] he use of an ACM is most appropriate for a distributor that: [a] does not have multiple discrete projects for each*

[2] https://www.oeb.ca/sites/default/files/uploads/Board_ACM_ICM_Report_20140918.pdf at pp. 13-14

of the four IR years for which it requires incremental capital funding; [b] is not seeking funding for a series of projects that are more related to recurring capital programs for replacements or refurbishments (i.e. "business as usual" type projects).

The vast majority of Toronto Hydro's capital expenditures as outlined in the Distribution System Plan at Sections E4-E8 consist of annual capital programs, rather than discrete projects. There are only a handful of discrete projects in Toronto Hydro's 2025-2029 Distribution System Plan that are not part of the utility's annual capital plan namely: Enterprise Data Center (Exhibit 2B, Section E8.1) , ADMS (Exhibit 2B, Section E8.4, page 22), AMI2.0 as part Metering (Exhibit 2B, Section E5.4), ERP (Exhibit 2B, Section E8.4, page 21), Stations Expansion (Exhibit 2B, Section E7.4). These projects total approximately $504.0 million out of the total $3,927.8 million capital expenditure plan. Applying for ACM treatment for these projects would not have been sufficient to carry out the necessary and prudent investments outlined in the 2025-2029 Distribution System Plan. In addition, it is key to note that there is no incremental funding available under ICM or ACM options for non-capital related expenditures. Approximately $66M of the revenue deficiency identified above is attributed to non-capital related revenue requirement expenses (i.e. OM&A and Other Revenue) that exceed revenue available to fund operations under a standard Price Cap IR framework.

QUESTION (D):

d) Please confirm that the IRM scenario in Reference 1 does not include consideration for the capital modules available to utilities on a Price-Cap IRM. Please add an "IRM with Capital Module(s)" scenario to both Figure 1 and the table in part a).

RESPONSE (D):

Confirmed. Please refer to the response in part (f) below.

QUESTION (E):

e) Based on the Capital Module regulatory mechanism, which projects or initiatives, would qualify? Please explain how they would apply.

RESPONSE (E):

Please refer to the response to part (c) above.

QUESTION (F) :

f) Please confirm that the revenue requirement projection presented in Reference 1 includes projects that would be subject to variance account treatment in the DRVA of the proposed plan. Please calculate the residual annual revenue requirement that would result if costs of generation protection monitoring and control, externally-initiated plant relocations and expansions, Hydro One contributions, metering, and non-wire alternatives were not funded by the index. Please then adjust this for Toronto Hydro's proposed X factor and place the results as a new row in the table of part a), or a new table, whichever suites Toronto Hydro.

RESPONSE (F):

Confirmed. Please see Table 3 below for the residual annual revenue requirement, adjusted for Toronto Hydro's proposed X-factor that would result of costs of the programs mentioned in the preamble were not funded by the index.

Table 3: Residual Revenue Requirement adjusted for X factor ($ Millions)[3] /C

		2025	2026	2027	2028	2029	Total
A	**Residual Revenue Requirement**	967	1,012	1,048	1,139	1,179	**5,346**
B	**Residual Revenue Requirement adjusted for the stretch factor**	967	1,005	1,033	1,115	1,146	**5,266**
A-B	**Variance**	**-**	**7**	**15**	**24**	**33**	**80**

[3] Based on updated evidence filed on April 2, 2024 where the total forecast 2025-2029 Revenue Requirement is $5,482.5 million. Please see Exhibit 1B, Tab 1, Schedule 3. /C

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-13

References: Exhibit 1B, Tab 2, Schedule 1, Section 3.2.2

EB-2014-0219, Report of the Board: New Policy Options for the Funding of Capital Investments: The Advanced Capital Module, September 18, 2014

Preamble:

Toronto Hydro has proposed an Innovation Fund to address needs that cannot be met by existing funding mechanisms. Toronto Hydro states that the variance account proposal and resultant rate rider will provide transparency to rate payers on their bill.

QUESTION (A):

a) Please summarize Toronto Hydro's evaluation of the Incremental and Advanced Capital Modules and articulate how these mechanisms are unable to fund the work Toronto Hydro proposes for the Innovation Fund.

RESPONSE (A):

Please see the response to interrogatory 1B-Staff-12(c).

QUESTION (B):

b) Please confirm it is Toronto Hydro's proposal, that if this proposal is approved, to identify the "Innovation Fund" as a separate line item on customer bills. Please identify which customer bills are proposed to display this charge. Please explain whether Toronto Hydro will request an exemption from the regulation on invoices for low volume customers to make this charge visible to them.

RESPONSE (B):

Toronto Hydro incorrectly used the term customer bills in the context of this evidence. The utility was referring to the Tariff Sheets for the different customer classes that are included in Exhibit 8. In the context of the Tariff Sheets, the Innovation Fund rate rider is separately identified and named.

QUESTION (C):

c) Please articulate how this proposed rate rider differs from, and is superior, to an Advance Capital Module rider to provide transparency, of any form.

RESPONSE (C):

Compared to an ACM rider, the Innovation Fund rider provides more specificity on the Tariff as to the investment purpose of the amounts being collected through the rate rider.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-14

References: Exhibit 1B, Tab 2, Schedule 1, Table 1
Report of the Board: Renewed Regulatory Framework for Electricity Distributors: A Performance-Base Approach, October 2012

Preamble:

Reference 1 provides a comparison of Toronto Hydro's current Custom Incentive Rate-setting Framework with that which is proposed in this application.

Reference 2 states:
"The Board expects a distributor's application under Custom IR to demonstrate its ability to manage within the rates set, given that actual costs and revenues will vary from forecast."

QUESTION (A):

a) Please explain and quantify which cost and revenue deviations Toronto Hydro is managing within the rates to be over the 2025-2029 rate term, given the proposed revenue growth factor, demand-related variance account, and a revenue cap approach.

RESPONSE (A):

As noted in the response to interrogatory 1B-Staff-3, under the proposed custom rate framework Toronto Hydro forecasts its costs (and revenues) for five years, and the utility has to manage its business within those forecasts even though actual costs may differ from forecasted costs. Over a five-year term, differences between forecasted and actual costs can, and in Toronto Hydro's experience over the last ten-years, do occur due to a multitude of business factors and operating conditions that the utility is responsible for managing. These factors and conditions include, but are not limited to:

i. Utility-specific cost pressures that exceed input price adjustments provided through the standard inflation factor;

ii. New and evolving regulatory and legislative requirements;
iii. Evolving customer expectations and requirements;
iv. Market-based conditions such as supply chain constraints and labour shortages;
v. Geopolitical instability and other impactful events such as the COVID-19 pandemic;
vi. Weather-related risks including the rising risk of adverse weather due to climate change;
vii. Changes in the overall business risk profile due to factors such as asset health, system utilization, cyber security, labour market, technological advancements, etc.; and,
viii. Coordination challenges and complexities associated with doing work in a dense, congested, and growing urban environment.

For the reasons noted in Exhibit 1B, Tab 2, Schedule 1 at pages 35 to 47, Toronto Hydro's 2025-2029 Custom Rate Framework proposes specific adjustment to manage deviations in cost and revenues associated with changes in customer demand. This adjustment is provided by the *Demand Related Variance Account (DRVA)* which seeks to protect ratepayers, the utility and its shareholder, from structural unknowns in forecasted costs and revenues related to demand growth in a time of unprecedented change and transformation in the economy and energy system. The RRF issued in October 2012 could not have contemplated these unprecedented changes. Given the uncertainty that is outlined in the evidence supporting this account, the DRVA is a mechanism that enables the utility to manage within the rates set for the 2025-2029 period without having to compromise customer and/or shareholder financial outcomes that could impede progress towards beneficial electrification and/or destabilize investor confidence in Ontario's regulatory system.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-15

References: Exhibit 1B, Tab 2, Schedule 1

EB-2007-0673: Report of the Board on 3rd Generation Incentive Regulation for Ontario's Electricity Distributors

Preamble:

In Reference 1, Toronto Hydro makes the following statements:

"Under a standard IRM scenario, Toronto Hydro's 2025-2029 capital investment plan would be underfunded by approximately 35% or $1.5B."

"The needs of Toronto Hydro's 2025-29 investment plan remain unmet under the current custom framework….[Its] investment plan would be underfunded by approximately $450 million."

"Adoption of a plan constrained by this funding envelope would force the utility into a sustainment plan that would be almost entirely reactive in nature, resulting in roughly an 8 percent deterioration in system reliability by the end of the rate period."

Table 2 of Reference 1, which is titled as "ROE Implications of the Existing Custom Framework" is reproduced below:

	2025	2026	2027	2028	2029
2025-2029 Investment Plan Revenue Requirement (A)	972	1,027	1,074	1,176	1,219
2025-2029 funding under the existing custom framework (B)	972	1,011	1,044	1,126	1,153
Variance (A) – (B)	-	16	30	50	66
ROE Impact (basis points) *	-	59.6	110.8	183.5	245.6

QUESTION (A):

a) Please provide a forecast of financial performance under a standard IRM scenario while maintaining capital expenditures as proposed in this application, detailing net income, depreciation, regulatory return on equity performance, and values which correspond to the 300 basis point dead band which may trigger a review under the OEB's rate-setting policy. Present these figures in a manner that supports comparison to the analysis contained in Table 2 of Reference 1.

RESPONSE (A):

Table 1 below provides a forecast of financial performance (ROE) under a standard IRM scenario while maintaining capital expenditures as proposed in this application.

Table 1: Financial Performance (ROE) under a standard IRM Scenario

	2025	**2026**	**2027**	**2028**	**2029**
2025-2029 Investment Plan Revenue Requirement (A)	972	1,027	1,074	1,176	1,219
2025-2029 funding under IRM (B)	972	986	1,000	1,014	1,028
Variance (C)=(A)-(B)	**-**	**41**	**75**	**162**	**191**
ROE Impact (basis points)	**-**	**151.8**	**276.2**	**599.6**	**708.4**

*Estimated where $27M per year equals approximately 100 basis points

Variance (C)	**-**	**41**	**75**	**162**	**191**
Tax impact (D) = (C) x 26.5%	-	11	20	43	51
Net Income Impact (C)-(D) (loss)	**-**	**30**	**55**	**119**	**141**

QUESTION (B):

b) Please calculate the expected change in reliability performance in the case where Toronto Hydro continues under its current custom framework, using the same methodology applied to estimate an 8% decline in reliability performance were Toronto Hydro to proceed with "a standard IRM scenario" discussed on page 13 of Reference 1 above.

RESPONSE (B):

Please see the response to 1B-SEC-21.

QUESTION (C):

c) Please discuss the acceptability of Toronto Hydro's financial performance were Toronto Hydro to continue under its current custom framework, with specific reference to the ROE impacts outlined in Table 2 of Reference 1 and the 300-basis point threshold at which a regulatory review may be initiated, in accordance with the policy established under Reference 2.

RESPONSE (C):

The financial performance associated with a continuation of the current rate framework is not acceptable. As noted in the evidence at Exhibit 1B, Tab 2, Schedule 1 at pages 14-15, the only way for Toronto Hydro to close the funding gap posed by a continuation of the current framework is through cost-reduction efforts that will *also* negatively impact customer outcomes and service levels. For this reason, a continuation of the current rate framework would effectively preclude the utility from having a reasonable opportunity (not guarantee) to earn the allowed rate of return. This is not a financially sustainable outcome for the next rate period, nor is it consistent with (i) customer needs and expectations, or (ii) the Fair Return Standard that is the bedrock of the regulatory compact.

As noted above, this is also not in the best interest of customers since the only reasonable option to manage financial performance under this outcome is to reduce prudent and necessary investments in the utility's grid, operations and workforce that will compromise outcomes that customers need and expect. For example, a deferral of work contained within the Grid Modernization Strategy at Exhibit 2B, Section D5 would mean that customers can expect a deterioration in reliability performance over the next rate period (see 1B-SEC-21), higher customer interruption costs and higher costs and system constraints in the next decade as the grid becomes more heavily utilized by customers due to electrification. Similarly, investments to increase grid capacity to connect and

enable beneficial electrification, including DER adoption, could be compromised – jeopardizing customer choice and impeding progress towards energy transition goals.

Toronto Hydro does not believe that the 300 basis points off-ramp is the appropriate test to assess whether a new (or existing) rate framework will yield just and reasonable rates and outcomes for customers and the utility when a rate plan is being established. To the best of the utility's knowledge, the 300-basis points test has never been used this way in forward-looking rate application. Rather, this test has been applied to evaluate and manage the financial performance during an incentive-rate period – the most recent example being the application of this 300-basis points threshold to determine whether distributors were eligible for relief during the COVID-19 pandemic. Applying a 300 basis point off-ramp test to determine the utility's revenue adequacy and resulting rates would compromise the financial viability of the electricity sector and weaken market confidence in Ontario's regulatory system.

QUESITON (D):

d) Please describe the actions Toronto Hydro would take if ROE results were to materialize as projected in Table 2.

RESPONSE (D):

If the ROE results in Table 2 were materialize as a result of the OEB approving a rate framework that constrains the utility's revenue through the imposition of a non-empirical stretch-factor and/or the denial of funding for prudent OM&A expenses that cannot be funded under IRM, Toronto Hydro would be faced with a difficult decision to reduce necessary investment in the grid, operations and its workforce. For the reasons noted above and supported by the evidence in Exhibits 1B, 2B and 4, this decision would put customer outcomes (e.g., reliability and customer service) and energy transition objectives at risk.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-16

Reference: Ontario Energy Board, Handbook for Utility Rate Applications

Preamble:

At page 26, Reference 1 states:

"Custom IR is not a multi-year cost of service; explicit financial incentives for continuous improvement and cost control targets must be included in the application."

QUESTION (A):

a) Please describe Toronto Hydro's proposals for continuous improvement within the rate term, with specific reference to its preference for targets to be established on a five-year basis rather than annually, as noted at page 31 of Reference 2.

RESPONSE (A):

Toronto Hydro's proposals for continuous improvements within the rate term are found both within and beyond the 2025-2029 Custom Scorecard and related targets that underpin the Performance Incentive Mechanism ("PIM").

Within the 2025-2029 Custom Scorecard and related PIM, Toronto Hydro has put forward various new performance measures and objectives that reflect the utility's ongoing commitment to continuous improvement. More specifically:

- reducing the duration of unplanned outages that customers experience;
- enhancing physical and cyber security threat detection and mitigation in accordance with NIST standards;
- advancing grid automation readiness for the horseshoe area of the grid by increasing remote operability of the distribution system and laying the foundation for self-healing;

- holding itself accountable for delivering demonstrative efficiency achievements commensurate with the expectations of the empirical stretch-factor proposed as part of the rate framework;
- tracking and reporting post-transactional customer satisfaction performance with respect to customer inquiries (phone and email), Key Accounts engagements, customer connections, and customer communications re planned outages and construction projects.
- tracking, reporting and resolving customer escalations in a timely manner.
- achieving and maintaining certification with international best practices (ISO) in various key management systems.
- reducing the company's GHG emissions in a paced and prudent manner
- expanding the scope of non-wires solutions by procuring 30MW of flexible capacity to address system capacity constraints.

The proposal for targets to be established on a five-year basis rather than annually reflect the necessary and practical considerations of: (i) operational complexity and uncertainty that the utility must manage in the normal course of business serving the needs of customers in a large, dense, urban environment; (ii) the multi-year nature of the work that utility needs to perform in order to achieve the target objectives reflects an integrated five-year plan (not five one-year plans); and (iii) the need to preserve operational flexibility within this integrated five-year plan to execute work programs effectively.

Outside of the 2025-2029 Custom Scorecard, Toronto Hydro's commitment to continuous improvement is detailed throughout the evidence. Notable examples include:

- Continuous improvement of the Asset management system, including:
    - Continue to improve the maturity of Toronto Hydro's asset risk management framework through the full implementation of the Condition Based Risk Management ("CBRM") methodology and fully embedding the Engineering Asset Investment Planning ("EAIP") solution within asset management processes, including a custom value framework to enable portfolio optimization.

- Develop Toronto Hydro's Asset Information Strategy to improve the quality of asset data and related data sources to support improved analytics & asset management decisions, as detailed in Exhibit 2B, D1.2.1
- Collect, store, classify, and integrate critical data to allow improvements in asset decision-making, increased operational forecasting and enable automation of processes
- Refine the Integrated Planning and Portfolio Reporting and Execution Work Program processes for increased integration with Toronto Hydro's EAIP tool

- Continuous improvement of operational and planning functions through Grid Modernization efforts as described in Exhibit 2B, Section D5.2, including:
  - Increase real-time system awareness efficiently through the use of monitoring technology, leading to enhanced fault location while allowing improved asset management and operational decision-making
  - Consolidate outage management and distribution management systems within an Advanced Distribution Management System ("ADMS") to establish a self-healing grid, optimize the integration and management of DERs, manage two-way flow of electricity, perform advanced outage management, manage DR programs, and enhance advanced analytics effectively
  - Improve monitoring, visibility, and forecasting of DER connections, allowing the utility facilitate DERs connections more efficiently and leverage DER connections to optimize the grid
  - Leverage advancement in advanced analytics, such as Machine Learning and Artificial Intelligence tools, to develop new descriptive, predictive, and prescriptive analytical capabilities to drive process efficiency and improve decision-making
- Continuous improvement with respect to reducing distribution system line losses and increasing system capacity to support electrification through paced investments in 4kv voltage conversions.

- Continuous improvement of operational efficiency, safety, and environmental objectives through the elimination of obsolete assets and system configurations as detailed in various capital programs within Exhibit 2B, Section E6.
- Continuous improvements with respect to process automation and business modernization is supported by IT initiatives that improve operational processes and enable responsiveness towards emerging electrification objectives as described in Exhibit 4, Tab 2, Schedule 17.
- Continuous improvement with respect to operational efficiency as evidenced throughout the programmatic evidence in Exhibit 4.
- Continuous improvement with respect to reducing restricted feeders and short capacity constraints to enable timely and efficient connection of DERs
- Continuous improvement with respect to proactive investments in reducing system capacity constrains to enable timely and efficient customer connections in areas of concentrated load growth.
- Continuous improvement with respect to the pursuit of innovative pilot projects that are aligned with the OEB's objectives as set out in the Framework for Energy Innovation, and the commitment to share learnings derived from these projects with the OEBs Innovation Sandbox as outlined in Exhibit 1B, Tab 4, Schedule 2.
- Continuous improvement with respect to core tools and processes that enable efficient day-to-day operation of the distribution system, as described in Exhibit 4, Tab 2, Schedule 5, p. 17-22 and Exhibit 4, Tab 2, Schedule 7, p. 18-23.
- Continuous improvement of the ways in which customers interact with Toronto Hydro, the information they have available to them, and the ease of interacting with Toronto Hydro, as described in Exhibit 4, Tab 2, Schedule 14, p. 39-41. This section also describes improvement of customer service efficiency and effectiveness of technology solutions, process optimization, and reporting. Examples of these improvements include:
    - Providing customer and staff a view of every interaction a person has had with Toronto Hydro including bills, calls, outages and connections,
    - Enhanced knowledge management systems and quality evaluation tools to train agents faster and service customers more consistently,

- Use of analytics and advanced technologies, such as artificial intelligence to identify potential issues and take steps to avoid the issue before the customer becomes aware,
- Advanced process management and control tools to identify when a customer service is at risk of being late or incomplete, and
- Evolution of new channels such as mobile application, chatbots, and the self service portal to manage customer interactions across each stage of their journey.

- Collections segment continuous improvement includes offering additional payment options for customers, improved outstanding debt management including due date notifications, and reporting, see Exhibit 4, Tab 2, Schedule 14, p. 40.
- Continuous improvement of the Low-Income Energy Assistance Program ("LEAP") by providing additional assistance and reaching a greater number of customers through higher grant amounts and funding, greater simplicity and assistance to customers during the sign-up process, and improved program awareness, see Exhibit 4, Tab 2, Schedule 19.

QUESTION (B):

b) What commitments, if any, does Toronto Hydro make to customers about improvements in cost and service performance to be achieved within the five-year term?

RESPONSE (B):

Please see the response above for a summary of numerous continuous improvement commitments that are form part of the utility's 2025-2029 investment plan underpinning this rate application.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-17

References: Exhibit 1B, Tab 2, Schedule 1, Table 5

Exhibit 1B, Tab 2, Schedule 1

Preamble:

Reference 1 is reproduced below:

Table 5: Efficiency Factor (0.15%) Revenue Reduction ($ Millions)

	2025	2026	2027	2028	2029
Revenue Requirement based on the 2025-2029 Investment Plan	972.4	1,027.0	1,074.4	1,175.7	1,219.2
Revenue Collected after 0.15% Efficiency Factor	972.4	1,025.5	1,071.3	1,170.9	1,212.2
Revenue Reduced by 0.15% Efficiency Factor	-	1.5	3.1	5.0	6.9

Note: There could be minor differences due to rounding.

In addition to the proposed 0.15% efficiency factor, Toronto Hydro also proposes a 0.6% performance incentive factor, and revenue growth factor of varying degrees for each of 2026 to 2029.

QUESTION (A):

a) Please confirm Toronto Hydro agrees with the following table produced by staff. If not, please provide Toronto Hydro's table for the revenue reduction in each year due to the proposed 0.6% performance incentive factor. For any changes to the values of the table, please provide all calculations to demonstrate the derivation of the number(s).

	2025	2026	2027	2028	2029
Revenue Requirement based on the 2025-2029 Investment Plan	972.4	1,027.0	1,074.4	1,175.7	1,219.2
Revenue Collected after 0.6% PIM factor	972.4	1,021.2	1,061.8	1,156.0	1,192.2
Revenue Reduction	-	6.2	12.6	19.7	27.0

RESPONSE (A):

Please see response to 1B-Staff-3 c), which demonstrates the revenue reductions resulting from application of the 0.6% incentive component of the X Factor. The response shows minor variances from OEB Staff's prepared table above.

QUESTION (B):

b) Please confirm Toronto Hydro agrees with the following table produced by staff. If not, please provide Toronto Hydro's table for the revenue enlargement in each year due to the proposed revenue growth factor. For any changes to the values of the table, please provide all calculations to demonstrate the derivation of the number(s).

	2025	2026	2027	2028	2029
Revenue Requirement based on the 2025-2029 Investment Plan	972.4	1,027.0	1,074.4	1,175.7	1,219.2
Inflation Adjusted RGF	-	3.61%	2.62%	7.43%	1.71%
Revenue Enlargement	-	35.1	62.0	141.9	162.0

RESPONSE (B):

The table presented above would provide an accurate depiction of revenue enlargement resulting from the RGF in a scenario where the RGF was applied to unreduced revenue requirements year over year. In actual practice, the CRCI's inclusion of a two-component X Factor totaling 0.75% has the effect of reducing the base revenue requirement to which the CRCI is applied. One result of this, are RGF revenue enlargements which are smaller than those shown above. Table 1 below shows RGF revenue enlargements taking this dynamic into account:

Table 1: RGF Revenue Enlargement for 2025-2029 Period

	2025	2026	2027	2028	2029
Revenue Requirement based on 2025-2029 Investment Plan	972.4	1,027.0	1,074.4	1,175.7	1,219.2
Revenue for previous year post-CRCI (used for application of CRCI in present year)	n/a	972.4	1,019.6	1,059.1	1,151.0
Revenue Growth Factor (RGF)	n/a	3.61%	2.62%	7.43%	1.71%
RGF Revenue Enlargement	n/a	35.1	61.8	140.5	160.2

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-18

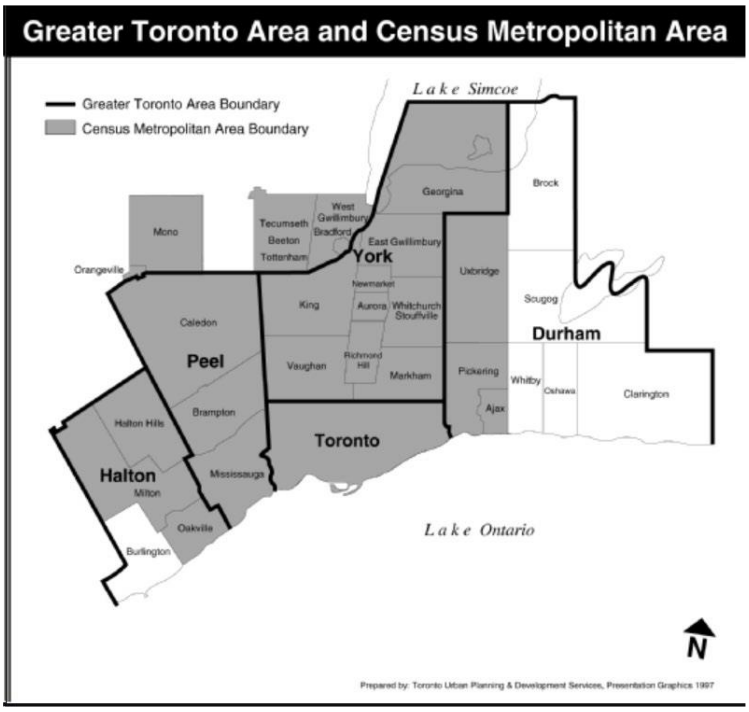
References: **Exhibit 1B, Tab 2, Schedule 1, Page. 7**
Exhibit 1B, Tab 2, Schedule 1, Table 3
Statistics Canada Map of Census Metropolitan Area 535 - Toronto, retrieved from: https://www12.statcan.gc.ca/census-recensement/geo/mapsartes/pdf/S0503/2016S0503535.pdf
Simplified Toronto CMA map: https://www.toronto.ca/wpcontent/uploads/2017/10/90c1-EDC-Map-GTA-CMA.png

Preamble:

Toronto Hydro states that "over the 2025-2029 period, its operations and capital investment needs are growing by approximately 37.5% due to a number of distinct and interrelated drivers." These drivers include:

"Responding to the extraordinary inflationary pressures experienced over the 2020-2024 period, wherein the non-residential Construction Index in the Toronto Census Metropolitan area rose 37.7% from Q1 2020 through Q1 2023."

Reference 3 is reproduced below (Statistics Canada Map of Census Metropolitan Area 535):



QUESTION (A):

a) Please provide details of the calculations that support the claimed need for 37.5% growth in "operations and capital investment needs." In particular, what definition of cost is used? If not the revenue requirement, why use an alternative definition of cost for this commentary?

RESPONSE (A):

Table 1 below provides a summary of Toronto Hydro's growth in capital and operational investments needs comparing actual/forecast expenditures in the current 2020-2024 rate term with the forecasted expenditures in the 2025-2029 rate term. The costs referenced in this table tie back to the expenditures outlined in OEB Appendix 2-AA and 2-AB (Capital) and OEB Appendices 2J (Operational).

Table 1: Comparison of 2025-2029 vs. 2020-2024 Expenditures ($ Millions)

	2020-2024	2025-2029	Variance ($)	Variance (%)
Capital Expenditures	2,787.4	4,001.8	1,214.4	43.6%
OM&A	1,460.7	1,856.3	395.6	27.1%
Total Expenditures	**4,248.1**	**5,858.1**	**1,610.0**	**37.9%**

Expenditures are a key aspect of financial management, and tracking them is essential for budgeting and financial planning. Revenue requirement is a concept in utility regulation and rate-setting processes – it reflects the total amount of money that a utility needs to collect from its customers in order to cover its costs (i.e. OM&A, depreciation, interest expense, return on equity and PILs/taxes).

QUESTION (B) :

b) Please explain Toronto Hydro's view regarding the relationship between the design of attrition relief mechanisms and the growth rate of revenue requirement for the years of the rate term that are affected by these mechanisms. Please confirm Toronto Hydro's proposed growth rate for revenue requirement in these years, i.e., 2026 to 2029.

RESPONSE (B):

An attrition relief mechanism is designed to address the utility's revenue deficiency over the rate term. Pleases see the response to 1B-Staff-12 where Toronto Hydro shows the revenue deficiency under standard Price Cap IRM.

The revenue deficiency is informed by two key considerations: (1) the growth rate of the revenue requirement over the rate period, and (2) the growth rate of the revenues to be collected from customers through existing rates over the rate term considering any expected increases in billing determinants per the utility load forecast.

QUESTION (C) :

c) Please explain how extraordinary inflation in 2020-2024 presages rapid cost growth for the 2026-2029 period.

RESPONSE (C):

The reference upon which this question was based seems to have been misinterpreted to mean that the extraordinary inflation in the current rate term is driving the rate of growth over the next rate term. Rather, as explained above in part (a), the referenced statement denotes the absolute growth in total expenditures comparing the current 2020-2024 rate term with the 2025-2029 rate term. The extraordinary inflation that the utility experienced in the current rate term is in part driving the absolute growth in in total expenditures in the next rate term compared to the current rate term.

QUESTION (D) :

d) Please identify what other indices Toronto Hydro considered for assessing inflation for the unit costs for power distribution system construction in Toronto Hydro's service territory. Please explain how Toronto Hydro determined the non-residential Construction Index in the Toronto Census Metro Area is the most relevant index of inflation in the unit cost of power distribution system construction in its service territory.

RESPONSE (D):

Toronto Hydro believes Reference 2 intends to refer to Exhibit 1B, Tab 3, Schedule 3, Table 3, which corresponds to the data point noted.

The reference is taken from a section of the evidence that provides a retrospective look at the steps taken by Toronto Hydro to complete its work programs and manage its business during a challenging time of 40-year high inflation in Canada, and the Toronto Area. Toronto Hydro was not able to locate any specific indices to assess inflation for the unit costs for power distribution system construction in Toronto Hydro's service territory. In the absence of a more specific index, Toronto Hydro believes

that the NRBCI is an instructive index for assessing the retrospective inflationary pressures of undertaking construction work in the Greater Toronto Area (GTA), which includes the City of Toronto.

QUESTION (E) :

e) Provide the filters and settings used on the Statistics Canada website to derive these values in Reference 2. Please detail the type of building and divisions selected. Explain why these filters and settings were selected and how all the categories selected are applicable to Toronto Hydro's inflationary pressures?

RESPONSE (E):

The settings selected on the Statistics Canada website were

a) Type of Building: Non-Residential Buildings
b) Division: Division Composite
c) Reference Period: Q1 2020 to Q2 2023

QUESTION (F) :

f) Please confirm the percentage land area of the Toronto Census Metropolitan Area that is served by Toronto Hydro.

RESPONSE (F):

Toronto Hydro has not completed a km^2 analysis of its service territory relative to the Toronto CMA.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-19

Reference: Exhibit 1B, Tab 2, Schedule 1, Appendix A

Preamble:

Page 2 of Reference 1, Toronto Hydro states:

> "the Company's proposed *changes* to the Rate Framework are generally consistent with how other electric *utilities* have responded to developments in the energy industry. [italics added]"

On page 3:

> "Given these developments in the energy industry, many regulatory jurisdictions have implemented changes to ratemaking frameworks and practices. These changes are designed to incorporate expanded objectives and priorities, such as clean energy goals, affordability, reliability, emission reduction, and utility financial integrity."

QUESTION (A):

a) Please confirm the following statements. If Toronto Hydro disagrees with any or all of these statements, please explain why.
   i. Toronto Hydro already operates under an approach to custom incentive rate-setting that it has dubbed CIR 1.0.
      1. This ratemaking system includes a price cap index formula with a C factor that effectively replaces capital revenue growth based primarily on inflation and productivity indexing with capital revenue growth based primarily on a cost forecast.
      2. The inflation measure in this formula includes a relevant input price index: the average weekly earnings on Ontario workers.

3. An asymmetrical Capital-Related Revenue Requirement Variance Account returns any and all capital-related revenue requirement savings to customers.
4. There is also a two-way variance account for miscellaneous externally-driven costs.

ii. Toronto Hydro's new CIR proposal entails the following changes from its old proposal.

1. A revenue growth factor ("RGF") would effectively replace OM&A as well as capital revenue growth based primarily on inflation and productivity indexing with growth that is based primarily on cost forecasts.
2. A revenue cap index would replace the price cap index, and a demand revenue variance account ("DRVA") would effectively establish weather-normalized revenue decoupling.
3. The DRVA would also establish two-way variance account treatment for a wide range of demand-sensitive costs.
4. The Capital-Related Revenue Requirement Variance Account would be discontinued.
5. There would, additionally be an Innovation Fund, a Getting Ontario Connected Act Variance Account, and PIM tied to customer service quality and various policy goals.

RESPONSE (A) - PREPARED BY SCOTTMADDEN:

i. Confirm.

1. Partially confirm. The C factor is subject to inflation and productivity factors.
2. Partially confirmed. The inflation factor includes a labour and non-labour component.
3. Confirm.
4. Confirm.

ii.

1) Partially confirm. The RGF factor is still subject to inflation and productivity factors.

2) Partially confirm. DRVA trues up billing determinants on a weather normalized basis.
3) Confirm.
4) Confirm.
5) Confirm.

QUESTION (B):

b) Does Toronto Hydro mean that each of these changes is individually consistent with industry trends or instead that many of these changes are consistent with industry trends?

RESPONSE (B) - PREPARED BY SCOTT MADDEN:

ScottMadden did not evaluate industry trends. Instead, ScottMadden evaluated Toronto Hydro's proposed custom IR plan for its relative consistency with other electric utility ratemaking frameworks and practices that support a clean energy transition. Please refer to the response to 1B-EP-23, part (a).

QUESTION (C):

c) Is Toronto Hydro stating that ratemaking in North America is moving away from the use of price and productivity indexing to escalate OM&A revenue and towards its escalation based on forecasts? If so, please substantiate.

RESPONSE (C) - PREPARED BY SCOTT MADDEN:

ScottMadden did not evaluate industry trends. Instead, ScottMadden evaluated Toronto Hydro's proposed custom IR plan for its relative consistency with other electric utility ratemaking frameworks and practices that support a clean energy transition. Please refer to the response to 1B-EP-23, part (a).

QUESTION (D):

d) Is Toronto Hydro stating that that ratemaking in North America is moving towards variance account treatment of most costs of demand growth, including the traditional costs of customer connections, billing, and collection? If so, please substantiate.

RESPONSE (D) - PREPARED BY SCOTT MADDEN:

ScottMadden did not evaluate trends in variance account treatment. Please refer to the response to 1B-EP-23, part (a).

QUESTION (E):

e) Please list the approved multi-year rate plans that Toronto Hydro thinks are most similar to Toronto Hydro's proposed CRCI plan and explain the similarities and differences.

RESPONSE (E) - PREPARED BY SCOTT MADDEN:

Please refer to Figure 1 in Exhibit 1B-2-1 Appendix A, (Review of Rate Framework), pp. 5-6.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-20

Reference: Exhibit 1B, Tab 2, Schedule 1, Appendix A, Pages 3-4.

Preamble:

Reference 1 states that:

> "The changing energy industry has prompted various modifications to ratemaking frameworks and practices. These changes are generally designed to provide cost recovery flexibility and stability to help address challenges related to the changing grid needs. Specifically, multi-year rate plans and performance-based regulation ("PBR") frameworks and practices have been modified as follows.
>
> 1. Attrition Relief Mechanisms ("ARMs") modified to reflect the scale and timing of investments.
>
> − For example, regulatory jurisdictions, such as the United Kingdom ("UK"), Australia, Philippines, and Malaysia, utilize a "building blocks" approach that reflects forecasted capital investments and operations, maintenance, and administration ("OM&A") expenditures within multi-year ratemaking frameworks. This approach better aligns cost recovery with the scale and timing of capital and OM&A needs."

QUESTION:

a) Please confirm the following statements. If Toronto Hydro disagrees with any statements, please explain why.

   i. Basing ARM escalation on cost forecasts is nothing new. This approach has, for example, been used for many years for OM&A and capital costs in New York and Great Britain and for capital cost in Australia.

   ii. The British energy utility regulator Ofgem has extensive experience with cost forecasting. Insofar as Ofgem's building block approach to ARM design is based on cost forecasts, is it therefore not necessarily based on utility forecasts.

iii. Stairstep rates in New York are usually the outcome of settlements.

iv. Indexing and forecasting are not the only established bases for escalation of capital revenue in ARMs. In particular, capital revenue has been based on a utility's recent average historical plant additions (sometimes adjusted for inflation) in the out years of multi-year rate plans (MRPs) in several jurisdictions that include Alberta, California, and Massachusetts.

v. Indexing is currently used or has recently been used to escalate OM&A revenue in a number of jurisdictions that include Australia, British Columbia, Ontario, Massachusetts, and Québec.

vi. Interest is growing, not diminishing, in indexed ARMs, as evidenced by recent developments in British Columbia, Connecticut, and Indiana ratemaking.

vii. Several MRPs have no explicit provision for OM&A revenue growth other than that which results from billing determinant growth and depreciation of plant value. Examples include the "tracker/rate freeze" ARMs of Cleco Power in Louisiana, Florida Power & Light, and Appalachian Power in West Virginia.

viii. The focus on the modernization of PBR rather than ratemaking generally sidesteps the reality that MRPs are increasingly popular in North America even though these may afford more risk of cost recovery than frequent rate cases. Jurisdictions that have recently adopted MRPs include British Columbia (for BC Hydro), North Carolina and West Virginia.

RESPONSE - PREPARED BY SCOTTMADDEN:

i. Confirm.

ii. Under the RIIO-ED2 price control, Ofgem sets regulated revenues and required outputs for the electricity distribution network operators using information obtained from the companies based on activities they intend to undertake in RIIO-ED2 and their associated costs. Companies provide this information in the form of a Business Plan, and utilize the

building blocks method to establish revenues based on forecasted capital and O&M expenditures for each year of the rate period.

iii. ScottMadden's review found New York utilities generally develop Joint Proposals (jointly sponsored by utilities and intervenors) based on capital spending and OM&A expense forecasts filed in their direct case. Joint Proposals are then filed before the New York Public Service Commission and subject to their approval. The Commission may approve, reject, or modify the Joint Proposals, which then forms the basis for setting electric utility rates in New York over the past several years.

iv. Utilization of historical data for capital spending forecasts in MYRP has generally been accompanied by some form of capital spending riders for electric utilities reviewed in the study.

For example, Massachusetts establishes a capital budget based on a historical five-year average of capital additions. However, the capital budget does not include capital spending for projects recovered through separate, non base rate mechanisms, such as solar, meter-related capital, and grid modernization projects.[1]

v. Confirm.

vi. ScottMadden did not evaluate trends in indexed ARMs.

vii. ScottMadden did not review the referenced utilities.

viii. ScottMadden did not review the referenced rate cases. Disagree with premise of the question. PBRs and MYRPs are not mutually exclusive. The building blocks method referenced in the report represents a form of multi-year ratemaking.

[1] Massachusetts D.P.U. 22-22, Final Order, November 30, 2022

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-21

References: Exhibit 1B, Tab 2, Schedule 1, Appendix A, Page 15

Exhibit 1B, Tab 2, Schedule 1, Appendix B

Preamble:

At Reference 1, Toronto Hydro identifies certain advantages of forecasting OM&A as well as capital costs.

Throughout Reference 2, Toronto Hydro cites Ofgem.

QUESTION:

a) Please explain Ofgem's Information Quality Incentive. Please explain the context under which the IQI was developed and implemented by Ofgem, particularly noting the regulatory risks it aims to address.

RESPONSE - PREPARED BY SCOTTMADDEN:

The Information Quality Incentive (IQI) provided an incentive to distribution companies to minimize variances between actual and forecast expenditures. The IQI mechanism was intended to address information asymmetry between Ofgem and electric distribution or network companies.

In RIIO-2, Ofgem replaced the IQI with a Business Plan Incentive (BPI) mechanism. Under BPI mechanism, companies present business plans that identify costs and outputs, such as service quality. The quality of the business plans are subject to rewards or penalties up to +/-2% of the utility revenues.[1]

[1] Jamasb, Tooraj. "Incentive Regulation of Electricity and Gas Networks in the UK: From RIIO-1 to RIIO-2." Economics of Energy & Environmental Policy, vol. 10, no. 2, Sept. 2021

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-22

Reference: Exhibit 1B, Tab 2, Schedule 1, Appendix B, Pages 3-11

Preamble:

At Reference 1, Toronto Hydro states that

"PBR mechanisms have been "modernized" to reflect energy transition.

- Modernized PBR mechanisms address cost recovery uncertainties that facilitate meeting policy objectives and utility financial health… (p. 3)
- Alternative Cost Recovery Mechanisms, such as cost trackers, provide cost recovery related to certain public policy goals (p. 5).

Modernized PBR mechanisms provide utilities with flexibility to address changing grid needs while maintaining safe and reliable service

- Address cost recovery challenges of achieving policy objectives
- Fund traditional and new investments to meet clean energy transition
- There is recognition that policy objectives cannot be achieved without ensuring cost recovery for necessary investments (p. 10)

Jurisdictions have implemented cost trackers for *traditional utility projects* and emerging cost categories (such as clean energy programs) (p. 11) [italics added]"

QUESTION:

a) Please confirm the following statements. If Toronto Hydro disagrees, please explain.

iii. In multiyear rate plans, regulators are increasingly approving cost variance accounts to encourage utility activities that advance public policy goals such as beneficial electrification and accommodation of distributed energy resources on the customer side of the meter. The cost of these activities is hard to predict accurately and utilities in some circumstances have weak incentives to pursue them. However, major expansions of distribution system (e.g. substation) capacity

to accommodate the energy transition have rarely been accorded tracker treatment in MRPs to date.

iv. Cost trackers for traditional utility capex in the States (e.g., distribution system improvement charges) have usually been approved not in the context of a multiyear rate plan but instead where the alternative is frequent rate cases. Roughly half of all US jurisdictions do not employ forward test years in rate cases.

RESPONSE - PREPARED BY SCOTTMADDEN:

iii. ScottMadden did not evaluate trends in cost variance accounts. Instead, ScottMadden evaluated Toronto Hydro's proposed custom IR plan for its consistency with other electric utility ratemaking frameworks and practices that support a clean energy transition.

iv. ScottMadden is unable to confirm the first sentence; however, one of the benefits of multiyear rate plans is to avoid frequent rate cases. Specifically, capital spending trackers are designed to achieve multiple benefits, including adequate cost recovery, address uncertainties related to the magnitude and pace of investments, and avoid frequent rate cases. There are several examples of adjustment clauses that recover investments in the distribution system as part of multi-year rate plans, such as in Hawaii and Massachusetts.

- Confirmed that approximately 50.00 percent of U.S. jurisdictions do not employ forward test years in rate cases.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-23

Reference: Exhibit 1B, Tab 2, Schedule 1, Appendix B, Pages 11 and 13

Preamble:

Reference 1 states the following regarding Hawaiian electric utility regulation:

- Hawaii's Exceptional Project Recovery Mechanism (EPRM) provides cost recovery certainty for eligible projects (primarily clean energy-related infrastructure and grid modernization investments) placed in service between rate cases (p. 11)
- The Commission has taken a broad approach to eligible projects, noting that "limiting eligible projects to pre-determined plans made in other dockets may limit the flexibility to address unforeseen events or take advantage of unexpected opportunities (e.g., improvements in technology, changes in consumption behavior, etc.)" (p. 11)
- The Hawaii PUC noted, "The PBR Framework approved in this D&O has been carefully designed to include multiple safeguards and review opportunities to protect the Companies' financial health from extreme hardship" (p. 13)

QUESTION:

a) Please confirm that the Hawaii Public Utilities Commission approved a revenue cap index formula that was much more favorable to consumers than the one that the Hawaiian Electric (HECO) companies requested.

RESPONSE - PREPARED BY SCOTTMADDEN:

Scott Madden did not evaluate whether the approved revenue cap index formula was much more favorable to consumers than the one HECO requested. Scott Madden found the approved revenue cap index formula is a ratemaking framework and practice used by electric utilities to support a clean energy transition.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-24

Reference: Exhibit 1B, Tab 2, Schedule 1, Appendix B, Page 20

Preamble:

Reference 1 provides a table that contains a taxonomy of "ARMs Cost Forecasting Methodologies" and includes the statement that a Forecasted/"Stairstep" methodology is "based on forecasted revenue requirements."

QUESTION (A):

a) For each item in the table, please explain the forecasting methodology employed for each attrition relief mechanism (ARM). For example, please explain how a "Rate Freeze" is a cost forecasting methodology for an attrition relief mechanism. Please do so for each item in the table.

RESPONSE (A) - PREPARED BY SCOTT MADDEN:

Please refer to the table below.

Attrition Relief Mechanism	Forecasting Methodologies
Rate Freeze	Rates are set for MYRP term based on a set revenue level. Revenue growth depends on growth in billing determinants.
Forecasted/ Stairstep	Rate adjustments based primarily on multi-year forecasts
Indexed ("I-X")	Rates or revenue adjusted annually to account for inflation less a productivity factor
Hybrid	Utilize a mix of indexing and other escalation methodologies, such as indexing O&M expenses and forecasting capital costs

QUESTION (B):

b) Please confirm that some approved stairstep and hybrid ARMs have not involved much if any capital cost forecasting. Budgets for most gross plant additions (or capex) have, for example, been set for several years at an average of recent historical capex or at the approved test year value (and these budgets have sometimes been adjusted for inflation). If Toronto Hydro disagrees with any of these statements, please explain why.

RESPONSE (B) - PREPARED BY SCOTTMADDEN:

ScottMadden is unable to confirm the general statement, but denies it with respect to utilities referenced in the report. The utilities referenced in the report generally rely on capital cost forecasting for rates based on the stairstep method.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-25

Reference: Exhibit 1B, Tab 2, Schedule 1, Appendix B, Page 21

Preamble:

Toronto Hydro provides information regarding the first generation of multiyear rate plans in Alberta ("PBR1") but not later generations. In the PBR1 plans, cost trackers provided supplemental capital revenue.

QUESTION:

a) Please confirm the following statement. Insofar as Toronto Hydro disagrees, please explain.

> The Alberta Commission has since approved two additional generic MRP design frameworks that it has called "PBR2" and "PBR3". In these frameworks the role of capital cost trackers and cost forecasting was greatly reduced. In each plan, most supplemental capital revenue has been provided by a "K-Bar" mechanism linked to the utility's recent historical capex. OM&A revenue has been escalated chiefly by a price cap index (for power distributors) or a revenue per customer index (for gas distributors).

RESPONSE - PREPARED BY SCOTT MADDEN:

Confirmed that the role of capital cost trackers and cost forecasting to provide supplemental capital revenue was reduced in PBR2 and PBR3 relative to PBR1. However, the role of capital cost trackers in PBR3 has not been greatly reduced as compared to PBR2. On the contrary, Alberta Utilities Commission (AUC) recognized the importance of the capital cost tracker to recover future investments related to the achievement of net-zero objectives. AUC also recognized the uncertainties related to the pace and scale of the investments, stating:

> "The Commission agrees that there is the potential for net-zero objectives to drive the need for additional expenditures during the PBR3 term, and that the level of

> uncertainty and risk associated with the need for and timing of net-zero objectives makes capital investments required to respond to any such objectives unsuitable for funding through the Type 2 K-bar mechanism."[1]

The PBR3 framework also includes supplemental capital funding through the K-bar mechanism which is a formulaic approach that provides utilities with additional capital funding calculated based on average recent historical capital additions.

Finally, cost forecasting is utilized to determine the going-in rates for the PBR3 framework. The AUC set the respective 2023 (rebasing year) revenue requirements for Alberta utilities based on approved forecasted costs.[2]

[1] Alberta Utilities Commission, Decision 27388-D01-2023, p. 62
[2] Id., p. 10

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-26

Reference: Exhibit 1B, Tab 2, Schedule 1, page. 5

Preamble:

Toronto Hydro proposes to replace the Custom Price Cap Index in its current plan with a Custom Revenue Cap Index ("CRCI").

QUESTION (A):

a) Why does the CRCI formula not include an escalator for growth in the number of customers that Toronto Hydro serves and/or some other external metric of Toronto Hydro's operating scale?

RESPONSE (A):

The CRCI formula does not include such an escalator because growth is captured inherently through the revenue cap approach, relying on the billing determinants projected for each rate class in the five-year load and customer forecast in Exhibit 3, Tab 1. Please see part b) for more information.

QUESTION (B) :

b) Please confirm that, in the absence of such an escalator, the entire cost of customer growth must instead be addressed by some combination of forecasting and variance accounts.

RESPONSE (B):

In both a price cap and revenue cap, incremental revenues driven by billing determinant growth is based on the load and revenue forecast in Exhibit 3, Tab 1. The difference is with respect to how the forecasted growth is reflected in rates. In a price cap, the growth is captured through a top-line growth factor (i.e. g-factor). As noted in Exhibit 1B, Tab 2, Schedule 1 at page 21: *The g-factor*

translates billing determinant growth across customer count, kWh, and kVa in all rate classes into a simplistic top-line figure that is applied formulaically to base rates. As noted in Exhibit 1B, Tab 2, Schedule 1 at pages 21, in a revenue cap, [r]*ather than escalate rates themselves each year, and use a simplistic g-factor to account for expected billing determinant growth, Toronto Hydro proposes to escalate revenue requirement each year, and design rates for each revenue requirement on the basis of forecasted customer and load growth over the rate term.*

QUESTION (C) :

c) Please describe Toronto Hydro's view on the advantages and disadvantages of a growth escalator in a revenue cap index. Please discuss any additional considerations, highlighting advantages and disadvantages, in the context of rapid growth in the number of customers in classes that are especially costly to serve.

i. In the above context, please explain how common is it for Toronto Hydro to serve bulk-metered residential apartment buildings or condominiums or residential apartment buildings with a single or bulk meter?

ii. What costs does Toronto Hydro incur for the ownership of assets or the provision of services inside these buildings?

RESPONSE (C):

Toronto Hydro is unclear about the definition of a "growth escalator" within the context of the question. To the degree a growth escalator is an adjustment to rates to account for growth in billing determinants over the rate term, there are no advantages to such an inclusion, as the effect would be to inappropriately account for growth in billing determinants twice. Under a Price Cap, *rates* are escalated each year based on an index. Absent an adjustment for growth, (i.e. a g-factor), the result is that the utility will retain all increased revenues resulting from increased billing determinants. In EB-2014-0116 and EB-2018-0165 a g-factor was implemented to remove a forecast of this increased revenue, on the rationale that Toronto Hydro's 5-year forecast costs should include the forecast cost of growth.

Under a Revenue Cap, *revenue requirement* is escalated each year by an index. Subsequently, the escalated revenue for each rate class is divided by the billing determinant forecast for the year to determine the rates. This adjustment reduces the rates by the expected growth in billing determinants for the year in question. The end result is a downward adjustment to rates (assuming billing determinants are forecast to increase year over year), in the same manner a Price Cap g-factor implements a downward adjustment to rates. The core difference is that the g-factor implements the adjustment on a generic, system-wide basis, while the revenue cap approach calculates adjustments on a rate class specific basis, based upon specific forecast billing determinants.

Please see response to interrogatory 2B-ED-25 for information regarding the proportion of multi-residential buildings served by Toronto Hydro which are served via bulk meter. Toronto Hydro does not incur any costs for assets not owned by the utility. For bulk metered buildings (e.g. residential apartment buildings or condominiums), Toronto Hydro owns the main service connection cable from the main distribution system to the electrical demarcation service point with the customer and the bulk meter. Toronto Hydro does not own any assets beyond this electrical demarcation point including any part of the buildings own electrical infrastructure or distribution system (e.g. panelboards, switchboard, secondary wires, and any meter provided by a third party unit sub-metering provider).

QUESTION (D):

Funding for connections to large commercial establishments can be increased using a revenue-weighted index of growth in various customer categories, such as a scale escalator in a revenue cap index formula. Please accordingly divide the number of customers served by Toronto Hydro into residential and other and, if practicable, itemize as well the revenue and customers receive general service 1,000 to 4,999 KW and larger) for the forecast period and back to 2015.

RESPONSE (D):

Tables 1 and 2 provide 2015-2029 customer numbers and distribution revenue by rate class.

Table 1: 2015-2029 Customer Numbers

Year		Residential		Non-Residential						Total
		Residential	CSMUR	GS <50 kW	GS 50-999 kW	GS 1,000-4,999 kW	Large Use	Street Lighting	USL	
2015	Actual	610,971	55,997	70,561	10,427	439	44	1	866	**749,306**
2016	Actual	611,150	65,791	70,534	10,418	438	44	1	866	**759,242**
2017	Actual	611,575	71,071	70,529	10,411	430	44	1	860	**764,921**
2018	Actual	612,262	75,028	71,266	10,470	427	42	1	839	**770,333**
2019	Actual	614,206	79,882	71,515	10,444	455	40	1	827	**777,369**
2020	Actual	614,229	83,686	71,899	10,213	480	44	1	824	**781,374**
2021	Actual	614,181	88,478	72,408	9,846	482	45	1	819	**786,258**
2022	Actual	614,926	92,126	72,614	9,731	461	42	1	799	**790,699**
2023	Bridge	615,795	94,391	72,871	9,672	455	47	1	793	**794,025**
2024	Bridge	616,778	96,411	73,152	9,685	453	46	1	793	**797,318**
2025	Forecast	617,563	98,427	73,396	9,699	451	45	1	793	**800,374**
2026	Forecast	618,292	100,404	73,632	9,712	462	48	1	793	**803,344**
2027	Forecast	618,985	102,150	73,857	9,725	460	47	1	793	**806,017**
2028	Forecast	619,849	103,674	74,165	9,740	463	46	1	793	**808,731**
2029	Forecast	620,742	104,994	74,455	9,754	461	46	1	793	**811,245**

* The Numbers are aligned with Exhibit 3, Tab 1, schedule 1, Table 2

Table 2: 2015-2029 Distribution Revenue ($ Million)**

Year		Residential		Non-Residential						Total
		Residential	CSMUR	GS <50 kW	GS 50-999 kW	GS 1,000-4,999 kW	Large Use	Street Lighting	USL	
2015*	Actual	250.7	18.2	89.6	170.6	54.4	27.4	12.3	3.2	**626.4**
2016*	Actual	259.6	21.9	92.2	176.9	56.1	28.8	12.8	3.3	**651.5**
2017	Actual	276.4	25.6	98.8	187.7	59.1	30.8	13.7	3.6	**695.7**
2018	Actual	294.0	28.8	105.3	196.8	62.6	31.0	14.5	3.7	**736.6**
2019	Actual	306.4	32.1	109.8	202.2	64.3	30.7	16.9	3.8	**766.2**
2020*	Actual	290.1	32.3	106.6	189.1	60.1	29.3	17.0	3.3	**727.8**
2021	Actual	299.6	35.4	115.9	196.7	61.8	30.9	18.0	3.5	**761.8**
2022	Actual	304.5	37.4	121.7	205.3	65.1	30.8	18.0	3.6	**786.5**
2023	Actual	324.5	40.8	128.7	214.5	68.4	34.5	19.0	3.8	**834.3**
2024	Bridge	340.0	43.6	136.5	223.8	71.5	35.4	19.6	4.0	**874.3**
2025	**Forecast**	372.1	44.3	155.4	254.1	81.6	38.9	21.7	4.4	**972.4**
2026	**Forecast**	390.2	46.5	163.0	266.5	85.5	40.8	22.7	4.6	**1,019.7**
2027	**Forecast**	405.2	48.3	169.3	276.8	88.8	42.4	23.6	4.8	**1,059.1**
2028	**Forecast**	440.4	52.4	184.0	300.8	96.5	46.0	25.6	5.2	**1,151.0**
2029	**Forecast**	453.4	54.0	189.4	309.7	99.4	47.4	26.4	5.3	**1,185.1**

* Include foregone revenue
** The Distribution Revenue shown in the table is weather-normalized.
*** The Distribution Revenue is aligned with Exhibit 3, Tab 1, Schedule 1, Table 1

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-27

Reference: Exhibit 1B, Tab 2, Schedule 1, Pages 26-27

Preamble:

Toronto Hydro states that

"Toronto Hydro proposes to replace the Ontario Average Weekly Earnings ("ON-AWE") inflation index within the OEB's inflation factor methodology with a custom Toronto Hourly Salary and Wages Index. This index can either be derived by the Conference Board of Canada ("CBC") economic data subscription service or can be reproduced by purchasing relevant tax data from Statistics Canada. For efficiency purposes, Toronto Hydro proposes to rely on the Conference Board of Canada index."

QUESTION (A) – (E):

a) Please provide a live spreadsheet (e.g., with formulas intact) with the calculations for the proposed custom Toronto Hourly Salaries and Wages Index and a detailed description of the methodology underlying these calculations, including but not limited, to the timeseries file IDs for the Conference Board of Canada data used in the calculations and any assumptions underlying the calculations.

b) Please confirm that the salary and wages data provided by the Conference Board of Canada are derived from tax data purchased from Statistics Canada such that whether the data are purchased from the Conference Board of Canada or Statistics Canada, the result will be the same. If not confirmed, please explain why.

c) Are tax data used in the construction of Statistics Canada's indexes for Average Hourly Earnings, Average Weekly Earnings, or fixed weighted index of average hourly earnings?

d) Please provide the live spreadsheet (e.g., with formulas intact) with the calculations for Toronto Hydro's Average Blended Salary Increase (Appendix 2-K) and a detailed description

of the methodology used for these calculations including any underlying assumptions (e.g., number of hours worked).

e) Please confirm that the Alberta Utilities Commission chose the fixed-weighted index of average hourly earnings as the labor price index for its inflation factor formula in PBR3. What is Toronto Hydro's view of this alternative?

RESPONSE (A) – (E):

Please see response to 1B-Staff-93.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-28

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 25

Preamble:

Toronto Hydro states that

"Aside from achieving the objective of providing funding certainty and stability in rates which is necessary to enable effective multi-year planning and operations, the RGF offers the added benefit of simplicity relative to the current C-factor since the entire revenue requirement is being escalated by the same inflation and productivity factors. [italics added]"

QUESTION:

a) Please confirm that firms in unregulated markets have achieved effective multiyear planning and operations without funding certainty and price stability. If not, please explain.

RESPONSE:

Toronto Hydro is unsure how this question applies to a proceeding to set rates for a regulated monopoly, and cannot comment on how unregulated organizations operate in a competitive market. However, it notes that the considerations of certainty and stability in rates are echoed in the Renewed Regulatory Framework objective of setting a more flexible (multi-year) approach to rate-setting that will: "(i) enhance predictability necessary to facilitate planning and decision-making by customers and distributors; (ii) better align rate-setting with distributor planning horizons; (iii) facilitate the cost-effective and efficient implementation of distributor multi-year plans that have been developed to achieve the outcomes for customer service and cost performance; and (iv) help to manage the pace of rate increases for customers."[1] [numbering added for organization]

[1] OEB Renewed Regulatory Framework for Electricity Distributors: A Performance-Based Approach (October 18, 2012) at page 10.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-29

Reference: Exhibit 1B, Tab 2, Schedule 1

Preamble:

Toronto Hydro proposes that future revenue from the PIM-DA rate rider, if achieved, should be exempt from Earnings Sharing Mechanism treatment.

QUESTION (A):

a) Please elaborate Toronto Hydro's proposal that the future PIM-DA riders be exempt from ESM treatment. Please also articulate Toronto Hydro's view of how this potential rider would qualify as "certain adjustments" cited on page 47 of Reference 1. What other Toronto Hydro riders are, or have been, exempt from ESM treatment.

RESPONSE (A):

The PIM is a *mechanism* that proactively reduces the utility's regulated allowed earnings to the benefit of customers. As such, achievement of the PIM and receipt of any resulting incentive amounts would only return Toronto Hydro to a position of earning its OEB-approved ROE. In other words, the PIM does not contribute to earnings in excess of OEB-approved ROE. Given the ESM is explicitly in place to protect against excessive overearnings, it would be inappropriate to subject incentives received under the PIM to ESM treatment. Consequently, any recognition of PIM-related revenue (that would be captured in the PIM-DA) should be adjusted/normalized out of the ESM calculation as an "*out-of-period items and to ensure there is no double counting.*"[1] This is consistent with how the 2012-2014 ICM rate riders (i.e. *out of period items*) were treated/adjusted for the purposes of the ESM calculation in the 2015-2019 custom rate period. If adjustments are not made, and the ESM is triggered, PIM-related earnings captured in the PIM-DA, would be clawed back

[1] EB-2018-0165, Decision and Order (December 19, 2019) at page 193.

through the ESM. This treatment leads to an outcome of penalizing the utility for lost revenues that is entitled to earn-back under the PIM as proposed.

QUESTION (B) AND (C):

b) Referencing only OEB policy and other OEB regulated utilities, please provide all examples known to Toronto Hydro where an incentive measure is exempt from that utility's ESM. Please articulate how Toronto Hydro's proposal is similar to these examples.

c) Referencing only OEB policy and other OEB regulated utilities, please provide all examples known to Toronto Hydro where an incentive measure is not exempt from that utility's ESM. Please articulate how Toronto Hydro's proposal is different from these examples.

RESPONSE (B) AND (C):

Toronto Hydro is not able to comment on the particulars of how other utilities handle their ESMs. The utility notes that ESMs were established by the OEB through adjudication of major rate applications, rather than as a matter of policy. In the 2016 Rate Handbook, the OEB only mentions ESMs under rate-setting considerations for distributors undergoing consolidation, which is not applicable to Toronto Hydro's circumstances. As noted above, Toronto Hydro's proposed ESM and its interaction with the PIM-DA is consistent with the OEB's decision in previous applications, and yields a fair and reasonable outcome where the ESM does not penalize Toronto for allowed earnings which its has proactively given up and proposed to earn-back through the achievement of performance outcomes under the PIM.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-30

Reference: Exhibit 1B, Tab 2, Schedule 1, Pages 3, 30

Preamble:

Toronto Hydro proposes to add a "pro-active 0.6% performance factor" to its revenue cap index formula. Toronto Hydro further states that this factor would provide customers with "a significant upfront rate reduction benefit of approximately $ 65 million over the 2025-2029 rate term." This factor is linked to the proposed custom scorecard.

QUESTION (A):

a) Please address the notion that if Toronto Hydro does not achieve the scorecard targets, the "up front rate reduction" constitutes compensation to customers for Toronto Hydro's poor performance. In this context, please explain Toronto Hydro's view of the nature of the proposed PIM. That is, does Toronto Hydro view the PIM proposal as an asymmetrical penalty-only PIM? Please explain.

RESPONSE (A):

Toronto Hydro does not agree with the characterization posed by this question. Toronto Hydro would make every effort to complete its plan. All the PIM does is shift the risk of completing the Plan away from the ratepayer and onto the utility. Its effect is to provide incremental benefits, and decreased risks to, ratepayers. The PIM was designed to be responsive to the OEB's guidance in the last decision (EB-2018-0165) with respect to *improving the balance of risk between customers and the utility*. For more information about how the PIM achieve this balance please refer to the utility's response to 1B-SEC-13.

QUESTION (B):

b) Please explain, from a ratemaking and design perspective, Toronto Hydro's view as to why is this ratemaking treatment preferable to separate ratemaking treatment of the PIM (e.g., a penalty-only PIM not linked to the X factor or to a $65 million rate discount in the first year of the plan)?

RESPONSE (B):

The proposed PIM is preferable to the two examples posed above for the following reasons:

- Toronto Hydro infers that "penalty-only" PIM, which is not linked to the X-factor, would operate such that in the event Toronto Hydro did not achieve targeted performance, amounts would be recorded in a deferral account for future disposition to ratepayers as a credit. This proposal is inferior to the proposed PIM, as customers would not receive the upfront benefit of lower rates during the next rate term. This approach would also place less risk on the utility and more risk on customers as they would be paying for benefits in rates that may or may not be achieved.
- Regarding the proposal of a "$65 million rate discount in the first year of the plan" Toronto Hydro assumes such an approach would work as a *one-time bill credit* of $65 million in 2025. This approach creates unnecessary rate volatility (i.e. lumpiness) in that it provides a short-term rate-relief in 2025 followed by a jump in rates in 2026 when the credit expires. This approach also places unnecessary pressure on the utility's liquidity (i.e. cash flows) by forcing the utility to increase borrowing in order to pay the one-time credit in 2025.

QUESTION (C):

c) Please describe whether and how Toronto Hydro established that customers accept the PIM cost and design.

RESPONSE (C):

Toronto Hydro's approach to application-specific customer engagement focuses on understanding customers needs and preferences with respect to investment priorities (Phase 1) and preferences

with respect to trade-offs between price and other outcomes (Phase 2). The insights that Toronto Hydro gained from customer engagement informed the development, refinement and finalization of the Plan, and the outcomes featured on the 2025-2029 Custom Scorecard, as described in Exhibit 1B, Tab 3, Schedule 1 at page 4. Customers were not directly consulted on the PIM design and cost because (as noted in the evidence and shown in the timeline provided in the response to 2B-SEC-32) the PIM was developed after the Plan was refined and finalized post Phase 2 Customer Engagement.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-31

Reference: Exhibit 1B / Tab 2 / Schedule 1 / pp. 30-31

Preamble:

Toronto Hydro states that

"Toronto Hydro carries the risk of achieving the performance outcomes since, if the targets are not achieved, Toronto Hydro cannot earn its approved return on equity ("ROE"). As such, the PIM is an asymmetrical incentive to the benefit of customers in that it provides Toronto Hydro with the opportunity (not the guarantee) to earn the approved ROE and make a fair return for its shareholder. It is aligned with the RRF, and responsive to the OEB's feedback in Toronto Hydro's 2020-2024 decision encouraging the utility to consider an alternative approach in the future that meets RRF requirements and improves the balance of risk between customers and the utility."

QUESTION (A):

a) Please confirm the following statements, explaining any disinclination to confirm statements.

i. If the proposed PIM were ultimately to result in a net penalty, this would compensate customers for Toronto Hydro's failing to achieve targets.

ii. Customer revenue under the proposed plan would in many cases fund activities, such as vegetation management and replacement of aging assets, that made achievement of the target possible.

iii. The asymmetrical design of the PIM improves the balance of risk between Toronto Hydro and customers in favor of customers.

RESPONSE (A):

i. Toronto Hydro disagrees with the characterization posed by the question. Please see the response to 1B-Staff-30(a).

ii. Yes, revenue collected from customers in exchange for the distribution services provided by Toronto Hydro funds the utility's capital and operations work programs. As stated in Exhibit 1B, Tab 3, Schedule 1, at page 5 the targets are based on Toronto Hydro's plan as-filed in this application.

iii. Yes. Please see the response to 1B-Staff-30(a).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-32

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 32

Preamble:

Toronto Hydro states that

"To implement the PIM, Toronto Hydro proposes a new deferral account - the Performance Incentive Mechanism Deferral Account (PIM-DA) - to record the PIM earnings. This account would be brought forward for review and disposition in the utility's next rebasing application, based on known (or forecasted) performance results for the 2025-2029 rate period. Only if the set performance targets are achieved (or forecasted be achieved with a high degree of confidence) by the end of the rate term would the incentive be recovered from customers in the next decade. [italics added]"

QUESTION:

On what ground would TH believe the likely outcome of performance on a specific measure ought to be sufficient to dispose of the balance in the account, rather than the actual results, regardless of when they are known?

RESPONSE:

If the likely outcome of achieving a target is *probable* based on the historical results (i.e. 2025-28) and the forecasted results for the bridge year (i.e. 2028-29), Toronto Hydro believes that it would be most efficient to deal with the disposition of the incentives associated with that target in the context of the rebasing application. As noted in the response to 1B-SEC-14, in the event that a target is forecasted to be achieved, but is not in fact achieved at year-end 2029, the utility would withdraw its request to recover the associated balances in the PIM-DA at the Draft Rate Order stage which normally occurs in the first quarter of the new rate period (i.e. Q1/2030).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-33

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 30

Preamble:

Toronto Hydro states that "Toronto Hydro carries the risk of achieving the performance outcomes since, if the targets are not achieved, Toronto Hydro cannot earn its approved return on equity."

QUESTION:

Please confirm that Toronto Hydro will have other means of achieving its target ROE, including accelerated efficiency gains and unexpectedly favorable external business conditions. If Toronto Hydro disagrees, please explain.

RESPONSE:

For clarity, the statement referenced above should have read: "Toronto Hydro carries the risk of achieving the performance outcomes since [*all things being equal*], if the targets are not achieved, Toronto Hydro cannot earn its approved return on equity."

While financial performance (ROE) can be impacted by factors such as changes in external business conditions, Toronto Hydro notes that such factors are both outside the utility's control and symmetrical (i.e. unfavourable conditions are equally as likely favourable ones). Please see the response to 5-Staff-315(a) for a list of the existing and emerging business risks that Toronto Hydro faces and must continue to manage to be successful in delivering its Plan and achieving its ROE.

With respect to the example of accelerated efficiency gains, it is unrealistic to expect that under a rate framework with the highest X-factor in the province as Toronto Hydro proposed in this application, Toronto Hydro would be able to achieve its allowed rate of return through accelerated efficiency gains. The various benchmarking studies and analyses filed in this application show that

Toronto Hydro exceeds the performance of its peers when the relevant operating conditions (e.g. dense urban environment) are taken into consideration, and even without factoring in those conditions is a good cost performer relative to its peers.

The proposed 0.75% X-factor yields a cumulative revenue reduction of approximately $81 million over the rate term, as shown in the response to 1B-Staff-03(b). Given the magnitude of this revenue reduction/deficiency resulting from the X-factor and Toronto Hydro's historical track-record of harvesting efficiency gains, the utility would not be able to achieve the allowed rate of return through accelerated efficiency gains.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-34

References: Exhibit 1B, Tab 3, Schedule 1, Table 1
Exhibit 1B / Tab 2 / Schedule 1, Appendix A
Report of the Board: Renewed Regulatory Framework for Electricity Distributors: A Performance-Base Approach, October 2012

Preamble:

Toronto Hydro proposes linking its custom scorecard to a performance incentive mechanism. At pages 17 and 18 of Reference 2, Toronto Hydro's evidence states that Toronto Hydro's proposed performance incentive mechanisms are consistent with similar mechanisms employed by other electric utilities.

In the questions below, for any utilities that have a combined regulated business type, for example a utility with both electricity distribution and transmission, or electricity and gas distribution, or any other such combination, respond only in the context of their electricity distribution service. Also, for the questions below, only consider what has been approved through a decision and order, or equivalent regulatory action, and thus in place at this moment in time. Please do not include "proposals" or examples in a currently ongoing proceeding where the given utility has not previously had a performance incentive mechanism.

QUESTION (A):

a) Please identify how many utilities were considered as part of the jurisdictional review. How many jurisdictions/regulators/commissions? Please provide a list or table identifying each jurisdiction/regulator/commission and the number of utilities for each.

RESPONSE (A) - PREPARED BY SCOTTMADDEN:

Please refer to the table below.

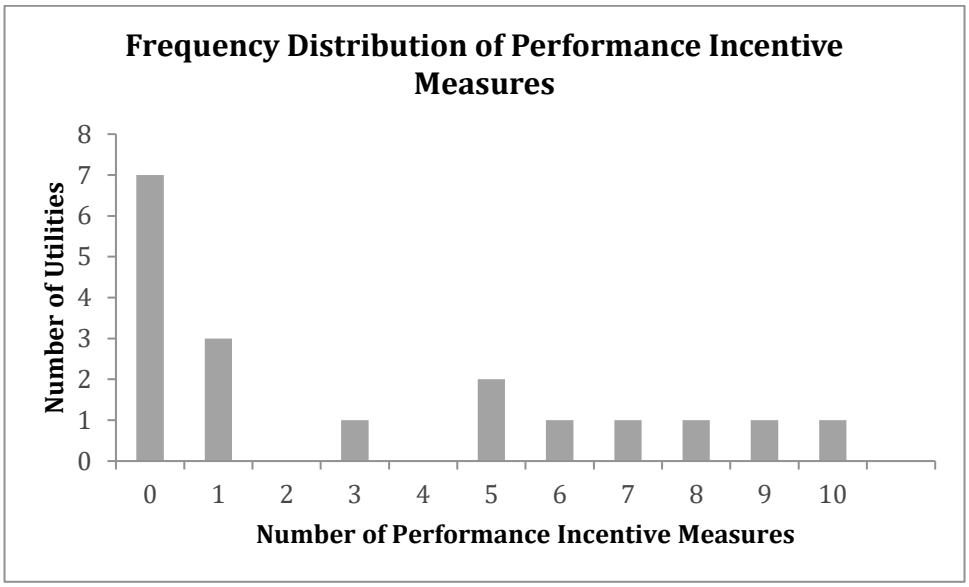
Jurisdiction	Utility
Alberta	ATCO Electric
California	SDG&E
California	PG&E
Hawaii	Hawaiian Electric
Illinois	Ameren
Maine	Central Maine Power
Massachusetts	Eversource
Minnesota	Northern States Power Company
New Jersey	PSE&G
New York	Con Edison
New York	National Grid
North Carolina	Duke Energy
Nova Scotia	Nova Scotia Power
Ohio	AEP
Pennsylvania	PECO
Rhode Island	Rhode Island Energy
UK	General Review
Vermont	Green Mountain Power

QUESTION (B):

b) For all the utilities in the jurisdictional review, provide a distribution of the number of measures in the performance incentive, with a resolution of one for the distribution. For example, how many utilities have only one measure? Two measures? And so on. As a further example, Toronto Hydro has proposed 12 measures. Please include the number of utilities that do not have any such performance incentive and thus the number of measures would be zero.

RESPONSE (B) - PREPARED BY SCOTTMADDEN:

Please refer to the figure below.[1]



QUESTION (C):

c) For all the utilities in the jurisdictional review, provide a count of utilities with: no performance incentive, penalty only performance incentive, reward only performance incentive, and mix of penalty and reward incentives. Please confirm Toronto Hydro's definition of a "penalty only performance incentive" and a "reward only performance incentive."

[1] Alberta Utilities Commission. Decision 27388-D01-2023. 2024-2028 PBR Plan for Alberta Electric and Gas Distribution Utilities. October 4, 2023; Rulemaking 14-10-003, Decision 16-12-036, California Public Utility Commission, December 15, 2016; Docket No. 2018-0088, Decision and Order No. 37507 Instituting a Proceeding to Investigate a Performance-Based Regulation, Hawaii Public Utilities Commission; Illinois Commerce Commission, Docket 22-0487, Order, December 14, 2023; Maine Public Utilities Commission, Docket No. 2022-00152, Order Approving Stipulation, June 6, 2023; Massachusetts D.P.U. 22-22, Exhibit ES-METRICS-Rebuttal-1, June 13, 2022; Minnesota Public Utilities Commission, Docket No. E-002/CI-17-401, Order, September 18, 2019; New Hampshire Public Utilities Commission, Docket No. DE 23-039, Liberty Utilities Direct Testimony, May 5, 2023; Cases 19-E-0065 et al., Consolidated Edison Company of New York, Inc. - Rates, Order Approving Electric and Gas Rate Plans (issued January 16, 2020) (2020 Rate Order); New York Public Service Commission, Niagara Mohawk Rate Case, Order Adopting Terms of Joint Proposal, January 20, 2022; North Carolina, Docket E-2, Sub 1300, Order, August 18, 2023; Nova Scotia Utility and Review Board, Decision, M10431, February 2, 2023; Rhode Island Public Utilities Commission, Docket No. 4770, Order No. 24088, July 27, 2022; Ofgem, RIIO-2 Framework Decision, July 2018; Vermont Public Utilities Commission, Case No. 22-0175-TF, Order, August 31, 2022

RESPONSE (C) - PREPARED BY SCOTTMADDEN:

Please refer to the figure below.

Jurisdiction	Utility	Penalty Only Performance Incentive	Reward Only Performance Incentive	Penalty and Reward Incentives	Total Metrics
Alberta	ATCO Electric	-	-	-	0
California	SDG&E	-	1	-	1
California	PG&E	-	1	-	1
Hawaii	Hawaiian Electric	-	3	2	5
Illinois	Ameren	-	-	1	1
Maine	Central Maine Power	6	-	-	6
Massachusetts	Eversource	7	1	-	8
Minnesota	Northern States Power Co.	-	-	-	0
New Jersey	PSE&G	-	-	-	0
New York	Con Edison	-	7	-	7
New York	National Grid	-	9	-	9
North Carolina	Duke Energy	1	2	-	3
Nova Scotia	Nova Scotia Power	-	-	-	0
Ohio	AEP	-	-	-	0
Pennsylvania	PECO	-	-	-	0
Rhode Island	Rhode Island Energy	4	1	-	5
UK RIIO	General Review	-	-	10	10
Vermont	Green Mountain Power	-	-	-	0

Under 'penalty only' incentives, utilities are penalized (such as through a downward adjustment in allowed revenues) if a performance target is not achieved. There is no reward or penalty if a performance target is achieved.

Under 'reward only' incentives, utilities are rewarded (such as through an upward adjustment in allowed revenues) if a performance target is achieved. There is no reward or penalty if the performance target is not achieved.

QUESTION (D):

d) Regarding part c), please comment on any general trends in the jurisdictional scan regarding penalty or reward incentive mechanisms. For example, is there a trend or relationship regarding incentive measures that are reliability based and whether they are

penalty or reward focused? Similarly, is there a trend or relationship regarding incentive measures related to government or regulatory policy?

RESPONSE (D) - PREPARED BY SCOTTMADDEN:

ScottMadden's review did not evaluate general trends in penalty or reward incentive mechanisms. Please refer to the response to 1B-EP-23, part (a).

The report found PIMs are one of the ratemaking frameworks and practices used by utilities to support a clean energy transition. There are jurisdictions, such as New York, where incentive measures are tied to government policies.

QUESTION (E):

e) For all the utilities in the jurisdictional review, provide a count of the number of utilities that have and a count of the number of utilities that do not have a performance incentive mechanism in place, by the length of the multi-year rate period in their currently effective rate period. For utilities that have more than one type of business, provide information only for its electricity distribution service. For example, for a multi-year rate plan that was set for a period of two years, identify how many such electrical distribution utilities have an incentive, and how many do not, across the jurisdictional review.

RESPONSE (E) - PREPARED BY SCOTTMADDEN:

Please refer to the table below.

MYRP Plan Term	Utilities With Performance Incentives	Utilities Without Performance Incentives
2-Year Plan	1	0
3-Year Plan	4	2
4-Year Plan	3	1
5-Year Plan	3	1

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-35

Reference: Exhibit 1B, Tab 2, Schedule 1, Appendix A

Preamble:

Pages 17 and 18 of Reference 2 state that Toronto Hydro's proposed performance incentive mechanisms are consistent with similar mechanisms employed by other electric utilities.

QUESTIONS:

a) Please explain why the first question of Part D to Reference 1 uses the plural of "performance incentive mechanisms"? Is Toronto Hydro proposing one mechanism with multiple measures, or multiple mechanisms? Please explain.

b) If Toronto Hydro is proposing more than one mechanism, please list and describe each of the mechanisms in the context of part a).

RESPONSE (A) AND (B):

The plurality referenced above is a typographical error. Toronto Hydro proposes one mechanism with multiple measures.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-36

References: Exhibit 1B, Tab 2, Schedule 1, Section 3.2.3

Exhibit 9, Tab 1, Schedule 1, Section 9.2

Preamble:

With both references, Toronto Hydro proposes a subaccount to the DRVA to track externally driven capital expenditures. Toronto Hydro states it proposes a symmetrical variance account that protects both ratepayers and the utility from structural unknowns in forecasted costs and revenues. Toronto Hydro states this particular subaccount, is approved, would enable Toronto Hydro to respond to unforeseeable increases in demand-related investment needs without having to defer other priority work and put customer outcomes are risk. Toronto Hydro further states that this subaccount would protect ratepayers by ensuring that they do not pay for demand-driven work that can be deferred and that funds are not repurposed to manage variance in other programs.

QUESTION (A):

a) Please summarize the internal decision-making process that would, in the rate-setting term, evaluate Toronto Hydro's policy environment and decide to reduce capital expenditure as a response to the policy environment. Please provide examples.

RESPONSE (A):

Please refer to the evidence Exhibit 2B, Section D1 for an overview of Toronto Hydro's Asset Management (AM) process through which capital investment decisions are made. On page 18 of this evidence the utility describes how System Growth & Capacity Needs are assessed as part of the AM process. Every year, Toronto Hydro prepares a 10-year weather-adjusted peak demand forecast ("System Peak Demand Forecast") using a driver based, top-down forecasting methodology. This forecast underpins the stations capacity planning process which enables Toronto Hydro to identify

capacity availability and anticipated constraints at substations in relation to future load growth. Please refer to the Capacity Planning evidence in Exhibit 2B, Section D4 for more information.

QUESTION (B):

b) Please explain how Toronto Hydro would manage workforce capacity or other potential constraints, including such considerations as impact on centralized planning and coordination functions, in the face of increases in unforeseen or unforeseeable demand-related investments. Even if additional work were funded, please explain how incremental demand could be satisfied "without having to defer other priority work" while still delivering and completing the planned capital program.

RESPONSE (B):

Toronto Hydro would rely on the talent strategies identified in the Staffing evidence at Exhibit 4, Tab 4, Schedule 3 starting on page 22 to ensure that it has the resourcing capacity necessary to execute its work programs safely and effectively.

QUESTIONS (C) AND (D):

c) Please demonstrate, with examples from this current proceeding and by illustrative scenarios, how Toronto Hydro would determine a change in its stations expansion program or regional planning process was tied to an external factor and would lead to a debit entry in this proposed sub-account.

d) Please demonstrate, with examples from this current proceeding and by illustrative scenarios, how Toronto Hydro would determine a change in its stations expansion program or regional planning process was tied to an external factor and would lead to a credit entry in this proposed sub-account.

RESPONSES (C) AND (D):

The question infers that only certain types of variances would be recorded in the account. However, as all changes in demand are driven by external factors "*the Expenditure Variances subaccount would record [all] symmetrical revenue requirement impacts, including PILs, arising from the variance between 2025-2029 planned and actual expenditures"*[1] in the program.

Toronto Hydro would identify variances in the Stations Expansion program through the Asset Management planning processes noted in the response to part (a). For example, if the outputs of the annual System Peak Demand Forecast described in Exhibit 2B, Section D4 trigger the need for additional investment to address capacity constraints, Toronto Hydro would identify this change as a positive (debit) variance for the purposes of the account. Conversely, if the System Peak Demand forecast shows a reduction in peak demand the utility would reassess the need for certain investments, as was the case with the Scarborough TS expansion which was deferred from the 2025-2029 Investment Plan through the January 29, 2024 evidence update. This would result in a negative (credit) variance for the purposes of the account.

QUESTIONS (E) AND (F):

e) Please provide a list of all externally driven factors that occurred in the current 2020-2024 rate period that have or are anticipated to have a material impact on the need, pacing, or prioritization of Toronto Hydro's demand related expenditure plan.

f) For the items in part e), please identify commensurate measures or responses from the OEB. For any externally driven factors where the OEB provided a regulatory mechanism to respond to, identify any which Toronto Hydro decided to not use or pursue. For any such items, please explain why Toronto Hydro did not utilize the regulatory mechanism provided by the OEB.

[1] Exhibit 1B, Tab 2, Schedule 1 at page 36.

RESPONSES (E) AND (F):

In the current rate period, Toronto Hydro experienced a material increase in demand-related expenditures relative to its forecasted plan, as explained in Exhibit 2B, Section E4 and in the applicable program evidence, namely Customer Connections (Exhibit 2B, Section E5.1) and Load Demand (Exhibit 2B, Section E5.3). The demand-driven pressures in these programs were managed within the approved 2020-2024 capital envelope by reducing prudent and necessary investments in other areas of the plan, namely the underground and overhead renewal programs. For detailed evidence with respect to the uncertainty factors and considerations that may impact demand related investments in the 2025-2029 rate period please refer to the detailed evidence in Exhibit 1B, Tab 2, Schedule 1 at pages 37-46.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-37

Reference: Exhibit 1B, Tab 2, Schedule 1, p. 36

Preamble:

The DRVA would also include a Revenue Variance subaccount that "would record the revenue impacts resulting from weather-normalized variances in billing determinants (i.e. customer count, kWh and kVA)."

QUESTION (A):

a) Please provide more details of how the decoupling mechanism would work. For example, is Toronto Hydro proposing any caps on the amounts of refunds or surcharges to customers? When and how would true ups occur? Please provide numerical examples of how the true up and revenue adjustments would function.

RESPONSE (A):

To determine debits or credits to ratepayers as part of the proposed DRVA - Revenue Sub-Account, the following exercise would be completed:

- For the applicable period, compare (1) weather-normalized actual revenue to (2) forecasted revenue based the approved rates and billing determinants, for each rate class
- Determine the variance values between the actual and forecasted revenue for each rate class as noted above;
- Enter the resulting debit or credit into the Revenue Variances Sub-Account.

Toronto Hydro has not proposed any caps to debits or credits which would be entered into the Revenue Variance Sub-Account. Amounts placed in the DRVA would be brought forward for disposition in the utility's next rebasing application.

QUESTION (B) :

b) Please confirm that, in noting that the DRVA would be weather normalized, Toronto Hydro means that it would shield customers from the risk of high or low loads that result from unusual weather conditions. If not, please explain.

RESPONSE (B):

Not confirmed. The term "weather-normalized variances" refers to variances between weather-normal values. Toronto Hydro's billing determinant forecasts, by virtue of being a forecast, are weather-normalized. To calculate weather-normalized variances, actual billing determinants would be adjusted to reflect billing determinants for the year in question under a weather-normal scenario. As such, ratepayers and the utility would not be "shielded" from weather-driven variances in billing determinants.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-38

Ref 1: Exhibit 1B / Tab 2 / Schedule 1, Table 1

Preamble:

Toronto Hydro has proposed a custom incentive rate-setting framework, as summarized with Reference 1.

QUESTION(A):

a) For all parameters or components in Toronto Hydro's proposed custom framework, please provide a table identifying which of each is set as per established OEB policy and which of each is set as per the proposals set out in this application.

i) For example, Toronto Hydro proposes a 0% productivity factor in accordance with current OEB policy.

ii) For example, Toronto Hydro proposes the labour component of the industry-specific price index to be set as per this application.

RESPONSE (A):

Please see below a reproduction of the table noted in Reference 1 with the requested information.

Table 1 - Comparison of Current and Proposed Custom Rate Frameworks

	2025-2029 Custom Rate Framework	Basis for the Proposal as Requested by the IR
Year 1	Standard COS rebasing	**Consistent with OEB policy**: the RRF notes that going into PBR, distribution rates are set based on a cost of service review.[1]
Year 2	Custom Revenue Cap Index ("CRCI"): $I_n - X + RGF_n$	**Consistent with OEB policy**: the RRF provides a custom rate-setting method with an index informed by the distributor's five-year forecasts of costs and revenues.[2] **Consistent with OEB convention:** Since the RRF was implemented in October 2012, the OEB has approved 10 Custom IR rate plans, providing multi-year custom rate funding for incremental funding needs.[3] **Per this application:** Request for custom rate-funding for both capital and OM&A investments.
OM&A	Five-year plan funded through the Revenue Growth Factor ("RGF")	
Capital	Five-year plan funded through the Revenue Growth Factor ("RGF")	
Inflation	OEB Inflation Factor	**Consistent with OEB Policy**: Reliance on the OEB's annual inflation factor applicable to electricity distributors. Please see response to 1B-Staff-93.
X-Factor	0% Productivity Factor	**Consistent with OEB policy:** The OEB's annual stretch factor assignment continue to reference and rely on the 0% productivity factor in PEG's November 2013 Report.[4]
	0.75% Incentive comprised of a 0.15% efficiency factor and a 0.6% performance incentive mechanism.	**Consistent with OEB policy**: the Rate Handbook expects implementation of an X-Factor which is higher than the OEB-approved X-Factor for Price Cap IR.[5]

[1] RRF at page 11.
[2] RRF, p.18
[3] Custom IR approvals not including Ontario Power Generation and Hydro One's rejected / truncated EB-2013-0416 application: EB-2012-0459, EB-2014-0002, EB-2014-0101, EB-2014-0116, EB-2015-0004, EB-2015-0083, EB-2017-0049, EB-2018-0165, EB-2019-0261, EB-2021-0110
[4] Pacific Economics Group, Productivity and Benchmarking Research in Support of Incentive Rate Setting in Ontario: Final Report to the Ontario Energy Board, November 2013, p.53
[5] Handbook for Utility Rate Applications, p.26

	2025-2029 Custom Rate Framework	Basis for the Proposal as Requested by the IR
		Per this application: A proactive incremental 0.6% performance incentive factor plus an empirically-derived 0.15% efficiency factor combining to form the proposed 0.75% X-Factor. In addition, Toronto Hydro proposes the opportunity (not the guarantee) to earn-back the revenue reductions resulting from the incremental 0.6% performance incentive factor on the basis of performance against a balanced custom scorecard.[6]
Growth	CRCI sets rates annually based on projected growth in billing determinants in each rate class	**Consistent with OEB convention:** Under standard Price Cap IR, utilities establish test year rates based on their cost of service, and subsequently retain any increased revenue resulting from growth in billing determinants during the IR term. Custom IR applicants forecast their costs and revenues over the full IR term, which historically resulted in a "growth factor" reduction to Toronto Hydro's Custom Price Cap Index. The CRCI accomplishes the same outcome by allocating escalated revenue requirement across forecast billing determinants each year, and reducing the rates by the forecasted billing determinant increases. See 1B-Staff-26(c).
Deferral and Variance Accounts (DVAs)	Demand-Related Variance Account	**Consistent with OEB policy**: Chapter 2 Filing Requirements three-part test for establishing new DVAs. **DRVA – Expenditures Sub-Account is consistent with OEB convention in past Custom IR applications:** Similar symmetrical variance accounts include Toronto Hydro Externally Driven Capital,[7] Hydro Ottawa subset of System Access Capital Additions Revenue Requirement Differential Variance Account,[8] or Hydro One Externally Driven Distribution Projects Variance Account[9]

[6] Exhibit 1B, Tab 3, Schedule 1
[7] EB-2014-0116; EB-2018-0165
[8] EB-2019-0261
[9] EB-2021-0110

	2025-2029 Custom Rate Framework	Basis for the Proposal as Requested by the IR
		Per this application: DRVA—Revenue Sub-Account
	Performance Incentive Mechanism Deferral Account	**Consistent with OEB policy**: Chapter 2 Filing Requirements three-part test for establishing new DVAs; DER Filing Guidelines include a fixed target scorecard option for setting incentives related to use of DERs and non-wires solutions. **Per this application:** use of an existing regulatory mechanism (i.e. a deferral account) to implement an innovative incentive-based rate framework proposal
	Innovation Fund Variance Account	**Consistent with OEB policy**: Chapter 2 Filing Requirements three-part test for establishing new DVAs.
	Getting Ontario Connected Act Variance Account	**Consistent with OEB policy:** Chapter 2 Filing Requirements three-part test for establishing new DVAs; Generic account established by the OEB.[10]
	Earning Sharing Mechanism	**Consistent with OEB convention:** ESMs have been approved in all but one[11] of the Custom IR frameworks referenced above.
	Property Sales	**Consistent with OEB convention:** This account was mandated by the OEB in the 2020-2024 Custom IR decision.[12]

1

[10] EB-2023-0143 – Decision and Order (October 31, 2023), Electricity Distributor Accounting Order (002-2023).
[11] Oshawa PUC EB-2014-0101
[12] EB-2018-0165, Decision and Order (December 19, 2019) at page 2 and at page 188.

QUESTION (B) :

Please explain Toronto Hydro's position regarding the potential for a generic proceeding to issue a decision during the rate term that affects a parameter or component identified in part a) and whether Toronto Hydro would seek to update it in accordance with that policy or maintain it as per this proceeding. Please indicate Toronto Hydro's position in this regard for each item.

iii) For example, if a generic proceeding resulted in a non-zero productivity factor, how would Toronto Hydro respond?

iv) For example, if a generic proceeding resulted in a change to use a different labour inflation index, how would Toronto Hydro respond?

v) For example, if a generic proceeding established a new variance account, how would Toronto Hydro respond?

RESPONSE (B):

With the exception of variance accounts which may be established by the OEB on a generic basis to deal with urgent and/or important policy or business conditions changes that the sector faces (e.g. *Getting Ontario Connected Act Variance Account*), Toronto Hydro would not update the parameter/components noted in the chart above. In order for the rate framework to provide predictability and stability to manage within the rates set, Toronto Hydro and the OEB must be committed to the rate framework approved for the duration of the rate term.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-39

References: Exhibit 1B / Tab 2 / Schedule 1 / p. 1
Exhibit 1B / Tab 2 / Schedule 1 / pp. 8-9
Exhibit 8 / Tab 6 / Schedule 1

Preamble:

Toronto Hydro states in Reference 1 that one of the principles that guided development of its 2025-2029 Custom Rate Framework is to "maintain rate stability and funding predictability to enable effective multi-year utility and customer planning and decision making."

In Reference 2, Toronto Hydro states that "the investment priorities and associated outcomes are aligned with customers' needs and preferences, as demonstrated by the results of Toronto Hydro's two-phased customer engagement process.

Reference 3 shows the bill impacts for various Toronto Hydro customer classes.

QUESTION (A):

How are annual residential distribution rate service charge increases averaging 7% during the proposed plan consistent with the principle of rate stability?

RESPONSE (A):

Rate stability refers to the consistency/uniformity and predictability/certainty of rates or prices in a particular market or industry over a certain period. It is a measure of how much rates fluctuate and how well they remain relatively constant/uniform, providing consumers with a sense of predictability for planning and decision-making. Stable utility rates allow households to budget more effectively, as they can anticipate and plan for their ongoing expenses without significant fluctuations (i.e. swings up and down) in their utility bills. The year over year variations in the residential distribution bill-

impacts (sub-total A) are relatively uniform. By virtue of this application, the bill impacts also provide the utility and customers predictability for planning and decision-making over the 2025-2029 period.

QUESTION (B) :

Where do Toronto Hydro's customer survey results indicate that 7% annual rate increases are acceptable?

RESPONSE (B):

As noted in Exhibit 1B, Tab 5, Schedule 1, Appendix A at page 244, residential customers participating in Phase 2 customer engagement were presented with a workbook which included both annual and cumulative distribution rate impacts. Customers were not asked specifically to opine on the acceptability of the 7% annual rate increases as the rates presented to customers in the workbook were not yet smoothed.[1] Residential customers opined on the acceptability of the total distribution rate increase associated with Toronto Hydro's 2025-2029 draft plan by the end of the rate period. As noted in Exhibit 1B, Tab 5, Schedule 1, Appendix A at page 17, in total, 32,187 residential respondents completed the Phase 2 survey. Eighty percent of residential customers gave the draft plan social permission indicating either:

1. They think Toronto Hydro should accelerate spending beyond the level in the draft plan to deliver better system outcomes.
2. They support the proposed rate increase that is reflected in the draft plan, or
3. They feel that the proposed rate increase in the draft plan is necessary, even though they don't like the proposed increase.

[1] Rate smoothing occurs in the final stages of the rate-making process shortly before filing the application.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-40

Reference: Exhibit 1B, Tab 2, Schedule 1, Pages 10-11

Preamble:

Toronto Hydro states on page 10 that

"While the pace and nature of electrification required to decarbonize the economy remains unsettled, there is broad societal and public consensus that an energy transition is required to mitigate the existential and economic impacts of climate change."

Toronto Hydro states on p. 11 that

"system peak demand could grow significantly, or more moderately, depending on technology, policy and consumer choices that will be made in the future."

QUESTION (A):

a) Please confirm the following statements. If Toronto Hydro disagrees, please explain.

i. If beneficial electrification is a public policy priority, matching capacity to demand is one of the biggest cost management challenges facing North American electric utilities.

ii. With Toronto Hydro expecting brisk demand growth, peak load management will play a key role in cost containment.

iii. Just as it is prudent to lay the groundwork in the next five years for future capacity expansion, it is prudent to lay the groundwork for more dynamic load management options, including distribution rate design, that reduce the need for such expansions.

iv. The regulatory cost savings from the new multiyear rate plan will free up Company resources to reconsider rate designs and experiment with changes.

RESPONSE (A):

With respect to i) and ii) Toronto Hydro agrees that matching required system capacity to forecasted demand is a challenge facing the electricity sector, and that part of the response to this sector-wide challenge requires utilities to: (a) modernize the grid to integrate new technology that enhances system observability and controllability (see Exhibit 2B, Section D5); and (b) develop enhanced operational capabilities for load management to optimize system investments and manage costs, which includes the use of non-wires solutions, such as demand-side management programs, to complement traditional capacity planning tools, as well as rate design structure to create demand management incentives and pricing signals for customers.

Toronto Hydro has been a leader in Ontario in developing non-wires solutions capabilities by integrating the use of demand-side management into its planning process, as described in the evidence at Exhibit 2B, Section 7.2, summarized below in part (b), and further explained in the responses to interrogatories 1B-Staff-88 and 1B-Staff-89.

With respect to iii) and iv) Toronto Hydro supports an evolution towards more dynamic load management/rate design and is investing in capabilities (i.e. technology and people) to pursue experimentation in the future. However, the utility notes that distributor tariff sheets and cost allocation policies are regulated by the OEB under various codes and rate filing requirements. Outside of generic revisions to these codes and policies, utilities have an opportunity to propose changes to the rate design structures through rebasing applications, which typically take place every five-years. Thus, any experimentation that the utility may pursue on its own initiative and outside of previous approvals would have to be done under the parameters of the OEB's Innovation Sandbox.

Along with the Innovation Fund proposal outlined in Exhibit 1B, Tab 4, Schedule 2, the regulatory capacity and capabilities proposed in Exhibit 4, Tab 2, Schedule 18 would enable Toronto Hydro to innovate and experiment with new rate design structures for the next rate term.

QUESTION (B):

b) Is Toronto Hydro proposing peak load management initiatives in the next five years that are top quartile by industry standards? If not, why not?

RESPONSE (B):

For Toronto Hydro "peak load management" refers to strategies and measures employed by electric utilities and grid operators to effectively handle and mitigate the challenges associated with high demand periods. Below is a summary of generally accepted best practices and guidelines for peak demand management to ensure the reliability and stability of the electricity grid, and a brief explanation of corresponding proposals and considerations outlined in the application. In many of these areas, Toronto Hydro is taking a leadership position within the Ontario context and following in the footsteps of leaders in the North American and the UK contexts.

- **Demand Response Programs:** Implementing demand response programs allows utilities to manage peak demand by incentivizing consumers to reduce their electricity usage during periods of high demand. As discussed in more detail below, Toronto Hydro is a sector leader in utility-scale demand response in Ontario. Based on its experience, the utility has created a plan to utilize DERs for targeted load-management with quantifiable distribution benefits, and will continue to explore opportunities and develop capabilities to expand the use of non-wires in the 2025-2029 period and beyond. Please see below for more information.
- **Advanced Metering Infrastructure (AMI)**: The deployment of smart meters and advanced metering infrastructure enables more granular and real-time monitoring of electricity consumption. This data can be used to identify patterns, forecast peak demand, and implement targeted strategies for demand management. As one of the first utilities in Ontario to implement smart meters (AMI 1.0), having deployed them between 2006-2008, Toronto Hydro is investing in this technology in the next rate period and plans to replace approximately 680,000 meters with next generation AMI 2.0 meters between 2023-2028. Please see Exhibit 2B, Sections D5.2.2 and D5.3.1 for more information.
- **Energy Storage**: Integration of energy storage systems, such as batteries, can help utilities store excess energy during low-demand periods and release it during peak demand,

improving grid stability. Toronto Hydro is investing in grid-side energy storage systems to enable renewables, and explore other use cases in the process of achieving that objective. Please see Exhibit 2B, Section E7.2 for more information.

- **Pricing Signals**: Encouraging consumers and businesses to shift their electricity usage to off-peak hours can help balance the load on the grid. Toronto Hydro continues to work proactively with the OEB to implement new rate structures such as the Ultra-Low Overnight (ULO) rates and provide customer choice with respect to Time of Use (TOU) versus Tiered pricing.
- **Grid Modernization**: Investing in grid modernization technologies, such as telemetry and advanced control systems, enables utilities to monitor and control the flow of electricity more efficiently, contributing to better demand management. It also supports enhanced forecasting and planning to help utilities anticipate future peak demand scenarios and implement proactive measures to address them. Toronto Hydro's Distribution System Plan outlines a detailed Grid Modernization Strategy in Exhibit 2B, Section D5, and the utility's operations and workforce plan supports this strategy. Please see Exhibit 4, Tab 1, Schedule 1 and detailed in programmatic evidence in Exhibit 4, Tab 2, as well as the staffing evidence in Exhibit 4, Tab 4, Schedule 3.
- **Renewable Energy Integration**: Renewable energy sources, such as solar, can help diversify the sources of electricity generation. Improving the ability to monitor these resources and forecast anticipated generation can help utilities capture the value during system peaks, enhancing planning capabilities. This requires investment in grid modernization technology and capabilities as noted above.
- **Energy Efficiency Programs:** Promoting energy efficiency measures and technologies can reduce overall electricity demand, particularly during peak hours. Toronto Hydro continues to support the IESO's CDM framework, including Local Initiatives programs, and will identify opportunities to benefit-stack where appropriate.

Active Peak Load Management Initiatives at Toronto Hydro

Toronto Hydro's flagship NWS program, Local Demand response ("LDR"), has been running since 2018 and is intended to continue in the 2025-2029 rate period with a target to triple the amount of system capacity (30MW) procured from flexible resources to support six stations across the city.

The focus on the six identified stations (i.e., Finch TS, Manby TS, and Leslie TS, Cecil TS, Strachan TS, and Copeland TS) is due to the high potential for NWSs to defer or avoid capital expenditure in these areas, based on system needs. Cumulatively, these stations will require about 130 MVA of load-transfers in the next rate-period, and if Toronto Hydro is able to successfully procure 30 MW of demand response, this could help avoid about 25% percent of the total load required to be transferred in these areas.

Setting a 30 MW target for demand-side capacity to defer or displace 25% of traditional capacity investments is ambitious given the current DER market capacity and maturity. To the best of Toronto Hydro's knowledge, it is also unprecedented by any other local distribution company in Ontario, given that the OEB only recently published its Framework for Energy Innovation (January 2023), Filing Guidelines for DERs (April 2023) and Benefit Cost Assessment Framework (October 2023).

Sector-Wide Peak Load Management Projects and Thought Leadership

Toronto Hydro has also demonstrated leadership in the area of NWS through its Benefit Stacking Transmission and Distribution Pilot ("Benefit Stacking Pilot"), supported by the IESO's Grid Innovation Fund, and the Ontario Energy Board's (OEB's) Innovation Sandbox. Toronto Hydro identified an opportunity to build on the LDR program planned for Manby TS and Horner TS to examine how Toronto Hydro and other distributors can work with IESO to better coordinate the use NWSs to maximize value and lower resource acquisition costs. Toronto Hydro partnered with Power Advisory LLC and Toronto Metropolitan University's CUE, to create a project that explores how to efficiently procure and deploy DR capacity to address overlapping distribution and transmission system level needs.

Toronto Hydro is an active member of the Transmission-Distribution Coordination Working Group (TDWG), established to support the IESO, LDCs, DER owners, and aggregators to develop operational coordination protocols intended to improve DER integration into local and bulk markets. Toronto Hydro has volunteered to co-lead, in partnership with Alectra, the development of a Functional Assessment work package that identifies the operational functions, capabilities, and tools required for utilities to support such coordination. Details about this work and all the deliverables can be found on the IESO's website (https://www.ieso.ca/Sector-Participants/Engagement-Initiatives/Engagements/Transmission-Distribution-Coordination-Working-Group).

Future DER Usage and Capability Building at Toronto Hydro

As noted here and in the pre-filed evidence, the current scope of Toronto Hydro's NWS program applies to *dispatchable demand response*, and this is because Toronto Hydro has a high-degree of confidence that these resources can be deployed reliably to meet an identified grid need. To be able to leverage other types of DERs*, particularly non-dispatchable resources*, as part of distribution planning and system management, it is essential to first have well-developed tools for grid observability. As demonstrated through the work of the TDWG, distribution utilities in Ontario are in the process of identifying the level of DER visibility required to be able to reliably predict generation patterns and the resulting grid impact.

In addition to the procurement and use of NWSs, as well as thought leadership and collaboration with energy sector stakeholders, Toronto Hydro has also made a significant effort to track, monitor and observe DERs currently connected to its system. Developing this situational awareness will enable utilities to credibly and reliably factor in forecasted DER generation in future capacity planning activities. Toronto Hydro currently requires SCADA telemetry for all DERs greater than 50 kW, and is undertaking several projects, including the AMI 2.0 initiative, which could significantly improve monitoring capabilities for DERs (discussed in detail in Exhibit 2B Section D5.3.1). Please see Exhibit 2B Section D5.2.2.3 for more information.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-41

References: Exhibit 1B, Tab 2, Schedule 1, Section 3.2.3
Exhibit 9, Tab 1, Schedule 1, Section 9.2
EB-2010-0060: Review of Distribution Revenue Decoupling Mechanisms, Pacific Economics Group Research, LLC, March 2010

Preamble:

Toronto Hydro proposes a revenue variance subaccount as part of the proposed demand related variance account. Toronto Hydro proposes this subaccount to symmetrically record revenue variances resulting from differences between forecasted and actual billing determinants on a weather normalized basis, doing so by rate class. Toronto Hydro states this account would record the revenue impact due to variances in billing determinants, kVA, kWh, and customer count, as set out in Exhibit 3, Tab 1.

QUESTION (A):

a) Please explain any differences between the proposed normalization process and that used for forecasting customer load for rate setting purposes as part of this application. Please confirm all billing determinants Toronto Hydro proposes to weather-normalize, such as kVA, kWh, customer count, or other variables if applicable and not explicitly mentioned in the evidence. For each, please explain why it is appropriate to do so.

RESPONSE (A):

There are no differences between the proposed normalization process and the process used for forecasting customer load. Toronto Hydro confirms its intention to weather normalize only KWh and kVA and no other variable.

QUESTION (B) :

b) Please confirm whether Toronto Hydro proposes to only track variances on a weather normalized basis, or to also normalize for other identifiable variances in energy usage such as economic and population factors that are also captured in its load forecasting methodology.

RESPONSE (B):

Toronto Hydro proposes to track all variances on a weather normalized basis. Stated differently, no other normalizing calculations outside of weather normalization will be completed for the purpose of making entries to the Revenue Variances Sub-Account.

QUESTION (C):

c) Please identify the data sets that underly the proposed variance account normalization process. Historically, how often has Toronto Hydro reviewed and updated these data sets? Please describe the circumstances under which Toronto Hydro would review and update these data sets in the future.

RESPONSE (C):

Please see weather-related drivers such as CDD, HDD and dew point that underlie the proposed variance account normalization process, as outlined in Exhibit 3, Tab 1, Schedule 1, page 9 and Appendices A-B of Exhibit 3, Tab 1, Schedule 1. Historically, there were no revenues subject to similar symmetrical variance account treatment as the proposed sub-account. The HDD, CDD, and dew point regression coefficients defined in the load forecast of Exhibit 3 in the rate application, once approved will remain for the duration of the rate period.

QUESTION (D)

d) Identify any other data sets or assumptions that Toronto Hydro would utilize in this weather normalization process. Similar to b), when is the last time these data sets were updated. Under what circumstances would Toronto review and update these data sets?

RESPONSE (D):

Please see subpart c) above.

QUESTION (E) :

e) By way of both monthly summary tables and any underlying calculations and modelling, please demonstrate the proposed "weather-normalization process for actual billing determinants" and the resulting account additions for each of:

i. 2020 actual in comparison the forecast(s) that underly the rates in place that year, i.e., those of EB-2018-0165

ii. 2023 actual in comparison the forecast(s) that underly the rates in place that year, i.e., those of EB-2018-0165

iii. 2023 actual in comparison to the 2019 forecast(s) that underly this proceeding

RESPONSE (E):

Please refer to 1B-SEC-16, Table 2. These variances would have formed entries to the DRVA Revenue Variances Sub-Account, if the account were in place at the time.

QUESTION (F):

f) For part e), please explicitly identify inputs and outputs to the process, including any intermediate steps or steps where one model, tool, or methodology interacts with another in the overall process. Please identify which data items are held constant as the reference forecast(s) and which items are inputs based on actual data. For all inputs, identify the source. Please identify any data variables that are calculated, derived, or otherwise require a mathematical operation to perform the process to derive variance account entries. Please explain the basis for those operations. For example, if a piece of recorded data requires conversion or "normalization" identify the operation and the technical basis for the mathematical operation.

RESPONSE (F):

Please see the response to part c) above and 1B-Staff-37 a).

QUESTION (G):

g) Please confirm that, in accordance with footnote 40 in Reference 1 and Reference 3, Toronto Hydro is proposing a variance account that will allow revenues to track costs. Is Toronto Hydro proposing a variance account that allows revenues to fully track costs, or only partially? Please explain.

RESPONSE (G):

Toronto Hydro proposes to book variances in distribution revenue to the DRVA Revenue Variances Sub-Account on a weather normalized basis, that is, on a partially decoupled basis.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-42

Reference: Exhibit 1B, Tab 2, Schedule 1, Pages 36, 41

Preamble:

Toronto Hydro proposes a Demand-Related Variance Account ("DRVA") with two subaccounts (p. 36). An Expenditure Variances subaccount

"would record the symmetrical revenue requirement impacts, including PILs, arising from the variance between 2025-2029 planned and actual expenditures related to the following capital and operations programs: Customer Connections, Customer Operations, Stations Expansion, Load Demand, Non-Wires Solutions, Generation Protection Monitoring and Control and Externally-Initiated Plant Relocations and Expansions (collectively the "Demand-Related Investments")."

Toronto Hydro states on p. 41 that

"In circumstances where demand-related investments are lower than planned, the subaccount would protect ratepayers by ensuring that (i) they do not pay for demand-driven work that can be deferred, and (ii) funds are not repurposed to manage variances in other aspects of the plan that are not driven by demand."

QUESTION (A):

a) Please provide analysis which demonstrates that the use of a variance account best serves customers from a cost perspective, including, but not limited to, the aggressive use of load management and other techniques to efficiently accommodate demand growth and other changes in system use.

RESPONSE (A):

In circumstances where demand-related investments can be adjusted down based on updated forecasting inputs, the subaccount would protect ratepayers by ensuring that (i) they do not pay for

demand-driven work that can be deferred, and (ii) funds are not repurposed to offset variances in other aspects of the plan that are not driven by demand. Such circumstances can occur due to a number of factors, including the impact of greater use of load management techniques, material changes in economic conditions that slow down the pace of growth in forecasted demand, or market constraints that alter the adoption of electrified technologies such as EVs. For more information about the use of "use of load management techniques" please see Toronto Hydro's response to interrgoatory 1B-Staff-40.

QUESTION (B):

b) Why is it necessary to track the entirety of these various costs when
ix) a sizable share of these costs will result from normal demand growth;
x) a customer growth escalator can address many/most costs of customer connections and customer operations with minimal regulatory cost or diminution of cost-containment incentives;
xi) variance account treatment is less controversial and likely to be approved for costs of NWAs, beneficial electrification, generation protection monitoring and control, Getting Ontario Connected Act compliance, and externally-initiated plant relocations and expansions.

RESPONSE (B):

Please refer to Exhibit 1B, Tab 2, Schedule 1 at pages 37 to 46 for detailed evidence of the need and justification for the Expenditure Variance Subaccount.

Implicit in this question is an assumption that what was "normal load growth" in the past will continue in the future. It is evident that the future will not be like the past in terms of load and demand. For example, and as noted in the above-referenced evidence at pages 38-39, Toronto Hydro saw a significant increase in the volume and complexity of load connections in the current rate period. From 2020 to 2022, high voltage connections (which often require system expansion work) increased by 27.6 percent, with a substantial increase in larger commercial and multi-use projects

requiring greater than 10 MVA of demand load per project, as well data centers with larger loads (e.g., 30-50 MVA) than ever before. These circumstances resulted in gross expenditures in the Customer Connections program that are expected to be approximately 1.75 times greater than the forecast that formed the basis of 2020-2024 rates. As a result, capital in-service additions related to demand-driven investments in System Access were approximately $153 million (32.5 percent) greater than the amounts included in base rates in the current period.

A "*customer growth escalator*" does not address the business concern underlying the proposed DRVA. As noted in the above-referenced evidence at page 35, due to a confluence of external factors (i.e., policy, technology and consumer behaviour changes) Toronto Hydro is entering a period of unprecedented change and transformation, as customers, communities and governments at all levels are actively embarking on an energy transition to mitigate the existential and economic impacts of climate change. Decarbonization is expected to create new roles for electricity, including as an energy source for transportation and building heating systems. While there is certainty that fundamental change is ahead, there are degrees of uncertainty about how that change will unfold (e.g., the pace and adoption of electrified technologies such as EVs and heat pumps; the role of low-emission gas; and the scale of local vs. bulk electricity supply). A "*customer growth escalator"* would fail to address the noted concerns with respect to uncertainty and variability in demand, and would not provide Toronto Hydro the necessary flexibility to manage demand-driven aspects of its plan in order to protect both rate payers and the utility from structural unknowns in forecasted costs and revenues.

Toronto Hydro believes that many of the same considerations which render the listed programs/priorities more likely to be approved for variance account treatment, apply to the other programs that form part of the DRVA Expenditure Account proposal, as detailed in Exhibit 1B, Tab 2, Schedule 1 at pages 37 to 46:

- **Customer Connections and Customer Operations:** Investments in these programs are driven by the utility's fundamental obligation to serve customers who want to connect to the system. In addition to enabling beneficial electrification, the need for investment is also

driven by other important policy considerations, including governments' priorities to accelerate transit and housing development.[1]

- **Stations Expansions and Load Demand:** Investments in these programs are subject to an ongoing regional planning process. Outputs of that process, which may extend beyond the timelines for adjudicating this application, or additional updates to regional plans that may be necessary during the 2025-29 rate term, could modify planned investments under the Stations Expansion and Load Demand programs. For example, Station Expansion projects such as Scarborough TS and Load Demand investments in the Horseshoe area of the grid, which were deferred through the evidence updated filed on January 29, 2024 may have to be pulled forward if needs in these areas of the grid exceed current expectations due to either (or both) *normal demand growth* and *beneficial electrification*.

[1] https://news.ontario.ca/en/backgrounder/1002525/more-homes-built-faster-act-2022

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-43

Reference: Exhibit 1B, Tab 3, Schedule 1, Page 10

Preamble:

Toronto Hydro states: "While the projection suggests that Toronto Hydro's investment plan is sufficient only to maintain Outage Duration as measured by the custom SAIDI metric over the 2025-2029 period, the utility challenged itself to set a modest improvement target, recognizing the importance of outage duration to customers when it comes to reliability performance. To set an achievable improvement target, Toronto Hydro calculated the statistical variability of the historical rolling five-year average (relative to the historical trendline), and on this basis applied two standard deviations to the most recent five-year historical reliability (48.2 min), resulting in an improvement target of 46.2 min."

QUESTION (A):

a) Does Toronto Hydro expect more or fewer scheduled outages for the 2025-2029 period than the previous 5-year period?

RESPONSE (A):

Toronto Hydro expects an increase in the number of scheduled outages during the 2025-2029 rate period compared to the 2020-2024 rate period. This increase is driven by the increase in expenditures within the 2025-2029 Distribution System Plan ('DSP') required deliver on the objectives of the plan.

QUESTION (B):

b) What were Toronto Hydro's projections of SAIDI using the IRM Scenario in the previous application?

RESPONSE (B):

Toronto Hydro did not include a SAIDI projection for an IRM scenario as part of its reliability projections in its previous rate application.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-44

References: **Exhibit 1B, Tab 3, Schedule 1, Pages 3 and 4**
Exhibit 1B, Tab 3, Schedule 1, Table 1
Amended and Restated Shareholder Direction Relating to Toronto Hydro Corporation retrieved from:
https://www.torontohydro.com/documents/20143/411589/Shareholder-Direction THC.pdf/4b8173bf-751e-82df-8593-90c61f33550c?t=1554134778000

Preamble:

Toronto Hydro proposes an incentive mechanism that would allow it to "earn-back" forgone revenue by achieving specific targets. Toronto Hydro proposes targets related to, generally, system reliability, customer service, environmental initiatives, and initiatives related to enhancing the grid for the future. The City of Toronto, as shareholder, has set objectives and principles to guide the Toronto Hydro Corporation, and thus, Toronto Hydro. The objectives and principles include providing a reliable and effective distribution system and operating Toronto Hydro in an environmentally responsible manner consistent with the City of Toronto's energy and climate change policies. The City of Toronto has established numerous energy and climate change policies that Toronto Hydro references throughout this application.

QUESTIONS (A) AND (B):

a) Please explain why Toronto Hydro propose a supplemental incentive mechanism to meet objectives established by its shareholder.
b) Please explain why the objectives and principles set by Toronto Hydro's shareholder are insufficient for Toronto Hydro to meet the reliability, customer service, environmental, and grid enhancement initiatives set out in its 2025-2029 investment plan.

RESPONSES (A) AND (B):

The proposed incentive mechanism applies to distribution-related business activities that are subject to rate regulation by the OEB in accordance with the *Ontario Energy Board Act, 1998*. Toronto Hydro has proposed a plan which meets the needs of its customers and its system within the present-day context of a pending energy transition. This plan is aligned with and responsive to the shareholder's objectives, which is also the municipal authority governing Toronto Hydro's service territory.

Over the upcoming 2025-2029 rate term, the proposed performance incentive mechanism (PIM) reduces the utility's revenue by approximately $65 million, relative to the revenue required to fund capital and operations work programs as part of the 2025-2029 Investment Plan. The PIM puts at risk approximately 14% of the incremental revenue that the utility needs to fund the 2025-2029 Investment Plan, compared to standard Price-Cap IR as shown in the response to 1B-Staff-12.

In the absence of a performance incentive that provides Toronto Hydro the opportunity (not the guarantee) to recover this lost revenue in order to be able to earn its allowed regulated rate of return, the utility would be faced with a difficult decision to reduce prudent and necessary investment in the grid, operations and its workforce putting customer outcomes, grid needs and shareholder objectives at risk.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-45

References: Exhibit 1B, Tab 3, Schedule 1

Exhibit 1B, Tab 3, Schedule 3

Preamble:

On page 42 of Reference 1, Toronto Hydro states that it "expects to achieve efficiencies of approximately $5.6M per year by 2024, consisting of $1.5M of cost reductions and $4.1M in cost avoidances."

On page 16 of Reference 2, Toronto Hydro states that the 2025 rebasing revenue requirement "is approximately $5.7M lower than it otherwise would be if Toronto Hydro had not undertaken" more than 30 initiatives which constitute a collective value of "over $23 million in costs that the utility expects to avoid or reduce by the end of the rate term."

QUESTION (A):

a) Please explain whether the $5.6 million figure of Reference 1, and the $5.7 million figure of Reference 2 denote the same annual savings activities.

RESPONSE (A):

Confirmed. $5.6 million in 2024 annual savings escalated for inflation (2%) results in $5.7 million in 2025 annual savings.

QUESTION (B):

b) Please explain the relationships between the $23 million, $4.1 million, and $1.5 million cited.

RESPONSE (B):

$4.1 million and $1.5 million are annual figures applicable to 2024, whereas $23 million is the cumulative five-year total from 2020-2024.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-46

Reference: Exhibit 1B / Tab 3 / Schedule 1, Table 1

Decision and Order, EB-2018-0165, December 19, 2019, Table 4

Preamble:

Toronto Hydro has proposed a 2025-2029 custom scorecard with 12 measures. In its EB-2018-0165 Decision and Order, the OEB set a 2020-2024 custom scorecard with 15 measures.

QUESTIONS (A) – (C):

a) Please confirm, by a list identifying each, which items in the proposed 2025-2029 custom scorecard are exactly the same measure as the 2020-2024 scorecard measure, without considering the target itself.
b) Please list and explain the rationale supporting all measures that have the same or similar name, but Toronto Hydro proposes a different definition of the measure for 2025-2029.
c) For each applicable measure, please explain the rationale supporting the removal of a 2020-2024 scorecard measure from the 2025-2029 scorecard.

RESPONSE (A) – (C):

The 2025-2029 scorecard represents an evolution over the 2020-2024 scorecard. Reliability, customer service, efficiency, safety and environmental outcomes continue to be key areas of performance focus in the 2025-2029 scorecard, but the measures that the utility has proposed to reflect these outcomes have evolved in accordance with the expanded investment objectives, customer needs and priorities, changing business conditions and the rate framework that underpins the plan.

Direct similarities between the two scorecards can be found with respect to reliability (SAIDI & SAIFI) and safety (TRIF) metrics. For 2025-2029 Toronto Hydro proposes to measure SAIDI excluding

scheduled outages, Loss of Supply and Major Event Day (rather than on SAIDI Defective Equipment as in the 2020-2024 period) for the following reason, which is articulated in the evidence at Exhibit 1B, Tab 3, Schedule 1 at page 9: *Toronto Hydro intends to improve Outage Duration performance … compared to historical performance. This objective aligns with customer needs and priorities based on the Phase 1 Customer Engagement survey results which revealed that when it comes to reliability performance all customers (except Key Accounts) prioritize reducing the overall length of outages rather than the overall number of outages.*"

As requested, the table below explains the continuity and concordance of the 2020-2024 scorecard metrics in the 2025-2029 scorecard.

2020-24 Custom Measures	Continuity to 2025-29 Custom Scorecard
Customers on eBills	Since 2013, Toronto Hydro converted approximately 381,000 customers, exceeding its target of reaching 347,000 customers on eBills by 2024. [1] Although Toronto Hydro intends to continue to monitor and proactively manage this metric[2], the initial penetration targets have been exceeded, and practices and cultures to drive further eBill adoption are well established. What's more, this metric measures one input that is relevant to the customer experience. Consistent with evolving to focus on measuring outcomes that matter to customers, Toronto Hydro is replacing this metric with two customer satisfaction and experience metrics.
Network Units Modernization	The Network Condition Monitoring and Control program is winding down in 2026. This measure was replaced with a complimentary grid automation readiness metric.
FESI-7	Toronto Hydro is supportive of developing more granular reliability metrics. However, recent upgrades to the utility's network management system and analytics had a material impact on the number of very small outages captured by record keeping systems, making it impractical to carry-over these measures without sufficient historical data to re-baseline
FESI-6 Large Customers	

[1] Exhibit 1B, Tab 3, Schedule 2 at Section 3.1 (page 22).
[2] Exhibit 4, Tab 2, Schedule 4 at Page 4.

2020-24 Custom Measures	Continuity to 2025-29 Custom Scorecard
	performance that meaningfully reflects customer-specific reliability experience.
MAIFI	As noted in the pre-filed evidence in EB-2018-0165, Toronto Hydro cannot track this metric accurately. As Toronto Hydro modernizes its system, the incremental observability will capture more momentary interruptions making it impractical to carry-over this measure without sufficient historical data to re-baseline performance.
System Capacity	Toronto Hydro did not include this metric because there is greater uncertainty as to the timing and specific location of capacity constraints on the grid. Please see Exhibit 2B, Section D4. The utility is replacing this metric with one that focuses on timely customer connections to the grid.
System Health (Asset Condition) – Wood Poles	Performance is managed as part of the Asset Management System which Toronto Hydro intends to certify under internally recognized standards (ISO55001). The reliability performance impact of these metrics is reflected in the proposed SAIFI (Defective Equipment) and SAIDI measures.
Direct Buried Cable Replacement	
Average Wood Pole Replacement Cost ▪	Replaced with a comprehensive Efficiency Achievements custom measure, which includes a target that is tied to the utility's empirical stretch-factor proposed as part of the custom rate framework.
Vegetation Management Cost per Km	
Oil Spills Containing PCBs	Performance is managed as part of the Environmental Management System which is certified with international standards under ISO14001.
Waste Diversion Rate	

QUESTION (D) :

For each measure and target on the proposed custom scorecard, please identify which initiatives would not be pursued in the absence of a performance incentive related to the initiative. For each such measure, please explain why not.

RESPONSE (D) :

The 2025-2029 Investment Plan, its performance objectives, and the Custom Rate Framework are an integrated proposal to meet the needs of Toronto Hydro's system and customers. The performance incentive mechanism (PIM) is a complimentary part of this proposal to improve the balance of risk between the utility and ratepayers. The PIM itself does not drive or justify the need for specific investments or initiatives within the plan. For more information please see 1B-Staff-52(a).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-47

References: Exhibit 1B, Tab 3, Schedule 1
Report of the Board: Renewed Regulatory Framework for Electricity Distributors: A Performance-Based Approach, October 2012

Preamble:

With Reference 1, Toronto Hydro describes its overall PIM proposal as an outcomes-based performance framework. Toronto Hydro provides some explanation for the proposed performance measures within this framework.

QUESTION (A):

a) Regarding system security, Toronto Hydro proposes to earn a performance incentive for the completion of a range of cybersecurity projects. Please explain why the completion of planned projects, which represent milestones rather than a measurable outcome, merits an incentive payment within an outcomes-based performance framework.

RESPONSE (A):

Toronto Hydro disagrees with the characterization of cybersecurity improvements as "milestones." Completion of each cybersecurity project *is* an important outcome, as they enhance Toronto Hydro's cybersecurity posture, and reduce exposure to threats. Further, cybersecurity threats are dynamic in nature, and are expected to vary widely in number and variety over time; limiting the degree to which pre-emptive targets for threat defence can be credibly established. Toronto Hydro's targets seek to reward the desired outcome (i.e. robust and resilience cybersecurity) rather than measure against a hypothetical baseline wherein cybersecurity is inadequate.

QUESTION (B):

b) Similarly, regarding grid automation readiness, Toronto Hydro proposes to earn a performance incentive for carrying out projects. Please explain why the completion of planned projects merits an incentive payment.

RESPONSE (B):

Similar to the above, Toronto Hydro submits the achievement of a state of grid modernization readiness is a desired outcome, which unlocks significant value for customers (e.g., improved reliability), while providing a core building block for proliferation of more electrified technologies and the connection of an increasing numbers of DERs onto its system. The use of an incentive mechanism, as is the case with all functioning incentive mechanisms, improves the prospects of Toronto Hydro maintaining the focus and commitment required to realize this important outcome, in a business environment marked by consistent competition for funding and management focus.

QUESTION (C) :

c) Regarding grid automation readiness, please explain the contribution of the 23 projects included in the custom measure, including manual FLISR, to Toronto Hydro's expected reliability performance over the term.

RESPONSE (C):

The 23 projects refer to the technology required to enable manual FLISR at all 20 transformer stations in the Horseshoe area, plus three software enhancements to enable auto FLISR. These projects are not expected to contribute materially to Toronto Hydro's reliability performance in the 2025-2029 period. However, Toronto Hydro does expect them to contribute materially to reliability performance in 2030 and beyond, once auto FLISR is operational.

QUESTION (D) :

d) Please explain any overlap between the PIM measures related to reliability and related to the results associated with grid automation readiness outlined in c)

RESPONSE (D):

The Grid Automation Readiness measure includes the subset of SCADA switch installations from the Contingency Enhancement program (Exhibit 2B, Section E7.1.3.1) that are required to enable automatic FLISR implementation across 90% of the Horseshoe beginning in 2030. These switches will provide some modest reliability benefits during the 2025-2029 period, and are therefore included in the reliability projections that underpin the Outage Duration and Outage Frequency PIM targets.

QUESTION (E) :

e) Toronto Hydro provides a qualitative rationale for the selection of 99% as a target for timely connection of new services, which mentions expected growth in demand, DER connections and expected complexity. Please explain whether there is a quantitative basis for selecting a 99% target for timely connections of new services and provide it as part of this response.

RESPONSE (E):

Yes, the quantitative basis for selecting a 99% target is Toronto Hydro's 2014-2022 average performance on this metric, which has been 98.36%.

To maintain performance at this level, despite the growth and electrification challenges expected during the 2025-2029 rate period, Toronto Hydro will continue a range of initiatives focused on enhancing timely customer communication, streamlining project planning, optimizing workflows, improving coordination with internal and external stakeholders, and refining asset investment planning.

QUESTION (F) :

f) Please provide annual results for TH's on-time performance related to new connections since 2014, both in aggregate and for the three connection categories identified.

RESPONSE (F):

Connection Type (weighting)	2014	2015	2016	2017	2018	2019	2020	2021	2022
Low Voltage (70%)	91.49%	96.91%	97.67%	98.32%	99.80%	99.74%	99.73%	99.86%	99.89%
High Voltage (20%)	100.00%	100.00%	100.00%	98.41%	100.00%	99.28%	100.00%	99.26%	99.19%
DER Connections and assessments (10%)	98.56%	100.00%	100.00%	86.75%	100.00%	100.00%	100.00%	96.16%	94.63%
Combined Performance	93.90%	97.83%	98.37%	97.18%	99.86%	99.68%	99.81%	99.37%	99.22%

QUESTION (G) :

g) Please explain the justification for a performance outcome associated with maintaining current customer satisfaction levels in the context of the OEB's statement that "the [Renewed Regulatory Framework] is intended to elevate utility performance by creating incentives for superior performance."

RESPONSE (G):

As noted throughout Toronto Hydro's application, the business environment in which it is operating is marked by both increasing complexity and workload. The result is a heightening of competition for funding and management attention when circumstances materialize in the rate term, necessitating targeted incentives for the most important objectives expected of the utility. As noted in the question, the OEB expects superior performance. An appropriate and targeted incentive will significantly increase the probability Toronto Hydro is able to maintain superior customer satisfaction.

QUESTION (H) :

h) Please provide in table form annual data, from 2014 to 2022, on Toronto Hydro's success in resolving escalated customer inquiries within 10 days.

RESPONSE (H):

	2014	2015	2016	2017	2018	2019	2020	2021	2022
Escalation Resolution Percentage within 10 Days	97.13%	95.63%	97.13%	98.17%	98.53%	98.52%	98.28%	98.71%	99.46%

QUESTION (I) :

i) Please quantify transportation fuel savings over the 2025-2029 period arising from the adoption of electric vehicles in accordance with projections indicated in the table entitled 'GHG Emissions (Scope 1') on page 37 of Reference 1.

RESPONSE (I):

Toronto Hydro estimates the following approximate efficiency savings for the 2025-2029 rate period:

- 110,000 litres in fuel savings;
- $168,000 in fuel expenditure savings; and
- 266 tonne to carbon dioxide equivalent ("tCO2e") greenhouse gas reductions.

QUSTION (J) :

j) Please confirm whether emissions from contracting out of work or business activities, that could reduce fleet size or building square footage, are included. Please explain Toronto Hydro's choice.

RESPONSE (J):

Please refer to Toronto Hydro's response to 1-Staff-9(b).

QUSTION (K) :

k) Please explain whether Toronto Hydro will quantify emissions reductions from the portion of its vehicle fleet that will not be electrified, such as through reduced idling time. If it does not plan to do so, please explain why.

RESPONSE (K):

Yes, Toronto Hydro will continue to monitor and take measures to reduce emissions from the portion of its vehicle fleet that will not be electrified, including through reducing idling time.

QUESTION (L) :

l) Please provide the business case underpinning Toronto Hydro's decision to pursue ISO 550001 certification, including any calculations, estimates or representations of the benefits and costs of doing so.

RESPONSE (L):

Toronto Hydro's decision to pursue ISO 55001 certification is based on the need to continuously improve in asset management, align with internationally recognized best practices and voluntarily be held accountable through independent audits. A formal cost benefit analysis was not undertaken for this initiative; however, Toronto Hydro qualitatively assessed the benefits of pursuing the ISO 55001 Certification prior to undertaking this initiative as the benefits were aligned with Toronto Hydro's goals to continuously improve in asset management. Please refer to Exhibit 2B, Section D1, pages 2 to 3 for Toronto Hydro's commitment to achieving ISO 55001 Certification.

QUESTION (M) :

m) Please provide the business cases underpinning maintenance of ISO 140001 and 450001 certifications, including costs and benefits of doing so or failing to do so.

RESPONSE (M):

The maintenance of the ISO 14001 and 45001 certifications is intended to re-enforce the ongoing framework that enables Toronto Hydro to focus on achieving legal compliance, demonstrating continual improvement, preventing employee injuries, and protecting the environment.
The direct costs associated with completing the audit needed to maintain these ISO certifications averaged $17,025 annually from 2021-2023. These certifications have led to significant benefits including mitigating EHS risks, reduction in injuries and improving environmental performance, all

of which has a positive impact on productivity, costs, and organizational reputation. The ongoing maintenance of the ISO standards following the annual audit increases Toronto Hydro's accountability and ensures that the elements of the ISO standards are maintained, legal compliance is achieved and continual improvement opportunities are pursued.

QUESTION (N) :

n) Does the Total Recordable Injury Frequency PIM metric include subcontracted field resources or only Toronto Hydro employees?

RESPONSE (N):

Please refer to Toronto Hydro's response to 1B-Staff-9(a).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-48

Reference: Exhibit 1B, Tab 3, Schedule 1

Preamble:

On pages 2, 7, and 43 of Reference 1, Toronto Hydro has proposed a stretch or efficiency factor of 0.15%, valued at $16.4 million over the term. Achieving the stretch factor is forecast to represent a sustained savings of $6.9M per year by 2029. Toronto Hydro has assigned a performance incentive to the achievement of these forecast efficiency achievements, valued at 15% of the $65M total PIM performance factor.

QUESTION (A):

a) Please confirm the value of the PIM attached to efficiency savings, which appears to be $9.75M (15% of $65M).

RESPONSE (A):

The total proposed incentive is $65 million based on performance against a balanced scorecard. 15% of scorecard achievement is assigned to Efficiency Achievements. 15% of $65 million is $9.75 million.

QUESTIONS (B) AND (C):

b) Please recalculate the value of the stretch factor net of the achievement of the PIMs, or confirm that it is 0.09% ((9.75/16.4)*(0.15)). Please show all calculations.

c) Please explain the rationale for this stretch factor design and net value, including its interaction within the PIMs framework, and with reference to the OEB's standard stretch factor values.

RESPONSE (B) AND (C):

The empirically-derived stretch factor of 0.15% proposed for the 2025 to 2029 rate term is not, and will not be net of any PIM achievement. Customers will directly receive the benefits of reduced rates through the 2025 to 2029 term as a result of the 0.15% stretch factor, which will not be adjusted for any PIM achievement. The purpose of the Efficiency Achievement metric, as articulated on page 42 of Exhibit 1B, Tab 3, Schedule 1, is "*holding the utility accountable for delivering sustained (and quantifiable) efficiency benefits to customers in the next rebasing application*."

The purpose of the Efficiency Achievement metric is to improve the incentive signals which are otherwise naturally embedded in incentive regulation; specifically, near-term cost control. One potential route to financial incentives under standard incentive regulation is the pursuit of short-duration cost cutting, or the deferral of important capital work which will ultimately result in back-logged and increased spending in subsequent years. The Efficiency Achievement metric requires that the utility demonstrate the achievement of sustained savings which would persist into subsequent rate terms. Please see 1B-SEC-20 (f) for more information.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-49

Reference: Exhibit 1B, Tab 3, Schedule 1

Preamble:

Table 18 of Reference 1, which outlines the net present value (NPV) of the benefits of capital deferral and avoidance based on the Local Demand Response (LDR) program proposed for the scored, is reproduced below.

	Deferred Capital	Avoided Capital
Parameters	$2.50 million in load transfer capital investment deferred for 5 years at an operational cost of $0.71 million	$7.50 million in load transfer capital investment avoided over the life of the assets (48 years) at an operational cost of $4.99 million
Costs	NPV of the operational costs of the non- wires solution (2025-2029): $0.57 million + NPV of the revenue requirement associated with the load transfer capital investment to be made in 2030: $1.80 million = $2.37 million NPV Costs	NPV of the operational costs of the non- wires solution (2025-2029): $4.00 million
Benefits	NPV of revenue requirement associated with capital investment deferred from 2025-29: $2.42 million *Less (-)* NPV Costs: $2.37 million *Equals (=)* $55.07 thousand NPV Benefits	NPV of revenue requirement associated with capital investment avoided in 2025 over the 48-year EUL: $7.27 million *Less (-)* NPV Costs: $4.00 million *Equals (=)* $3.27 million NPV Benefits
Total NPV Benefits =$3.32 million		

Table 19 of Reference 1 is reproduced below.

	Deferred Capital	Avoided Capital
Approach	Quantify the net present value (NPV) of the foregone ROE associated with the deferred and avoided capital investments.	
Parameters	$2.50 million in load transfer capital investment deferred for 5 years (i.e. from 2025 to 2030)	$7.50 million in load transfer capital investment avoided over the estimated useful life (EUL) of the assets (48 years)
Lost NPV of ROE	NPV of foregone ROE: $0.99 million *Less (-)* NPV of ROE associated with capital investment in 2030: $0.73 million *Equals (=)* $0.26 million NPV of Foregone ROE[29]	NPV of Foregone ROE: $2.97 million
Total NPV of Foregone Revenue: $3.23 Million		

QUESTION:

Please provide detailed calculations that show the derivation of all amounts shown in tables 18 and 19.

RESPONSE:

Please find attached as an appendix to this response a live spreadsheet with the detailed calculations requested. In the process of preparing this interrogatory response Toronto Hydro discovered a minor typographical error in Table 19. The Total NPV of Foregone Revenue is $3.22 million, and not $3.23 million as stated in the written evidence.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-50

Reference: Exhibit 1B, Tab 3, Schedule 1

Preamble:

In Reference 1, Toronto Hydro provides some information regarding local demand response (LDR).

QUESTION:

Please explain the basis for the assumption that "5 years of LDR is sufficient to avoid the capital investment," citing examples or direct experience if available.

RESPONSE:

The assumption of 5 years is based on experience and engineering planner judgement. As noted in Exhibit 2B Section E.7 on pages 10-12, Toronto Hydro has been successful in avoiding incremental load transfers in the Manby TS and Horner TS service areas through the application of targeted demand response. This has allowed Toronto Hydro to reassess the need for these load transfers each year and make the decision to defer them. By the end of the five-year rate-period, the load transfers were no longer necessary. The assumption of five years is subject to change based on the specific area targeted and was selected for the purpose of planning based on the best available assumptions and information at this time.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-51

Reference: Exhibit 1B, Tab 3, Schedule 1

Preamble:

In Reference 1, Toronto Hydro provides some information regarding new High Voltage and Low Voltage connections. Toronto Hydro provides the value of the benefit of the connection on the basis of overall average loads for the given customer groups.

Question (A):

a) For a representative sample of new HV and LV connections, please provide the actual average customer load during the first 21 days following a new HV connection, and 13.5 days following a new LV connection.

RESPONSE (A):

Toronto Hydro is unable to derive a representative sample within the timelines for responding to interrogatories. As explained in more detail in part (b) below, a representative sample would require a relatively large number of data points. Extracting this information entails a labor-intensive manual effort as the data cannot be processed automatically. To be helpful, below Toronto Hydro provides a few examples (categorized by rate class) of customer load during the first days following a new connection.

Table 1: Examples (by rate class) of customer load in the first days following a new connection

HV Connections – Large Users
There have been four customers connected in 2021-2023. 1. A customer was connected in 2022. A new customer owned substation for existing customer was installed and connected. Average load for this customer in the first 21 days was 1.25MW. 2. A customer was connected in 2022. The connection was completed three months prior to the opening to the public. The average load in the first 21 days since the connection was 14kW, with a max demand of 22kW.

HV Connections – GS 1MW-5MW
There have been about 30 customers connected each year in 2021-2023. 1. A condo tower in Etobicoke was connected in the Fall of 2021. At time of connection, the tower was in the final stages of the construction. The average load in the first 21 days since the connection was 52kW, with a max demand of 119KW. 2. A metal fabrication manufacturing site was switched from overhead supply to underground supply and a new pad-mounted transformer was installed in spring 2022. The average load in the first 21 days was 104kW, with a max demand of 471kW. 3. A condo tower was connected in Summer 2022. Construction started about seven years ago and is nearing its completion. The average load in the first 21 days was 21kW, with a max demand of 70kW.
HV Connections – GS 50KW-1000KW
There have been about 90 customers connected each year in 2021-2023. 1. A complex of townhouses was connected in Spring of 2023. The project was in the development for more than 10 years, construction started in 2020, and at the time of the connection, the complex was still under construction. The average load in the first 21 days since the connection was 33kW, with a max demand of 75KW. 2. A two-storey office-industrial building was connected in Fall 2023. The building was in the final stages of its completion. The average load was 20kW, with a max demand of 64kW. 3. A condominium complex was connected in Spring 2023. The condominium is still under construction. The average load in the first 21 days since the connection was 34kW, with a max demand of 84KW.
LV Connections
There have been more than 5,000 LV connections in the recent years. 1. House in Etobicoke, connected in November 2023. The average load in the first 13.5 days was 0.24kW, with a max demand of 1.25kW. 2. House in Old Toronto, connected in August 2023. The average load in the first 13.5 days was 0.11kW, with a max demand of 2.28kW. 3. House in North York, connected in January 2023. The average load in the first 13.5 days was 0.02kW, with a max demand of 0.32kW.

QUESTION (B):

b) For part a), please provide the total number of new HV and LV connections to identify the proportion of the representative samples relative to the total.

RESPONSE (B):

The table below lists the total number of HV and LV connections reported to the OEB through RRR:

Table 2: Number of HV and LV Connections

Year	LV Connections	HV Connections
2019	5826	138
2020	7041	87
2021	4932	135
2022	5260	123

To determine whether a data sample is representative or not, several key pieces of information are needed. These data help ensure that the sample accurately reflects the broader population from which it is drawn, thereby allowing for generalizations to be made with a reasonable degree of confidence. The challenge of achieving representativeness is particularly pronounced in the context of new service connections, where the diversity of customer types necessitates a larger sample size to draw accurate conclusions.

HV connections have diverse customer categories, including Large users (5MW+), GS 1MW-5MW, and GS 50KW-1000KW customers. Each category requires a representative sample to accurately reflect its population. Large User connections are occasional and distinct, making it difficult for a small number of samples from this group to represent the entire category. Similarly, the 1MW-5MW connection category encompasses a wide range of customers, such as industrial sites, hospitals, educational institutions, and residential buildings, each with unique characteristics. The GS 50KW-1000KW category also presents a challenge due to the varied nature of its customers, who differ in physical size, capacity, and energy needs.

The representativeness of data is critical in dynamic areas like energy consumption, where the timing of data collection can significantly influence the accuracy of insights. A representative sample must account for seasonal variations and different days of the week to capture the full spectrum of energy consumption patterns among HV and LV connections.

Furthermore, the greater the variability in characteristics of interest within the population, the larger the sample size required to capture this diversity accurately. In the case of new HV and LV

connections, variability can arise from differences in consumption patterns, peak loads, and the effects of industry-specific factors on energy usage.

QUESTION (C):

c) Please recalculate the value of the benefit of connection, using the same customer interruption cost and other inputs, but based on the actual average load in those post-connection periods rather than the overall average loads of these customer groups.

RESPONSE (C):

As noted above, due to time constraints and the manual process required for data extraction, Toronto Hydro is unable to gather hundreds of data samples for HV and LV connections to compile a representative sample. Furthermore, undertaking such an extensive sampling effort is unlikely to yield significant insights.

The load immediately following connection may not accurately represent the customer's operational load. This initial period is often used for business setup or residential preparations rather than full-scale operations or living, leading to a discrepancy between immediate and operational energy usage. Delays in electrical connections can have cascading effects on subsequent phases of the construction and setup process, such as postponing heavy equipment installation, delaying testing and commissioning, and affecting the issuance of occupancy permits. Electrical connections are critical to the timely progression of these stages, highlighting their broader economic significance to customers.

This concept is illustrated by LV connection examples in part b), where the observed electricity consumption significantly increased after the initial low-usage period. For instance, a house in Etobicoke showed an average consumption increase to 1.8kW in the eight days following an initial period of 0.24kW, or seven times higher consumption. Similarly, increases were observed in Old Toronto and North York (respectively, 40 and 15 times higher), demonstrating the potential delay in occupancy and normal electricity usage that could result from postponed connections.

Given these considerations, Toronto Hydro maintains that using an average load for the purpose of benefit calculation remains the most appropriate approach for the purpose of a macro-level benefits analysis. This method acknowledges the variability and uncertainty inherent in the early stages of a new connection and provides a more stable and reliable basis for calculating connection benefits. While the desire for precise data is understandable, it is important to recognize that the benefits derived from new connections are indicative (not exact), and that the purpose of the analysis is to reflect the broader economic and social impacts of Toronto Hydro's services, acknowledging that delays in electrical connections can significantly influence the overall timelines and plans of businesses and residents.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-52

Reference: Exhibit 1B, Tab 3, Schedule 1, Table 1

Preamble:

With Reference 1, Toronto Hydro shows the proposed 2025-2029 custom scorecard with 12 measures and targets.

QUESTION (A):

a) Please reproduce Reference 1 with the following information:

i. A column which indicates the total revenue requirement during the rate term of all identified key programs associated with the delivery of the result, as detailed throughout Reference 1.

ii. A column which indicates the dollar value of the PIM at proposed weight and total PIM envelope of $65M as proposed.

iii. A column which indicates the calculated value of customer benefits realized in the 2025-2029 period (as identified in Table 21, p. 57, or elsewhere if applicable).

iv. A column which indicates the ratio of iii) to ii) for each proposed PIM

RESPONSE (A):

Please see attached a table which lists each of the 12 scorecard metrics and targets, alongside a column which assign a proportion of the proposed $65 million incentive to each metric, and a column which assigns a proportion of quantifiable benefits realized over 2025 to 2029, as presented in Exhibit 1B, Tab 3, Schedule 1.

Toronto Hydro cannot assign portions of its total revenue requirement to each metric on the custom scorecard as there is not a one to one relationship between expenditures in these programs and achieving specific performance metrics. Multiple programs contribute to multiple

performance objectives and it is not possible to attribute specific costs to specific measures and targets. Toronto Hydro also notes that the request appears to infer that the capital and operational programs detailed in this application are proposed on the basis and justification of target achievement and associated economic benefits for customers. This is not the case. The capital and OM&A program budgets proposed stand on their own merits, on the basis of the detailed evidence submitted in Exhibits 2B and 4 describing the processes, needs, inputs, and other factors relied on to conclude that the proposed 2025 to 2029 investment plan is the appropriate plan to meet the needs of Toronto Hydro's system and customers. The performance incentive is a complimentary proposal to improve the balance of risk between the utility and ratepayers in responsiveness to the OEB's feedback in the last rate application.

QUESTION (B):

b) Please Discuss:

i. The proportion and significance of the PIM and its weighting within the PIM framework, relative to the proportion and significance of identified key programs, as provided in part i) above, in the context of Toronto Hydro's overall spending plan. Please evaluate how well the scope and value of its proposed PIMs correspond with the scope and value of Toronto Hydro's key spending and investment areas within its plan.

ii. The rationale and basis for the proportions of costs and benefits calculated in iv) above, including variations in the observed ranges.

iii. For any value where iii) is less than or equal to i), please explain Toronto Hydro's rationale for the particular PIM proposed, including its weight.

RESPONSE (B):

Please see a) above with respect to the comparison of program costs and PIM incentives and benefits. With respect to the PIM incentive relative to quantified benefits, the benefits received by customers outweigh the cost of the PIM incentive in all scenarios, with the lifetime benefits significantly outweighing the size of the PIM. This analysis does not take into account numerous

measures and targets (e.g. Customer Satisfaction, Customer Escalations, TRIF, Security Enhancements, Grid Automation Readiness, ISO Certification) which although cannot reliably quantified nonetheless provide long-term value to customers.

Performance	Weight	Measures	Five-Year Target	Incentive	Quantified Benefits (2025-2029)	Quantified Benefits (Lifetime)	Ratio: Incentive vs. 2025-29 Benefits	Ratio: Incentive vs. Lifetime Benefits
System Reliability & Resilience	**15%**	**Outage Duration:** System Average Interruption Duration Index (SAIDI) excluding Major Event Days (MEDs), Loss of Supply (LoS) and Scheduled Outages	46.2 minutes (five-year average)	$9.8	$32.5	$605.2	3.33	62.02
	10%	**Outage Frequency:** System Average Interruption Frequency Index (SAIFI) - Defective Equipment	0.38 – 0.45 (five-year average)	$6.5	$6.5 - 21.6	$182.5 - 413.4	1.00 - 3.32	28.05 - 63.55
	5%	**System Security Enhancements:** Deliver initiatives that enhance Toronto Hydro's physical and cyber security posture against the NIST framework	100% by 2029	$3.3	n/a	n/a	n/a	n/a
Customer Service & Experience	**10%**	**New Services Connected on Time:** Percentage of new connections and service upgrades completed on time consisting of Low Voltage Connections (70%), High Voltage Connections (20%) and DER Connections (10%)	99% (five-year average)	$6.5	$31.7 - 142.6	$31.7 - 142.6	4.87 - 21.92	4.87 - 21.92
	5%	**Customer Satisfaction:** Post-transactional customer satisfaction surveys for Customer Inquiries (Phone & Email), Key Accounts Engagements, Customer Connections, and Communications (Outages & Construction Projects)	Maintain historical baselines	$3.3	n/a	n/a	n/a	n/a
	5%	**Customer Escalations Resolution:** Percentage of customer escalations resolved within 10 business days.	98% (five-year average)	$3.3	n/a	n/a	n/a	n/a
Environment, Safety and Governance	**10%**	**Total Recordable Injury Frequency (TRIF):** Injuries per 100 employees (or 200,000 hours worked) per year.	0.83 (five-year average)	$6.5	n/a	n/a	n/a	n/a

Performance	Weight	Measures	Five-Year Target	Incentive	Quantified Benefits (2025-2029)	Quantified Benefits (Lifetime)	Ratio: Incentive vs. 2025-29 Benefits	Ratio: Incentive vs. Lifetime Benefits
	5%	**Emissions Reductions:** Tonnes of CO2e emissions produced by Toronto Hydro's fleet and facilities.	2.5 kilo tonnes CO2 emissions in 2029	$3.3	$0.2	$1.5	0.06	0.46
	5%	**ISO Compliance and Certification:** Achieve and maintain certification with select ISO governance standards, specifically achieve ISO 55001 (60%), and maintain ISO14001 (20%) and ISO45001 (20%).	100% by 2029	$3.3	n/a	n/a	n/a	n/a
Efficiency & Financial Performance	**15%**	**Efficiency Achievements:** Sustained efficiency benefits for customers that will produce a lower revenue requirement in the next rebasing application.	$6.9 million per year by 2029	$9.8	$16.4	$50.7	1.68	5.20
	10%	**Grid Automation Readiness:** Completion of milestones to enable the automation of the overhead system in the horseshoe areas of the grid starting in 2030.	100% by 2029	$6.5	n/a	n/a	n/a	n/a
	5%	**System Capacity (Non-Wires):** Flexible system capacity procured through demand response offerings.	30 MW by 2029	$3.3	$3.1	$21.0	0.95	6.77
			Total	**$65.0**	**$90.4**	**$892.6**	**1.39**	**13.73**
					$216.4	**$1,234.4**	**3.33**	**18.99**

High Range | Low Range

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-53

Reference: Exhibit 1B, Tab 3, Schedule 1

Preamble:

At page 6 of Reference 1, Toronto Hydro states "only if the set performance targets are achieved….by the end of the rate term would the incentive be recovered from customers."

QUESTIONS (A) – (C) :

a) Please explain Toronto Hydro's proposal for recovery of the PIM-DA account balance in the event that not all performance targets are achieved in full. For instance: what amounts, if any, should be paid in the event that only some targets are achieved in full?

b) Does Toronto Hydro propose partial disposition in the event that a particular target is partially achieved?

c) In determining the amount for disposition, does Toronto Hydro propose that outperformance in one area should compensate for underperformance in another?

RESPONSES (A) – (C):

The proposed design of the PIM reflects a series of stacked, binary targets with financial incentives allocated explicitly to each metric. As such, Toronto Hydro does not propose any partial incentive for partial achievement of targets, and performance on one metric will not have any impact (positive or negative) on the performance or financial outcomes of other metrics. Please see response to the response to 1B-Staff-54 for more information, including comments relating to the potential for a reward associated with over-performance.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-54

References: Exhibit 1B, Tab 3, Schedule 1, Pages 12-13

Preamble:

Toronto Hydro details its proposed PIM in Tab 3 Schedule 1. Key attributes include the following.

• The incentive factor term of the revenue cap index formula would include a 0.6% performance factor that has an estimated value to customers of $ 65 million during the five years of the proposed plan.

• The PIM would give Toronto Hydro a means to earn back the $ 65 million depending on its performance as measured using 12 metrics.

• The potential revenue impact of each metric is a share of the $ 65 million.

• Results of the PIM metrics would be detailed on a Custom Scorecard.

• Rewards would be based on performance over the five years of the plan and would be considered in the next rebasing.

QUESTION (A):

a) For each PIM performance category j in year t, suppose that

$\bar{M}_j^{Actual}$ = Toronto Hydro's average value of metric 2025-2029
M_j^{Target} = target value of the metric
α_j = share of the maximum $65 million penalty

i. Does one of the following formulas accurately characterize the proposed net reward from the PIM?

i. $Net\ Penalty = \max\left[65 - SUM_j \alpha_j \cdot 65 \cdot \left(\frac{\bar{M}_j^{Actual}}{M_j^{Target}}\right), 0\right]$

ii. $Net\ Penalty = SUM_j \max\left[\alpha_j \cdot 65 - \alpha_j \cdot 65 \cdot \left(\frac{\bar{M}_j^{Actual}}{M_j^{Target}}\right), 0\right]$

$= SUM_j \max\left[(\alpha_j \cdot 65) \cdot \left(1 - \frac{\bar{M}_j^{Actual}}{M_j^{Target}}\right), 0\right]$

ii. If not, please provide an alternative formula that does provide an accurate characterization.

RESPONSE (A):

Since it is meant to hold the utility accountable for achieving target performance outcomes, Toronto Hydro's proposal is based on a threshold test, such that if the utility does not achieve the target performance on a particular metric the incentive is not met. This ensures that the utility is not able to earn-back the incentive associated with an individual metric if the performance is below the target.

The following formula can be used to determine the incentive amount for each individual metric. The total entry to the PIM-DA will be the sum of this formula completed for each individual metric.

$$\text{Earnback}_j = \text{IF}(M_j\text{Actual} \geq M_j\text{Target}, \alpha_j * 65, 0)$$

$$\text{PIM-DA Credit} = \text{SUM}(\text{Earnback}_j)$$

QUESTION (B):

b) Please confirm that the design of the PIM would only permit Toronto Hydro to earn back the $65 million value of the proactive 0.6% performance factor. Explain any disinclination to affirm.

RESPONSE (B):

Confirmed.

QUESTION (C):

c) Does this PIM design preclude the use of metrics that should be paired with rewards? Is there merit in permitting rewards in some performance areas?

RESPONSE (C):

The design of the PIM can be altered to include incentives/rewards for superior performance as envisioned by the Renewed Regulatory Framework at page 61. This can be done by enabling the utility to earn incremental incentives (i.e. in excess of $65 million) for achieving higher than target performance on metrics or by setting incremental objectives/goals for the utility to meet in the next rate term, provided that the utility can do so within the overall revenue requirement approved for the purpose of setting rates.

QUESTION (D):

d) Why does demand response receive only a 5% weight in the PIM given the sizable capacity additions that the Company suggests are looming for the energy transition?

RESPONSE (D):

The 5% target for non-wires system capacity is weighed proportionally to the NPV of the efficiency benefits provided by the achievement of the target, as summarized in Table 18 of the referenced evidence.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

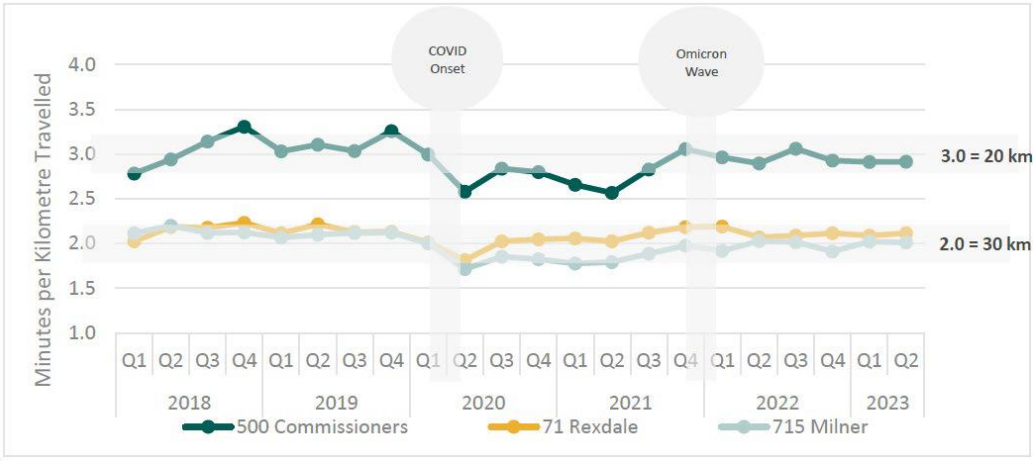
INTERROGATORY 1B-STAFF-55

References: Exhibit 1B, Tab 3, Schedule 3, Pages 7-8

THESL_Drive Time Data_20240207

Preamble:

Toronto Hydro provides Figure 1 outlining drive times per kilometer from its 3 work depots; Figure 1 is reproduced below.



QUESTION (A):

a) What drive trips were incorporated into the data for the analysis? Does the data utilize include only the drive time to and from the job site? Does it include any ancillary driving activities?

RESPONSE (A):

The data includes all driving to and from work sites, as well as all ancillary commuting. Omitted from the analysis is any time driven within the designated home zone and any driving/commuting time for vehicles that were taken out of service for five days or more in a given month.

QUESTION (B):

b) What was the calculated average drive time per work activity?

RESPONSE (B):

Drive time includes all driving activity outside of the home zone; Toronto Hydro currently does not possess the capability to distinguish the subset of drive time related to work activity and therefore does not have the data to calculate average drive time per work activity.

QUESTION (C):

c) What was the average drive distance per work activity?

RESPONSE (C):

As noted in the response to subpart (b), Toronto Hydro currently does not possess the capability to distinguish the subset of drive time related to work activity and therefore does not have the data to calculate average drive distance per work activity.

QUESTION (D):

d) What is the percentage of time driving of the overall work activity?

RESPONSE (D):

As noted in the response to subpart (b), Toronto Hydro currently does not possess the capability to distinguish the subset of drive time related to work activity and therefore does not have the data to calculate the percentage of drive time corresponding to work activity.

QUESTION (E):

e) What was the total number of trips used for the calculation of each field depot?

RESPONSE (E):

Drive time includes all driving activity outside of the home zone; the data set in Reference 2 provides a summary of each month for each vehicle by distance and drive time. Toronto Hydro does not have visibility into the total number of trips beyond this data.

QUESTION (F):

f) What is defined as the Home Zone?

RESPONSE (F):

The home zones are defined as Toronto Hydro work centres or stations. Each vehicle is assigned to a work centre or station to track their home zone.

QUESTION (G):

g) Are cars used for typical field work activities or more for supervision and administrative purposes? Why are cars included in the calculations?

RESPONSE (G):

Cars are used for general administrative purposes, supervision, by employees that do not require field work equipment at their job site, such as for media and public relations purposes, or to conduct field work activities where equipment is not required to be transported to the work site or is transported in larger vehicles by other crew members travelling to the same job site. Although cars constitute a small portion of Toronto Hydro's vehicle fleet (2.5% or 9 out of 359 vehicles), the utility includes them in its fleet-related productivity initiatives to monitor and continuously improve efficiency across the board.

QUESTION (H):

h) In Ref 2 why are there multiple entries per vehicle in a given month in the yearly data tabs? What does each row signify?

RESPONSE (H):

Each row signifies monthly usage for each vehicle; multiple entries reflect a change in the vehicles' assigned home zone.

QUESTION (I):

i) Would 5km or less of driving for a vehicle in a given month be representative of typical drive times for field productivity?

RESPONSE (I):

No, Toronto Hydro does not consider 5 kilometres or less to be representative of typical vehicle operations. Distances driven by fleet vehicles is not an indicator of field productivity because field work is achieved when the vehicle is parked at the worksite.

QUESTION (J):

j) Was the drive time per kilometer benchmarked against another city or utility?

RESPONSE (J):

No.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-56

Reference: Exhibit 1B, Tab 3, Schedule 3, Page 12

Preamble:

Toronto Hydro provide Table 3 which is reproduced below:

Table 3: Non-Residential Buildings Construction Index for Metropolitan Areas[18]

		Toronto		Canada 11 Census Metropolitan Area Composite	
		Qtr to Qtr	Cumulative	Qtr to Qtr	Cumulative
2020	Q1	0.0%	0.0%	0.0%	0.0%
2020	Q2	0.5%	0.5%	0.1%	0.1%
2020	Q3	0.7%	1.2%	0.5%	0.6%
2020	Q4	0.2%	1.4%	0.1%	0.6%
2021	Q1	1.9%	3.3%	1.4%	2.0%
2021	Q2	5.0%	8.4%	3.9%	6.0%
2021	Q3	4.3%	13.0%	2.9%	9.0%
2021	Q4	3.4%	16.9%	2.9%	12.1%
2022	Q1	3.8%	21.3%	3.0%	15.5%
2022	Q2	5.0%	27.4%	4.0%	20.1%
2022	Q3	2.6%	30.7%	2.1%	22.6%
2022	Q4	2.5%	33.9%	1.6%	24.6%
2023	Q1	1.7%	36.2%	1.7%	26.7%
2023	**Q2**	**1.1%**	**37.7%**	**1.5%**	**28.6%**

QUESTION (A) AND (B):

a) Provide the filters and setting used on the Statistics Canada website to derive these values? Please detail the type of building and divisions selected?

b) Explain why these filters and settings were selected and how all the categories selected are applicable to Toronto Hydro's inflationary pressures?

RESPONSE (A) AND (B):

Please refer to Toronto Hydro's response to interrogatory 1B-Staff-18 part (e).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-57

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Pages 15-16

Preamble:

PEG wishes to better understand the Toronto Hydro cost data used in Clearspring's benchmarking study.

QUESTION (A):

a) Please discuss what labor costs besides salaries and wages might be present in Toronto Hydro's O&M expenses used in the study.

RESPONSE (A):

Besides salaries and wages, labour costs as presented in Toronto Hydro's O&M expenses used in the study include: performance pay, overtime, leaves such as vacation, sick time, and statutory holidays, and other contractual obligations such as stand-by pay, and shift premiums.

QUESTION (B):

b) What types of cost are included in the pension and benefits expenses that Clearspring removed from the Company's O&M expenses?

RESPONSE (B):

Pension and benefit expenses include: Toronto Hydro's portion of OMERS contribution, post-employment benefits, payroll taxes, Canadian Pension Plan ("CPP") and Employment Insurance ("EI") contributions made by Toronto Hydro, and other employee benefits which includes: medical, dental, and group life insurance.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-58

Reference: Exhibit 1B, Tab 3, Schedule 3. Appendix A, Page. 19

Preamble:

The sample period for the power distributor cost research is the twenty-one years from 2000 to 2021. There are data from 78 US distributors in the sample.

Data for 9 of the sampled utilities are excluded from the total cost benchmarking sample only in 2021, the final year of the dataset[1].

QUESTION (A):

a) Please explain why data for 9 utilities were excluded only in 2021.

RESPONSE PROVIDED BY CLEARSPRING (A):

Five of the 2021 observation exclusions are due to implausible substation data. The five are PacifiCorp, Madison Gas & Electric, Kentucky Utilities, Portland General Electric, and Public Service of New Hampshire. Three other utilities were excluded in 2021 due to reported OM&A expenses decreasing by an implausible amount of 90% or more with two of them reporting negative OM&A expenses. These three are Pennsylvania Electric, Southwestern Public Service, and Nevada Power. Duke Energy Ohio was excluded due to reporting zero customers in 2021.

Clearspring conducted a sensitivity analysis regarding the five exclusions in 2021 due to substation data. We used the 2020 value for the number of substations and capacity and included the 2021

[1] Data for 3 additional utilities are excluded from the sample for longer periods. These are California utilities that experienced massive wildfire damage. PEG and Clearspring have discussed and agreed to exclude these data in other proceedings.

observations into the sample to test the impact of excluding the 2021 observations. The impact on Toronto Hydro's benchmark results was essentially zero. The 2025 to 2029 benchmark score decreased to -23.0% from -22.9% indicating the exclusion of the utilities in 2021 does not meaningfully impact the study.

QUESTION (B):

b) Were there additional major omissions with publicly available data which could potentially have been included in the sample, but were excluded altogether? If so, please provide the reasons for the exclusion of each. For example, did Clearspring exclude any subset of utilities because they are small?

RESPONSE PROVIDED BY CLEARSPRING (B):

There are no systematic exclusions to utilities based on size or other common characteristics with plausible data and variable values that were processed and available in the modeling dataset. Given the U.S. investor-owned utility dataset utilized by Clearspring in the study, there are no extremely small utilities in the sample and the econometric model is able to adjust for the modeled service territory conditions of Toronto Hydro.

QUESTION (C):

c) Why did the sample not include 2022 data?

RESPONSE PROVIDED BY CLEARSPRING (C):

The project timeline was not able to accommodate a 2022 data update.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-59

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Pages 20-21 and 38

Preamble:

The model parameters presented in the report result from a sample that excluded Toronto Hydro. While PEG acknowledges that excluding the subject utility is the appropriate way to estimate the model that is actually used for benchmarking Toronto Hydro's cost performance results (and to do the same for each individual company's results), it is common in econometric benchmarking for the model development and presentation to be based on the entire sample.

QUESTION (A):

a) Please provide the econometric model parameter estimates that result when Toronto Hydro is included in the estimation.

RESPONSE (A) – PREPARED BY CLEASPRING:

Please see the table below which provides the reported parameter estimates alongside the requested parameter estimates.

Variable	Reported Parameter Estimates	Requested Parameter Estimates
Constant	12.735	12.766
Customers (N)	0.512	0.530
Peak Demand (D)	0.397	0.388
Area (A)	0.050	0.051
N*N	0.490	0.635
D*D	0.840	0.878
A*A	0.036	0.042
N*D	-1.297	-1.468
N*A	0.096	-0.009
D*A	-0.112	-0.020
% Electric	0.152	0.146
Standard Deviation of Elevation	0.012	0.010
% OH*% Forest	0.052	0.055
% Congested Urban	22.256	12.095
% AMI	0.060	0.047
Dx Work (% Tx Lines Above 50 kV)	0.157	0.147
O&M Scope Variable	0.088	0.081
# of Dx Substations	0.071	0.059
Capacity of Dx Substations	0.011	0.014
Trend	-0.005	-0.005

QUESTION (B):

b) Please comment on whether any changes in the parameter estimates when Toronto Hydro is excluded are of a magnitude which indicates a possible problem with the variable or model specification.

RESPONSE (B) – PREPARED BY CLEASPRING:

The parameter estimate differences do not indicate a possible problem with the variable or model specification. In fact the opposite is true, the differences indicate that the variables and model specification is robust. All the first order parameter estimates continue to be highly statistically significant with minor tweaks in the values due to including Toronto Hydro. The percent congested urban is the possible exception to this, while it remains highly statistically significant the magnitude of the variable value does change noticeably. This is due to the unavoidable fact that Toronto Hydro is an extreme outlier in the challenges it encounters with serving a congested urban core. Only Consolidated Edison of New York City encounters a similar type of condition. It is expected in econometric modeling that either including or excluding an outlier utility would meaningfully impact that variable's parameter estimate. This does not indicate a model specification problem. It does illustrate that, ideally, it would be helpful if it were possible to include more utilities with similar service territory conditions of Consolidated Edison or Toronto Hydro in order to make Toronto Hydro less of an outlier within the dataset and still include the appropriate cost challenge variable, however, that is not a feasible option.

Clearspring also notes that we are in agreement with PEG that the model used for benchmarking should not include the studied utility so that the benchmark is fully external to the cost performance of the studied utility. The reason the percent congested urban variable declines when Toronto Hydro is inserted in the sample is because Toronto Hydro has an extremely large congested urban cost challenge combined with strong cost performance (i.e., actual costs are well below model-expected costs). If Toronto Hydro's cost performance was average, the change in the congested urban variable would be far less pronounced. Toronto Hydro's strong cost performance

and outlier status is not a reason to assume the model specification or variable construction is problematic.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-60

References: **Exhibit 1B, Tab 3, Schedule 3, Appendix A, page. 21**
Cunningham, M., Hirschberg, J., and Giovani, A. (Quantonomics) (2023), Memorandum to the Australian Energy Regulator/Australian Competition and Consumer Commission, Subject: Opex Cost Function - Options to Address Performance Issues of Translog Models, October 25.
https://beta.aer.gov.au/system/files/2023-11/Quantonomics%20%E2%80%93%20Memorandum%20%E2%80%93%20Opex%20Cost%20Function%20Development%20%E2%80%93%20October%202023.pdf

Preamble:

Clearspring's power distributor cost model has three scale variables: the number of customers served, a peak load variable, and area. This model also includes second-order (quadratic and translog) terms for these variables. This treatment adds six scale-related variables to the model for a total of nine and results in custom cost elasticities with respect to scale variables for Toronto Hydro.

An ongoing discussion in Ontario Custom IR proceedings is whether a rolling average of past peak demands or a ratcheted peak demand variable are better for a power distributor cost model.

An important result of cost theory is that cost should rise monotonically with output.

QUESTION (A):

a) What are the estimated custom cost elasticities with respect to these three scale variables for Toronto Hydro?

RESPONSE PROVIDED BY CLEARSPRING (A):

We calculated the first derivative with respect to each output to calculate the custom elasticities. The equation for the custom customer elasticity that we calculated is, thus, the first order

customer coefficient plus the coefficient on the quadratic customer variable times the natural log of the mean-scaled customer value plus the coefficient on interaction with customers and peak demand multiplied by the natural log of the mean-scaled peak demand variable plus the coefficient on the interaction with the customers and service area variable multiplied by the natural log of the mean-scaled service area variable. For the custom peak demand elasticity and the area elasticity we conducted the same calculation procedure but using the peak demand and area first order, quadratic, and interaction terms.

Since the custom elasticities do not change in any way that would be material to this analysis from year to year for the same utility, the 2021 values for Toronto Hydro are calculated to be 0.235 for customers, 0.895 for peak demand, and -0.062 for service area.

QUESTION (B):

b) Parameter estimates for output variables may be assessed for consistency with the monotonicity condition predicted by cost theory. Reference 2 is an example of such a study in a report to the Australian Energy Regulator. Are Clearspring's scale variable parameter estimates in each year of the sample consistent with the monotonicity conditions predicted by cost theory? Do any other sampled companies have violations?

RESPONSE PROVIDED BY CLEARSPRING (B):

Given the flexibility of the translog cost function it leaves open the possibility of specific output variable elasticities being negative as the model adjusts for economies of scale and interactions with other output variables. In the case of Toronto Hydro it is the service area custom elasticity that is negative. This means that the cost benchmark for Toronto Hydro would decline in the model if Toronto Hydro somehow added service territory area to its service territory variable value. Yet, in the real world, it is difficult to imagine how this would occur and Toronto Hydro at the same time not adding customers and peak demands. The additions of the customers and peak demands would raise Toronto Hydro's benchmark costs likely more than the service area variable would

reduce it. There are other instances of custom output elasticities being negative within the sample. The majority of them are regarding the service area variable, similar to Toronto Hydro.

QUESTION (C):

c) The peak load variable that Clearspring uses in its model is a rolling average of past peak load values. Up to ten past values are averaged to the extent that data are available. If the sample period were shortened by ten years, wouldn't this permit ten-year averages for all years? If ratcheted peak demand was then calculated the same way for Toronto Hydro as for the sampled US distributors, why would a moving average peak demand variable be better than a ratcheted peak demand variable?

RESPONSE PROVIDED BY CLEARSPRING (C):

To accommodate all ten years within the ten-year sample average, Toronto Hydro's first year must be 2011 since its first year of peak demand data is 2002. The sample has peak demand data collected from 1994, indicating that 2003 could be the first year where a rolling average variable would have ten years available to calculate it.

Clearspring's sample begins in 2000 which matches the start year that we used in the last distribution total cost benchmarking research for Hydro One in EB-2021-0110. In Clearspring's report in that proceeding we explained the rationale for using an average peak demand variable rather than a ratcheted one. One reason includes Clearspring considering the merits of and then responding to intervenors who in the past questioned how it makes sense that a ratcheted peak demand variable can never decrease even after years of falling peak demands. The total cost research is focused on the long-run total costs of utilities. This is why capital costs are included into the analysis and Clearspring goes back to the 1940's to gather cost data and determine those costs. To say that utilities will never adjust costs downward to declining peak demands is not accurate and so the peak demand variable should be able to decline if that is the reality of the situation. Clearspring agrees there will be a lag and a residual cost impact to prior high peak demand values which is why we used the 10-year rolling average approach. The second rationale for the rolling

average peak demand variable versus the ratcheted approach is that a lot of the focus on the benchmarking research results in this context are on the projected years of 2025 to 2029. Those peak demands are weather normalized expectations, or averages, around the probabilities of extreme or mild weather outcomes. Since the peak demand forecasts themselves are essentially averages, using a variable that is itself an average is the more consistent approach in Clearspring's view.

QUESTION (D):

d) Did Clearspring try ratcheted peak demand as an alternative to the rolling average? If so, which had stronger statistical support?

RESPONSE (D) PROVIDED BY CLEARSPRING:

Yes, Clearspring did calculate the variable. The first order ratcheted peak demand variable while still highly statistically significant is less so than the 10-year rolling peak demand used by Clearspring. The t-stat on the ratcheted peak demand is 13.82 versus a t-stat of 22.16 for the rolling average variable. This indicates that it is the rolling average variable that has the stronger t-statistic.

QUESTION (E):

e) Does the company believe that the number of customers it reports on the RRR is significantly affected by high rise housing where the building is only counted as one "customer"? If so, please provide a rough estimate of the number of unmetered residential customers (1 dwelling = 1 customer) that are jointly served from a single meter. Is serving one customer with 100 tenants more costly than serving 100 separately-metered and separately sited households? If so, why?

RESPONSE (E):

As discussed in lines 18-23 on page 11 of Exhibit 4, Tab 1, Schedule 1, Toronto Hydro serves far more electricity users through bulk-metering and competitive sub-metering arrangements than its

actual customer count indicates and the utility estimates that it serves at least 340,000 end-consumers behind bulk meters.

Serving 100 separately metered and sited households (e.g. in a multi-unit residential building suite metered by Toronto Hydro), typically drives some additional billing, payment processing and customer contact costs due to the greater number of account holders, compared to a single bulk metered customer with 100 tenants/occupants behind the meter. Other than these costs related to account transactions, there is no material OM&A cost difference between the two types of customers.

QUESTION (F):

f) Did Clearspring consider using other normalization factors other than number of customers due to the stated concern regarding the quantity of high-rise building? What other normalization factors were considered but rejected? If no other normalization factors were considered, why not in consideration of Toronto Hydro concerns regarding using customer count?

RESPONSE (F) PROVIDED BY CLEARSPRING:

We did identify this challenge as a possible candidate for a business condition variable or other possible correction, however, no feasible normalization factors surfaced because of the lack of data visibility into the sampled utilities regarding this condition. Not including a normalization factor that adjusts for this cost challenge likely disadvantages Toronto Hydro in the benchmarking research.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-61

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 34

Preamble:

Clearspring used an employment cost index ("ECI") for the utility industry as the wage rate trend index for US utilities in its sample. The wage rate trend index chosen for Toronto Hydro was Ontario Average Weekly Earnings ("AWE").

The wage rate level chosen for Toronto Hydro was based upon 2011 Census data.

QUESTIONS (A)

a) Why was the Ontario AWE chosen as the wage rate trend index for Toronto Hydro?

RESPONSE (A)– PREPARED BY CLEASPRING:

The Ontario AWE was used to escalate Toronto Hydro's wage rate levels because it is the index used in Clearspring's prior benchmarking research in Ontario and was the index used in the Hydro One Joint Report put forth by Clearspring and Pacific Economics Group (PEG). The index was also deemed appropriate and used in the 4th Generation IR benchmarking and productivity research, and the index is one of two components in the inflation factor. It is Clearspring's understanding that PEG has also used the Ontario AWE to escalate Ontario distributor wage levels in its other Ontario benchmarking research.

QUESTIONS (B)

b) Please confirm that, in its recent "PBR3" decision, the Alberta Utilities Commission decided to replace the Alberta AWE with Statistics Canada's Alberta fixed weighted index ("FWI") of average hourly earnings in its inflation factor formulas for jurisdictional energy distributors.

RESPONSE (B) – PREPARED BY CLEASPRING:

Confirmed.

QUESTIONS (C)

c) Did the AWE or the FWI yield more plausible estimates of wage rate inflation in Ontario and Canada during the recent recession and recovery?

RESPONSE (C)– PREPARED BY CLEASPRING:

The Alberta Utilities Commission (AUC), in the context of that generic proceeding, determined that the FWI was the better index to use within the inflation factor calculation for PBR3.

QUESTIONS (D)

d) Is the methodology for the US Employment Cost Index (ECI) used in Clearspring's study more similar to the Ontario FWI for average hourly earnings or the AWE that Clearspring used?

RESPONSE (D)– PREPARED BY CLEASPRING:

The FWI appears not to be influenced by occupational and hours worked changes. It is Clearspring's understanding this better aligns with how the U.S. ECIs are calculated.

QUESTIONS (E)

e) Did Clearspring use forecasted values of AWE in its benchmarking in some years (other than 2023) where actual values are now available? Is this a problem with other variables in its cost benchmarking study as well? If so, which?

RESPONSE (E)– PREPARED BY CLEASPRING:

Clearspring would not characterize this as a problem. Rather, as time elapses it is possible to update values in the model. As new data becomes available, all of the time variant variables can be updated.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-62

References: Ref 1: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 30-31

Ref 2: Exhibit 1B, Tab 2, Schedule 1

Preamble:

Clearspring provides benchmarking values for SAIFI, SAIDI and CAIDI.

QUESTIONS (A)

a. Why is there the expectation that the SAIDI benchmark value increase with time? What is the physical justification for this versus theoretical modelling? Please provide empirical quantitative evidence and not qualitative correlation explanation.

RESPONSE (A) – PREPARED BY CLEASPRING:

This stems primarily from the CAIDI benchmark increasing due to the congested urban variable increasing for Toronto Hydro over time. As congestion increases, the time required to respond increases. The empirical quantitative evidence is the highly statistically significant congested urban variable present in the CAIDI model.

QUESTIONS (B)

b) How does the proposed benchmark and forecasted SAIFI, CAIDI and SAIDI values differ in consideration of Toronto Hydro's proposed IRM as compared to the IRM scenario in Reference 2?

RESPONSE (B)– PREPARED BY CLEASPRING:

Reference 2: IRM Scenario

Table 1 Year-by-Year Reliability Benchmarks vs. Actual

Year	SAIFI (Actual)	SAIFI (Benchmark)	SAIFI (% Difference)	CAIDI (Actual)	CAIDI (Benchmark)	CAIDI (% Difference)
2005	0.93	0.46	70.2%	76.59	110.00	-36.2%
2006	1.11	0.46	88.1%	64.98	110.73	-53.3%
2007	1.14	0.47	89.7%	69.12	111.59	-47.9%
2008	1.08	0.46	85.0%	67.40	112.68	-51.4%
2009	0.95	0.46	72.8%	84.13	113.75	-30.2%
2010	0.98	0.46	75.5%	77.30	115.32	-40.0%
2011	1.05	0.45	83.9%	80.13	117.26	-38.1%
2012	0.88	0.45	67.4%	68.06	118.66	-55.6%
2013	0.95	0.45	75.8%	70.61	120.35	-53.3%
2014	0.92	0.45	72.6%	63.76	123.09	-65.8%
2015	0.97	0.44	78.4%	64.04	125.48	-67.3%
2016	0.93	0.45	73.3%	59.71	128.08	-76.3%
2017	1.09	0.45	87.4%	53.14	129.25	-88.9%
2018	1.09	0.46	86.8%	53.25	130.44	-89.6%
2019	0.95	0.45	73.9%	50.39	132.46	-96.6%
2020	1.11	0.45	91.2%	50.77	135.21	-98.0%
2021	1.20	0.44	100.3%	48.55	136.49	-103.4%
2022	1.24	0.43	105.0%	45.75	138.95	-111.1%
2020-2022 average	**1.18**	**0.44**	**98.8%**	**48.36**	**136.88**	**-104.1%**
2023	1.28	0.43	108.1%	42.76	141.81	-119.9%
2024	1.20	0.43	101.7%	52.52	144.87	-101.5%
2025	1.19	0.43	100.8%	48.93	148.16	-110.8%
2026	1.20	0.43	101.7%	48.93	151.67	-113.1%
2027	1.20	0.43	101.7%	48.65	155.43	-116.2%
2028	1.21	0.43	102.5%	48.85	159.47	-118.3%
2029	1.22	0.43	103.3%	48.97	163.82	-120.8%
2025-2029 average	**1.20**	**0.43**	**102.0%**	**48.87**	**155.71**	**-115.8%**

Reference 2: IRM Scenario

Table 2 Toronto Hydro's SAIDI Actuals and Benchmarks 2005-2029

Year	SAIDI (Actual)	SAIDI (Benchmark)	SAIDI (% Difference)
2005	71.3	50.7	34.0%
2006	71.9	50.7	34.8%
2007	78.9	51.9	41.8%
2008	72.9	52.1	33.7%
2009	80.2	52.3	42.7%
2010	75.4	52.8	35.5%
2011	84.2	53.2	45.8%
2012	60.2	53.5	11.8%
2013	67.1	53.6	22.4%
2014	58.8	54.9	6.8%
2015	61.9	55.4	11.2%
2016	55.7	57.4	-3.1%
2017	58.1	58.8	-1.1%
2018	57.8	59.7	-3.3%
2019	47.8	60.1	-22.9%
2020	56.3	60.3	-6.9%
2021	58.2	60.1	-3.1%
2022	56.8	60.3	-6.0%
2020-2022 average	**57.1**	**60.2**	**-5.3%**
2023	54.8	61.5	-11.7%
2024	62.9	62.9	0.0%
2025	58.1	64.3	-10.1%
2026	58.5	65.9	-11.9%
2027	58.6	67.5	-14.1%
2028	59.3	69.2	-15.5%
2029	59.8	71.1	-17.3%
2025-2029 average	**58.9**	**67.6**	**-13.8%**

Updated Investment Plan

Table 3 Year-by-Year Reliability Benchmarks vs. Actual

Year	SAIFI (Actual)	SAIFI (Benchmark)	SAIFI (% Difference)	CAIDI (Actual)	CAIDI (Benchmark)	CAIDI (% Difference)
2005	0.93	0.46	70.2%	76.59	110.00	-36.2%
2006	1.11	0.46	88.1%	64.98	110.73	-53.3%
2007	1.14	0.47	89.7%	69.12	111.59	-47.9%
2008	1.08	0.46	85.0%	67.40	112.68	-51.4%
2009	0.95	0.46	72.8%	84.13	113.75	-30.2%
2010	0.98	0.46	75.5%	77.30	115.32	-40.0%
2011	1.05	0.45	83.9%	80.13	117.26	-38.1%
2012	0.88	0.45	67.4%	68.06	118.66	-55.6%
2013	0.95	0.45	75.8%	70.61	120.35	-53.3%
2014	0.92	0.45	72.6%	63.76	123.09	-65.8%
2015	0.97	0.44	78.4%	64.04	125.48	-67.3%
2016	0.93	0.45	73.3%	59.71	128.08	-76.3%
2017	1.09	0.45	87.4%	53.14	129.25	-88.9%
2018	1.09	0.46	86.8%	53.25	130.44	-89.6%
2019	0.95	0.45	73.9%	50.39	132.46	-96.6%
2020	1.11	0.45	91.2%	50.77	135.21	-98.0%
2021	1.20	0.44	100.3%	48.55	136.49	-103.4%
2022	1.24	0.43	105.0%	45.75	138.95	-111.1%
2020-2022 average	**1.18**	**0.44**	**98.8%**	**48.36**	**136.88**	**-104.1%**
2023	1.28	0.43	108.1%	42.76	141.81	-119.9%
2024	1.20	0.43	101.7%	52.52	144.87	-101.5%
2025	1.19	0.43	100.8%	51.86	148.16	-105.0%
2026	1.18	0.43	100.0%	51.68	151.67	-107.7%
2027	1.16	0.43	98.3%	51.52	155.43	-110.4%
2028	1.16	0.43	98.3%	51.82	159.47	-112.4%
2029	1.16	0.43	98.2%	51.81	163.82	-115.1%
2025-2029 average	**1.17**	**0.43**	**99.1%**	**51.74**	**155.71**	**-110.1%**

Updated Investment Plan

Table 4 Toronto Hydro's SAIDI Actuals and Benchmarks 2005-2029

Year	SAIDI (Actual)	SAIDI (Benchmark)	SAIDI (% Difference)
2005	71.3	50.7	34.0%
2006	71.9	50.7	34.8%
2007	78.9	51.9	41.8%
2008	72.9	52.1	33.7%
2009	80.2	52.3	42.7%
2010	75.4	52.8	35.5%
2011	84.2	53.2	45.8%
2012	60.2	53.5	11.8%
2013	67.1	53.6	22.4%
2014	58.8	54.9	6.8%
2015	61.9	55.4	11.2%
2016	55.7	57.4	-3.1%
2017	58.1	58.8	-1.1%
2018	57.8	59.7	-3.3%
2019	47.8	60.1	-22.9%
2020	56.3	60.3	-6.9%
2021	58.2	60.1	-3.1%
2022	56.8	60.3	-6.0%
2020-2022 average	**57.1**	**60.2**	**-5.3%**
2023	54.8	61.5	-11.7%
2024	62.9	62.9	0.0%
2025	61.8	64.3	-3.9%
2026	60.9	65.9	-7.8%
2027	59.9	67.5	-12.0%
2028	60.0	69.2	-14.4%
2029	60.0	71.1	-17.0%
2025-2029 average	**60.5**	**67.6**	**-11.0%**

SUPPLEMENTAL RESPONSE – PREPARED BY TORONTO HYDRO:

Regarding the Updated Investment Plan tables provided above, please see Toronto Hydro's response to 2B-SEC-42, part (c).

Regarding the IRM Scenario tables provided above, Toronto Hydro notes that a substantial deterioration in unplanned outages under the IRM scenario is offset by a material improvement in Scheduled Outages in the projection methodology. This large swing results from the application of Toronto Hydro's limited approach to projecting Scheduled Outages. As discussed in Exhibit 2B, Section E2, pages 16-19, Toronto Hydro's recent and ongoing implementation of more advanced network management and utility analytics capabilities has led to the capture of more detailed and accurate outage information, with the most significant impacts being on the Scheduled Outage cause code. These impacts began in 2022, and for this reason, Toronto Hydro is not able to rely on a multi-year statistical approach to forecast Scheduled Outages. The best-efforts approach that Toronto Hydro applied in order to provide a Scheduled Outages projection for Clearspring's benchmarking study was to take the actual SAIDI and SAIFI impacts from Scheduled Outages in 2022, and relate those impacts to the dollars invested in the subset of programs that overwhelmingly drive Scheduled Outages. The utility then applied this simple ratio to the magnitude of future planned spending. In reality, the utility expects that the ratio of Scheduled Outage impacts to spending will vary materially from year-to-year depending on the mix of project work executed. The application of such a limited and linear approach for Scheduled Outages to an expenditure reduction of the magnitude contemplated in the IRM scenario is of limited value. A reduction in spending of this magnitude would result in a fundamentally different operational reality than the one captured by Toronto Hydro's historical reliability performance.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-63

Reference: Exhibit 1B, Tab 3, Schedule 3, Page 33

Preamble**:**

Toronto Hydro states that increase in costs occurred in 2019 and 2020 due to switching from bi-monthly billing to monthly billing.

QUESTION (A):

Provide detailed explanation of increase in Billing O&M cost from 2018 to 2022 of more than double 2018 customer billing costs.

Explain how productivity and economies of scale was not achieved with the adjustment of billing period?

RESPONSE (A):

The Billing O&M costs provided in Table 10 do not provide a consistent representation of Toronto Hydro's unit cost per customer over the 2018-2022 period. The key contributing factors are: 1) the introduction of monthly billing costs into the calculation; and 2) enhanced mapping precision between the Ontario Energy Board USoA accounts 5315 and 5320 following the utility's conversion from the its legacy accounting system, Ellipse, to its current accounting system, SAP, in 2019.

As shown in Table 1, when USoA accounts 5315 and 5320 are combined from 2018 to 2022, Toronto Hydro's costs are accurately represented, including the impact of monthly billing starting in 2020. Other variances are explained throughout Exhibit 4, Tab 2, Schedule 14.

Table 1: Combined USoA Accounts – 2018 to 2022

Accounts ($ million)	2018 Actual	2019 Actual	2020 Actual	2021 Actual	2022 Actual
Combined USoA accounts 5315 and 5320	23.3	22.2	26.4	25.1	28.5

As shown above, costs are relatively flat during the period of 2018 to 2022, when normalized for the inclusion of $4.8 million in incremental costs for the conversion from bi-monthly billing to monthly billing in 2020. A detailed discussion of the impact on costs related to the mandatory transition to monthly billing can be found in Toronto Hydro's 2020-2024 CIR rate application.[1]

The vast majority of costs associated with billing customers monthly are not subject to economies of scale benefits. For example, postage, paper and printing, and payment processing costs, which combined make up 64% of the incremental operational costs, are directly related to the number of bills sent.

To minimize the incremental labour costs, Toronto Hydro undertook a number of initiatives, including automation, process improvements, outsourcing and campaigns to drive ebill adoption. An example was the replacement of "gatekeeper systems" which gather and transmit data from meters to Toronto Hydro's billing system, which resulted in more timely and accurate data being gathered automatically and reduced the labour (and associated costs) required to manually collect and estimate hard to read meters. Along with the higher transactional volumes, labour economies of scale were further improved through these initiatives, such that the FTE per 100,000 bills issued reduced from approximately 4.5 FTEs in 2015 to 3.0 FTEs in 2020.

[1] EB-2018-0165, Exhibit 9, Tab 1, Schedule 1, Page 20 to 31

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-64

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 36-37

Preamble:

The service price approach that Clearspring uses to calculate capital costs, prices, and quantities depends on asset price indexes such as Handy Whitman construction cost indexes. It also depends on the assumed rate of decay.

QUESTIONS (A)

a) Please explain the rationale for escalating post-2021 asset prices in Ontario by a 50/50 average of Conference Board projections of growth in the Ontario AWE and the gross domestic product implicit price index ("GDP-IPI"). Why wasn't the Conference Board of Canada's forecast of the Implicit Price Deflator, Business gross fixed capital formation, Non-residential structures for either Ontario or Canada used? Did Clearspring consider incorporating forecasts of Handy Whitman indexes that are available from S&P Global? What other indexes for asset price forecasts were considered if any?

RESPONSE (A)– PREPARED BY CLEASPRING:

In an effort to manage the extent of methodological differences and build upon rather than depart from the foundation laid in the Hydro One Joint Report, Clearspring only considered using the same 50/50 average projections used in the Hydro One distribution total cost benchmarking research by both Clearspring and PEG.

QUESTIONS (B)

b) The assumed 4.59% rate of decay was taken from the TCB benchmarking work in 4th GIR and it applied to all Ontario distributors. Did Clearspring consider other decay rates that

might be more appropriate for Toronto Hydro and US distributors? If so, what were they and how did the results differ with an alternative specification?

RESPONSE (B) – PREPARED BY CLEASPRING:

No, Clearspring only considered using the 4.59% rate of decay number. Clearspring and PEG both agreed to and used the 4.59% rate of decay in the 4th GIR research and in all subsequent electric distribution cost benchmarking studies by both consultants within Ontario. Concern regarding the appropriateness of this assumption has not been raised by PEG, or any intervenors, to Clearspring's knowledge in any of the prior CIR applications containing econometric total cost benchmarking research.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-65

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page 34

Preamble:

The price of materials and services is an important cost driver for many utilities in an age when a sizable share of utility OM&A expenses often takes the form of outsourced services. PEG notes the use of a propriety macroeconomic price index such as the GDP-PI as a stand-alone proxy for trends in the prices of materials and services that utilities use.

QUESTION (A):

a) For a selected year in the 2020 to 2022, please provide a break-down of all components of the OM&A expenses, explicitly showing and defining the OM&A expenses of Toronto Hydro exclusive of salary and wage and pension and benefit OM&A that take the form of outsourced services. If not unduly burdensome, please also provide an estimate for additional prior years of the sample period and years in the 2025 to 2029 forecast period.

RESPONSE (A):

Table 1 below shows OM&A costs that take the form of outsourced services for 2020 to 2023 actuals, to 2024 Bridge and 2025 to 2029 forecast period.

Table 1: 2020-2029 Outsourced OM&A Costs ($ Millions)

Actual				Bridge	Forecast				
2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
118.7	134.9	139.2	146.0	151.0	159.2	162.7	164.7	169.5	173.7

QUESTION (B) :

b) What are Toronto Hydro's four biggest uses of outsourced services?

RESPONSE (B):

Toronto Hydro's four biggest uses of outsourced services in 2023 were: distribution system maintenance, information technology support, customer care operations, and facilities management.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-66

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 18

Preamble:

Clearspring's distribution cost model also includes a scope of electric services provided variable.

QUESTIONS (A)

a) Did Clearspring consider any alternative specifications for this scope variable? If so, what were the results?

RESPONSE (A)– PREPARED BY CLEASPRING:

In the recent Hydro One Joint Report, PEG suggested and discussed the merits of the OM&A-based scope variable that measures the ratio of distribution to distribution, transmission, and generation activities. We investigated and were persuaded by PEG that the new scope variable is preferable to the plant-based variable we initially used in the Hydro One research. We therefore agreed, in the Joint Report, to use the scope variable put forward by PEG. Given that we had already investigated the merits and agreed that this was the best approach to the variable, we did not consider for inclusion any other scope variable.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-67

Reference: Exhibit 1B , Tab 3, Schedule 3, Appendix A, Page. 18

Preamble:

Mr. Fenrick's new model adds two substation variables that he has not used in prior power distributor cost benchmarking studies he has submitted in OEB proceedings. However, he previously used a substation variable in a transmission cost benchmarking model he prepared for a Hydro One proceeding (EB-2021-0110).

QUESTIONS (A)

a) Please confirm whether the US substation data used in this study reflect the corrections to the double-counting issue PEG identified in Clearspring's transmission substation variable during the Hydro One proceeding (see EB-2021-0110 Exhibit M Appendix B.2)?

RESPONSE (A)– PREPARED BY CLEASPRING:

Yes, that was Clearspring's intention. With the understanding that there are hundreds of thousands of addresses to filter and not all of them are labeled consistently from company to company, year to year, or even within a year. In the case that Clearspring missed some of the distribution substations and double-counted them, this would likely have the impact of disadvantaging Toronto Hydro's benchmark score.

QUESTIONS (B)

b) Please describe how stations were identified in cases in which either no T or D identifier was available or a station was not exclusively designated as distribution.

RESPONSE (B)– PREPARED BY CLEASPRING:

If the station did not have a clear identifier as being either T or D or if it was designated as both or had no designation, we included the station as unknown. We then divided that station as half being T and the other half D.

QUESTIONS (C)

c) Please explain the rationale for the ".5" multipliers in the formulas for "nsub", "mva" and "ntrans". Was this to divide stations designated as T&D?

RESPONSE (C)– PREPARED BY CLEASPRING:

Yes, plus dividing unknown stations between T and D.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-68

References: Ref 1: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 40
Ref. 2: ACIL Allen, "Opex Partial Productivity Study 2022" report to Australian Gas Networks (Victoria and Albury), Multinet and Ausnet, June 16, 2022

Preamble:

PEG believes that discussions in ratemaking proceedings of the properties of alternative econometric estimators should be theoretically correct even if the use of a particular imperfect estimator in research is reasonable.

Mr. Fenrick states in Reference 1 that "Two common issues arise in multivariate regression using real world data: heteroscedasticity and autocorrelation. Neither of these issues causes the coefficient values to be biased or less precise."

QUESTIONS (A)

a) Please confirm that, in statistical theory, heteroskedasticity and autocorrelation cause ordinary least squares ("OLS") coefficient estimates to be less precise than the appropriate generalized least squares ("GLS") estimator.

RESPONSE (A)– PREPARED BY CLEASPRING:

Clearspring cannot confirm this. Autocorrelation and heteroskedasticity causes the standard error estimates to be less precise, but not the coefficient estimates themselves. Autocorrelation and heteroskedasticity, along with cross-sectional correlation will distort the standard errors of the parameter estimate, even though the parameter estimate itself remains unbiased and cannot be improved upon. For this reason, Clearspring conducts the Driscoll-Kraay ("DK") method to correct the standard errors due to autocorrelation, heteroskedasticity, and cross-sectional correlation. The DK method does not influence the parameter estimates (which is what is used to calculate the

benchmark) and only adjusts the standard errors of the variable. The ordinary least square (OLS) parameter estimates are used in the DK approach, and these parameter estimates are not manipulated based on underlying assumptions like they are when using a GLS estimator. The DK approach is the more modern and transparent approach to dealing with autocorrelation, heteroskedacity, and cross-sectional correlation.

We would further add that these older GLS or Feasible GLS (FGLS) methods that are sometimes employed are inappropriate on an unbalanced or balanced dataset where the time periods (T) are fewer than the cross sections (N), which is the case in this benchmarking dataset. Please see p. 4 of the following journal article: https://journals.sagepub.com/doi/pdf/10.1177/1536867X0700700301 where the author states:

> *In an early attempt to account for heteroskedasticity as well as for temporal and spatial dependence in the residuals of time-series cross-section models, Parks (1967) proposes a feasible generalized least-squares (FGLS)–based algorithm that Kmenta (1986) made popular. Unfortunately, however, the Parks–Kmenta method, which is implemented in Stata's xtgls command with option panels(correlated), is typically inappropriate for use with medium- and large-scale microeconometric panels for at least two reasons. First, this method is infeasible if the panel's time dimension, T, is smaller than its cross-sectional dimension, N, which is almost always the case for microeconometric panels. Second, Beck and Katz (1995) show that the Parks–Kmenta method tends to produce unacceptably small standard error estimates.*

In that same section on p. 5 the author states:

> *Therefore, Driscoll and Kraay's approach eliminates the deficiencies of other large-T–consistent covariance matrix estimators such as the Parks–Kmenta and the PCSE approach, which typically become inappropriate when the cross-sectional dimension N of a microeconometric panel gets large.*

QUESTIONS (B)

b) Please confirm that, in the Reference 2 study by an Australian utility consultant, benchmarking results using a feasible GLS estimator are preferred to results using OLS.

RESPONSE (B)– PREPARED BY CLEASPRING:

Yes, the Australian consultant compared OLS with FGLS, and preferred FGLS although did not mention the newer DK method. The report stated that when hetereoskedacity and autocorrelation are present OLS is inefficient, although it remains unbiased (p. 12). The report continues on page 12 to say that in the context of this type of research the interval estimation and hypothesis testing can no longer be trusted from OLS.

Clearspring fully agrees with these statements, which is why we use the DK method which does not insert potential bias into the coefficient estimates themselves (which enter the calculation of the benchmarks) like FGLS, rather the DK corrects the variance-covariance matrix in calculating improved standard errors (which only are relevant in this context for including or excluding explanatory variables based on statistical confidence testing, that is to say interval and hypothesis testing).

QUESTIONS (C)

c) The ACIL Allen report also favors stochastic frontier benchmarking over econometric benchmarking with OLS. What is Clearspring's view?

RESPONSE (C)– PREPARED BY CLEASPRING:

As stated earlier, the report did not evaluate econometric benchmarking using DK corrected standard errors. The ACIL Allen report seemed to favor stochastic frontier analysis (SFA) and econometric benchmarking with FGLS over OLS but, again, did not evaluate the DK method as Clearspring used in our research. Using and evaluating OLS only seems to indicate to Clearspring that the consultant might not be fully aware of the newer DK method and how it corrects the

standard errors and fixes the problems of hypothesis and interval testing that they cite as the shortcoming for the OLS method.

Regarding SFA generally to econometric benchmarking, in our view, SFA still requires sophisticated modeling but then additionally requires a highly questionable exercise in trying to separate out the error term into the components of random noise and inefficiency. Trying to estimate the frontier of the production curve would be fraught with inaccuracy and assumptions that, to Clearspring, would be unhelpful and lead to far more methodological disagreements and misleading conclusions. Better to compare firms, in our view, to the model expectations estimated by a well-specified econometric model which are centered around the mean to compare and contrast utility performance. This makes results less dependent on a fewer number of firms near the frontier because it is established off of the mean of the data rather than the frontier of that data. As even this report states on page 14,

> *"Because of the error term into two separate components, estimation of SFA cost models are more computationally demanding than conventional econometric methods. Moreover, separating random and inefficiency components of the error term requires a large number of data points."*

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-69

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 40

Preamble:

On page 40, Clearspring says "Under the assumptions of the model, this coefficient value (obtained from the OLS estimation procedure that Clearspring uses) is considered an unbiased estimator of the relationship."

The finite sample properties of time series data in OLS require strict exogeneity.[1] This is a strong assumption and if it fails, model parameters estimated with OLS are not unbiased. This strict exogeneity assumption is unlikely to be met in this model due to use of proxy variables, the likely presence of measurement error, and known omitted relevant variables such as system age.

Rather than claiming unbiased parameters, it may be more appropriate to claim consistency of the OLS parameter estimates. This assumption only requires contemporaneous exogeneity[2], which is more plausible for these data and models. PEG believes that the type of retrospective, observational time series data needed for distributor benchmarking will only ever meet claims of consistency, which can be appropriate and sufficient.

To further clarify, PEG is not implying Clearspring's choice of model estimation method is incorrect or inappropriate; rather PEG believes Clearspring's specific claim of unbiased parameters is incorrect. Importantly, as a result of the conclusions above, PEG believes that other estimation

[1] This means that the error term (which by definition must contain all measurement error in the variables, all omitted variables, and any sample bias) is uncorrelated with all explanatory variables in every time period, past and future.
[2] For contemporary exogeneity, the only necessary claim is that the error term is uncorrelated with the variables in the same time period (with no claims about past or future correlation required).

methods such as Feasible Generalized Least Squares may also meet claims for consistency in the estimated model parameters and can be an appropriate choice for distributor benchmarking.

QUESTIONS (A)

a) Please confirm whether Clearspring agrees with this assessment of the requirements of the sample properties for the unbiasedness of OLS parameters, as stated in the Preamble.

RESPONSE (A)– PREPARED BY CLEASPRING:

Clearspring's view is that, as PEG implies, both OLS and FGLS would not meet this definition of strict exogeneity from a technical perspective. However, as the preamble alludes to, this is an extremely technical position that should not impact the choice of estimators or put into question the value of econometric benchmarking. In normal parlance of practioners of applied econonmetrics, it is common to state that OLS is an unbiased estimator. We would point to interrogatory 1B-Staff-68 where the question referenced a report from an Australian consultant. That report also claimed that OLS remained unbiased even in the presence of autocorrelation and heterskedacity.

QUESTIONS (B)

b) Does Clearspring believe its model meets the definition of strict exogeneity?

RESPONSE (B)– PREPARED BY CLEASPRING:

Strictly speaking, no, but this is not be a concern as it is well-established that the estimator is an appropriate and proper method to use. We would suggest that no econometric benchmarking model put forth in any jurisdiction has met this strict definition.

QUESTIONS (C)

c) If yes, please provide Clearspring's theory and data to support this answer.

RESPONSE (C)– PREPARED BY CLEASPRING:

Please see response to part (b).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-70

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 22

Preamble:

Clearspring states that "The first order terms of all variables have the theoretically expected signs and are statistically significant at a 90% level of confidence, except for the distribution substation variable which is significant at an 85% confidence level. In fact, all the other first order explanatory variables are statistically significant at a 99% confidence level. The adjusted R-Squared of the model equals a robust 0.977."

QUESTIONS (A)

a) Please confirm that the use of panel data is known to result in artificially high R-Squared values.

RESPONSE (A)– PREPARED BY CLEASPRING:

Confirmed, however, the explanatory of the model is quite strong regardless of the exact R-Squared value and the variables themselves display extremely high statistical significance.

QUESTIONS (B)

b) Please confirm that in the portion of the report quoted above, Clearspring meant to say the distribution substation capacity variable is significant at an 85% confidence level.

RESPONSE (B) – PREPARED BY CLEASPRING:

Confirmed.

QUESTIONS (C)

c) Given the lower significance of the substation capacity variable, please explain Clearspring's decision to include it.

RESPONSE (C)– PREPARED BY CLEASPRING:

As we stated in footnote 17 of the Clearspring benchmarking report, the distribution substation capacity fell below our typical 90% confidence level and came in at an 85% level. Since the variable is on the borderline of statistical significance and the theoretical basis for the variable impacting costs is straightforward, we believed it would be helpful to intervenors to see the model with the variable. As stated in the footnote, the results are not significantly impacted by the inclusion of the variable.

QUESTIONS (D)

d) Did Clearspring test any alternative forms of this variable (e.g., MVA per substation)?

RESPONSE (D)– PREPARED BY CLEASPRING:

No.

QUESTIONS (E)

e) Were other variables considered in the modelling that had parameter estimates with significance in the 75% to 90% range but were excluded from the model? If so, what were they?

RESPONSE (E)– PREPARED BY CLEASPRING:

No. Clearspring focused efforts on continuing the model specification that stemmed from the Hydro One Joint Clearspring/PEG Report and exploring if we could add to it by including the substation variables and the time variant urban variable.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-71

References: Ref 1: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 18

Ref 2: EIA 861: https://www.eia.gov/electricity/data/eia861/

Preamble:

Clearspring states that

"The percentage of smart meters variable measures the percentage of customers that have an installed smart meter. Smart meters enable hourly or sub-hourly interval use data to be collected from the meter. While installing more capable meters and the necessary infrastructure is expected to increase distribution costs, these meters enable time-of-use ("TOU") electricity rates that can create efficiencies mainly in the realm of power supply."

QUESTIONS (A)

a) Does Clearspring's definition of smart meters exclude meters that only permit automated meter reading?

RESPONSE (A)– PREPARED BY CLEASPRING: Yes, the smart meter data only includes those meters designated as Advanced Metering Infrastructure (AMI) on the EIA-861 form and does not include those meters designated as Automated Meter Reading (AMR).

QUESTIONS (B)

b) Please confirm that Clearspring relied solely on Form EIA-861 for smart meter data beginning in 2007. If confirmed, please explain why the number of AMI meters for Arizona Public Service in 2007 in the Clearspring working papers is nearly double that reported in the EIA-861 in that year. If not confirmed, please identify your data source.

RESPONSE (B)– PREPARED BY CLEASPRING:

Clearspring did rely solely on the Form EIA-861 for the smart meter data beginning in 2007. Regarding the cited example of Arizona Public Service, we agree that the number in the Clearspring dataset is nearly double (290,769 AMI meters) than what the EIA-861 form reports (154,300 AMI meters). Given that much of this data was processed several years ago, we are unsure regarding why the discrepency is present. In responding to this interrogatory, Clearspring examined the 2007 AMI data. In addition to the APS example, we also noticed that Pacific Gas and Electric (PG&E) was given a zero value in 2007 when the EIA-861 reports 136,469. All other 2007 observations appeared correct. To assure these two data errors did not meaningfully influence the model or results, we modified the AMI data and variable for APS and PG&E. Regarding APS, we also needed to change the 2008 value because due to the 2007 data error we previously extrapolated 2008 data so that AMI meters in 2008 would not decline from the wrong 2007 value. Given the correction, this extapolation is no longer necessary and we removed it. The APS percent AMI value in 2007 shifted from 26.766% to 14.204%, the APS value in 2008 shifted from 29.350% to 17.424%, and the 2007 PG&E value shifted from 0.000% to 2.629%.

After making those three changes, we re-ran the total cost benchmarking model and there were very minimal changes to the parameter estimates and the Toronto Hydro result of -22.9% in the CIR period of 2025 to 2029 was unchanged.

QUESTIONS (C)

c) What data source did Clearspring use to get values for the percentage of smart meters variable for years prior to 2007?

RESPONSE (C)– PREPARED BY CLEASPRING:

Clearspring did not gather AMI data for years prior to 2007 with the exception of PPL. PPL had, by far, the largest AMI deployment in the dataset by 2007. PEG had raised this to our attention in a prior application and we inserted estimates for years prior to 2007 based on PEG's information. Given the lack of AMI deployment from the rest of the dataset, we have not deemed it necessary to gather AMI data prior to 2007 and have assumed values of 0 for those years, except for PPL. To

illustrate why gathering the data is unnecessary prior to 2007 note that the modeling dataset has 75 U.S. utilities in 2007. Out of those 75, 66 of the utilities had zero AMI meters in 2007. Seven had deployments of less than 1% of their system (six of those seven with deployments of less than 0.3%). For the remaining two utilities (APS and PPL), the dataset does include estimates for PPL for prior years. APS deployment numbers are still relatively low in 2007 at 14.204% and while it is possible they had some AMI meters deployed prior to 2007, we have already tested the model sensitivity to a change in the APS number and we are confident that the model and the results would not be impacted in a meaningful way.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-72

Refrences : Ref 1: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 17

Ref 2:

https://www.eia.gov/naturalgas/ngqs/#?year1=1997&year2=2022&company=Name

Preamble:

Clearspring states that "The percentage of electric customers measures the percentage of electric customers served by a utility out of total gas and electric customers. This variable measures the economies of scope available from serving both electric and gas customers."

The query system at Ref 2 shows that Dominion Energy South Carolina had natural gas volumes for residential, commercial, and industrial customers for the 1997-2022 period.

QUESTIONS (A)

a) Please confirm that beginning in 2019, South Carolina Electric & Gas began filing FERC Form 1s as Dominion Energy South Carolina Inc.

RESPONSE (A)– PREPARED BY CLEASPRING:

Confirmed.

QUESTIONS (B)

b) Please explain why Dominion Energy South Carolina (f/k/a South Carolina Electric and Gas) has a percent electric value of 100% in all years.

RESPONSE (B)– PREPARED BY CLEASPRING:

Likely due to the name change, Clearspring did not account for the gas customers in the variable. After making this correction, the model is essentially the same with minor changes and Toronto Hydro's CIR 2025 to 2029 results slightly improve to -23.8%.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-73

References: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Pages 25-29

Exhibit 2B, Section C, Page 4

Preamble:

On page 25 of Ref. 1, Clearspring states

"Several jurisdictions, including Ontario in recent years, exclude extraordinary events from reliability statistics, with the goal of reducing year over year volatility due primarily to extreme weather. If a day is excluded, it is denoted as a major event day ("MED"). The bulk of MEDs stem from major storms. These severe storms vary in number and intensity from year to year."

On p. 4 of Ref. 2, Toronto Hydro presents System Level SAIFI reported in several ways: total SAIFI, SAIFI excluding Loss of Supply ("LOS"), SAIFI Excluding Major Event Days ("MEDs"), SAIFI excluding MEDs and LOS, and SAIFI Excluding MEDs, LOS, and Scheduled Outages.

QUESTION (A):

a) Please confirm that the Toronto Hydro reliability data are for five minute sustained outages, exclude loss of supply outages, and exclude outages for Major Event Days based on the IEEE 2.5 beta methodology. If not confirmed, please explain. Were planned outages also excluded? Are any other characteristics of the outage definition notable?

RESPONSE (A):

Toronto Hydro provided reliability data as requested by Clearspring. This included SAIDI and SAIFI annual reliability data (historical and forecasts), excluding Major Event Days (consistent with IEEE-1366 Standard Beta Method), under a five-minute interruption basis. Loss of Supply and Scheduled Outages interruptions were included.

RESPONSE (A) PROVIDED BY CLEASPRING:

The reliability data are for five minute sustained outages, include loss of supply outages and exclude Major Event Day outages based on the IEEE 2.5 beta methodology.

Planned outages are included in the indexes to align with the U.S. dataset. No other characteristics are notable as we defined the data for Toronto Hydro consistent with the dataset definitions.

QUESTION (B):

b) What versions of SAIFI and CAIDI were used in Clearspring's research for the sampled US utilities (e.g., did the data include or exclude loss of supply or transmission outages, were planned outages included or excluded)?

RESPONSE (B) PROVIDED BY CLEASPRING:

The reliability indexes in the U.S. dataset includes loss of supply and planned outages.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-74

Ref 1: Exhibit 1B / Tab 3 / Schedule 3 / Attachment A/ pp. 25-28

Preamble:

PEG is seeking to better understand the sample and data Clearspring used in its reliability benchmarking models.

QUESTION (A):

a) Please provide the location of the calculations in the working papers that show how Clearspring combined reliability data for US utilities that serve multiple states into a single value for each year. If this information is not included in the working papers, please provide these.

RESPONSE (A) PROVIDED BY CLEASPRING:

Please see the included Excel spreadsheet file named 1B-Staff-74 Excel File, being provided on a confidential basis.

QUESTION (B):

b) Please confirm that the database takes the form of an unbalanced panel. Please provide the rationales for excluding some observations of each utility that contributed data for the model.

RESPONSE (B) PROVIDED BY CLEASPRING:

Confirmed. Observations were excluded in the reliability dataset when they were excluded in the total cost dataset, based on the exclude variable. Additional observations were excluded due to missing or implausible reliability data values.

QUESTION (C):

c) Please explain why the data for some US utilities were excluded from the reliability sample entirely.

RESPONSE (C) PROVIDED BY CLEASPRING:

Observations in the reliability dataset are only excluded due to the total cost exclude variable or due to missing or implausible reliability data observations.

QUESTION (D):

d) What is the source for Toronto Hydro's forecasted SAIDI, SAIFI, and CAIDI? What assumptions underlie these forecasted values?

RESPONSE (D):

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-42 for a description of Toronto Hydro's reliability projection model. The results produced from this model are aligned with IEEE 1366 definitions. To align with US reliability reporting standards, sustained interruptions lasting longer than five minutes in duration were considered for the purpose of the Reliability Benchmarking Study. CAIDI projections were derived from the SAIDI and SAIFI projections (i.e., CAIDI = SAIDI / SAIFI).

For the reliability projections provided to Clearspring, Toronto Hydro included projections of Loss of Supply and Scheduled Outage events. Toronto Hydro's approach for Loss of Supply was to set the projections for SAIDI and SAIFI equal to the most recent five-year average. For Scheduled Outages, the utility calculated the ratio of for each of 2022 actual SAIFI and SAIDI for the Scheduled Outages cause code over the capital spending in 2022 for the programs most responsible for scheduled outages, and applied that ratio to future planned spending. Please refer to 1B-Staff-62, part (b) for additional information on Scheduled Outages.

QUESTION (E):

e) If now available, please provide the 2023 actual SAIDI, SAIFI, and CAIDI values for Toronto Hydro.

RESPONSE (E):

Please see below for Toronto Hydro's 2023 SAIDI, SAIFI, and CAIDI values, based on a 5-minute threshold for sustained outages consistent with the Reliability Benchmarking Study (Exhibit 1B, Tab 3, Schedule 3, Appendix A). For more information, see response to 1B-Staff-73.

Table 1 – Actual SAIDI, SAIFI and CAIDI values for 2023

Metric	2023 Result
SAIDI (A)	51.55 Minutes
SAIFI (B)	1.12
CAIDI (A/B)	45.83 Minutes

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-75

References: Ref 1: Exhibit 1B, Tab 3, Schedule 3, Attachment A, Page. 25-28

Ref 2: EB-2019-0261, Exhibit 1, Tab 1, Schedule 12, Attachment A, Page. 28-29

Preamble:

On pages 27-28 Clearspring stated

"Clearspring did not change the variables for either the SAIFI or CAIDI models that were included in the prior Toronto Hydro research, except to take out the percentage AMI variable in the CAIDI model because it was not statistically significant. The procedure for estimating the two reliability models is much the same as the procedure for the cost models, except that different variables are used."

QUESTIONS (A)

a) Please explain why the Clearspring model was not updated when:

i. several years of additional data are available;

ii. Mr. Fenrick subsequently presented different reliability models in a Hydro Ottawa proceeding;

iii. the literature on reliability modelling has grown; and

vi. it is usually possible to improve a model when revisiting the issue with fresh eyes after several years.

RESPONSE (A)– PREPARED BY CLEASPRING:

Research efforts focused on making refinements and incremental improvements to the total cost benchmarking model. Clearspring did not expend time attempting to improve the reliaiblity model. This decision to use resources elsewhere in the research was due to two reasons. First is the limited focus on the reliability results in past proceedings. The reliability benchmark results, to Clearspring's knowledge, have not been mentioned prominently in prior Board decisions and no

suggestions on improvement ideas have been made. This point was illustrated during the most recent Hydro One custom IR proceeding where Clearspring did not conduct econometric reliablility benchmarking and this did not seem to be an issue. The second reason is that the findings for SAIFI and CAIDI in relation to Toronto Hydro are both large and have been consistent. SAIFI results have consistently been above benchmarks by large amounts, CAIDI results are the opposite. In Clearspring's view, any improvements or model enhancements are very likely to produce that same conclusion. If, for example, SAIFI is found to be 80% or 120% above benchmarks rather than the 99.4% that we reported, to our thinking this will have no impact on the conclusion that Toronto Hydro's SAIFI metrics are considerably higher than benchmarks. The same is true for CAIDI only with the opposite conclusion that the Company's CAIDI is considerably below benchmarks.

QUESTIONS (B)

b) Did Clearspring not consider the variables (e.g., congested urban in the SAIFI model and rural density, percentage of plant underground, and average wind speeds above 20 MPH in the Hydro Ottawa CAIDI model) included in its SAIFI and CAIDI models from the previous Hydro Ottawa proceeding (EB-2019-0261)? If Clearspring did consider these variables, please provide the results and associated working papers.

RESPONSE (B)– PREPARED BY CLEASPRING:

Please see the response to part (a). We did not consider other variables but updated the data and provided the same models as in the prior Toronto Hydro application.

QUESTIONS (C)

c) Please confirm that the 2025-2029 average value in Table 11 for SAIFI (% difference) should be 94.9% rather than 99.4%.

RESPONSE (C) – PREPARED BY CLEASPRING:

The 99.4% number is the correct one. The % SAIFI Difference column needs to be re-calculated. Below is the table after making that calculation.

Year	SAIFI (Actual)	SAIFI (Benchmark)	SAIFI (% Difference)	CAIDI (Actual)	CAIDI (Benchmark)	CAIDI (% Difference)
2005	0.93	0.46	70.2%	76.59	110.00	-36.2%
2006	1.11	0.46	88.1%	64.98	110.73	-53.3%
2007	1.14	0.47	89.7%	69.12	111.59	-47.9%
2008	1.08	0.46	85.0%	67.40	112.68	-51.4%
2009	0.95	0.46	72.8%	84.13	113.75	-30.2%
2010	0.98	0.46	75.5%	77.30	115.32	-40.0%
2011	1.05	0.45	83.9%	80.13	117.26	-38.1%
2012	0.88	0.45	67.4%	68.06	118.66	-55.6%
2013	0.95	0.45	75.8%	70.61	120.35	-53.3%
2014	0.92	0.45	72.6%	63.76	123.09	-65.8%
2015	0.97	0.44	78.4%	64.04	125.48	-67.3%
2016	0.93	0.45	73.3%	59.71	128.08	-76.3%
2017	1.09	0.45	87.7%	53.14	129.25	-88.9%
2018	1.09	0.46	86.3%	53.25	130.44	-89.6%
2019	0.95	0.45	73.7%	50.39	132.46	-96.6%
2020	1.11	0.45	91.1%	50.77	135.21	-98.0%
2021	1.20	0.44	100.2%	48.55	136.49	-103.4%
2022	1.24	0.43	105.1%	45.75	138.95	-111.1%
2020-2022 average	**1.18**	**0.44**	**98.8%**	**48.36**	**136.88**	**-104.1%**
2023	1.28	0.43	108.2%	42.76	141.81	-119.9%
2024	1.19	0.43	100.8%	51.28	144.87	-103.9%
2025	1.19	0.43	100.7%	51.49	148.16	-105.7%
2026	1.18	0.43	99.9%	51.54	151.67	-107.9%
2027	1.17	0.43	99.3%	51.68	155.43	-110.1%
2028	1.17	0.43	98.8%	51.85	159.47	-112.3%
2029	1.16	0.43	98.2%	51.96	163.82	-114.8%
2025-2029 average	**1.17**	**0.43**	**99.4%**	**51.70**	**155.71**	**-110.2%**

QUESTIONS (D)

d) Clearspring's working papers show that it had the data for SAIFI and SAIDI, but had to calculate CAIDI in its code. Why did Clearspring present an econometric model for CAIDI rather than SAIDI?

RESPONSE (D)– PREPARED BY CLEASPRING:

The relationship between the reliability indexes is that SAIDI equals the product of SAIFI and CAIDI. This is similar to why a load forecaster tends to model customers and model use per customer separately and then multiplies the results together to forecast sales. Separating the models based on the frequency of outages and then duration per outage is the best way to model the impacts of frequency and duration, in Clearspring's view. If SAIDI was modeled alone, which can be done, this would be less than optimal because SAIDI includes both components of frequency and duration in its definition. This is the same approach we used in the last Toronto Hydro application.

QUESTIONS (E)

e) Form EIA-861 has data on whether outages are recorded automatically (e.g., yes/no). Did Clearspring consider using these data in its reliability benchmarking results? If so, please provide these models and associated working papers.

RESPONSE (E)– PREPARED BY CLEASPRING:

No.

QUESTIONS (F)

f) Why don't the SAIFI and CAIDI models include trend variables?

RESPONSE (F)– PREPARED BY CLEASPRING:

Trend variables could be considered in the models, however, trend variables in reliability models can be larger than their total cost counterparts. When projecting out-of-sample benchmarks to

2029 this can make the benchmarks volatile. For this reason, Clearspring is generally reluctant to insert trend variables into reliability models.

QUESTIONS (G)

g) Why isn't the IEEE MED Definition variable in the CAIDI model?

RESPONSE (G)– PREPARED BY CLEASPRING:

Please see response to part (a). The results for Toronto Hydro would improve by less than 2% if the IEEE variable were included in the CAIDI model.

QUESTIONS (H)

h) Why is the number of customers included in the CAIDI model when it has a p-value of 0.341?

RESPONSE (H)– PREPARED BY CLEASPRING:

In prior reliability benchmarking work, we have left the customer variable in regardless of the level of statistical significance. This is analogous to treating it as a second order quadratic or interaction term in the total cost model. The same approach is used for SAIFI. This is because SAIFI and CAIDI are the sum of outages or outage duration divided by either total customers or total outages.

The results for Toronto Hydro would change by less than 0.5% (they would get slightly better relative to the CAIDI benchmark) if the number of customers is excluded in the CAIDI model.

QUESTIONS (I)

i) Please provide the adjusted R-squared values for each model. Are these values robust?

RESPONSE (I)– PREPARED BY CLEASPRING:

The adjusted R-squared is 0.417 for the SAIFI model and 0.205 for the CAIDI model. Yes, they are robust in that the models help to explain the variation of reliability outcomes and are able to adjust for certain challenges and characteristics that impact the reliability metrics.

QUESTIONS (J)

j) Does Clearspring have any insights as to why Toronto Hydro is an extreme outlier in both the SAIFI and CAIDI models? Does this speak to the possibility that the models are missing some relevant variables or have other possible errors?

RESPONSE (J)– PREPARED BY CLEASPRING:

Clearspring cannot speak to the engineering or any other underlying causes for these results. In our view, the models are informative and helpful and we would be surprised if other relevant variables or methodological changes had a large directional impact on the results. While we acknowledge that there may other relevant variables that could be included in the model and those may end up being enhancements, we do not believe that Toronto Hydro being an outlier in the two models is itself evidence of any possible errors.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-76

Reference : Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 10

Preamble:

"Both Clearspring and PEG used the Driscoll-Kraay ("DK") method in the Joint Report and Clearspring continues to use the DK method for this study."

PEG would like to clarify that the estimation method is pooled Ordinary Least Squares ("OLS"), which is followed by Driscoll-Kraay corrections to the standard error estimates. While the dataset consists of panel data, pooled OLS treats each company's data for each variable as though it all occurs in one time period. As a result, each coefficient estimate reflects the variable's average effect on distributor cost over the entire 20-year sample period.

QUESTIONS (A)

a) Please confirm the estimation method and standard error adjustment method Clearspring used in its econometric benchmarking.

RESPONSE (A)– PREPARED BY CLEASPRING:

Confirmed. The Driscoll-Kraay (DK) estimation procedure includes estimating parameter estimates using the pooled OLS procedure and then correcting the standard error estimates for autocorrelation, hetereoskedacity, and spatial correlations.

QUESTIONS (B)

b) Please confirm that, other than the sample-wide yearly cost trend coefficient estimate, the individual coefficients produced by the pooled OLS model reflect a time-indifferent average of the variable's effect.

RESPONSE (B)– PREPARED BY CLEASPRING:

Correct. While many of the variables themselves change over time (i.e., are time variant) the estimate of the impact of the variables is indifferent to the year of that variable value. Clearspring is of the view that using this newer DK method that uses pooled OLS for parameter estimation but produces robust standard error estimates in the presence of a autocorrelation, hetereoskedacity, and spatial correlations is the most straight-forward approach. The alternative of Generalized Least Squares requires the researcher to make assumptions on how to modify the underlying data prior to estimation. There is no need for that step and it introduces the possiblity of a bias and incorrect assumption. Far better, in Clearspring's view, to use the DK method which sidesteps those issues.

QUESTIONS (C)

c) If (b) is confirmed, does Clearspring consider this to be a strength or weakness for its model?

RESPONSE (C)– PREPARED BY CLEASPRING:

A strength. Rather than modifying the underlying data prior to estimation, it is a strength of conducting the DK estimation procedure that pooled OLS can be used which requires no assumptions or modifications to the underlying data but still produces robust standard error estimates.

QUESTIONS (D)

d) If (b) is confirmed, does Clearspring have any concerns about the implications of a two-decade sample period?

RESPONSE (D)– PREPARED BY CLEASPRING:

No. Generally the more data the model has access to the better. There has been no pronounced structural shift in the electric distribution industry during this time period that would cause us to

question the 2000 start year. This is the same start year used in the most recent Hydro One distribution benchmarking research conducted by Clearspring.

QUESTIONS (E)

e) Did Clearspring consider or test the model using a shorter sample period? If so, please provide results.

RESPONSE (E)– PREPARED BY CLEASPRING:

No, we did not consider there to be a need to test for different sample periods. We purposed to remain consistent with the Hydro One Joint Report research that Clearspring and PEG put forth. Consistency in the start year from study to study is helpful and starting in 2000 seems an appropriate year to begin the dataset from.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-77

Reference : Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 40

Preamble:

Clearspring says "This is important because it means the researcher does not need to worry about correcting the coefficient values: they are not misleading." Clearspring goes on to claim that the "standard correction procedure" for dealing with serial correlation and heteroskedasticity was to "figure out the nature of each problem" and "strategically [weight] the regression."

QUESTIONS (A)

a) Please confirm that there are numerous standard statistical tests and procedures, available as programmed commands within any modern econometric software program, to identify and rule out the presence of different forms of serial correlation and heteroskedasticity.

RESPONSE (A)– PREPARED BY CLEASPRING:

Confirmed. The older method of FGLS does have programmed commands in standard econometric software programs that allow the researcher to insert their own assumptions on the correlation of the lags. These programmed procedures and inputted assumptions will then modify the underlying data within the statistical program to produce alternative parameter estimates.

QUESTIONS (B)

b) Please confirm that it is proven that researchers can consistently (the same statistical claim which applies to time-series model parameters) estimate the rho-squared - a.k.a. the autocorrelation coefficient - in the model and thus it can be appropriate to use.

RESPONSE (B)– PREPARED BY CLEASPRING:

The autocorrelation coefficient can be estimated after making an assumption that the residuals are only correlated by one lag instead of multiple lags. This assumption then forms the basis to transform the underlying data and, thus, the parameter estimates themselves and the benchmark results. Just because an AR(1) autocorrelation coefficient can be estimated does not mean, however, it is the best estimation method to use. The newer DK method which requires zero assumptions by the researcher and does not impact the underlying data and thus the results, yet still corrects the standard errors (which are the issue in the presence of autocorrelation and hetereoskedacity), should be the preferred approach.

QUESTIONS (C)

c) Please confirm that if specific forms of serial correlation and/or heteroskedasticity are identified, there are programmed systematic procedures which correct for the problem in a clear and reproducible way.

RESPONSE (C)– PREPARED BY CLEASPRING:

Yes, the DK method is the best method for doing that in terms of being both clear and reproducible. It uses pooled OLS which requires no assumptions or modifications of the underlying data and then is able to adjust the standard errors appropriately.

QUESTIONS (D)

d) Please confirm that the systematic procedures for serial correlation and heteroskedasticity do not, in fact, alter the regression estimation procedure, but instead make the appropriate systematic corrections to the data which will then result in different coefficient values.

RESPONSE (D)– PREPARED BY CLEASPRING:

Yes, FGLS is a systematic procedure that does alter the underlying data prior to the estimation procedure after an assumption of how to adjust the data is made by the researcher. It does result

in different coefficient values and that is the problem. There is no reason to alter the coefficient values and introduce possible wrong assumptions into the estimation procedure.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-78

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 23

Preamble:

In previous econometric models of total distribution cost presented on behalf of Toronto Hydro (two studies with different samples in 2014, and one study in 2019), Mr. Fenrick has found the Company to be a superior cost performer in early years followed by a markedly large, steady deterioration in cost performance going forward and through the forecast period. These models all predicted Company performance in the forecast period to be generally in the "average" range. The 2014 model with the US-only sample and the 2019 model produced largely similar results. Clearspring's updated model of distribution cost improves Toronto Hydro's entire series of historic and forecasted cost performance by 13-29% across the board compared to the previous models.

QUESTIONS (A)

a) What in Clearspring's view are the main drivers of this wholesale cost performance shift for Toronto Hydro?

RESPONSE (A)– PREPARED BY CLEASPRING:

The refinements and improvements made to the model and methodology are the main driver. This includes the refinement to the percent urban core variable to enable it to be time variant. This refinement increased the explanatory power of the variable and given that Toronto Hydro has a high value for the variable this will have a large impact on its benchmark score. This is especially true for the forecasted periods where Toronto Hydro's cost challenges are increasing relative to the sample because of the fast-growing nature of the city it serves. The new refinement in the variable is now able to capture the increasing cost challenge Toronto Hydro faces and adjust for future years. Other refinements since the last Toronto Hydro proceeding such as adding the substation variables, subtracting out pension and benefits, moving the capital benchmark year back to 1947,

not including Ontario distributors to allow better cost and variable definitions, new scope variable, updating data for 2017-2021, and the distribution work variable also impact the scores in either direction but to a lesser extent than the refinement and improvement to the percent congested urban variable.

QUESTIONS (B)

b) Are there any material differences in variables or methods between this work and that done earlier not discussed in the current Clearspring report?

RESPONSE (B)– PREPARED BY CLEASPRING:

No, the material differences are referred to in the Clearspring Report. As indicated in the report, Clearspring replicated the methodology found in the Hydro One Joint Clearspring/PEG Report research after the conferral process with PEG. Other than refining the congested urban variable and adding the two substation variables, the variables and methodology is the same as that in the Joint Report.

QUESTIONS (C)

c) Did any other utilities common to the sample have similar shifts?

RESPONSE (C)– PREPARED BY CLEASPRING:

There were a handful of utilities that had similar sized shifts in both directions.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-79

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Pages 11, 35-36

Preamble**:**

When using a service price approach to the calculation of capital costs, calculation begins in a "benchmark" year in which the capital quantity is the ratio of plant value to an average of asset prices in prior years.

QUESTION (A):

a) The computer code shows that various capital benchmark years were used for US distributors. Please explain why.

RESPONSE (A) PREPARED BY CLEASPRING:

Two capital benchmark years for the U.S. distributors are used: 1947 and 1959. Most of the utilities have a capital benchmark year starting in 1947. Seven utilities had missing capital data from 1947 to 1959, in those cases we used a 1959 capital benchmark year.

QUESTION (B):

b) The OEB's Ontario total cost benchmarking work uses pre-2002 Toronto Hydro data in the capital cost calculations whereas the Clearspring study does not. Please discuss why the exclusion of the pre-2002 data leads to more accurate capital stocks than its inclusion. Does Toronto Hydro have actual values for any plant additions data that were estimated in the Ontario total cost benchmarking work? If so, please provide.

RESPONSE (B) PREPARED BY CLEASPRING:

It is Clearspring's understanding that the pre-2002 data used on the OEB total cost benchmarking work is extrapolated and is essentially an unknown assumption regarding when the plant additions

occured and at what level prior to 2002. Clearspring prefers the approach of using the actual data that begins in 2002.

RESPONSE (B) BY TORONTO HYDRO:

Table 1 below presents the gross capital additions for 2000-2001. However, within the amounts presented below, due to the lack of detailed records, Toronto Hydro believes that unregulated gross capital additions and changes in Construction Work in Progress (CWIP) are included, both of which are inconsistent with the cost definitions used by Clearspring in the benchmarking report. Prior to July 1999, the businesses of Toronto Hydro were owned and operated by the Toronto Hydro-Electric Commission, due to which gross capital additions prior to 2000 cannot be provided.

Table 1: 2000-2001 Gross Plant Additions ($M)

	2000	2001
Gross Plant Additions	164.9	131.6

QUESTION (C):

c) Given the general inaccuracy of benchmark year cost calculations and Clearspring's recent benchmark year for Toronto Hydro (2002), should benchmarking results for some of the early years since 2002 be disregarded or downplayed?

RESPONSE (C) PREPARED BY CLEASPRING:

This is a valid point. The earlier year results will contain an unknown influence because of the recent capital benchmark year. This lessens as time increases and actual fixed asset plant additions are added to the capital calculation making it more accurate as more years accumulate from 2002.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-80

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 34

Preamble:

Toronto Hydro states that "To construct the overall OM&A input price we weighted each sub]index using the customized labour and non-labour cost shares calculated from the FERC Form 1 data or based on data provided to us from Toronto Hydro."

QUESTIONS (A)

a) The SST code in the provided working papers has a remark indicating a 70% weight for Toronto Hydro labor in the calculation of the O&M price index whereas the data files and formulas suggest a 40% value was used in the historical period. Please confirm that the 70% labor weight is no longer used in the calculations.

RESPONSE (A)– PREPARED BY CLEASPRING:

The SST code remark is a relic of past projects. Clearspring requested from Toronto Hydro to estimate its OM&A payroll costs as a percentage of OM&A. The Company was able to do this for 2020 to 2029. The 2020 value is 40%, so we used that value for 2020 and prior. The specific year estimates for 2021 to 2029 are used. These can be seen on row 33 in the OM&A Forecast worksheet found in the Excel file titled THESLdata2025 found in the working papers.

QUESTIONS (B)

b) If a 40% share is instead used, what is the basis for this calculation?

RESPONSE (B)– PREPARED BY CLEASPRING:

Please see the response to part (a).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-81

References: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page. 22-23, 38

Preamble:

In order to make econometric projections of Toronto Hydro's proposed cost, Clearspring needed to obtain forecasts of labor OM&A, non-labor OM&A, and asset prices.

Clearspring did not provide a detailed description to address these in its report or in the working papers.

QUESTIONS (A)

a) Please provide full descriptions and Timeseries File IDs for each of the input price forecasts that Clearspring used in its research.

RESPONSE (A)– PREPARED BY CLEASPRING:

Clearspring purchased from the Conference Board of Canada the GDP-IPI with the ID of PGDP and the following description : Implicit Price Deflator - GDP at Market Prices (2012=1.0) and the AWE with the ID of RLAWWIO and the following description : Average Weekly Wages & Salaries Per Employee, Ontario ($, Industrial Composite).

QUESTIONS (B)

b) Please explain why forecasts from January 23, 2023, were used when the report was dated October 31, 2023?

RESPONSE (B)– PREPARED BY CLEASPRING:

Clearspring did not purchase forecasts after the January 23, 2023 date. During this time period is when we conducted the majority of our data collection efforts.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-82

Reference: Exhibit 1B, Tab 3, Schedule 3, Page 38

Preamble:

Toronto Hydro states that the ION meter is more expensive than a typical meter and implies small installed quantities of ION meters can have a material effect on Meters CAPEX unit costs.

QUESTION (A):

a) Why is the ION meter being utilized and has a lower cost alternative been investigated and considered?

RESPONSE (A):

As discussed on page 6 of Exhibit 2B, Section 5.4, ION meters provide benefits such as easier data access for customers, enhanced data analytics granularity, and improved power quality data analysis. Through the ION meter, customers have access to enhanced data such as power factor, voltage, power consumption, and waveform analysis. The customer is able to access the meter at any time and export data directly into their energy management systems. In addition, the ION meter provides customers the benefits of power factor correction and the implementation of sag mitigation technology. For example, Toronto Hydro leveraged sag data to help a customer take corrective action on their under voltage protection, prevent multiple outages, and minimize the customer's lost production time.

At the time Toronto Hydro chose to begin installing ION meters in limited circumstances, lower cost alternatives that provided similar benefits and were Measurement Canada certified were not available.

QUESTION (B):

b) What percentage of installed meters in each of 2018 to 2022 were ION meters?

RESPONSE (B):

Please see Table 1.

Table 1 – Percentage of ION Meters Installed Between 2018-2022 Period

Year	Total Installations	ION Meter Installations	Percentage of ION Meter Installations
2018	28,395	31	0.109%
2019	26,182	43	0.164%
2020	24,688	10	0.041%
2021	12,241	2	0.016%
2022	19,603	5	0.026%

QUESTION (C):

c) What is the cost difference between an ION meter and a typical meter?

RESPONSE (C):

The installed cost of an ION meter is approximately $9,300 compared to the installed cost of a typical meter at approximately $1,500.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-83

References: Exhibit 1B, Tab 3, Schedule 3, Appendix C

Preamble:

In its unit cost benchmarking study, UMS Group states that the seven asset categories represent 52% of the planned capital budget and that the five maintenance programs represent approximately 57% of the preventive and predictive maintenance costs.

QUESTION (A):

a) Please show the detailed calculations to derive the above percentages.

RESPONSE (A):

The percentage for the planned capital budget represented by the seven asset categories is based on Toronto Hydro's ISA data for 2020 to 2022. The unit cost methodology outlined as part of the updated approach in interrogatory response 1B-AMPCO-09 is followed to exclude demand driven programs and outliers from the population. The total cost corresponding to the seven asset categories is then divided by the total cost of all assets represented in the ISA data for that year. The average of the three years is taken resulting in a percentage of 48%.

Upon further review, Toronto Hydro identified that the original denominator used in the calculation underrepresented the total cost as it did not consider the exhaustive asset classes in the ISA data. This consequently resulted in the percentage change from 52% to 48%.

Table 1: Calculation of 7 Asset Categories' Percentage of Planned Capital Budget

	2020 – 2022 ($M)
UMS Provided Capital Assets	262.7
Filtered Total Cost View*	551.5
%	48%

**Total costs after unit cost methodology has been applied*

For the five maintenance programs, summation of the actual spend under these five programs was divided by the total spend under the Preventative and Predictive maintenance portfolio for each of the years between 2020 – 2022, and average percentage was obtained resulting in a percentage of 56%. This represents a decrease of approximately 1% from the original calculation following review and update of the total spend under the Preventative and Predictive programs used in the calculation.

Table 2: Calculation of 7 Asset Categories' Percentage of Planned Capital Budget

	2020 – 2022 ($M)
UMS Provided Maintenance Costs	28.6
Total Preventative and Predictive Programs	51.0
%	56%

QUESTION (B):

b) Please show the detailed calculations to derive the respective percentages for the 2025-2029 period.

RESPONSE (B):

Forecasted values are not available for the 2025-2029 period and Toronto Hydro did not forecast the unit costs in the UMS Unit Cost Benchmarking Study. Toronto Hydro forecasts volumes and total costs at a segment/program level using program-specific methodologies and is unable to forecast the 2025-2029 period in a manner that can be relatable to the unit cost as the unit cost methodology utilizes ISA data from completed projects.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-84

Reference: Exhibit 1B, Tab 3, Schedule 3, Section 3.0

Preamble:

In Reference 1, which is titled "2020 to 2024 Productivity Achievements," Toronto Hydro states it has achieved more than $2.2 billion of savings since 1999 through the amalgamation of the six utilities that served the former municipalities that now make-up the City of Toronto.

QUESTION:

Of the cited $2.2 billion in savings generated by the utility since Toronto Hydro was created in 1999, please quantify the new savings that were actually, as opposed to being forecast, realized since 2020.

RESPONSE:

Please see Toronto Hydro's response to 1B-AMPCO-07.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-85

Reference: Exhibit 1B, Tab 3, Schedule 3, section 3.1

Preamble:

Toronto Hydro provides forecast reduced expenditures and forecast avoided operating costs for several corporate projects.

QUESTIONS (A):

a) Please complete the following table to identify the actual realized reduced expenditures in each year:

Project	2020	2021	2022	2023
Enterprise Resource Planning, Enterprise Connect, and People Connect				
e-Tailboard				
Streetlight Management System Project				
Non-conformance Reporting				
Electronic Red Construction Folder				
Accounts Payable Processing Automation				
Storm Prediction Impact Tool				
SAP Business Warehouse Project				

RESPONSE (A):

As requested, the table below lists the cost reduction benefits from 2020-2023 for the noted projects.

Project	2020 ($000)	2021 ($000)	2022 ($000)	2023 ($000)	Total ($000)
Enterprise Resource Planning, Enterprise Connect, and People Connect	$1,150	$1,150	$1,150	$1,532	$4,982
e-Tailboard	N/A	N/A	$6	$6	$12

Project	2020 ($000)	2021 ($000)	2022 ($000)	2023 ($000)	Total ($000)
Streetlight Management System Project	N/A	N/A	N/A	N/A	N/A
Non-conformance Reporting	N/A	N/A	N/A	N/A	N/A
Electronic Red Construction Folder	N/A	$25	$32	$33	$90
Accounts Payable Processing Automation	N/A	$164	$170	$179	$513
Storm Prediction Impact Tool	N/A	$6	$10	$10	$26
SAP Business Warehouse Project	N/A	N/A	N/A	N/A	N/A

Note : The above amounts have been rounded to the nearest thousand.

QUESTIONS (B):

b. Please complete the following table to identify the actual realized cost avoidance in each year:

Project	2020	2021	2022	2023
Enterprise Resource Planning, Enterprise Connect, and People Connect				
e-Tailboard				
Streetlight Management System Project				
Non-conformance Reporting				
Electronic Red Construction Folder				
Accounts Payable Processing Automation				
Storm Prediction Impact Tool				
SAP Business Warehouse Project				

RESPONSE (B):

As requested, the table below lists Cost Avoidance benefits from 2020-2023 for the noted projects.

Project	2020 ($000)	2021 ($000)	2022 ($000)	2023 ($000)	Total ($000)
Enterprise Resource Planning, Enterprise Connect, and People Connect	$305	$612	$990	$716	$2,623

Project	2020 ($000)	2021 ($000)	2022 ($000)	2023 ($000)	Total ($000)
e-Tailboard	N/A	N/A	$725	$309	$1,034
Streetlight Management System Project[1]	N/A	N/A	$628	$659	$1,287
Non-conformance Reporting	N/A	N/A	$400	$420	$820
Electronic Red Construction Folder	N/A	N/A	$245	$257	$502
Accounts Payable Processing Automation	N/A	N/A	N/A	N/A	N/A
Storm Prediction Impact Tool	N/A	N/A	$3	$3	$6
SAP Business Warehouse Project	N/A	$18	$41	N/A	$59

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-86

References: Exhibit 1B, Tab 3, Schedule 1, Section 3.2.2
Report of the Board: Renewed Regulatory Framework for Electricity Distributors: A Performance-Base Approach, October 2012

Preamble**:**

On page 10 of Reference 1, Toronto Hydro reports that its investment plan is "sufficient only to maintain outage duration as measured by the custom SAIDI metric over the 2025-29 period" (p.10), yet set a target two standard deviations below this level - 2 minutes lower than historical 5 year average of 48.2 minutes.

On page 16 of Reference 1, Toronto Hydro proposes to maintain outage frequency and has established a target range enveloping its most recent five-year historical outage frequency measure of 0.42. Regarding outages, its investment plan is to invest "the minimum level necessary to manage asset condition"; this intent is informed by customers' prioritization of reduced outage duration rather than frequency.

QUESTION (A):

a) Please explain what actions and management decisions Toronto Hydro would need to undertake in order to achieve the 46.2 minute SAIDI target attached to the performance incentive mechanism.

RESPONSE (A):

Toronto Hydro's Asset Management Process (refer to Exhibit 2B, Section D) combined with the necessary funding and resources to execute the work programs outlined in the 2025-2029 investment plan, and the performance incentives proposed in Exhibit 1B, Tab 3, Schedule 1 will enable the utility to attain the proposed System Reliability targets for Outage Duration and Outage Frequency.

QUESTION (B):

b) Please confirm whether the steps in a) are included in Toronto Hydro's investment plan.

RESPONSE (B):

Yes. All of the above are part of the 2025-2029 investment plan and rate application.

QUESTION (C):

c) Please explain under what conditions the steps in a) would be included in Toronto Hydro's plan, and whether any other work would not be carried out if the steps in a) were undertaken.

RESPONSE (C):

Please refer to the response in part a.

QUESTION (D):

d) In the event Toronto Hydro follows its investment plan, which is not sufficient to achieve this target, and it achieves this target nevertheless, to what factors could its success be attributed?

RESPONSE (D):

Toronto Hydro cannot comment on a hypothetical future scenario the parameters of which are unclear and speculative. The utility notes however that in its experience as a performance-drive

organization, the achievement of the targets can be attributed to a combination of operational management, innovative approaches, adaptability, collaboration, and risk management. Effective decision-making is at the crux of all these factors. In a balanced incentive regime, where performance targets are set in a challenging but achievable way, the utility is encouraged to optimize decision-making towards achieving performance objectives.

In a regulatory regime that focuses predominately on financial/cost outcomes, decisions are optimized to manage profitability, efficiency and cost containment. Over time and/or under certain circumstances (e.g., the utility faces new requirements or rising cost pressures) this may compromise the utility's ability to achieve target service quality performance objectives.

Toronto Hydro believes that both types of incentives are important to drive effective decision-making and ensure that there is an appropriate balance of risk/reward in the regulatory framework. That is why its proposed X-factor includes both an empirical-based efficiency factor and a performance-focused incentive mechanism. For more information, please refer to the Rate Framework evidence in Exhibit 1B, Tab 2, Schedule 1 at pages 29-33.

QUESTION (E):

e) Please explain why an incentive is warranted in the circumstances referenced above.

RESPONSE (E):

Please see response to (d) above.

QUESTION (F):

f) Regarding outage frequency please explain why an incentive is required or justifiable to prevent deterioration from current service levels and investing "the minimum level necessary."

RESPONSE (F):

Refer to response in part d).

QUESTION (G):

g) Please discuss the proposal to maintain outage frequency in the context of the OEB's statement in Reference 2 that "The [Renewed Regulatory Framework] is intended to elevate utility performance by creating incentives for superior performance."

RESPONSE (G):

In Toronto Hydro's view, the quoted statement must be considered holistically when evaluating the effectiveness of the performance incentive regime. To apply this statement in a wholesale manner to each and every performance objective would run contrary to other important considerations in the RRF: *"The renewed regulatory framework is a comprehensive performance-based approach to regulation that is based on the achievement of outcomes that ensure that Ontario's electricity system provides value for money for customers.*"

With respect to value for money for customers, the RRF's customer focus outcome encourages distributors to provide services "*in a manner that responds to identified customer preferences*." With this customer focus outcome in mind, the target to maintain (rather than improve) Outage Frequency reflects the key consideration that customers in all classes (except Key Accounts) prioritize outage duration over frequency, and expect the utility to balance reliability performance with price and other key outcomes. Please see Exhibit 1B, Tab 5, Schedule 1 for more information about Toronto Hydro's application-specific customer engagement results that informed development of the 2025-2029 Investment Plan underpinning this application.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-87

References: Exhibit 1B, Tab 3, Schedule 1, Page 48

Exhibit 2B, Section E7.2

Preamble:

Toronto Hydro states the use of Local Demand Response (LDR) to avoid capital spent on load transfers resulting in significant long-term savings for ratepayers.

QUESTION (A):

a) Please provide the benefit-cost analysis, or equivalent document, that supports Toronto Hydro's selection of target stations for demand response and those which have not been proposed, including: Fairbank TS, Finch TS, Bathurst TS, Manby TS, Leslie TS, Cecil TS, Strachan TS, and Copeland TS.

RESPONSE (A):

As noted on pages 8 and 9 of the updated (January 29th, 2024) Exhibit 2B, Section E7.2, the Flexibility Services program will target Finch TS, Manby TS, Cecil TS, Strachan TS, Leslie TS and Copeland TS. The program is not currently focused on Fairbank TS or Bathurst TS, but should the opportunity and need arise to target these stations, Toronto Hydro will investigate the possibility of doing so. A key feature of the Flexibility Services program is that it can easily adapt in terms of scope and location to meet the most pressing system needs. The program target areas will shift based on needs, as has been the case in previous LDR programs.

As noted in Toronto Hydro's response to the OEB's stakeholder consultation on the *Benefit – Cost Analysis Framework for Addressing Electricity System Needs* (EB-2023-0125), submitted on February 1, 2023, Toronto Hydro applies pre-screening criteria when selecting potential applications of NWSs, and selects projects that can be clearly defined and linked to a system need.

These projects are then put through a cost-benefit analysis to ensure the application of NWSs is cost-effective. For more information on the cost-benefit analysis that has been undertaken for the selected stations, please see Interrogatory 1B-Staff-89.

QUESTION (B):

b) Please list any other LDR projects that were considered but rejected for the 2025 to 2029 period.

RESPONSE (B):

As described in Exhibit 2B, Section E7.2, the Flexibility Services program (i.e. LDR) directly supports Load Demand by identifying opportunities to defer or avoid bus-level load transfers when and where it is appropriate. As noted in the evidence, all stations that are targeted for bus-level relief in 2025-2029 were evaluated and considered for the LDR program. Some of these stations are excluded (i.e. Dufferin TS, Terauley TS, Esplanade TS, Horner TS and Windsor TS) as the planned transfers are either carry-over projects that were deferred in 2020-2024, or projects where overloading is not the primary driver. The work planned for these stations is described in Exhibit 2B, Section E5.3. All six of the remaining stations that are expected to require bus-level load transfers in the 2025-2029 period (i.e. Finch TS, Manby TS, Cecil TS, Strachan TS, Leslie TS and Copeland TS) will be targeted for LDR capacity.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-88

References: Exhibit 1B, Tab 3, Schedule 1, Section 2.4.3, Pages 46-56

Exhibit 2B, Section E7.2.1

Preamble:

Toronto Hydro provides details of its proposed system capacity (non-wires) proposals, including the LDR and performance incentive structure. Toronto Hydro proposes a budget of $5.7 million to deploy an expanded version of its LDR initiative to address system capacity constraints and procure 30 MW of flexible system capacity to displace and defer the need for load transfers in the Horseshoe North area over the 2025-2029 term.

QUESTION (A) AND (B):

a) Please discuss what considerations Toronto Hydro undertook about expanding the LDR program greater than 30 MW, including cost, impact on neighboring stations, ability to procure necessary capacity and any subsequent changes to performance incentive structures.
b) Please discuss the rationale for limiting LDR capacity at 30 MW for the 2025 to 2029 period.

RESPONSE (A) AND (B):

Toronto Hydro considered the following key factors in setting the 30 MW target:

Resource Availability: Toronto Hydro's experience shows that procurement of targeted demand response ("DR") for the purpose of capital deferral/avoidance is most successful when targeting areas with a higher penetration of large loads (e.g., 1 MW or more, or large groupings of 100 kW or more customers), as these customer types are more likely to be able to curtail on demand. The utility selects stations with a high penetration of these customer types when possible, and sets achievable targets that reflect the anticipated availability of DR amongst these customers. During the 2020-2024

rate period, Toronto Hydro set a target of 10 MW for a group of two stations (Manby TS and Horner TS), and even this modest target proved to be challenging from a procurement perspective (see below for details). For a group of six stations, Toronto Hydro set an ambitious goal of 30 MW (10 MW per 2 stations), which reflects both the utility's experience and commitment to continuous improvement with respect to non-wires solutions.

Market Dynamics: Local Demand Response ("LDR") is subject to market forces that could impact the outcome of the program. In the current Etobicoke Pilot, the utility intended to procure 10MW but could only secure 4 MW for the first summer (2023). This a reflection of available market capacity, particularly as many resources are already committed to other programs (e.g., IESO's Capacity Auction, the Industrial Conservation Initiative ("ICI"). Aggregators (i.e., participants in LDR) expressed that significant time and effort is required to acquire capacity for new programs, and that the average time required to onboard new capacity for a new program could be anywhere between 6 to 12 months, resulting is some participants choosing to stick with existing market obligations and forego participation in new programs. These are important factors to consider when setting reasonable targets for non-wires solutions ("NWS").

Other Considerations: In setting the 30 MW target, Toronto Hydro also considered the cost recovery impacts of acquiring DR capacity (please see Exhibit 2B Section E7.2 for details) in addition to many other urgent and important operational requirements that the utility must address in the next rate term as summarized in the OM&A Overview evidence at Exhibit 4, Tab 1, Schedule 1, and detailed throughout the programmatic evidence in Exhibit 4, Tab 2. The utility also considered the ongoing regulatory uncertainty with respect to performance incentives and cost recovery for investments that are needed to develop capabilities in this emerging area of focus. Coupled with the operational and market risks identified above, these considerations led Toronto Hydro to set a challenging but achievable target of 30MW.

QUESTION (C):

c) Please discuss what considerations are required if the LDR program was to be leveraged to alleviate long-term capacity needs for the various stations identified.

RESPONSE (C):

For DR to replace a permanent, long-term capacity investment, Toronto Hydro needs confidence that this market-based product can deliver the same safety and reliability requirements as a tried and tested conventional wires solution at a cost-effective price. At this time, adequate volumes of DR resources are not available to meet these requirements. As noted in part (a), it can be difficult to procure even 10 MW of DR. To avoid larger scale, long-term station investments, Toronto Hydro would need to procure upwards of 50 MW in one station area. Furthermore, to rely on DR at this scale, Toronto Hydro would need to pay a high $/MW-day daily capacity payment along with potential energy payments, for each day that the resource is relied upon. As the market matures and more resources become available, Toronto Hydro will evaluate the feasibility and cost-effectiveness of using DR to replace longer-term capacity investments.

QUESTION (D):

d) Please discuss and provide any analysis undertaken to consider similar LDR initiatives in other areas of Toronto Hydro's system that have identified constraints, including Horseshoe East and West. Please indicate why similar projects have not been proposed for additional areas on the system.

RESPONSE (D):

As described in Exhibit 2B, Section E7.2, the Flexibility Services program (i.e. LDR) directly supports Load Demand by identifying opportunities to defer or avoid bus-level load transfers when and where it is appropriate. As noted in the evidence, Toronto Hydro evaluated all the stations that are targeted for capacity bus-level relief in 2025-2029, including those in Horseshoe East and West, as well as

Downtown.[1] From this evaluation, the utility selected six stations that are expected to require bus-level load transfers in the 2025-2029 period (i.e. Finch TS, Manby TS, Cecil TS, Strachan TS, Leslie TS and Copeland TS) for LDR capacity. The target areas could shift based on system needs, similar to previous LDR programs, because as noted in Exhibit 2B, Section E7.2 on pages 8-9, the ability to easily adapt in terms of scope and location to meet the most pressing system needs is a key feature of the Flexibility Services program.

QUESTION (E):

e) Please discuss what considerations and analysis was conducted by Toronto Hydro related to CDM programs being offered in its service territory, including those in partnership with other entities, including the IESO and the Local Initiatives Program during the 2025-2029 period.

RESPONSE (E):

Toronto Hydro has not proposed its own local programs under the 2021-2024 CDM framework. However, the utility continues to support programs delivered by IESO under the Local Initiatives Program. This includes outreach and marketing support for programs such as Coolsaver, BizEnergySaver, and the upcoming heat pump program. Given the effort and success of centrally delivered CDM, at this time, Toronto Hydro is focused on building on and supporting the IESO's efforts rather than duplicating programs. Toronto Hydro remains open to collaborating on future CDM programs with the IESO, and exploring opportunities for benefit-stacking where possible.

Toronto Hydro's own efforts in the realm of demand-side management, focus on targeted and credible opportunities where capital deferral or avoidance through non-wires solutions can be identified and measured. This is based on a ground up analysis of system needs, and the targeted deployment of demand-side management program called Local Demand Response ("LDR"), as outlined in detail in the evidence at Exhibit 2B, Section E7.2.

[1] This did not include certain stations (i.e. Dufferin TS, Terauley TS, Esplanade TS, Horner TS and Windsor TS) for which projects carried over from 2020-2024. The work planned for these stations is described in Exhibit 2B, Section E5.3.

QUESTION (F):

f) Please discuss the Benefit Stacking Pilot that is supported by the IESO Grid Innovation Fund and OEB's Innovation Sandbox, including project timelines and how Toronto Hydro expects to apply findings from the pilot project.

RESPONSE (F):

Toronto Hydro has partnered with Power Advisory LLC and Toronto Metropolitan University's Centre for Urban Energy (CUE) to create a project that explores how to effectively and efficiently procure and deploy DR capacity to address overlapping distribution and transmission system level needs. This project is called the Benefit Stacking Transmission and Distribution Pilot ("Benefit Stacking Pilot") and is supported by the IESO's Grid Innovation Fund, and the Ontario Energy Board's (OEB's) Innovation Sandbox. The project began in June 2022 and will be completed by March 2025. An overview of the Benefit Stacking Pilot was provided on pages 12 and 13 of Exhibit 2B Section E7.2.

In its first year (2022), the pilot was focused on designing the program, developing rules, contracts, measurement and verification, and the settlement processes. During this period, Toronto Hydro also ran a procurement for DR capacity to be deployed in Summer 2023.

Last year (2023) was focused on testing the program by deploying DR capacity in the summer, resulting in four dispatch events, with each event yielding close to 5 MW of DR capacity. Throughout the year, the utility's partner Toronto Metropolitan University (TMU) created several tools and platforms to enable auction-based procurement, dispatch coordination, and automated measurement, verification and settlement. Additionally, 6 MW of DR was procured for future deployment.

In summer 2024, Toronto Hydro intends to dispatch this capacity utilizing the TMU tools and upon completion of these events, the utility and its partners will analyze the results.

The utility will apply the learnings from this pilot to inform future LDR programs in its service territory and provide insights to the electricity sector on transmission-distribution coordination.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-89

References: Exhibit 1B, Tab 3, Schedule 1, Section 2.4.3, Pages 49-55
OEB Filing Guidelines for Incentives for Electricity Distributors to Use Third-Party DERs as Non-Wires Alternatives, March 28, 2023
OEB Draft Benefit-Cost Analysis Framework for Addressing Electricity System Needs, December 2023

Preamble:

Toronto Hydro has proposed a performance incentive related to the LDR program as well as has conducted a Benefit Cost Analysis on the proposal. As part of this analysis, Toronto Hydro outlines the NPV of the benefits of capital deferral and avoided based on the LDR program based on a set of assumptions informed by prior experience with load transfer projects.

QUESTION (A):

a) Please provide any data from Toronto Hydro's existing LDR program that supports the assumption of 75% of load transfer projects in scope can be avoided entirely, while 25% deferred for at least 5 years.

RESPONSE (A):

The LDR program that is currently underway is targeting two stations, Manby TS and Horner TS. As described on page 11 in Exhibit 2B Section E7.2, the consideration of LDR as an NWS has enabled planners to avoid all incremental load transfers that would otherwise have been carried out in order to manage Manby TS between 2022 and 2024.

This experience has confirmed that adding the consideration of NWSs to the load demand project selection and scoping process introduces the opportunity to re-prioritize capital work. As a result, in cases where the LDR can successfully be procured, load transfers that are intended to manage

capacity constraints during an interim period (prior to executing a permanent wires solution) can be avoided.

Looking ahead at 2025-2029, as described in on pages 8 and 9 in Exhibit 2B Section E7.2, Toronto Hydro is targeting 30 MW at a group of six stations. Each of these stations currently has an estimated volume of load transfers that could materialize. The high range is 175 MVA and the low range is 100 MVA. Based on the diversity of needs at these stations, it is not prudent to assume that 100% of the load transfers targeted by the procurement of 30 MW of DR can be entirely avoided. Engineering judgement was utilized to estimate that 75% could be avoided, while 25% could be deferred. Note that this estimate, and the resulting BCA, provides a conceptual understanding of the difference in value and benefit that arises in cases where capital is entirely avoided versus capital being deferred. The figures could change based on the actual load demand projects targeted, as well as the ability to procure DR capacity. This is to be expected when considering the use of third-party owned, market-based solutions to address dynamic demand-related system needs.

QUESTION (B):

b) Please discuss the impacts to the analysis, including operational cost figures, summarized in Table 18 using different assumptions, including 50% of load transfer projects in scope are avoided entirely while 50% are deferred for at least 5-years; and, if 100% of projects are avoided entirely.

RESPONSE (B):

Table 1 below restates the analysis applying an assumption that 50% of load transfer projects in scope are avoided entirely while 50% are deferred for at least 5-years.

Table 1

	Deferred Capital	**Avoided Capital**
Parameters	$5.00 million in load transfer capital investment deferred for 5 years at an operational cost of **$1.43 million**	$5.00 million in load transfer capital investment avoided over the life of the assets (48 years) at an operational cost of **$4.28 million**
Costs	NPV of the operational costs of the non-wires solution (2025-2029): **$1.14 million** + NPV of the revenue requirement associated with the load transfer capital investment to be made in 2030: **$3.59 million** = **$4.74 million** NPV Costs	NPV of the operational costs of the non-wires solution (2025-2029): **$3.43 million**
Benefits	NPV of revenue requirement associated with capital investment deferred from 2025-29: **$4.85 million** *Less (-)* NPV Costs: **$4.74 million** *Equals (=)* $110.14 thousand NPV Benefits	NPV of revenue requirement associated with capital investment avoided in 2025 over the 48-year EUL: **$4.85 million** *Less (-)* NPV Costs: **$3.43 million** *Equals (=)* **$1.42 million** NPV Benefits
	Total NPV Benefits = $1.53 million	

Table 2 below restates the analysis applying an assumption that 100% of load transfer projects in scope are avoided entirely.

Table 2

	Deferred Capital	Avoided Capital
Parameters	**n/a**	**$10.00 million in load transfer capital investment avoided over the life of the assets (48 years) at an operational cost of $5.70 million**
Costs	**n/a**	**NPV of the operational costs of the non-wires solution (2025-2029): $4.57 million**
Benefits	**n/a**	**NPV of revenue requirement associated with capital investment avoided in 2025 over the 48-year EUL: $9.69 million *Less (-)* NPV Costs: $4.57 million *Equals (=)* $5.12 million NPV Benefits**
	Total NPV Benefits = $5.12 million	

The analysis presented in the tables above aligns with Toronto Hydro's understanding that capital avoidance of load transfers constitutes the primary source of economic benefits for the LDR program. At the same time, while deferral of load transfers may ultimately provide small (but positive) economic benefits, this approach can provide operational flexibility to areas of grid that face demand volatility or uncertainty. In these more dynamic circumstances that the utility could be faced with in the next rate period as customers adopt new technologies, deferring load transfers through LDR can be a prudent strategy even if the economic benefits are relatively small. Postponement or deferral of load transfers "buys time" to let the uncertainty and volatility settle before making the decision to undertake a load transfer investment that will add cost to the rate base for many years. Postponement can also result in the decision to avoid the related capital expenditures should it become apparent that such work is no longer needed.

QUESTION (C):

c) Please discuss any consideration or analysis Toronto Hydro has conducted on its BCA analysis following the OEB's release of the draft BCA Framework. If Toronto Hydro has conducted any analysis using the OEB's BCA Framework examples, please provide.

RESPONSE (C):

Overall, the BCA methodology that Toronto Hydro applied is aligned with the draft BCA framework released by the OEB. The largest source of difference is the 'Pre-Assessment' Criteria, which Toronto Hydro addressed in its February 1, 2024 comments to the OEB in EB-2023-0125.[1] Toronto Hydro intends to continue to evolve its BCA methodology to maintain alignment with the OEB framework as it evolves and takes shape.

QUESTION (D):

d) Please clarify if the WACC was used as the sole discount rates as part of the BCA analysis to calculate net present values, or if additional discount rates (e.g., social discount rate, inflation rate) were used.

RESPONSE (D):

WACC used for the BCA analysis is a nominal weighted average cost of capital, that includes inflation. Assuming that inflation will be around 2% post 2025, the real WACC used for the BCA is 4.17%.

QUESTION (E):

e) Please discuss the analysis and consideration Toronto Hydro conducted related to possible bulk system benefits related to the proposed LDR program.

[1] https://www.rds.oeb.ca/CMWebDrawer/Record/835141/File/document

RESPONSE (E):

Toronto Hydro's assessment of NWS benefits applies to distribution systems needs and value. Bulk value assessments have not been included as part of Toronto Hydro's DSP at this time, as there is no established framework for capturing this value.

QUESTION (F):

f) Please confirm that if successful, the LDR program will not require Toronto Hydro to raise the capital required for the traditional wires solution, either in whole or in part, depending on the level of transfer projects entirely avoided or deferred.

RESPONSE (F):

Confirmed for the proposed 2025-2029 program.

QUESTION (G):

g) Please provide the factors and considerations that led Toronto Hydro to the conclusion that the Shared Savings Mechanisms incentive options were not sufficient to level the playing field between the LDR program and load transfers.

RESPONSE (G):

Please see the evidence in Exhibit 1B, Tab 3, Schedule 1 at pages 53-54. To arrive at this conclusion, Toronto Hydro assessed the foregone opportunity to earn a regulated rate of return ("ROE") on the capital investments avoided and deferred, using an NPV approach. The resulting analysis presented in Table 18 of the evidence shows that the LDR target to procure 30MW results in foregone utility ROE of approximately $3.2 million due to the deferral and avoidance of load transfer capital expenditures. By comparison a 50:50 shared saving mechanism based on the calculated NPV of benefits associated with the proposed target ($3.3 million) yields an incentive of approximately $1.7 million. Compared to the foregone revenue of $3.2 million, and the operational and market

risk and complexity associated with a successful delivery of the LDR proposal, Toronto Hydro did not find the shared savings outcome acceptable.

QUESTION (H):

h) Please discuss how the LDR program will be evaluated to verify its performance and calculate total costs and benefits, after the fact, and determine final net benefits.

RESPONSE (H):

The LDR program's success will be evaluated on the basis of capacity procured, cost of DR ($/MW-day), capacity deployed, and avoided or deferred load transfers in each station area targeted by the program. The methodology utilized in the BCA provided will be recalculated annually to evaluate cumulative program success throughout the rate-period.

QUESTION (I):

i) Please discuss the proposed method for determining final incentive value for the LDR program if it will be based on final actual or forecast values.

RESPONSE (I):

Consistent with the fixed incentive option outlined at page 8 of the OEB's *Filing Guidelines for Incentives for Electricity Distributors to Use Third-Party DERs as Non-Wires Alternatives*, Toronto Hydro's proposal is that the final incentive value will be based on actual versus forecast "*amount [MW] of system capacity provided by third-party owned DER solutions that would otherwise have to be provided by a wires solution.*"

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-90

References: Exhibit 1B, Tab 3, Schedule 1, Page 10
Exhibit 2B, Section A, Page 2
Exhibit 2B, Section E2, Page 23
Exhibit 2B, Section D3, Page 40
Exhibit 2B, Section D3, Page 53

Preamble:

In determining its SAIDI target excluding LoS, MEDs and Scheduled Outages, Toronto Hydro appears to be conflating the stated customer desires of maintaining overall system reliability with the stated customer desires of addressing long outage durations which are primarily caused by MEDs.

QUESTION (A):

a) Please provide a list of projects that contribute to achieving the SAIDI target of 46.2 shown in Figure 1 in Reference 1, and the contribution of each project to achieving that target.

RESPONSE (A):

Please refer to Table 3 (Exhibit 1B, Tab 3, Schedule 1, pages. 12 to 15) for a breakdown of key investments contributing to the achievement of the Outage Duration performance target. Toronto Hydro is unable to provide a specific list of projects that will contribute to successfully achieving the target by the end of 2029, as those projects have yet to be planned, designed, and issued for execution. Toronto Hydro typically issues detailed scopes of work for capital projects 12-18 months ahead of construction.

QUESTION (B):

b) Please reconcile the stated customer preference of reducing the impact of MEDs against Toronto Hydro's stated target of improving SAIDI excluding LoS, MEDs and scheduled outages. Why should the target for SAIDI excluding LoS, MEDs and scheduled outages not be maintained at 48.2 minutes as per stated customer preference?

RESPONSE (B):

Major Event Days ('MEDs') and outages caused by extreme weather are not one and the same. The investments that Toronto Hydro plans to make to improve SAIDI will have benefits for outage duration during adverse and extreme weather events, whether those events meet the statistical classification threshold for MEDs or not.

As stated in the OEB's RRR,[1] "such [Major] events disrupt normal business operations and occur so infrequently that it would be uneconomical to take them into account when designing and operating the distribution system." The IEEE 1366 standard[2] clarifies the intended purpose of Major Event Day classification is "to allow major events to be studied separately from daily operation, and in the process, to better reveal trends in daily operation that would be hidden by the large statistical effect of major events". In essence, MEDs are a way of classifying statistical outlier events that would otherwise obscure and distort average performance statistics. MEDs are inherently difficult to predict, highly variable in their circumstances and outcomes, and not suited to reliability performance target setting.

As stated in the evidence (Exhibit 1B, Tab 3, Schedule 1, page 9), for the 2025-2029 period, Toronto Hydro intends to improve Outage Duration performance as measured by the custom SAIDI metric compared to historical performance. This objective aligns with customer needs and priorities identified through Phase 1 of Toronto Hydro's Customer Engagement which highlighted that when it comes to reliability performance, all customers (except Key Accounts) prioritize reducing the overall length of outages rather than the number of outages. For more information on the outputs

[1] Ontario Energy Board: Electricity Reporting and Record Keeping Requirements ('RRR')
[2] IEEE Std 1366-2022: IEEE Guide for Electric Power Distribution Reliability Indices

of the customer engagement process, in particular reliability priorities, please refer to Exhibit 1B, Tab 5, Schedule 1, Appendix A at page 8).

QUESTION (C):

c) Please provide a capital and O&M budget that would achieve a target SAIDI of 48.2 minutes.

   i. Please provide the list of capital projects that are not required or are reduced as part of maintaining a 48.2 minute SAIDI target.

RESPONSE (C):

As illustrated by the IRM scenario in Exhibit 1B, Tab 3, Schedule 1, at page 10, Toronto Hydro would be unable to maintain historical performance of 48.2 (2018-2022 average) without incremental investment. The reliability projection for Toronto Hydro's proposed capital expenditure plan suggests that the utility's investment plan is only sufficient to maintain Outage Duration as measured by the custom SAIDI metric over the 2025-2029 period. However, the utility challenged itself to set a modest improvement target, recognizing the importance of outage duration to customers when it comes to reliability performance as noted in part (a). As such, the entirety of the 2025-2029 Investment Plan (approximately $4.0 billion in capital and supporting OM&A expenditures) is required to support expanding, modernizing and sustaining the foundations of the grid and essential to managing Outage Duration performance in the next rate period.

QUESTION (D):

d) Please provide an updated Figure 1 (with supporting tabular data) that separates SAIDI (excluding LoS, MEDs, and scheduled outages) between the Horseshoe and Downtown areas.

RESPONSE (D):

Please note, Toronto Hydro forecasted SAIDI system-wide for the purpose of the Performance Incentive Mechanism and cannot break the forecast into Horseshoe and Downtown. In lieu of that,

the figure below shows historical contribution of each region (Horseshoe and Downtown Core) to SAIDI (Excluding Loss of Supply, Major Events, and Scheduled Outages). See table below for the tabular data.

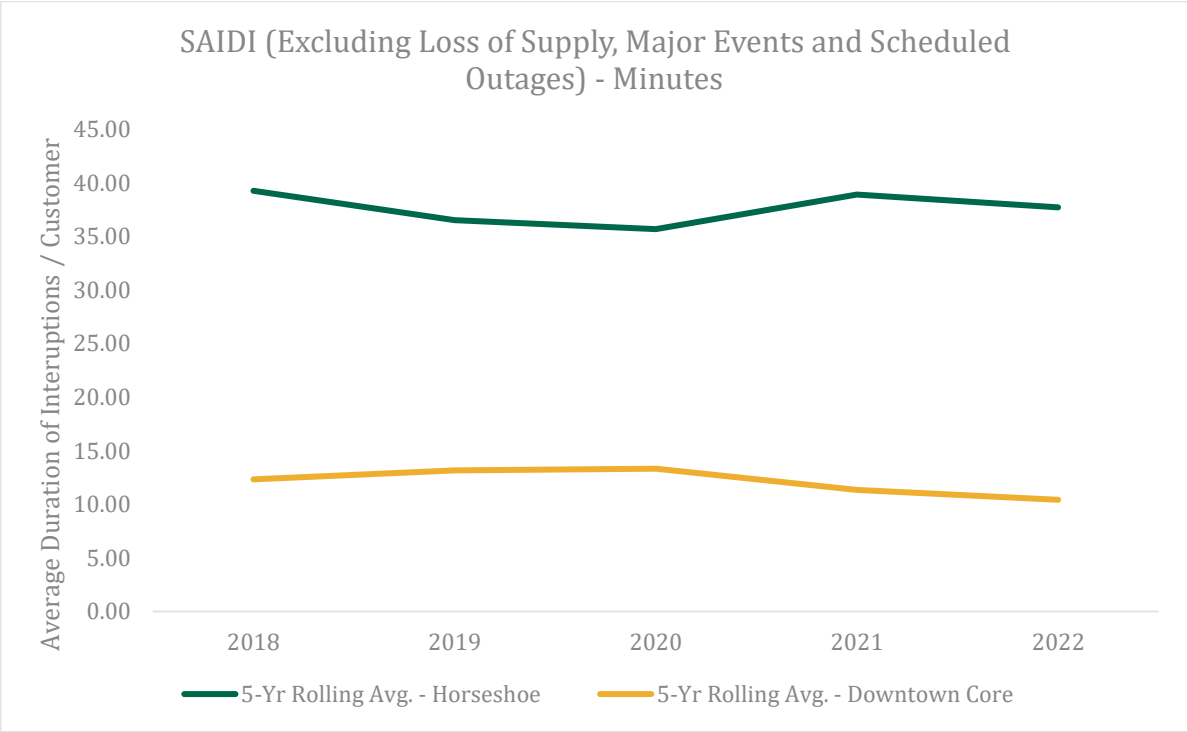


Figure 1: Historical SAIDI Contribution by Region (excluding LoS, MEDs and scheduled outages)

Breakdown of SAIDI Contribution	2018	2019	2020	2021	2022
5-Yr Rolling Avg. – Downtown Core	**12.33**	**13.19**	**13.33**	**11.35**	**10.43**
5-Yr Rolling Avg. – Horseshoe Region	**39.28**	**36.54**	**35.70**	**38.93**	**37.73**

QUESTION (E) AND (F):

e) Please provide a capital, O&M budget, and resultant SAIDI & SAIFI that would result from a target increase in rates that is the same as the rate increases of the past 5 years.

f) Please provide a capital, O&M budget, and resultant SAIDI & SAIFI that would result from a target increase in rates that is the same as the forecast rate of inflation for the next 5 years.

RESPONSE (E) AND (F):

To determine these values, the utility would need to undertake a bottom-up planning exercise to assess and evaluate the implications of the proposed reductions on its business plan. It is not possible to complete such an exercise within the context of IRs. Please see response to 1B-SEC-21.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-91

References: Exhibit 1B, Tab 3, Schedule 1, Pages. 16-18
Exhibit 2B, Section A, Page. 2

Preamble:

Please refer to Figure 2 from Reference 1 and the associated commentary, and that Toronto Hydro notes in Reference 2 that its key objectives and outcomes for the execution of this plan included "Replacing assets at a pace sufficient to maintain reliability with historical levels of performance and to maintain system health in line with 2017 condition".

QUESTION (A):

a) Please update Figure 2 from Reference 1 and provide the supporting tabular data and the associated calculation of target SAIFI (Defective Equipment) starting in 2013 and ending in the year 2029.
   i. If a revised target SAIFI (Defective Equipment) based on the 10-year average is higher than the 5 year average in the original Figure 2, please provide updated capital (and O&M if applicable) budgets that would achieve this revised SAIFI (Defective Equipment) target.
   ii. Please provide the list of capital projects (and their capital costs) that are not required or are reduced as part of meeting the revised SAIFI (Defective Equipment) target.

RESPONSE (A):

Please see below for Figure 2, updated in a manner which reflects a target setting approach conducted on a 10-year rolling average basis instead of the filed 5-year rolling average basis (as stated in the evidence under Reference 1). Refer to Appendix A for the supporting tabular data. Under a 10-year rolling average approach, the theoretical target range would be between 0.44 and 0.49 for SAIFI (Defective Equipment).

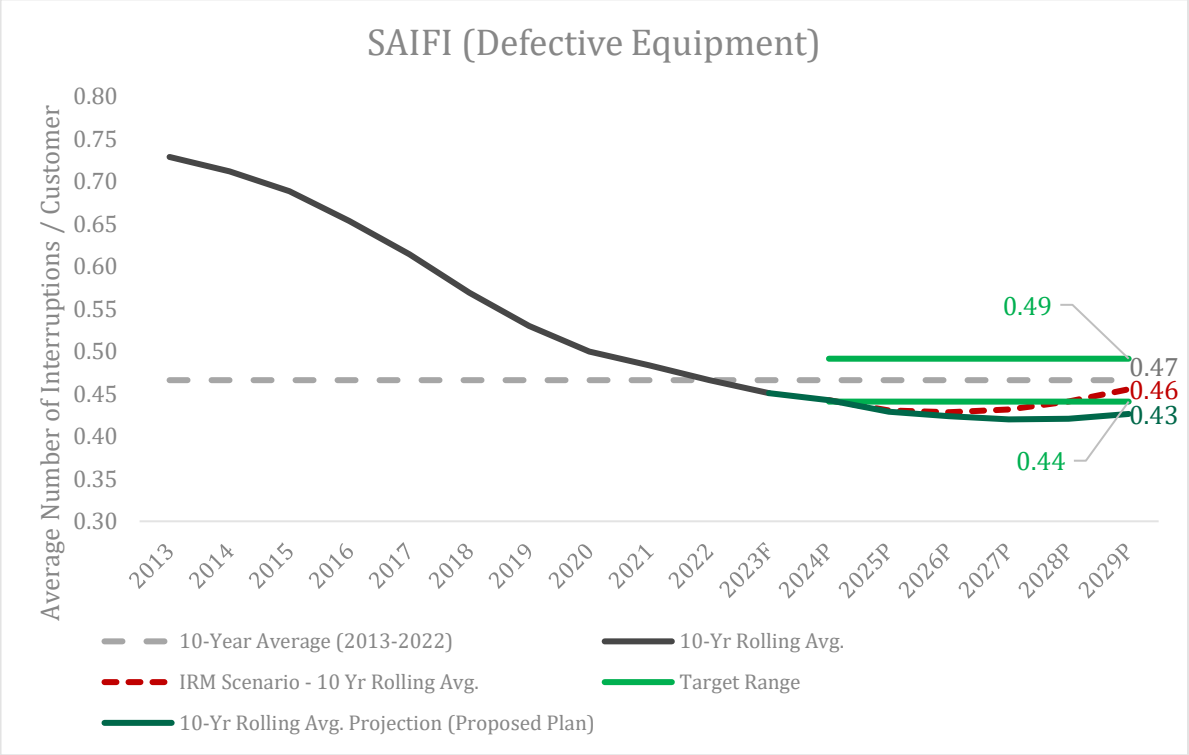


Figure 2: Historical and Projected SAIFI (Defective Equipment) – 10-year Rolling Basis

Toronto Hydro notes that setting reliability targets on a five-year average basis is aligned with the OEB's Electricity Distributor Scorecard approach. Settling reliability targets on a five-year rolling average basis is a common practice in the sector because it allows utilities to track performance over a relatively short time frame while still smoothing out short-term fluctuations and providing a reasonable basis for planning. Expanding the rolling average to 10-years presents several challenges that makes it less valid:

- **Relevance of data:** A 10-year rolling average includes data that is less relevant to current conditions and technology standards.
- **Risk of masking recent trends and investment impacts:** A 10-year rolling average smooths out recent performance fluctuations to the extent that it can mask important trends or issues that need immediate attention within the context of five-year investment planning. It also increases the historical inertia in the measure from year-to-year, making it less

meaningful as performance incentive that can be influenced through actions taken in the next five years.

- **Changing customer expectations:** Customer expectations for reliability change over time due to many factors. A 10-year rolling average may not capture these changing expectations as effectively as a shorter time frame. Applying a 10-year rolling average approach to Toronto Hydro's data would result in a target that would represent significant deterioration in reliability performance compared to the recent five-year average. This outcome would not be aligned with the result of Toronto Hydro's Customer Engagement.

i. Toronto Hydro is unable provide a business plan corresponding to the theoretical 10-year average target. Please see response to 1B-SEC-21.

ii. Please see response to part (a), part (i). A target set on the basis of a 10-year rolling average represents a significant deterioration in reliability. The target would in fact be worse than the reliability performance projected under a high-level IRM scenario measured on the same 10-year average basis. As discussed in Exhibit 1B, Tab 3, Schedule 1, an IRM funding level would translate to a capital plan that would be almost entirely reactive in nature. This level of investment would erase much of the improvement achieved in the last 10-years and set Toronto Hydro on a long-term path of higher costs and worse reliability.

QUESTION (B):

b) Please provide an updated Figure 2 starting in 2013 (with supporting tabular data) that separates SAIFI (Defective Equipment) between the Horseshoe and Downtown areas.

RESPONSE (B):

Please note, Toronto Hydro forecasted SAIFI (Defective Equipment) system-wide for the purpose of the Performance Incentive Mechanism and cannot break the forecast into Horseshoe and

Downtown. In lieu of that, the figure below shows historical contribution of each region (Horseshoe and Downtown Core) to SAIFI (Defective Equipment). See the table below for tabular data.

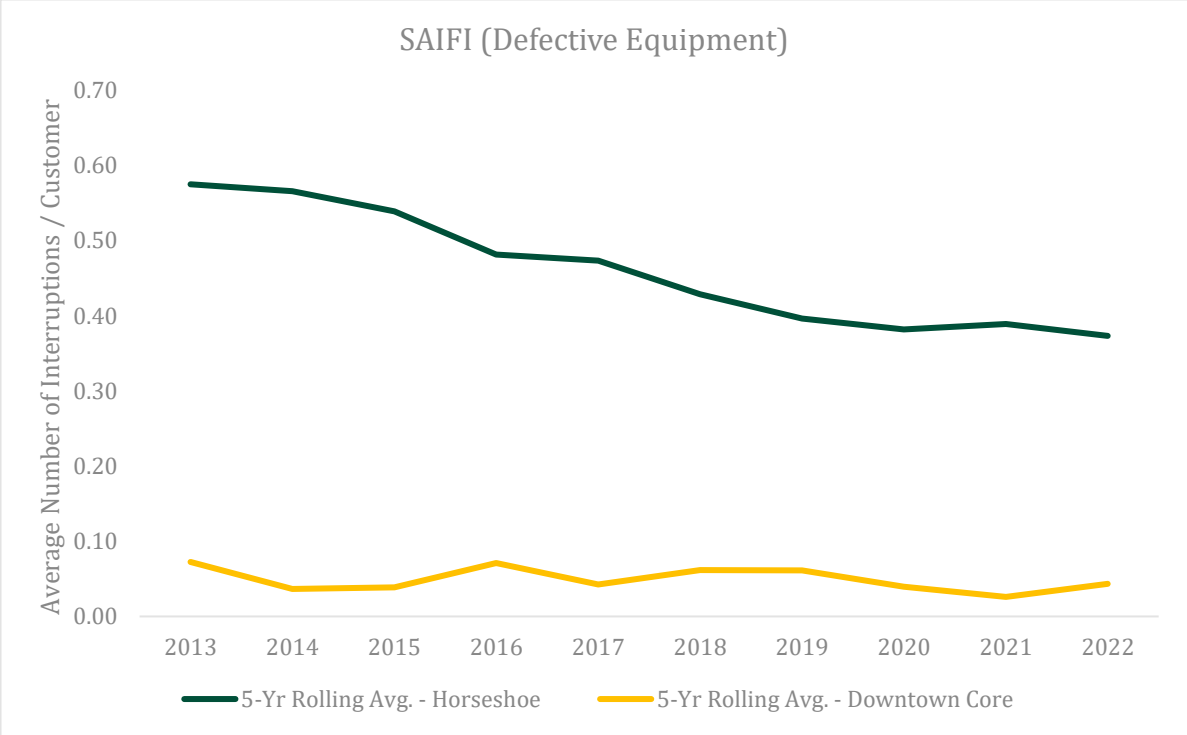


Figure 2: SAIFI (Defective Equipment) – Horseshoe and Downtown areas

Table 1: SAIFI (Defective Equipment) – Horseshoe and Downtown areas

SAIFI (Defective Equipment) Contribution	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
5-Yr Rolling Avg. - Downtown Core	0.07	0.04	0.04	0.07	0.04	0.06	0.06	0.04	0.03	0.04
5-Yr Rolling Avg. - Horseshoe	0.58	0.57	0.54	0.48	0.47	0.43	0.40	0.38	0.39	0.37

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-92

Reference: Exhibit 1B, Tab 2, Schedule 1, Pages 25, 26

Preamble:

Toronto Hydro stated that to allow for updates of the annual inflation factor in rates without double-counting the impact of inflation, Toronto Hydro adjusted the Revenue Growth Factor (RGF) by removing a 2% forecasted annual inflation factor for the 2026 to 2029 period. Toronto Hydro stated that it is presenting the RGF as an increase in revenue requirement, on an inflation-adjusted basis for rate-setting purposes.

Toronto Hydro also noted that there is "current volatility in national and global inflation, which may or may not subside over the 2025 to 2029 rate period."

OEB staff notes that the Canadian consumer price index rose 3.4% in December from a year ago, following a 3.1% increase a month earlier, as reported by Statistics Canada in January 2024.

QUESTION (A):

a) Please explain the basis for the 2% forecasted annual inflation that will adjust the RGF.

RESPONSE (A):

The 2% inflation that was applied to adjust the RGF/CRCI was based on the Bank of Canada's projection for inflation as presented in the quarterly monetary policy reports, which consistently indicated throughout 2023 that inflation will reach the 2% target by the end of 2024 or middle of 2025.[1] The actual inflation factor that Toronto Hydro proposes to apply in the CRCI during the annual

[1] https://www.bankofcanada.ca/publications/mpr/

rate update applications (i.e. 2021-2024) is the OEB's annually published Inflation Factor, made up of 70% GDP-IPI-FDD and 30% Ontario Average Weekly Earnings.[2]

QUESTION (B):

b) Please explain how the 2% forecasted annual inflation relates to capital expenditures, gross plant additions, and OM&A expenses.

RESPONSE (B):

The 2% inflation factor referenced above is a rate-making mechanism for the purposes of establishing an index (i.e., the CRCI) that can be applied to set rates mechanistically during the outer years of the rate period (i.e., 2026 to 2029). This approach is consistent with standard incentive regulation before the OEB which relies on broad indices (rather than bottom-up cost forecasts) to capture variances in costs driven by business market conditions.

For planning purposes (i.e. to forecast the capital expenditures and OM&A expenses outlined in Exhibits 2B and 4 that form the revenue requirement presented in Exhibit 6), Toronto Hydro relied on different assumptions for the different components of the plan:

- Internal labour costs: Forecasting for these costs was based on existing negotiated labour agreements. In cases where there are no existing agreements for certain groups of employees, Toronto Hydro relied on historical rolling forecast to estimate future labour-related costs.
- Non-Labour Related Costs: These costs were estimated assuming an annual 2% inflationary increase over the 2026-2029 period.

[2] In 1B-Staff-93, Toronto Hydro withdrew its request for a custom labour component for the inflation factor.

QUESTION (C):

c) Please explain why a higher amount than 2% to adjust the RGF may be more appropriate, given that inflation remains trending in Canada at a rate greater than 3% and Toronto Hydro also noted that inflation may not subside over its rate term.

RESPONSE (C):

Toronto Hydro does not believe that a higher amount would be more appropriate because the Bank of Canada's latest monetary policy report, issued in January 2024, continues to note that *"[t]he Bank projects that inflation will stay around 3% through the first half of 2024, returning to [the 2%] target in 2025.*" In any event, applying a higher amount to adjust the RGF at this stage of the rate-setting process leads to the same outcome on a forecast basis since the proposed RGF has been inflation adjusted so that the actual inflation factor prevailing at the time of the annual rate update can be added back in to set rates for the upcoming year. Table 3 of the Rate Framework evidence at Exhibit 1B, Tab 2, Schedule 1 at page 25 (reproduced below for ease of reference) sets this out:

Table 3: 2026-2029 Revenue Growth Factor ($ Millions)

	2025	2026	2027	2028	2029
Base Revenue Requirement (BRR)	972	1,027	1,074	1,176	1,219
Difference	-	55	47	101	44
RGF before Inflation Adjustment	-	**5.61%**	**4.62%**	**9.43%**	**3.71%**
Forecast Inflation Factor (%)	-	(2.00%)	(2.00%)	(2.00%)	(2.00%)
RGF after Inflation Adjustment	-	**3.61%**	**2.62%**	**7.43%**	**1.71%**

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-93

References : Exhibit 1B, Tab 2, Schedule 1, Page. 3, 23, 26, 27, Table 4

THESL_4_T04_S02 - OEB Appendix 2-K_20240208

Preamble:

Toronto Hydro explained that the CRCI includes an inflation factor component. Toronto Hydro stated that the inflation factor (I) is aligned with the OEB's methodology. However, Toronto Hydro noted that it includes an alternative Toronto-based salary and wages index to establish the labour component of the inflation factor to better reflect the real cost drivers of attracting and retaining talent in the Toronto labour market.

Toronto Hydro noted that the inflation factor will be updated annually as per the OEB's standard methodology, with an alternate labour index for Toronto salary and wages.

Toronto Hydro proposes to replace the Ontario Average Weekly Earnings (AWE) inflation index within the OEB's inflation factor methodology with a custom Toronto Hourly Salary and Wages Index. This index can either be derived by the Conference Board of Canada (CBC) economic data subscription service, or can be reproduced by purchasing relevant tax data from Statistics Canada.

Toronto Hydro stated that for efficiency purposes, it proposes to rely on the CBC index. In its evidence, Toronto Hydro has provided "Table 4: 2016-2022 Labour Inflation" which is reproduced below.

Toronto Hydro Table 4: 2016-2022 Labour Inflation

	Statistics Canada Average Weekly Earnings (AWE) Ontario	Toronto Hydro Average Blended Salary Increase (Appendix 2-K)	Conference Board of Canada Toronto Hourly Salary & Wages
2016	2%	1.2%	4.9%
2017	2.6%	2.5%	3.3%
2018	1.1%	3.2%	0.2%
2019	1.9%	3.7%	3.4%
2020	2.9%	3.9%	5.4%
2021	2.8%	3.8%	1.5%
2022	7%	4.6%	4.3%
2016-2022 Average	**2.9%**	**3.3%**	**3.3%**

Question(s):

a) Please provide and summarize Toronto Hydro's analysis of the pros and cons of a custom Toronto Hourly Salary and Wages Index using the CBC economic data as compared to "relevant tax data" from Statistics Canada. Please identify what is meant by relevant tax data and provide an explanation as to the rationale supporting its relevance.

b) Please provide the webpage links to the specific CBC economic data subscription service and the relevant tax data from Statistics Canada that Toronto Hydro references in its application. Please explain step-by-step the process Toronto Hydro used to derive the amounts shown in the column "Conference Board of Canada Toronto Hourly Salary & Wages."

c) As Toronto Hydro is proposing to rely on the CBC index, please confirm that the relevant output from CBC index is identical to the "relevant tax data from Statistics Canada". If this is not the case, please explain, including the impacts on the numbers shown in the above Table 4.

d) Please provide the source data and all calculations that support the data in Toronto Hydro's Table 4.

e) Please confirm that the amounts shown in Toronto Hydro's Table 4 relating to "Toronto Hydro Average Blended Salary Increase (Appendix 2-K)" relate to salary and wage increases only and exclude benefits. If this is not the case, please explain.

f) Please show how the amounts shown in Toronto Hydro's Table 4 "Toronto Hydro Average Blended Salary Increase (Appendix 2-K)" are derived based on Toronto Hydro's Appendix 2-K.

g) Please demonstrate, by way of calculations using one example, the flow through impacts of Toronto Hydro's proposal in each year of the term for each of the three labour inflation parameters considered in Toronto Hydro's "Table 4: 2016-2022 Labour Inflation".

RESPONSE :

In the course of validating the table above, Toronto Hydro discovered an error with respect to the data that formed the basis of the referenced table. Part of this data came from Appendix 2-K (i.e. 2016 and 2017) and other historical assumptions (i.e. 2018-2022) that were not derived from Appendix 2-K. When the full dataset (i.e. 2016-2022) is normalized per Appendix 2-K, the year-over-year increases per FTE is lower than the historical assumptions included in the original table (please see the Table below). This is because the cost per employee in Appendix 2-K is impacted by other variables such as overtime and volume of retirements that Toronto Hydro experienced historically as it replenished its aging workforce (i.e. when higher direct compensation cost of employees are replaced by lower direct compensation cost employees this yield a lower average cost per employee). As such, Toronto Hydro has decided to withdraw the custom labour inflation proposal. The evidence will be updated to reflect this change.

	Statistics Canada Average Weekly Earnings (AWE) Ontario	Toronto Hydro Average Blended Salary Increase (Appendix 2-K)	Conference Board of Canada Toronto Hourly Salary & Wages
2016 Actual	2%	1.2%	4.9%
2017 Actual	2.6%	2.5%	3.3%
2018 Actual	1.1%	5.7%	0.2%
2019 Actual	1.9%	0.8%	3.4%
2020 Actual	2.9%	1.9%	5.4%

	Statistics Canada Average Weekly Earnings (AWE) Ontario	Toronto Hydro Average Blended Salary Increase (Appendix 2-K)	Conference Board of Canada Toronto Hourly Salary & Wages
2021 Actual	2.8%	4.0%	1.5%
2022 Actual	7%	2.6%	4.3%
2016 - 2022 Average	**2.9%**	**2.7%**	**3.3%**

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-94

References: Exhibit 1B, Tab 2, Schedule 1, Table 4

OEB Letter, 2024 Inflation Parameters, June 29, 2023

Preamble:

In its evidence, Toronto Hydro has provided "Table 4: 2016-2022 Labour Inflation" which is reproduced below.

Toronto Hydro Table 4: 2016-2022 Labour Inflation

	Statistics Canada Average Weekly Earnings (AWE) Ontario	Toronto Hydro Average Blended Salary Increase (Appendix 2-K)	Conference Board of Canada Toronto Hourly Salary & Wages
2016	2%	1.2%	4.9%
2017	2.6%	2.5%	3.3%
2018	1.1%	3.2%	0.2%
2019	1.9%	3.7%	3.4%
2020	2.9%	3.9%	5.4%
2021	2.8%	3.8%	1.5%
2022	7%	4.6%	4.3%
2016-2022 Average	**2.9%**	**3.3%**	**3.3%**

As noted in the OEB Letter, 2024 Inflation Parameters, the OEB's methodology uses a labour component "Average Weekly Earnings (AWE) - All Employees - Ontario."

OEB staff has calculated the Statistics Canada AWE Ontario using the OEB's methodology in the table below.

Table 1B-1: Statistics Canada AWE Ontario using the OEB's Methodology

Table 1B-1: Statistics Canada AWE Ontario using the OEB's Methodology

	Statistics Canada AWE - downloaded January 7, 2024	Average % Annual Change - arithmetic growth rate	Average % Annual Change - logarithmic growth rate
2015	$ 963.37		
2016	$ 974.41	1.1%	1.1%
2017	$ 993.23	1.9%	1.9%
2018	$ 1,022.00	2.9%	2.9%
2019	$ 1,049.72	2.7%	2.7%
2020	$ 1,126.30	7.3%	7.0%
2021	$ 1,166.72	3.6%	3.5%
2022	$ 1,194.21	2.4%	2.3%
Average		3.1%	3.1%

OEB staff observes that the OEB typically uses the logarithmic growth rate in its calculations, as noted in the OEB Letter, 2024 Inflation Parameters, June 29, 2023, Appendix.

As set out in the EB-2021-0212, OEB 2022 IPI Generic Proceeding, Procedural Order No. 1, Fact Sheet, August 27, 2021, the calculations of the "Annual % Change" ….are based on the logarithmic growth rate, as opposed to the arithmetic growth rate.

QUESTIONS (A) – (C):

a) Please explain whether the years noted in Toronto Hydro's Table 4 represent rate years rather than calendar years. If yes, please restate Toronto Hydro's Table 4 with data relating to calendar years, as opposed to rate years. If no, please explain what is being shown.

b) Please reconcile the numbers shown in "Table 1B-1: Statistics Canada AWE Ontario using the OEB's Methodology" to the "Statistics Canada Average Weekly Earnings (AWE) Ontario" values shown in Toronto Hydro's Table 4.

c) Please confirm that Toronto Hydro agrees with the values and calculations shown in "Table 1B-1: Statistics Canada AWE Ontario using the OEB's Methodology". If this is not the case, please update this table.

RESPONSES (A) – (C):

Please see Toronto Hydro's response to 1B-Staff-93.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-95

References: **Exhibit 1B, Tab 2, Schedule 1, Table 4**
OEB Letter, 2024 Inflation Parameters, June 29, 2023, Appendix
Filing Requirements for Electricity Distribution Rate Applications – 2023 Edition for 2024 Rate Applications, Chapter 2, Cost of Service. December 15, 2022, Page 6

Preamble:

OEB staff notes that the impact of Toronto Hydro's proposal to replace the Ontario AWE inflation index with a custom Toronto Hourly Salary and Wages Index has an immaterial impact on Toronto Hydro's revenue requirement.

OEB staff's calculations demonstrating the immaterial impact are shown below. OEB staff has incorporated the values shown in the above "Table 1B-1: Statistics Canada AWE Ontario using the OEB's Methodology" derived by OEB staff,

Table 1B-2: OEB Staff's Calculations of Immaterial Impact of Toronto Hydro's Proposal

Toronto Hydro's Table 4 – Conference Board of Canada Toronto Hourly Salary & Wages 2016-2022 Average	3.3%
Less: OEB staff's Table 1B-1: Statistics Canada AWE Ontario using the OEB's Methodology 2016-2022 Average	3.1%
Difference	0.2%
Multiplied by the OEB's standard weighting of the inflation factor labour component of 30% for electricity distributors	30%
Equals an approximate net impact of 0.06% on Toronto Hydro's revenue requirement	0.06%
Toronto Hydro's 2025 Base Revenue Requirement as per RRWF	$972,362,213
Approximate net impact of 0.06% on Toronto Hydro's revenue requirement	$583,417
Toronto Hydro's materiality threshold	$1,000,000

As noted in the OEB Letter, 2024 Inflation Parameters, the labour component weighting used in the OEB's calculations of inflation parameters is 30% for electricity distributors.

As per the filing requirements, Toronto Hydro's materiality threshold is $1 million.

QUESTION (A) AND (B):

a) Please confirm that Toronto Hydro agrees with the values and calculations shown in "Table 1B-2: OEB Staff's Calculations of Immaterial Impact of Toronto Hydro's Proposal". If this is not the case, please update this table, showing all associated calculations.

b) Please elaborate whether Toronto Hydro agrees or disagrees with OEB staff's demonstration that the impact of Toronto Hydro's proposal to replace the Ontario AWE inflation index with a custom Toronto Hourly Salary and Wages Index has an immaterial impact on Toronto Hydro's revenue requirement.

RESPONSE TO (A) AND (B):

Please see response to 1B-Staff-93.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-96

References: Exhibit 1B, Tab 2, Schedule 1, Page. 26

Preamble:

Toronto Hydro stated that substituting the labour component of the inflation factor with a Toronto-specific index is responsive to the consideration that labour is a key cost driver within the utility's plan.

Toronto Hydro noted that a Toronto-specific labour index could be more suitable to account for the localized inflationary cost pressures that the utility faces in the 2025-2029 rate period.

Toronto Hydro observed that while it is not possible to predict what these pressures would be, or how they would differ regionally, the historical trend over the last six years (i.e. 2016 to 2022) suggests that regional differences may be a factor.

QUESTIONS (A) AND (B):

a) Please explain why Toronto Hydro should be treated differently than other Ontario electricity distributors in respect of the labour component of Toronto Hydro's proposed inflation factor.
b) Please provide an OEB precedent (including EB#) where the OEB approved a region-specific labour component of the inflation factor.

RESPONSES (A) AND (B):

Please see response to 1B-Staff-93.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-97

References: Exhibit 1B, Tab 3, Schedule 1, Pages. 37-38 and Table 13 (Summary)
Exhibit 2B, Section E8.2, Pages. 18-20 (Facilities Reductions)
Exhibit 2B, Section E8.3 (Fleet)
Exhibit 4, Tab 2, Section 11 (Fleet)
Exhibit 4, Tab 2, Section 12 (Facilities reductions)

Preamble:

Toronto Hydro indicates that to further reduce its fleet and facilities emissions to 2.5 kt of (Scope 1) CO2e by 2029, it plans to: 1) electrify 50% of its fleet by the end of the rate term, and 2) reduce GHG emissions produced at its work centers by 3% annually through fuel switching, conservation and energy efficiency measures.

QUESTION (A):

a) Please confirm that Toronto Hydro's scorecard measure titled "Emissions Reductions" which it has proposed a 5% overall weight, includes the proposed activities to electrify 50% of its fleet and reduce GHG emissions at its work centers by 3% each year.

RESPONSE (A):

Confirmed.

QUESTION (B):

b) Please discuss and define how Toronto Hydro will consider its fleet to be electrified.

RESPONSE (B):

Toronto Hydro considers vehicles in its fleet to be electrified if they are an electric vehicle ("EV"), plug-in hybrid electric vehicle ("PHEV"), or hybrid vehicle. Hybrid vehicles include heavy duty vehicles equipped with an electric power take off.

QUESTION (C):

c) Please confirm that the 3% annual GHG reductions from Toronto Hydro work centers is an incremental annual target and that by 2029, a minimum GHG emissions reduction of 15% will have been achieved.

RESPONSE (C):

Confirmed.

QUESTION (D):

d) Please discuss what baseline Toronto Hydro proposes to establish in order to calculate annual GHG emissions reductions. For example, does Toronto Hydro proposes that annually, 3% net incremental GHG emissions reductions will take place relative to 1990 (consistent with the City of Toronto's TransformTO Net Zero Strategy)?

RESPONSE (D):

Toronto Hydro will use its 2019 emissions as the baseline.

QUESTION (E):

e) Please discuss and provide the criteria Toronto Hydro proposes to use to determine and verify that it has achieved 3% GHG emissions reductions from improvements at its work centers during the 2025 to 2029 term.

RESPONSE (E):

Please refer to Toronto Hydro's methodology for calculating scope 1 emissions outlined in the response to 1B-SEC-20, subpart (e). The utility will annually determine its emissions levels using this methodology and hold its Facilities Management programs accountable for achieving the 3% GHG emissions reductions.

QUESTION (F):

f) Please discuss how site closures will be included in the calculation of GHG emissions reductions as part of this scorecard item.

RESPONSE (F):

Toronto Hydro does not anticipate a site closure to affect Scope 1 emissions in the 2025-2029 rate period, as the utility's facilities-related emissions are only attributable to its work centres, which will remain in operation for the duration of the rate period. All stations facilities are already 100% reliant upon electrical appliances and amenities.

QUESTION (G):

g) Please provide the detailed plan and decision-making process that Toronto Hydro will use to identify, analyze and prioritize the capital improvements targeted at reducing GHG emissions at its work centers, including fuel switching and improving building efficiency.

RESPONSE (G):

Please refer to the detailed evidence laid out in the following documents:

- Exhibit 2B, Section E8.2, subsection E8.2.3.3 "Work Centres" at pages 18-20;
- Exhibit 4, Tab 2, Schedule 12, subsections 5 "Facilities Maintenance Services Segment" and 7 "Utilities & Communications Segment" at pages 8-12 and 17-18, respectively;
- Exhibit 2B, Section D6 "Facilities Asset Management Strategy"; and
- Exhibit 2B, Section D7, subsection "Toronto Hydro's Facilities Emissions" at pages 4-6.

QUESTION (H):

h) Please discuss if all GHG emissions related capital improvements are proposed to be funded through rates or if any portion will be funded by the shareholder.

RESPONSE (H):

Toronto Hydro proposes to fund all capital improvements listed in the references to be funded through rates, net of capital contributions or revenue offsets from all available government and other rebates the utility is able to obtain. For an overview of funding that Toronto Hydro leveraged in the 2020-2024 rate period, please see the response to 3-DRC-14(c).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-98

References: Exhibit 1B, Tab 3, Schedule 2, Table 1, Page. 1

Exhibit 2B, Section D5, Pages 4, 14-17

Preamble:

Regarding stated investments to improve SAIDI and SAIFI in the above referenced sections.

QUESTION (A):

a) Are Toronto Hydro's historical investments in grid sensor, remote-operable switches, smart meters and SCADA controlled switches (advancing "self-healing" grid operations) the primary drivers for the improvements achieved in SAIDI and SAIFI since 2013?
   i. If not, what are the primary drivers of the improvements?
   ii. If yes, please discuss the impact that continued investment in these activities at the same pace will have on improvements in SAIDI and SAIFI results.

RESPONSE (A):

Out of the technologies listed in the question, only remote-operable switches (which are the same as SCADA controlled switches) have had a material impact on reliability since 2013. Specifically, these switches have had a positive impact on SAIDI. Remote operable switches require operator intervention, meaning that they do not typically result in reductions in the frequency of sustained interruptions, and therefore do not have a material impact on SAIFI. As noted in Exhibit 2B, Section E7.1.3.1, page 7, analysis of 2018-2022 reliability data shows that the average duration for outages on feeders with less than three SCADA tie-points was approximately 707 minutes per year per feeder, whereas the average duration of those feeders with three or more SCADA tie-points was approximately 496 minutes. As part of Toronto Hydro's reliability projections for 2025-2029, the utility quantified estimated improvements from SCADA switch installations (see response to interrogatory 2B-SEC-42 for more details).

Regarding the other technologies referenced in the question, Toronto Hydro has not broadly deployed grid sensors, except within its network system (see Exhibit 2B, Section E7.3 for details and benefits), and its existing, first-generation smart meters do not possess "last gasp" technology, meaning that they do not have the capabilities to assist with outage restoration efforts.

(i) Regarding the primary drivers of reliability improvement in the historical period, in addition to the relevant modernization investments discussed above, Toronto Hydro's System Renewal and System O&M investments have been foundational to mitigating asset risk, eliminating obsolete assets and system configurations, and ultimately improving both SAIDI and SAIFI performance since 2013. For additional details on Toronto Hydro's historical performance from 2018 to 2023, please see Exhibit 2B, Section C.

QUESTION (B):

b) Please compare the historic and forecast substantial reliability improvements in SAIDI and SAIFI achieved by Toronto Hydro with the improvements reported by the US Department of Energy for utilities that implemented FLISR.

RESPONSE (B):

To clarify, Toronto Hydro has not yet implemented automated FLISR, nor is Toronto Hydro anticipating benefits from automated FLISR during the 2025-2029 period. For longer-term reliability improvements pertaining to automated FLISR, please refer to the response to 2B-Staff-162.

QUESTION (C):

c) Are the forecast substantial incremental reliability improvements "three to seven percent for SAIFI and four to seven percent for SAIDI on the overhead system"?

i. If not, what are the forecast substantial incremental reliability improvements for SAIDI and SAIFI?

RESPONSE (C):

The percentages referenced are associated with the forecasted improvements at the end of the 2025-2029 period upon the completion of additional SCADA switches and new mid-line recloser installations, as described in the System Enhancements program (Exhibit 2B, Section E7.1).

For longer-term reliability improvements pertaining to Fault Location Isolation and Service Restoration ("FLISR"), also referred to as Distribution Automation ("DA"), please refer to Toronto Hydro's response to interrogatory 2B-Staff-162.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-99

References: Exhibit 1B, Tab 4, Schedule 1, Pages 1-20
Exhibit 1B, Tab 4, Schedule 2
Exhibit 2B, Section D5

Preamble:

In its description of innovation over the 2020 to 2024 rate period, Toronto Hydro describes its approach to building innovative strategies across numerous dimensions of its business including the creation of an Innovation Sandbox.

QUESTION (A):

a) Please explain how Toronto Hydro funded its Innovation Sandbox, how it measured success of the initiatives and provide additional details on which initiatives have been scaled into normal operations.

RESPONSE (A):

The Innovation Sandbox was self-funded by Toronto Hydro over the 2020-2024 rate period. Success of pilot projects developed through Toronto Hydro's Innovation Sandbox is assessed against a set of criteria that is determined as a part of project approval prior to launch. If deemed successful upon completion of proof-of-concept, the project is recommended for full-scale adoption.

Descriptions of projects that have been tested through the Innovation Sandbox and scaled into normal operations can be found at Exhibit 1B, Tab 4, Schedule 1 at pages 2-3.

QUESTION (B):

b) Outside of its sandbox, please explain how Toronto Hydro determines what innovative pilots it will fund and how it assesses when an initiative is ready for scale?

RESPONSE (B):

Outside of the Sandbox, Toronto Hydro has proposed an Innovation Fund, along with an associated Governance Framework, which is described in Exhibit 1B, Tab 4, Schedule 2.

QUESTION (C) :

c) Please explain how Toronto Hydro determines which initiatives fall under the heading of innovation and why this isn't considered a part of normal utility management. For example, under System Observability: Network Condition, Monitoring and Control (1.2 of above noted scheduled), Toronto Hydro references how it continues to advance its Network Condition Monitoring and Control to increase situational awareness the low voltage distribution network.

RESPONSE (C):

As outlined in Exhibit 1B, Tab 4, Schedule 1 and Schedule 2 at page 4, initiatives under the heading of innovation are designed to test new technologies, advanced capabilities, and alternative strategies that are more early stage, exploratory and developmental in nature. These explorations can lead to innovation that is then scaled up into normal utility operations. The Network Condition Monitoring and Control (NCMC) initiative exemplifies this approach. Initially conceived as an innovation project, NCMC has proven successful and has since been integrated into Toronto Hydro's standard utility operations. Furthermore the insights gained, skills honed, and benefits realized through the NCMC program have led to the continued implementation of system observability technologies, as outlined in the Grid Modernization Strategy detailed in Exhibit 2B, Section D5, and summarized in Exhibit 1B, Tab 4, Schedule 1 at section 2.1.

QUESTION (D):

d) Please explain how the areas in which Toronto Hydro plans to test specific new distribution capabilities in the upcoming rate period differ from the areas explored and funded previously by Toronto Hydro in the current rate period (during which it did not have an Innovation Fund).

RESPONSE (D):

The internal sandbox was launched to engage and encourage employees to bring forward ideas for proof-of-concept projects that are novel and provide value to customers across all areas of the company's business and processes. This initiative empowers employees to embrace change and fosters a culture of innovation, meaning a solution-oriented mindset that obstacles can be overcome through creative problem-solving. Please refer to Exhibit 1B, Tab 4, Schedule 01, Section 1.1 for more details on about the internal Sandbox.

The proposed Innovation Fund represents a more targeted approach to the innovation that is required to address the fundamental changes in the energy landscape and manage the uncertainty driven by the imperatives of decarbonizing key sectors of the economy through electrification. Particularly in response to expectations set by the Ontario Energy Board (OEB) regarding Distributed Energy Resource (DER) integration, as outlined in the Framework for Energy Innovation (FEI) report. The Innovation Fund addresses needs that are not adequately met by existing funding mechanisms. In this way, the Innovation Fund would be complementary to existing funding mechanisms insofar as they relate to innovation.

Key differentiators for the Innovation Fund supported projects include an emphasis on adapting operational practices to manage DERs effectively, modifying planning processes to incorporate non-utility-owned DER solutions, and prioritizing the development of skills and knowledge within the organization.

Additionally, the projects under the Innovation Fund are expected to deploy inventive solutions aligned with the OEB's definition of innovation, focusing on leveraging new technologies, innovative business practices, and enhancing distribution services for the benefit of customers. This strategic alignment ensures that Toronto Hydro remains at the forefront of industry advancements and delivers value to stakeholders. Please refer to Exhibit 1B, Tab 4, Schedule 02, Section 3 for more details on Areas of Innovation.

QUESTION (E):

e) Please explain why Toronto Hydro requires both the support of the Future Energy Scenarios tool as well as the Innovation Fund to stress test grid modernization investments in the 2025-2029 rate period.

RESPONSE (E):

The Future Energy Scenarios is a model that was created to help Toronto Hydro understand possible changes to future peak demand under different scenarios, and was used to stress-test whether the utility's capacity plan can accommodate energy transition needs (e.g. building heating electrification) in the early part of the next decade, if required.

The Future Energy Scenarios inform possible grid modernization investments as they relate to the various scenarios. For more information, please refer to Exhibit 2B Section D4.

The proposed Innovation Fund is funding mechanism for exploring innovative capabilities that can help Toronto Hydro better adapt to fundamental changes taking place in the energy system as a result of the transition, by leveraging technology to achieve expanded benefits for customers. It is an important part of Toronto Hydro's approach to innovation because it addresses needs that are not adequately met by existing funding mechanisms. For more information, please refer to Exhibit 1B Tab 4 Schedule 2.

In summary, the Future Energy Scenarios is a tool for planning and conceptualizing innovative approaches relating to peak demand management, while the Innovation Fund provides the necessary funding to scope, design and execute innovative pilot projects.

QUESTION (F):

f) The four pilot areas tagged for the Innovation Fund were identified as part of the Grid Modernization Strategy in reference 3. What focus areas of the strategy do they fall under

and can Toronto Hydro please explain why they can't be incorporated into the initiatives already planned?

RESPONSE (F):

The four pilot projects (as described in Exhibit 2B Section D5 Appendix I) would fall under the *Grid Readiness* focus area of the Grid Modernization Strategy. However, these projects are distinct from other initiatives which are proposed in the Grid Readiness focus area, which Toronto Hydro proposes would be funded through normal mechanisms as they may be deployed as standard distribution system solutions or IT projects. Whereas existing mechanisms tend to support spending where the beneficial outcomes are more proven or certain, the proposed Innovation Fund would be able to support work that is more early stage, exploratory and developmental in nature. The four pilot project concepts fall into this earlier stage and exploratory category and were considered to be too nascent to deploy as standard distribution system solutions. They were also identified as posing a funding risk because more developmental work is needed to test the technologies and prove related beneficial outcomes for Toronto Hydro's system.

It is important to note that funding these pilot project ideas through the Innovation Fund would allow Toronto Hydro to determine the funding implications in real time based on the facts of each project or initiative. Thereby, Toronto Hydro would be able to design and implement pilot projects and other exploratory initiatives more effectively.

QUESTION (G):

g) Please provide any additional analysis of comparable jurisdictions innovation funding amounts, other than those included in the application (i.e., Ofgem, New York, Enbridge Gas).

RESPONSE (G):

Please refer to Toronto Hydro's response to interrogatory 1B-DRC-06 part (d).

QUESTION (H):

h) Please provide more details regarding the proposed governance framework, including titles and responsibilities of the steering committee members, anticipated timelines for review of each project, how innovation projects will be staffed (e.g., will existing staff people be leveraged, will new FTEs be dedicated to pilot project owner roles, etc.), and if Toronto Hydro proposes to keep the OEB and industry updated on its progress so opportunities and lessons learned can be considered.

RESPONSE (H):

Please see Toronto Hydro's response to interrogatory 1B-DRC-06 part (i).

QUESTION (I):

i) Please discuss the likelihood of the innovation fund exceeding the requested $16M. If so, what mechanisms does Toronto Hydro propose be put in place to ensure that any additional funding is appropriate and will provide benefits to ratepayers.

RESPONSE (I):

Toronto Hydro cannot speculate on the likelihood of actual expenditures exceeding the requested funding amount since it has not commenced the pilot selection and design phases of the Governance Framework, which is where the projects will be scoped, and workplan and budgets created. For further discussion, please refer to Toronto Hydro's response to interrogatory 1B-CCC-46 part (h).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-100

References: Exhibit 1B, Tab 5, Schedule 1, Pages 8-10

Exhibit 2B, Section E2, Page 5

Preamble: In Reference 1 Toronto Hydro states Phase 2 of the customer engagement "solicited detailed customer feedback on the $5.9 billion draft plan… In direct response to customer feedback, Toronto Hydro challenged itself to reprioritize certain investment, and reduce the overall capital plan by approximately $70 million, as further described in Exhibit 2B, Section E2."

In reference 2 Toronto Hydro states it "set upper limits of $4,000 million for the capital plan and $1,900 million for the operational plan over the 2025-2029 period".

QUESTION (A):

a) OEB staff are unclear where in Exhibit 2B, Section E2 the $70M reduction to the $5.9 billion draft plan is described. Please reference the section of the application that outlines the $70 million reduction Toronto Hydro made in response to the Phase 2 customer engagement or provide the description.

RESPONSE (A):

Please refer to Exhibit 2B, Section E2.1.3 at pages 10-11. Please see response to 2B-SEC-54 for additional details.

QUESTION (B):

b) Please confirm that the $70M reduction is reflected in the capital and OM&A budgets presented in Exhibit 2, Exhibit 4 and the Exhibit 2 excel models.

RESPONSE (B):

Toronto Hydro confirms that the $70 million reduction is reflected in the capital budget presented in Exhibit 2B and OEB Appendices 2-AA and 2-AB.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-101

References: Exhibit 1B, Tab 5, Schedule 1, Appendix A
A Renewed Regulatory Framework for Electricity Distributors: A Performance Based Approach, October 2012

Preamble:

With Reference 1, Toronto Hydro provides the summary of its customer engagement. On page 1 of this report, Innovative Research Group, Inc. provides context regarding the importance of meaningful customer engagement, citing OEB policy documents. The statement is made that the OEB's "consumer-centric" approach to rate applications requires electricity distributors to demonstrate that their services are provided in a manner that responds to identified customer needs and preferences.

Footnote 1 is duplicated below: OEB Renewed Regulatory Framework for Electricity Sections 2.4.2, 5.0, and 5.0.4.

QUESTION (A):

a) Please confirm that, in footnote 1, Innovative Research Group, Inc, intended to reference the OEB's October 2012 report A Renewed Regulatory Framework for Electricity Distributors: A Performance Based Approach. If not, please identify which report is referenced.

RESPONSE (A) – PREPARED BY INNOVATIVE:

On review, we confirm that this particular footnote contains an incorrect reference and should instead refer to the 2016 Handbook for Utility Rate Applications.

QUESTION (B):

b) Please provide, as attachments to this interrogatory response, section 2.4.2, section 5.0, and section 5.0.4 of the "OEB Renewed Regulatory Framework for Electricity."

RESPONSE (B) – PREPARED BY INNOVATIVE:

As noted above, the references in the footnote are in error. Given that, we have not provided sections as attached but rather cite below some of the important references in the Handbook, including:

- **Reference to customer focus as one of four categories of outcomes under the RRFE**.
  "Customer Focus: Customer engagement is now an explicit and important component of the regulatory framework. Utilities are expected to develop a genuine understanding of their customers' interests and preferences and reflect those interests and preferences in their business plans. Utilities are expected to demonstrate value for money by delivering genuine benefits to customers and by providing services in a manner which is responsive to customer preferences (p2)."
- **Reference to the role of customer preferences in the Business Plan**.
  "The OEB expects the business plan to be informed by the utility's engagement with customers (p6)."
- **Role of customer expectations in the OEB review**.
  "A utility's proposals are expected to demonstrate the alignment of the utility's strategic objectives with its current and future customers' expectations for reliable and reasonably priced service (P9)."
  "The business plan should demonstrate that the utility's goals are appropriately aligned with the needs and preferences of its customers (p10)."
- **Expectation of customer engagement**.
  "Customer engagement is foundational to the RRF. Enhanced engagement between utilities and their customers provides better alignment between utility plans and customers' needs and expectations. Today's customers are more informed and more active participants in their energy services. They should have a say in shaping utility plans,

particularly given the customer's role in conservation efforts and the customer focused nature of future technological innovation. Customers should also help determine the pace of utility investment (p11).

… Utilities are expected to develop a genuine understanding of their customers' interests and preferences and integrate those interests and preferences into their plans. (p11)

Customer engagement is expected to inform the development of utility plans, and utilities are expected to demonstrate in their proposals how customer expectations have been integrated into their plans, including the trade-offs between outcomes and costs. (p11)

The OEB expects a utility's rate application to provide an overview of customer needs, preferences and expectations learned through the utility's customer engagement activities. (p12)"

QUESTION (C):

c) Please identify where, in Toronto Hydro's view, Reference 2 identifies a "consumer-centric" approach to rate applications. Please articulate Toronto Hydro's view as to the relative weight and priority of customer "needs and preferences" in relation to each of prices, adequacy, reliability, and quality of electricity service.

RESPONSE (C) – PREPARED BY INNOVATIVE:

The above response (b) addresses the "customer-centric" aspect of the OEB direction.

The primary role of identifying customer needs and preferences is to help Toronto Hydro set priorities among investments after meeting this primary consideration. While the 2016 Handbook for Utility Rate Applications already requires applications provide "A focus on cost effective delivery of outcomes that matter to customers", the engagement helps Toronto Hydro to understand the

range of investments customers would like Toronto Hydro to address and the pace at which Toronto Hydro should implement those investments.

RESPONSE (C) – PREPARED BY TORONTO HYDRO

For Toronto Hydro's position on the balance between price and progress towards other outcomes that customers expect, please refer to the response to Interrogatory 1B-CCC-48(a).

QUESTION (D):

d) Please explain Toronto Hydro's definition of "customer needs and preferences." How does Toronto Hydro distinguish between needs and preferences? How would Toronto Hydro prioritize these compared to economic efficiency and cost effectiveness?

RESPOND (D) – PREPARED BY INNOVATIVE:

On page 4 of the Customer Engagement Executive Summary, customer needs are defined as "understanding the gap between the services and experience customers want and the services and experience customers are receiving". Within the customer engagement, needs are identified in the Phase 1 survey by asking "Is there anything in particular you would like Toronto Hydro to do to improve its services to you?". Needs are also identified on an ongoing basis across the entire customer service team.

Preferences in this engagement include three broad categories:

- What outcomes matters to customers and how important is each outcome (this is the means by THESL can ensure its goals are aligned with customer preferences per multiple references on pages 10 and 11 of the OEB Handbook).
- Trade-offs between competing outcomes (see the reference to trade-offs on p11 of the OEB Handbook).
- Pacing of specific initiatives (see the reference to pacing on p11 of the Handbook).

Cost effectiveness and efficiency are not in conflict with customer needs and preferences. In fact, they are important customer considerations. Customers generally raise cost effectiveness and efficiency in the context of delivering reasonable distribution rates and comments to this effect can be seen in the various comment box summaries in the report. Customers expect Toronto Hydro to find efficiency whenever possible and want to see customer benefits associated with new investments.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-102

References: Exhibit 1B, Tab 6, Schedule 3, Appendix A, Pages 11-13, 17

Preamble:

Several of Clearspring's recent models have contained an urban congestion variable of general form AreaCongested Urban / AreaTotal. In this study, Clearspring has created time-variant values for this variable using data on the number of tall buildings ("skyscrapers") in various urban areas. Skyscrapers are defined as buildings with a height of at least 100 meters.

Adding the high-rise building data to the congested urban variable appears to boost the elasticity estimate for this variable. This matters to Toronto Hydro's score because it has an unusually high value for the variable.

QUESTION (A):

a) Please confirm that the sensitivity of the parameter estimates for the congested urban variable to the inclusion in the sample of one company (Consolidated Edison of New York) that has an extremely high value is disadvantageous.

RESPONSE PROVIDED BY CLEARSPRING (A):

Consolidated Edision is a strong peer to Toronto Hydro and important to include in a benchmark study of Toronto Hydro. It is true that it would be helpful, if it were possible, to add more utilities similar to Consolidated Edison and Toronto Hydro to the sample, however, that is not currently feasible. Both Clearspring and PEG have agreed on the need to and importance of including the percent congested urban variable for the most recent benchmarking applications. In fact, both consultants have used the same percent congested urban variable in their models for the last three applications (Toronto Hydro's last one, Hydro Ottawa, and Hydro One). During the experts' Hydro

One joint conferral process, the inclusion of the percent congested urban variable was not controversial or a concern raised by PEG.

QUESTION (B):

b) Please provide Toronto Hydro's cost performance scores and rankings with and without the congested urban variable in the model.

RESPONSE PROVIDED BY CLEARSPRING (B):

Clearspring is of the view that the score and ranking without the congested urban variable is not a valid or appropriate comparison because it leaves out a known, highly statistically significant, and impactful cost challenge from the analysis. Both Clearspring and Board Staff's benchmarking expert, PEG, have included the congested urban variable in its total cost benchmark models in the last three Custom IR applications involving econometric benchmarking. This was the last Toronto Hydro application (EB-2018-0165), Hydro Ottawa's CIR application (EB-2019-0261), and Hydro One's CIR application (EB-2021-0110). Clearspring recognizes that the variable is quite impactful on the benchmark score of Toronto Hydro and without the variable the score increases. This makes sense, as serving a highly urbanized service area is going to increase costs substantially. A benchmarking analysis without a proper percent congested urban adjustment is not valid in evaluating performance and is not Clearspring's model, nor has it been PEG's model in recent applications.

QUESTION (C):

c) Why were Atlantic City Electric (serving Atlantic City, NJ), Puget Sound Energy (serving Bellevue, WA), Consumers Energy (serving Grand Rapids, MI), and Connecticut Light and Power (serving Hartford, CT) assigned zero values for this variable? All of these cities had skyscrapers higher than 100 meters.

RESPONSE PROVIDED BY CLEARSPRING (C):

Constructing the congested urban variable involved a large effort which required meticulous mapping of city blocks and streets. For this reason, only cities with populations above 200,000 were examined. The cities cited above did not pass that threshold.

QUESTION (D):

d) Please confirm that some utilities serving cities with congested urban areas (e.g., El Paso, TX) do not have skyscrapers that are at least 100 meters tall. Does that suggest that the 100-meter basis for the skyscraper definition is optimal?

RESPONSE PROVIDED BY CLEARSPRING (D):

The first sentence of the question is confirmed. The congested urban variable was constructed based on examining areas of cities that had building clusters of 7 stories or higher. The optimal basis for the skyscraper definition would, therefore, be 7 stories. However, the Council on Tall Buildings and Urban Habitat (CTBUH) does not provide complete building data under 100m, and indicates that building data under 150m may be incomplete in its dataset. Based on this, balanced with the desire to include the shorter skyscrapers because of the 7 story criterion used in the construction of the variable, we used the cut-off at 100m as being a reasonable approach.

QUESTION (E):

e) Did Clearspring produce results using alternative minimum heights for skyscrapers? If so, please provide these results.

RESPONSE PROVIDED BY CLEARSPRING (E):

No. We only gathered and collected the 100m and above dataset and use that as the basis for variable escalation.

QUESTION (F):

f) Please provide the full skyscraper database (e.g., including skyscrapers less than 100 meters in height) so PEG can undertake its own sensitivity analyses.

RESPONSE PROVIDED BY CLEARSPRING (F):

Clearspring does not have an expanded database other than the one provided in the working papers, as we only gathered the 100m and above dataset for the large cities that were served by our sampled utilities and that was provided in the working papers.

QUESTION (G):

g) Please confirm that Clearspring only included data for at most congested urban areas in a single city of a utility's service territory. If a utility served multiple metropolitan areas with one or more congested urban zones (e.g., Pacific Gas & Electric serves the cities of San Francisco and San Jose, two of the twenty largest cities in the United States), was only the metro area with the largest congested urban zones counted?

RESPONSE PROVIDED BY CLEARSPRING (G):

This is not confirmed. We included data for multiple cities in the case where a utility served multiple large cities with skyscrapers above 100m. In the case of PG&E this included both San Francisco and Oakland. San Jose does not have any buildings above 100m according to the CTBUH.

QUESTION (H):

h) For metropolitan areas with sizable suburban business districts (e.g., St. Louis, MO), did Clearspring include the suburban business districts in its calculations?

RESPONSE PROVIDED BY CLEARSPRING (H):

We only used the major city data. If there are buildings above 100m but outside of the city of St. Louis then they were not counted.

QUESTION (I):

i) Did Clearspring confirm that all of the qualifying skyscrapers are served by the utility and located in the congested urban area?

RESPONSE PROVIDED BY CLEARSPRING (I):

We used the full building count for the city and did not locate every single skyscraper and assure it was within the service area of each utility. Given that this data is only used to escalate the urban variable this level of analysis was not required, in Clearspring's opinion.

QUESTION (J):

j) Did Clearspring change the estimated size of the congested urban data for any utilities since the last Toronto Hydro Custom IR proceeding? If so, please provide the new maps.

RESPONSE PROVIDED BY CLEARSPRING (J):

The congested urban variable is the same as used by Clearspring and PEG in the most recent Hydro Ottawa and Hydro One applications. There were a handful of very small refinements made in the Hydro Ottawa application which was the next iteration of Ontario Clearspring benchmarking research right after the prior Toronto Hydro proceeding. No new maps were produced since the changes were so minor. The changes made in the Hydro Ottawa proceeding from the Toronto Hydro proceeding in the percent congested urban were all less than 0.1% changes in the variable value. For example, Toronto Hydro's value was refined and increased by 0.001%.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 1B-STAFF-103

References: Exhibit 1B, Tab 7, Schedule 3, Appendix A, Pages 22-24

Preamble:

While Clearspring did not present a table of the rankings of each utility in the sample, cost performance data are automatically produced as part of obtaining the values for Toronto Hydro's performance evaluation and forecasting.

QUESTION (A):

a) In the econometric model for total distribution cost, where does Toronto Hydro rank among the sampled utilities?

RESPONSE PROVIDED BY CLEARSPRING (A):

Ranking Toronto Hydro's last three historical years to all of the sample's last three historical years results in a ranking of 6th out of the 79 utilities in the sample (when including Toronto Hydro).

QUESTION (B):

b) How does this compare to their rankings in previous power distribution total cost econometric models and studies authored by Mr. Fenrick?

RESPONSE PROVIDED BY CLEARSPRING (B):

In the last Toronto Hydro CIR application, Toronto Hydro's last three historical years ranked 15th out of the 90 utilities in the sample.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-1

Reference: Exhibit 1B, Tab 1, Schedule 1, Figure 1

Figure 1 provides a percentage breakout of SAIDI (Excluding Loss of Supply & Major Events) by outage cause for 2018-2022.

Please provide the data for each of the years 2018-2023.

RESPONSE:

Please see Table 1 below for the percentage breakdown of SAIDI (Excluding Loss of Supply and Major Events) by major cause code from 2018 to 2023.

Table 1: SAIDI (Excluding Loss of Supply & Major Events) Breakdown by Outage Cause 2018-2023

Major Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	0%	0%	0%	0%	1%	0%
Adverse Weather	21%	10%	4%	10%	7%	11%
Defective Equipment	43%	41%	40%	37%	41%	32%
Foreign Interference	10%	10%	22%	21%	14%	17%
Human Element	1%	6%	3%	4%	2%	2%
Lightning	0%	0%	0%	2%	0%	0%
Scheduled Outage	4%	6%	1%	2%	14%	18%
Tree Contacts	16%	21%	18%	19%	12%	13%
Unknown	4%	6%	11%	5%	7%	7%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-2

Reference: Exhibit 1B, Tab 1, Schedule 1

Please add a column to Tables 5-8 to show 2020-2024 actual spending.

RESPONSE:

See below tables for 2020-2024 actual/forecast spending added to tables 5-8. Please note that tables 5-8 have been updated to the latest forecasts submitted on January 29, 2024[1].

Table 5: Sustainment Capital Programs

Capital Program/Segment	2020-2024 Investment ($M)	2025-2029 Investment ($M)
Area Conversions	209	237
Underground Renewal - Horseshoe	363	476
Underground Renewal - Downtown	81	165
Network System Renewal	116	123
Overhead Renewal	224	273
Stations Renewal	125	218
Reactive and Corrective Capital	307	328
Sustainment Capital	**1,425**	**1,820**

Table 6: City Growth and Electrification Capital Programs

Capital Program/Segment	2020-2024 Investment ($M)	2025-2029 Investment ($M)
Customer Connections	369	476
Externally Initiated Plant Relocations & Expansions	60	76

[1] OEB File No. EB-2023-0195, Toronto Hydro-Electric System Limited ("Toronto Hydro") 2025-2029 Custom Rate Application for Electricity Distribution Rates and Charges – Evidence Update

Capital Program/Segment	2020-2024 Investment ($M)	2025-2029 Investment ($M)
Load Demand	135	217
Generation Protection, Monitoring, and Control	10	35
Non-Wires Solutions	2	23
Stations Expansion	142	122
Growth Capital	**718**	**949**

Table 7: Modernization Capital Programs

Capital Program/Segment	2020-2024 Investment ($M)	2025-2029 Investment ($M)
System Enhancement	26	151
Network Condition Monitoring and Control	54	6
Metering	80	248
Overhead Resiliency	-	86
Stations Control and Monitoring	28	65
IT Cyber Security & Software Enhancements	88	95
Legacy Network Equipment Renewal	4	-
Modernization Capital	**280**	**651**

Table 8: General Plant Capital Programs

Capital Program/Segment	2020-2024 Investment ($M)	2025-2029 Investment ($M)
Control Operations Reinforcement Program	40	-
Enterprise Data Centre	-	72
Facilities Management and Security	85	145
Fleet and Equipment Services	37	44
Information and Operational Technology	169	206
General Plant Capital	**331**	**467**

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-3

Reference: Exhibit 1B, Tab 1, Schedule 2, Page 3

% Contribution to 4 Strategic Priorities	EB-2023-0195	EB-2018-0165
Growth	25%	
Sustainment	46%	
Modernization	17%	
General Plant	12%	

RESPONSE:

Please see Table 1 below for 2020-2024 actual capital expenditure contributions to each of the four strategic priorities by percentage. Toronto Hydro notes that the percentages presented in EB-2023-0195 reflect the update filed on January 29, 2024[1].

Table 1: Percent Contribution to Four Strategic Priorities

% Contributions to Strategic Priorities	EB-2023-0195	EB-2018-0165
Growth	24%	26%
Sustainment	47%	52%
Modernization	17%	10%
General Plant	12%	12%

[1] EB-2023-0195, Evidence Update (January 29, 2024)

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-4

Reference: Exhibit 1B, Tab 1-3, page.4

Please complete the following Table:

Rate Period	2015-2019	2020-2024	2025-2029
EB#	EB-2014-0116	EB-2018-0165	
Requested Base Revenue Requirement			
OEB-Approved Base Revenue Requirement			

RESPONSE:

Please see the table below for the requested information:

Table 1 Base Revenue Requirement ($ Millions)

Rate Period	EB-2014-0116	EB-2018-0165		EB-2023-0195
	2015-2019	2020-2023	2020-2024	2025-2029
Requested Base Revenue Requirement	3,799	3,351	4,255	5,387
OEB-Approved Base Revenue Requirement[1]	3,533	3,188	4,081	N/A
Actual Revenue[2]	3,455	3,095	N/A	N/A

[1] Based on the OEB-approved inflation

[2] Based on the OEB-approved inflation

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-5

Reference: Exhibit 1B, Tab 1, Schedule 3 page.7

Please provide the footnote to Depreciation in Table 7 and Table 8.

RESPONSE:

The requested footnote has been added under Tables 1 and Table 2 below. Both tables were also updated to reflect the updated Exhibit 2A, Tab 1, Schedule 1 (filed January 29, 2024) at page 2.

Table 1: 2020-2024 Rate Base Summary ($ Millions)

	OEB Approved	Actuals			Bridge	
	2020	**2020**	**2021**	**2022**	**2023**	**2024**
Opening PP&E NBV	4,229.4	4,233.2	4,419.2	4,628.1	4,893.9	5,244.3
In-Service Additions	527.4	447.9	485.2	554.4	607.9	606.3
Depreciation[1]	(265.4)	(262.0)	(276.2)	(288.7)	(257.4)	(271.8)
Closing PP&E NBV	4,491.3	4,419.2	4,628.1	4,893.9	5,244.3	5,578.8
Monthly Avg PP&E NBV	**4,298.6**	**4,284.3**	**4,457.7**	**4,686.3**	**4,954.3**	**5,348.5**
Working Capital Allowance	216.2	249.8	217.2	220.7	221.1	230.3
Rate Base	**4,514.8**	**4,534.1**	**4,674.9**	**4,907.0**	**5,175.3**	**5,578.8**

[1] Excludes allocated transportation depreciation

1 **Table 2: 2025-2029 Rate Base Summary ($ Millions)**

	Forecast				
	2025	**2026**	**2027**	**2028**	**2029**
Opening PP&E NBV	5,578.8	5,934.5	6,325.6	6,794.1	7,219.0
In-Service Additions	642.1	691.7	789.8	769.2	859.5
Depreciation[2]	(286.3)	(300.6)	(321.4)	(344.3)	(356.5)
Closing PP&E NBV	5,934.5	6,325.6	6,794.1	7,219.0	7,722.0
Monthly Avg PP&E NBV	**5,668.6**	**6,041.6**	**6,460.1**	**6,911.7**	**7,335.2**
Working Capital Allowance	231.5	237.1	242.5	250.8	255.6
Rate Base	**5,900.0**	**6,278.7**	**6,702.6**	**7,162.5**	**7,590.8**

[2] Excludes allocated transportation depreciation

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-6

Reference: Exhibit 1B, Tab 2, Schedule 1, Page. 34

QUESTION:

Toronto Hydro indicates it carefully considered the amount of funding requested for this proposal and based on research, the utility decided to allocate 0.3 percent of the proposed revenue requirement to the Innovation Fund, which amounts to approximately $16 million over the 2025-2029 rate period. This is the low end of a range found in research of comparable ratepayer-funded initiatives aimed at facilitating innovation by utilities and regulatory bodies in other jurisdictions, as well as general data on utility spending for research and development activities.

Please provide a description and details of comparable ratepayer-funded initiatives in other jurisdictions and the corresponding funding amounts.

RESPONSE:

Please see Toronto Hydro's response to interrogatory 1B-DRC-06 part (d).

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-07

Reference: Exhibit 1B, Tab 3, Schedule 1, Page 42

With respect to Figure 9: 2020 - 2024 Efficiency Achievements (Actual and Forecast), please provide the data and underlying calculations and assumptions used.

RESPONSE:

Table 1 below provides the data behind Figure 9: 2020 – 2024 Efficiency Achievements (Actual and Forecast). Table 2 below provided a breakdown of each initiative along with an explanation of how the benefits were calculated for each particular initiative.

Table 1: 2020-2024 Efficiency Achievements Summary ($ Millions)

Year	2020	2021	2022	2023*	2024*	Total
Cost Reduction	1.16	1.83	1.74	1.45	1.52	**7.70**
Cost Avoidance	1.49	1.58	3.72	3.90	4.10	**14.79**
Total	**2.65**	**3.41**	**5.46**	**5.35**	**5.62**	**22.49**

Table 2: 2020-2024 Efficiency Achievements Breakdown by Initiative ($ Millions)

Productivity Initiative	Cost Reduction or Avoidance Calculation	Total Benefit ($ Millions)
Enterprise Resource Planning, Enterprise Connect, and People Connect	Amount saved through the avoidance of maintenance costs connected to the legacy systems and the hours saved through the automated functionalities multiplied by the standard labour rate.	10.57
e-Tailboard	Amount saved through the avoidance of costs associated with the legacy process (tangible, paper-copy tailboards) and the number of hours saved	2.28

Productivity Initiative	Cost Reduction or Avoidance Calculation	Total Benefit ($ Millions)
	through the use of electronic tailboard creation and use multiplied by the standard labour rate.	
Streetlighting Management System Project[1]	Amount saved through the avoidance of streetlight work management costs following the existing, legacy system reaching end of life.	1.98
Non-conformance Reporting	Number of hours saved through the automated and streamlined process associated with progressing beyond the legacy system multiplied by the standard labour rate.	1.26
Electronic Red Construction Folder	Amount saved through the digitization of the existing red construction folder process and the number of hours saved through the use thereof multiplied by the standard labour rate.	0.89
Accounts Payable Processing Automation	Number of hours saved through the introduction of an automated solution for the invoicing process multiplied by the standard labour rate.	0.70
Storm Prediction Impact Tool	Number of hours saved by utilizing the procured IBM weather dashboard to support disaster response decision making multiplied by the standard labour rate.	0.06
SAP Business Warehouse Project	Amount saved through the implementation of the SAP tool to the business warehousing process.	0.15
Find It Fix It Program	Amount saved for key underground and overhead maintenance programs based on the number of find-it fix-it items completed	2.95

[1] This benefit is associated with Toronto Hydro Energy Services Incorporated (THESI)

Productivity Initiative	Cost Reduction or Avoidance Calculation	Total Benefit ($ Millions)
Regulatory Intelligence Subscription Service	Annual payrolls costs (0.5 FTE) avoided by having access to this subscription service, plus avoided costs related to outsourcing regulatory intelligence research and analysis to higher cost external service providers.	0.40
Porcelain Insulator Replacement Initiative	Year-over-year decrease in cost for insulator washing program.	0.20
Equipment Failure Analysis Dashboard	Year-over-year decrease in time for equipment failure analysis multiplied by the standard labour rate.	0.04
Standardized Outage Tracking Process	Amount of overtime expenses avoided due to the standardized nature of outage tracking which avoided overtime hours of contractor work, including the removal of major rescheduling triggers.	0.06
Online Training	Number of hours saved by delivering a course virtually multiplied by the standard labour rate.	0.59
RISE 360	Number of courses developed using RISE 360 multiplied by $7,500 per course.	0.09
Classroom Maximization	Number of training hours in both the PLT lab and at Parkdale multiplied by $55/hr and $110/hr, respectively.	0.07
CenarioVR	Number of scenarios developed using CenarioVR multiplied by 6000/course plus the number of attendees multiplied by 2.5 and then multiplied by the standard labour rate.	0.04
Change Order Billing Process	The time difference between monthly billing reviews and the review of change orders during closeout review multiplied by the standard labour rate.	0.03
Total efficiency benefits yielded by the above initiatives.		**22.5**

1

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-8

Reference: Exhibit 1B, Tab 3, Schedule 2, p.26

With respect to Figure 4, please provide the MAIFI values for each of the years 2018-2023.

RESPONSE:

Please see Table 1 below for MAIFI results from 2018 to 2023 (excluding major events).

Table 1: MAIFI (excluding Major Events) 2018-2023

Year	MAIFI
2018	2.78
2019	2.85
2020	3.18
2021	3.39
2022	3.36
2023	3.34

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-9

Reference: Exhibit 1B, Tab 3, Schedule 2, Page. 35

In 2021, Toronto Hydro refined its unit cost methodology with respect to wood poles and applied the new methodology retrospectively to ensure year-over-year comparability in the results.

QUESTION (A):

a) Please provide the two methodologies and discuss the differences.

RESPONSE (A):

The two methodologies used by Toronto Hydro for unit costs can be summarized as the following:

Table 1: Summary of Refined Unit Cost Methodology

Previous Approach (pre-2021)	Updated Approach
ISA Data for the respective year is formatted and cleansed to exclude demand driven programs and to group costs and quantities by project and asset type	Unchanged
Unit cost calculated by taking the total cost of the project divided by quantity of the project for that particular asset type	Unchanged
Exclude outliers (top and bottom 10th percentiles)	Unchanged
Aggregate the unit costs and divide by the number of projects	Aggregate the total costs and total quantities from all projects corresponding to that asset type
Sum of all unit costs across projects divided by the number of projects	Compute the average unit cost by dividing total costs by total quantities

Toronto Hydro observed higher volatility in the unit costs when using the former method, particularly in the case when projects had low quantities.

QUESTION (B):

b) Please provide the wood pole unit cost for the years 2018 to 2023 based on the original methodology.

RESPONSE (B):

Please see the table below for the 3-year weighted average wood pole unit costs aligned with the original methodology.

Table 2: Wood Pole Unit Costs 2018 to 2023 – Original Methodology

2018	2019	2020	2021	2022	2023
$7,332.6	$7,639.4	$7,778.7	$7,846.6	$7,973.5	$8,178.6

QUESTION (C):

c) Please explain the difference between the average wood pole replacement cost for the years 2020-2022 in Table 3 at 1B-3-2 page 22 and the wood pole preplacement data in Figure 14 at 1B-3-2 page 35.

RESPONSE (C):

Table 3 in Exhibit 1B, Tab 3, Schedule 2 provides the 2020-2024 Custom Measure results for 2020-2022 which are reported annually as part of Toronto Hydro's MD&A. The 2021-2022 unit costs are derived on the basis of the previous methodology to ensure consistency with 2020 unit cost results (these align with the unit costs in part (b)). On the other hand, Figure 14 utilizes the updated methodology, deriving the three-year weighted average from 2020 to 2022.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-010

Reference: Exhibit 1B, Tab 3, Schedule 3 p.13

Toronto Hydro slowed down the pace of work in the Underground Downtown, Underground Horseshoe, and Overheard Renewal programs by approximately 22 percent leading to a $189 million reduction compared to forecasted budgets for these programs in the 2020-2024 rate application.

QUESTION (A):

a) Please discuss the process Toronto Hydro undertook to reprioritize the capital work and investment levels and conclude where to slow the pace of work.

RESPONSE (A):

Toronto Hydro's Asset Management Process is described in detail in Exhibit 2B, Section D1. This is the overarching process that the utility leverages to implement, track and adjust its capital expenditure plan. More specifically, the utility makes adjustments to short- and long-term plans at appropriate frequencies through the complimentary Program Management & Execution and Investment Planning & Portfolio Reporting ("IPPR") processes (as depicted in Section D1.2). The annual IPPR process produces final recommendations for updated programmatic investment levels. Management arrives at these recommendations by making trade-offs, ultimately working to balance various risks and outcomes in alignment with corporate objectives, including funding constraints.

QUESTION (B):

b) Please provide the impact of the change on the forecast outcomes of each program.

RESPONSE (B):

Toronto Hydro's 2025-2029 investment plan for the referenced programs accounts for the current state of the distribution system. As a result of deferrals within the referenced programs, the current state of the system is worse than it would have been had all work been completed in accordance with the 2020-2024 plan. This contributes to greater investment needs in 2025-2029 to maintain asset condition demographics and reliability performance, and address various asset risks (e.g., safety). (Toronto Hydro refers to this as the "snowplow" effect, where delayed investment within a rate period results in a greater increase in investment needs in the next period.) For a detailed discussion of the relevant program-specific investment needs and variances within the 2020-2024 period, please refer to Exhibit 2B, Sections E6.2, E6.3, and E6.5.

QUESTION (C):

c) Please discuss if incentive payments are impacted by the change.

RESPONSE:

As noted in response to part (b), deferrals within the referenced programs have led to the current state of the system being worse than it would have been had all work been completed in accordance with the plan. This has had an inherent effect on the reliability forecasts that Toronto Hydro used to inform the reliability targets which underpin the Performance Incentive Mechanism. For a detailed discussion of how asset condition demographics and reliability performance trends have influenced Toronto Hydro's 2025-2029 Capital Expenditure Plan (and associated expectations regarding reliability performance in the next rate period), please see Exhibit 2B, Section E2.2.1.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-11

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A, Page 14

QUESTION:

With respect to the data in Table 2, Clearspring forecasts that Toronto Hydro's average SAIFI over 2025-2029 (1.17) is stable compared to the 2020-2022 average (1.18). However, Clearspring's average projections for CAIDI show a slight decline in 2025-2029 (51.70) compared to the 2020-2022 (48.36). In Table 3, Clearspring forecasts a slight decline in SAIDI.

Please discuss the drivers for the forecast decline in SAIDI/CAIDI.

RESPONSE:

Toronto Hydro provided Clearspring with projected SAIFI and SAIDI performance for the 2025-2029 period (refer to 1B-Staff-73 for more details). Projected CAIDI performance was derived by dividing SAIDI by SAIFI. Scheduled Outages were the most significant driver that contributed to the slight decline in SAIDI performance (2025-2029 Average vs. 2020-2024 Average). Scheduled Outages are projected to increase due to a larger capital work program. For more information, please refer to 1B-Staff-74, part (d), and 1B-Staff-62, part (b).

All other cause codes are projected using the historical five-year average with the exception of Defective Equipment, which did not contribute to the decline in SAIDI. Defective Equipment was modeled by projected failures and interruption impacts at an asset class level based on asset demographics and the expected benefits of the reliability-related Grid Modernization investments, as detailed in Toronto Hydro's response to interrogatory 2B-SEC-42.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 1B-AMPCO-12

References: EB-2018-0165, Exhibit 1B, Tab 2, Schedule 1, Appendix B
Exhibit 1B, Tab 3, Schedule 3, Appendix C

Preamble:

At Reference #1, Toronto Hydro filed a UMS Unit Costs Benchmarking Study. At Reference #2, Toronto Hydro filed an updated UMS Unit Costs Benchmarking Study dated October 2023.

QUESTION (A):

a) Please explain why unit costs for OH Switch Replacement and Switchgear Replacement were included in the EB-2018-0165 study but not included in the October 2023 UMS Study.

RESPONSE PROVIDED BY UMS GROUP (A):

We used the list of asset classes from the previous application (EB-2018-0165) as a starting point for discussion and applying our industry experience, we reviewed the viability of gaining consistency across utilities for each Asset Class and Maintenance Program. Citing significant variability in the selection, installation, and accounting for overhead switches, we opted to remove that category from the study. With respect to Switchgear Replacement, though initially targeted for inclusion in the previous application (EB-2018-0165 1B-2-1 Appendix B), it was ultimately removed from consideration as the number of these replacements within each utility were too few and sporadic to enable viable comparisons.

RESPONSE PROVIDED BY TORONTO HYDRO (A):

In identifying asset types to include for benchmarking, Toronto Hydro sought to ensure major asset classes that accounted for considerable expenditures in the 2020-2022 period were included. Although switches are critical components within the overhead distribution system, they do not

pose the same level of asset deterioration pressures to the overhead system as Wood Poles at the current time as discussed in Exhibit 2B, Exhibit 6.5.3.1. In addition, the focus of the Overhead System Renewal program remains on eliminating PCB at-risk transformers through spot replacement approaches while managing reliability concerns through rebuilds. In selecting the asset classes to benchmark, Toronto Hydro also attempted to align to the Activity Based Performance Benchmarking ("APB") asset classes where appropriate, which was another driver for not including OH Switch Replacement within the benchmarking study.

QUESTION (B):

b) Please provide the unit costs for OH Switch Replacement and Switchgear Replacement if calculated as part of UMS' work for the October 2023 study but not included in the report.

RESPONSE PROVIDED BY UMS GROUP (B):

The OH Switch Replacement and Switchgear Replacement was excluded from the October 2023 study, and thus there was no calculation for unit cost.

QUESTION (C):

c) Please provide the drivers for the increase in unit costs in the October 2023 UMS study compared to the EB-2018-0165 UMS Study for the following asset categories: UG Cable, Pole Top Transformers, Padmount/UG Transformer, Network Transformer Replacement and Breaker.

RESPONSE PROVIDED BY UMS GROUP (C):

We have noted a general increase in costs across the industry over the past three years, driven largely by inflation (including its effect on commodity prices), supply chain challenges (limited manufacturing capability and excessive lead times, causing demand to exceed supply resulting in increased prices), and COVID related policies, most notably the requirement that individuals be in separate vehicles thus increasing crew size and fleet / heavy equipment costs. We understand that

the industry is only recently beginning to relax COVID-related restrictions, but inflation and supply chain issues have remained an issue.

RESPONSE PROVIDED BY TORONTO HYDRO (C):

For Toronto Hydro, the increases can be attributed to various factors, including but not limited to inflation and supply chain impacts discussed in Exhibit 1B, Tab 3, Schedule 3, and asset-specific variability such as seen with stations assets discussed in Exhibit 2B, Exhibit 2B, Section E6.6.4.1.

QUESTION (D):

d) Please explain the basis for adding Cable Chambers to the asset category in the October 2023 UMS Study.

RESPONSE PROVIDED BY UMS GROUP (D):

Cable Chambers were added with the intention of providing a more diverse and representative sample set of THESL's work, particularly given the amount of civil work being performed. Of the asset classes to be considered, cable chambers represented one that would be most conducive to conducting industry comparisons.

RESPONSE PROVIDED BY TORONTO HYDRO (D):

Toronto Hydro found it prudent to add Cable Chambers to the asset categories within the latest UMS Unit Costs Benchmarking Study due to the continued and increasing investments required for managing this asset class over the long term. Toronto Hydro is proposing to invest 162 percent more in this asset class in 2025-2029 in comparison to the 2020-2024. The asset classes' health demographics also indicate that sustained investments will be required over the long term. Cable Chambers also represent a key investment in civil assets within Toronto Hydro's Underground Renewal – Downtown program and the overall System Renewal category. As such, including Cable Chambers in the study increases the proportion of total investment that is covered by the UMS Unit Costs Benchmarking Study.

QUESTION (E):

e) There were 17 electric utilities in the Peer Group Panel in the EB-2018-0165 study and only 12 electric utilities in the October 2023 UMS study. Please explain and discuss any impact on the results.

RESPONSE PROVIDED BY UMS GROUP (E):

The difference in number of participants for this study as compared to that conducted for the EB-2018-0165 application is reflective of utilities' willingness / capacity to dedicate resources to this effort. As always, we casted a wide net across the North American utilities and experienced the normal churn of some accepting but having to back out as the required completion date neared, and others declining at the initial offering, citing either overriding priorities or general policies not to participate in such endeavors. When we embark on these types of efforts, we prefer a peer group as large as possible, one that has at least 10 to 12 participants to achieve the level of directional accuracy that is called for in focused studies of this type.

QUESTION (F):

f) On page 8 of the UMS report in EB-2018-0165, UMS provides Table II-1 that shows the Fully Normalized Benchmark Comparisons. Please provide the same table using the data in the October 2023 UMS Study.

RESPONSE PROVIDED BY UMS GROUP (F):

Regarding our study in the EB-2018-0165 filing the Board provided THESL and UMS Group constructive feedback that questioned various aspects of the 2018 normalization formula. To be responsive to the Board's questions and feedback, we simplified our normalization efforts to focus on those criteria accepted by the Board in 2018 (i.e., metric and USD to CAD conversions and differences in accounting practices). However, as requested by this question: if we were to have applied the normalization adjusters for other factors as was done in the previous study (modified somewhat to reflect improvements in benchmarking practices), the following comparisons,

generally favoring THESL (as THESL's higher congestion undoubtedly has a negative effect on productivity), would have resulted:

Table II – 1: Fully Normalized Benchmark Comparisons (October 2023 UMS Study)

			Median	Percent from Median
Asset Categories				
Wood Pole	Each	$8,317	8,317	0.0%
UG Cable (XLPE)	Per Meter	$131	131	0.0%
Pole Top Transformer	Each	$18,691	18,687	0.0%
Pad mount / UG Transformer	Each	$37.373	37,129	0.7%
Network Transformer / Protector	Each	$127,649	130,085	-1.9%
Breaker	Each	$37,983	41,040	-7.4%
Cable Chambers / Manholes	Each	$136,409	139,607	-2.3%
Maintenance Programs				
Vegetation Management	Per Line KM	$2,175	2,140	1.6%
Pole Test and Treat	Each	$17	19	-8.1%
Overhead Line Patrol	Per Line KM	$23	26	-9.9%
Substation Maintenance	MVA	$1,712	1,712	0.0%
Building Vault Inspection	Each	$258	271	-5.0%

QUESTION (G):

g) On page 29 of the UMS report in EB-2018-0165, UMS provides Table C-2 which shows the % of Labour and Non-Labour costs. Please provide the same table using the data in the October 2023 UMS Study.

RESPONSE (G) PROVIDED BY UMS GROUP:

Per your request, the following table is provided:

Table C-2: Labour and Non-Labour Cost Split (October 2023 UMS Study)

Asset Category / Capital	A	B	C	D	E	F	G	H	I	J	K	L	THESL
Wood Poles Installed / Replaced	75%	80%	75%	75%	75%	66%	66%	75%	70%	55%	64%	64%	76%
UG Cable Installed / Replaced	75%	70%	70%	70%	70%	37%	69%	72%	75%	55%	82%	51%	70%
Pole Top Transformers Installed / Replaced	70%	70%	70%	70%	70%	54%	42%	65%	70%	55%		34%	68%
Padmount Transformers Installed / Replaced	60%	55%	55%	60%	60%	45%	37%	62%	60%	55%		25%	56%
Network Transformers / Protectors Installed / Replaced	50%	55%	50%	50%	50%	19%		45%	55%		46%	51%	49%
Breakers Installed / Replaced	70%	70%	70%	65%	65%	35%	85%	70%	75%	70%			64%
Cable Chambers / Manholes Installed / Replaced	95%	95%	95%	95%	90%	60%	57%	80%	90%		76%		94%
Maintenance Programs / OM&A	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**THESL**
Vegetation Management (Inspected / Trimmed)	99%	95%	95%	95%	95%	99%	100%	95%	99%	95%	100%	78%	99%
Pole Test and Treat	99%	95%	95%	95%	95%	99%	93%	95%	99%	95%		76%	99%
Overhead Line Patrol	99%	95%	95%	95%	95%	99%	50%	95%	99%	95%	100%	66%	99%
Substation Maintenance (Inspection, Test)	70%	60%	60%	40%	50%	60%	80%	65%	60%	95%	80%	77%	60%
Building Vault Inspections	99%	95%	95%	95%	95%	99%		92%	99%	100%	80%		99%

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-8

Reference: Exhibit 1B, Tab 1, Schedule 1 at page 3

The evidence states that the Investment Plan makes the minimum investments necessary (the "least regrets" investments) to maintain key outcomes in the near term while also making paced and deliberate progress in readying the grid and utility operations for the future irrespective of the path the energy transition takes. How does Toronto Hydro demonstrate to the OEB that it is making the minimum investments necessary? What are "least regrets" investments?

RESPONSE:

Please refer to Exhibit 2B, Section D4 starting on page 9 for an explanation of the least regrets planning approach and how it translates into balanced investments as part of the 2025-2029 Distribution System Plan. Please also see Toronto Hydro's responses to interrogatories 1B-DRC-03 and 1B-Staff-4(d).

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-9

Reference : Exhibit 1B, Tab 1, Schedule 1, Page 1

QUESTIONS (A) – (G):

Toronto Hydro has referred to a number of City of Toronto initiatives. Please provide a brief summary of each of these initiatives. Please indicate, specifically, how each of these initiatives has impacted Toronto Hydro's revenue and cost forecasts for the rate plan term:

a) Transform TO
b) Net Zero Existing Building Strategy
c) Electric Vehicle Strategy
d) Toronto Green Standard
e) Home Energy Loan Program
f) Energy Retrofit Loans
g) City of Toronto Green Will Initiative

RESPONSE (A) – (G):

Initiative	Summary Description
Transform TO	The TransformTO Net Zero Strategy responds to the climate emergency by focusing on a new target of net zero GHG emissions community-wide by 2040. The strategy outlines the rationale behind the net zero pathway and opportunities needed to successfully reach the net zero target. The Strategy presents a set of 2030 interim targets for community-wide emissions and City corporate targets.
Net Zero Existing Building Strategy	Building on the TransformTO strategy, the Net Zero Existing Building Strategy presents the background information and set recommended building-scale actions and the city-wide policies necessary for the City of Toronto to transform its existing building sector.
Electric Vehicle Strategy	As one of the key goals identified in Transform TO, the Electric Vehicle strategy identifies a range of actions to help the City achieve its 2050 goal of having all transportation powered by zero carbon energy sources. This strategy is one of

Initiative	Summary Description
	many initiatives informing Toronto's approach to sustainable transportation and focuses on activities for passenger light duty vehicle electrification.
Toronto Green Standard	The Toronto Green Standard is Toronto's sustainable design and performance requirements for new and city-owned developments. The Standard performs an important role as a market transformation tool to progressively push development beyond the minimum standards of the Ontario Building Code towards Toronto's zero-emission targets set in TransformTO.
Home Energy Loan Program	To help make it easy and affordable for homeowners to pay for home improvements, Toronto homeowners can borrow up to $125,000 to cover the cost of a variety of applicable home energy improvements.
City of Toronto Green Will Initiative	Connect building portfolio owners with the City of Toronto and other buildings owners to share experiences and best practices to reduce greenhouse gas emissions.

Critical climate change mitigation and adaptation efforts demand a bigger, more efficient and more resilient system that will serve customers for generations to come. In combination with many other business and customers inputs which are detailed throughout the evidence in Exhibits 1B, 2B and 4, the above-noted climate change mitigation initiatives informed Toronto Hydro's strategic direction and investment priorities for the 2025-2029 planning period – to get the grid and its operations ready and able to support long-term societal decarbonization imperatives. For more information about how Toronto Hydro's application enables energy transition via electrification please refer to Toronto Hydro's response to 1B-PP-08.

The Electric Vehicle Strategy specifically impacted Toronto Hydro's cost and revenue forecasts. To align with the goals of TranformTO to have 100% of light duty vehicles to be zero emission by 2050, the City of Toronto Electric Vehicle Strategy outlines interim goals by passenger vehicles. From these goals, the Strategy converted targets to EV sales goals. Toronto Hydro incorporated the City EV Strategy sales targets in the System Peak Demand Forecast found in Exhibit 2B, Section D4 and revenue forecast in Exhibit 3. Please refer to Exhibit 3, Tab 1, Schedule 1, Section 10 and Appendix J for more details on the integration of EV forecasts into Toronto Hydro's revenue load forecast.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-10

Reference: Exhibit 1B, Tab 1, Schedule 1, Page 7

QUESTION:

Toronto Hydro's evidence is that approximately one quarter of the utility's grid equipment continues to operate past useful life. An additional 11% is expected to reach that point by 2030 unless the utility invests in upkeeping system infrastructure in the 2025-2029 period. How does Toronto Hydro calculate the level of the utility's grid equipment operating past its useful life.

Please indicate the level of grid equipment operating past its useful life in 2018. What level of capital spending was proposed at that time to deal with assets operating beyond their useful life. How does that compare to the level being proposed during the rate plan period?

RESPONSE:

Toronto Hydro considers an asset to be operating past useful life if the asset remains in service at an age that is greater than its useful life. To calculate the percentage of Assets Past Useful Life ("APUL"), Toronto Hydro compares the age demographics of its asset population to the useful life of each asset type.

By 2018, approximately 24 percent of the asset population was operating past its useful life with an additional 9 percent by the end of the forecast period (2025). The level of capital spending proposed as part of the 2020-2024 Rate Application was approximately $2.8 billion.[1] Out of which, approximately $1.8 billion was proposed for System Renewal and Metering related investments that would have had the largest impact on addressing assets operating past their useful lives with some contribution from System Access and System Service investments as well.

[1] EB-2018-0165, U-VECC-71

By 2023, approximately 25 percent of the asset population was operating past its useful life with an additional 11 percent by the end of the forecast period (2030). As part of the 2025-2029 CIR Rate Application, Toronto Hydro is proposing approximately $2.2 billion in System Renewal and Metering related investments which is a 27 percent increase compared to the last rate application.

Details on the increased investment can be found in Exhibit 2B, Section E2.2 (page 15) and Section E4.2 (pages 16 and 18).

Please note that Toronto Hydro utilizes the APUL metric as a simple, high-level indicator meant to represent the age demographics of all assets. However, APUL is not intended to furnish detailed insights into the age distribution and condition of assets within a specific class. Such granular details are crucial for assessing the extent of System Renewal investment necessary on a programmatic level. For comprehensive information on this, please refer to the System Renewal programs detailed in Section E6 of the Distribution System Plan (Exhibit 2B). Please also refer to interrogatory response 2B-SEC-44 for a comprehensive discussion regarding expected asset demographic changes over the 2025-2029 period with investment.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-11

Reference : Exhibit 1B, Tab 1, Schedule 1, p. 9

QUESTION:

Toronto Hydro's population is expected to grow by approximately 23.8 % between 2021 and 2031, a marked increase from the 6.8% growth over the prior decade. Please specify how that increased growth has impacted Toronto Hydro's cost and revenue projections for the rate plan.

RESPONSE:

Please see the Customer Connections capital program in Exhibit 2B, Section E5.1 at pages 4 to 6 for an explanation of how population growth impacted the capital expenditure plan. Addressing the pressures of population growth within the City of Toronto requires a concerted effort between the government, the private sector (e.g. developers) and Toronto Hydro. As the need for accommodation (and supportive services such as transit, hospitals, office, etc.) increases, new building connections and service upgrades increase. This yields a greater demand for access to Toronto Hydro's distribution system (e.g. more condominiums, large multi-use developments) which is reflected in the increase of customer connection capital expenditures since 2020 above previous forecasts. The growth of these developments is projected to continue through the 2025-2029 period and is reflected in Toronto Hydro's customer connections forecast.

Increases in capital expenditures associated with Customer Connections also drive costs in the Customer Operations program at Exhibit 4, Tab 2, Schedule 8.

Please see the load and customer forecast in Exhibit 3, Tab 1, Schedule 1 at page 4 for an explanation of how population growth impacted the revenue forecast.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-12

Reference: Exhibit 1B, Tab 1, Schedule 1, Page 10 - 11

Toronto Hydro's evidence refers to extreme weather events and states, "As evidenced by recent events (outlined in Table 3 below), extreme weather has become a regular operating condition that the utility must consider and manage in its day-to-day operations and long-term planning activities. With the frequency and intensity of adverse weather increasing due to climate change, Toronto Hydro's grid and operations must become more resilient to this challenge." Please explain how the frequency and intensity of adverse weather increasing has impacted Toronto Hydro's operating and capital costs for the years 2025-2029.

RESPONSE:

Please refer to the following evidence for a general summary of how the frequency and intensity of adverse weather increasing impacts the distribution system:

- Exhibit 2B, Section D2, Subsection D2.1.2, "Climate and Weather"

Specific program level impacts are discussed in the following evidence:

- Exhibit 2B, Section E6.7 – Reactive and Corrective Capital Program
- Exhibit 4, Tab 2, Schedule 4 – Corrective Maintenance Program
- Exhibit 4, Tab 2, Schedule 5 – Emergency Response Program
- Exhibit 4, Tab 2, Schedule 6 – Disaster Preparedness Management Program.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-13

Reference : Exhibit 1B, Tab1, Schedule 1, pp.11-12

QUESTION :

Toronto Hydro expects to have over 4,400 DER connections by the end of the decade which represents a 67% increase compared to 2022. Please explain, specifically, how the forecast of DERs was derived. How does this impact capital and operating costs for the years 2025-2029? Please provide a full list of DER connection projects for the years 2020-2029. Please include all assumptions.

RESPONSE:

Please see Exhibit 2B, Section E5.1 at page 13 for an explanation of how the forecast was derived and a summary of the projects by year and by capacity.

Capital investments to support DER enablement are detailed under the Generation Protection, Monitoring and Control (Exhibit 2B, Section E5.5), the Non-Wires Solutions (Section E7.2) and Stations Expansion – Sheppard TS (Section E7.4) programs.

Operational investments to support DER maintenance and corrective costs are detailed in the Customer Location Maintenance segment of the Preventative and Predictive Station Maintenance Program at Exhibit 4, Tab 2, Schedule 3 starting on page 8. Operational investments to support system planning related to DER connections are detailed in the System Planning segment of the Asset and Program Management program at Exhibit 4, Tab 2, Schedule 9 starting on page 15.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-14

Reference: Exhibit 1B, Tab 1, Schedule 1, Page 12

Since 2015 Toronto Hydro has served the needs of a growing city, evolving customer and policy demands, and an aging system while addressing intensifying challenges identified above with a staffing complement that is essentially flat from 2015-2024. Over this period Toronto Hydro's replenished a large wave of retirements. It has also "rightsized" its workforce through continuous improvements in productivity, including harmonizing key jobs to create a more agile compliment of staff and automating manual processes to increase employee output levels.

QUESTION (A):

a) Please explain, in detail, how Toronto Hydro determined that a 25% increase was appropriate.

RESPONSE (A):

Please refer to the evidence at Exhibit 4, Tab 1, Schedule 1 at pages 25-50 for a detailed overview of the planning considerations, needs and drivers of the operations and workforce plan. Please refer to the Staffing evidence Exhibit 4, Tab 4, Schedule 3 for more information about the workforce plan.

Toronto Hydro considered the following quantitative and qualitative factors in determining the reasonableness of the 25% workforce increase proposed in this application:

1. FTE-normalized benchmarking analysis presented in the OM&A Overview evidence at Exhibit 4, Tab 1, Schedule 1, which shows that Toronto Hydro has a comparatively lean staffing contingent compared to its Ontario peers using publicly available OEB yearbook data

2. FTE trending which shows that forecasted FTE trends (e.g. FTE/CAPEX and FTE/customer as shown below in Figure 1 and 2, respectively) are keeping in line with (or better than) historical ratios.
3. Increasing volumes and complexity of work requirements across programs/portfolios as presented in the programmatic evidence and summarized in the OM&A Overview evidence.
4. The ability to train and safely absorb new staff (i.e., apprentices) into the utility's operations.
5. Professional judgement of senior utility leaders who have extensive experience managing operational requirements in the areas of construction, engineering, grid operations, customer operations, IT, finance, human resources and public, legal and regulatory affairs.

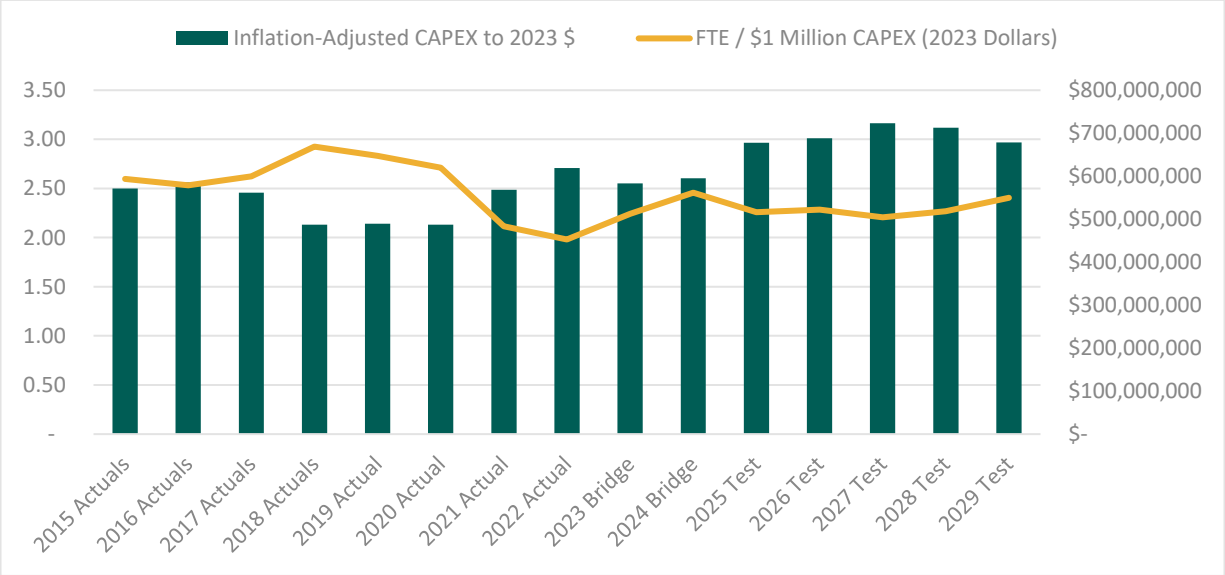


Figure 1: FTE per $1 million CAPEX 2015 – 2029

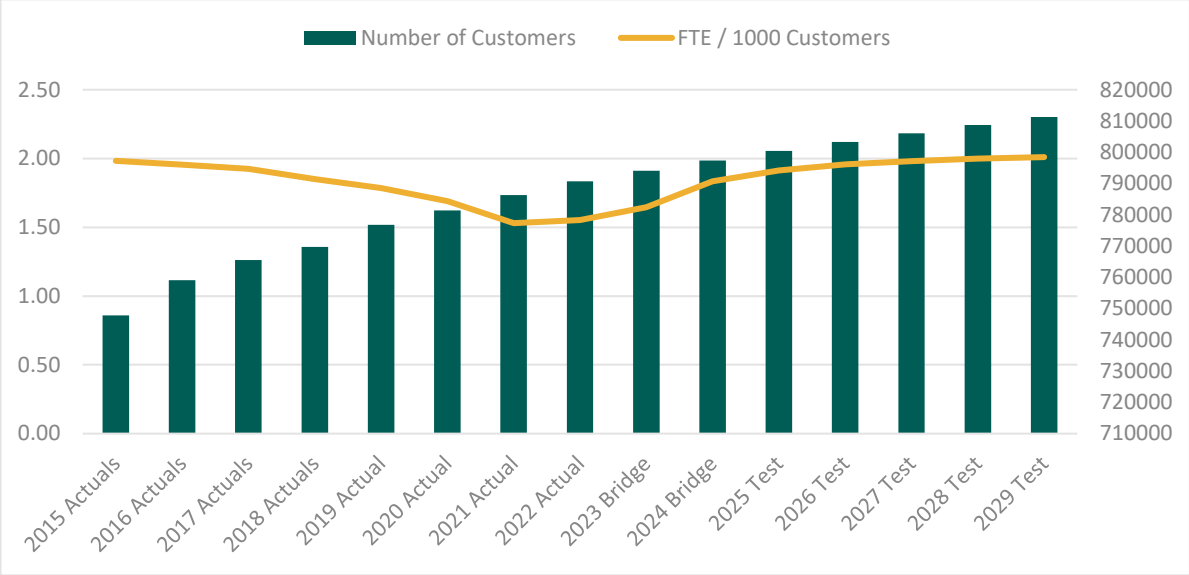


Figure 2: FTE per Customer 2015 – 2029

QUESTION (B):

b) If the staff compliment was the "right size" in 2024, how can that staffing level now be deemed inadequate?

RESPONSE (B):

The reference above notes Toronto Hydro's staffing complement is essentially flat from 2015 to 2024, and that this was made possible through productivity improvements (e.g., process automation, job harmonization, outsourcing) which enabled the utility to right-size (i.e. constrain) staffing levels over this period of time. The reference does not mean to suggest or imply that the staffing complement was right-sized in the year 2024 specifically, but rather, that it was right-sized over this period of time. However, it is no longer possible to operate with the historical staffing levels as business conditions are changing and the utility needs more resources to deliver its work programs, comply with legal and regulatory requirements and meet customer needs safely, reliably and efficiently.

QUESTION (C):

c) When did Toronto Hydro determine it was no longer possible to meet its obligations without additional staffing resources?

RESPONSE (C):

Workforce requirements were assessed through the utility's integrated business planning process which is described in the evidence at Exhibit 4, Tab 1, Schedule 1 starting at page 25. Please refer to interrogatory: (i) 2B-SEC-32 for a chronology of the business planning process and (ii) 4-CCC-58(d) for more information about the workforce planning part of the process.

QUESTION (D) :

d) What is the overall impact on the 2025 revenue requirement of increasing its workforce relative to 2024?

RESPONSE (D):

The 2025 revenue requirement impact of increasing workforce by 68 FTE relative to 2024 levels is approximately $6.5M.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-15

Reference: Exhibit 1B, Tab 1, Schedule 1, Page 26, Table 9

QUESTION:

Table 9 sets out Toronto Hydro's OM&A programs for the period 2025-2029. The CCC is interested in comparing this to the prior period. For each of those programs please provide the forecast and actual spending levels for the period 2020-2024. Please provide the year-by-year numbers as well as the total.

RESPONSE:

Please see Toronto Hydro's response to interrogatory 4-SEC-89 subpart (c).

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-16

Reference: Exhibit 1B, Tab 1, Schedule 1, Page. 33

QUESTION (A):

a) Toronto Hydro points to "notable" improvements in cost-efficiency achieved over the last decade.

Please explain how the $200 million which will be returned to customers by the end of the decade was calculated. Please explain how the $132 per customer amount was calculated.

RESPONSE (A):

Table 1: Calculation of $200 Million Returned to Customers

CIR Period	Account	DVA Balance ($ Millions)	Monthly Rate Rider ($)	Clearance Period	Amount paid per customer ($)
2015-2019[1]	Operating Centres Consolidation Program ("OCCP")	72.5	- 1.48	34 months	- 50.32
2020-2024[2]	OCCP	73.7	- 2.13	22 months	- 46.86
2020-2024	50/60 Eglinton	11.8	- 0.34	22 months	- 7.48
Sub-total		**158.0**	**n/a**		**- 104.66**
2025-2029[3]	OCCP	33.4	- 1.73	12 months	- 20.76
2025-2029	50/60 Eglinton	10.7	- 0.14	48 months	- 6.72
Total		**202.0**	**n/a**		**- 132.14**

[1] EB-2014-0116 – Decision and Rate Order (March 1, 2016)
[2] EB-2018-0165, DRO Reply Submission and Draft Rate Order Update at Page 13 of 32.
[3] Exhibit 9, Tab 3, Schedule 1 – Rate Rider Table

QUESTION (B):

b) Please explain how the $26 million reduction related to fleet was calculated. Is this an annual amount?

RESPONSE (B):

The $26 million reduction related to fleet is an aggregate figure for the 2017-2023 period and is not an annual amount. Toronto Hydro calculated it as follows (dollar figures rounded to the nearest thousand or million):

Table 2: Calculation of $26 million Fleet Reduction[4]

	(a)	(b)	(c)	(d)	
Vehicle Type	**Average Capital Replacement Cost by Vehicle Class ($)**	**Number of Units**	**Total Cost Avoidance by Class ($ millions) (a x b)**	**Average OPEX Cost per Year by Vehicle Class ($)**	**Replacement Cost Savings 2017-2023 ($ millions) (c + d) X (7 years) X (# of vehicles per class)**
Light Duty	51,000	62	3.2	4,000	1.7
Heavy Duty	296,000	49	14.5	13,000	4.4
Equipment	113,000	21	2.4	2,000	0.3
Total			**20**		**6.4**

In responding to this interrogatory, Toronto Hydro discovered an error in the original evidence referenced. The $26 million figure calculated above relates to an earlier, outdated fleet vehicle reduction count of 132 vehicles. The correct number of vehicles that Toronto Hydro replaced during the 2017-2023 period is 163 vehicles which, using the above methodology, corresponds to a total OPEX cost savings of $9.2 million and capital cost avoidance of $30.5 million, for a total of $39.7 million.

[4] Variances due to rounding may exist

QUESTION (C):

c) What is the total number of Toronto Hydro customers and the number of those customers on e-billing. How many customers are expected to convert to e-billing during the rate plan term by year. What are the expected annual savings from further conversion to e-billing? Have these savings been incorporated into the forecasts? If not, why not?

RESPONSE(C):

As of 2022, Toronto Hydro had a total of 790,699 customers[5] out of which 381,490 were on ebills. By 2029, Toronto Hydro expects to have 487,917 customers on ebills, with the annual forecast as follows:

Table 3: Number of Customers and Incremental new customers on ebills

	2022	2023	2024	2025	2026	2027	2028	2029
Number of customers on ebills at year end	381,490	404,854	427,275	442,135	455,413	466,433	478,664	487,917
Incremental number of new customers on ebills	30,497	23,364	22,421	14,860	13,278	11,020	12,231	9,254

Based on the above forecast of incremental eBill conversion, Toronto Hydro expects annual savings to increase between $0.1 million and $0.2 million each year over the 2025-2029 period, with cumulative savings adding up to approximately $2 million. Savings resulting from transitioning customers to ebills are primarily seen in forecast paper, printing, and postage costs, offset by the cost of producing an ebill. The 2025-2029 OM&A cost forecast for the Customer Care program in Exhibit 4, Tab 2, Schedule 14 is net of these savings.

[5] Exhibit 1, Tab 1, Schedule 3, Table 5.

QUESTION (D):

d) Please provide an explanation as to how the $23 million in expected cost reductions by the end of 2024.

RESPONSE (D):

For details on the $23 million in expected reduced or avoided costs by the end of 2024, please see Exhibit 1B, Tab 3, Schedule 3, at Section 3, pages 15-27.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-18

Reference: Exhibit 1B, Tab 1, Schedule 1, Page 34

Please provide a complete list of all jurisdictions that Toronto Hydro drew on when developing its Custom Scorecard Measures. Please provide materials setting out the mechanisms and frameworks being used in those jurisdictions.

RESPONSE:

In developing its Custom Scorecard measures, Toronto Hydro drew upon Hawaii, Washington, Massachusetts, New York and the UK. The resulting scan grouped Key Performance Indicators (KPIs) identified in these jurisdictions into 62 categories, which Toronto Hydro organized into the four categories outlined in the OEB's Renewed Regulatory Framework (RRF) of Customer Focus, Operational Effectiveness, Public Policy Responsiveness, and Financial Performance. This analysis was relied upon as a starting point for Toronto Hydro to assess common metrics which were applicable to Toronto Hydro's circumstances and investment plan, as well as metrics which Toronto Hydro had confidence in its ability to measure consistently and accurately.

The scan of KPIs described above was not relied upon in establishing Toronto Hydro's mechanisms and/or rate framework. Exhibit 1B, Tab 2, Schedule 1, Appendix B provides a jurisdictional scan completed by ScottMadden Management Consultants which is specific to Modernized Performance-Based Regulation; describing associated mechanisms and frameworks across various jurisdictions. Please also see response to 1B-SEC-19 (a), which lists jurisdictions examined by ScottMadden, and outlines core aspects of their respective frameworks.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-19

References: **Exhibit 1B, Tab 1, Schedule 3, Page. 3**

Preamble:

Please provide the proposed Distribution Bill Impacts on one schedule with and without the impacts of any rate riders.

RESPONSE:

The below table includes the proposed distribution bill impacts with and without the impacts of any rate riders.

		Change in Bill	2025 Proposed	2026 Proposed	2027 Proposed	2028 Proposed	2029 Proposed
Residential	Base Distribution (Excluding Rate Riders)	$/30 days	$4.22	$2.35	$1.94	$4.43	$1.80
		%	9.3%	4.7%	3.7%	8.2%	3.1%
	Distribution Subtotal A (Including Rate Riders)	$/30 days	$3.24	$3.40	$3.72	$3.97	$2.86
		%	7.6%	7.4%	7.5%	7.5%	5.0%
Competitive Sector Multi-Unit Residential	Base Distribution (Excluding Rate Riders)	$/30 days	-$0.16	$1.03	$0.80	$2.63	$0.81
		%	-0.4%	2.8%	2.1%	6.8%	2.0%
	Distribution Subtotal A (Including Rate Riders)	$/30 days	-$1.27	$1.84	$2.18	$2.27	$1.64
		%	-3.6%	5.4%	6.0%	5.9%	4.0%
General Service <50 kW	Base Distribution (Excluding Rate Riders)	$/30 days	$17.31	$6.62	$5.27	$11.71	$4.63
		%	13.9%	4.7%	3.5%	7.6%	2.8%
	Distribution Subtotal A (Including Rate Riders)	$/30 days	$14.18	$9.24	$9.61	$10.67	$7.29
		%	12.0%	7.0%	6.8%	7.0%	4.5%
General Service 50-999 kW	Base Distribution (Excluding Rate Riders)	$/30 days	$278.46	$120.50	$103.45	$207.35	$105.57
		%	14.5%	5.5%	4.5%	8.5%	4.0%
	Distribution Subtotal A (Including Rate Riders)	$/30 days	$235.35	$166.42	$175.01	$192.67	$150.45
		%	13.0%	8.1%	7.9%	8.1%	5.8%
General Service 1,000-4,999 kW	Base Distribution (Excluding Rate Riders)	$/30 days	$2,437.49	$1,100.29	$955.20	$1,709.85	$1,027.33
		%	15.5%	6.1%	5.0%	8.5%	4.7%
	Distribution Subtotal A (Including Rate Riders)	$/30 days	$1,993.46	$1,466.61	$1,516.65	$1,599.65	$1,381.30
		%	13.4%	8.7%	8.3%	8.0%	6.4%
Large Use	Base Distribution (Excluding Rate Riders)	$/30 days	$10,742.68	$4,022.74	$5,778.50	$10,048.74	$5,794.31
		%	13.2%	4.4%	6.0%	9.8%	5.2%
	Distribution Subtotal A (Including Rate Riders)	$/30 days	$10,124.44	$5,874.70	$8,564.26	$9,530.78	$7,560.71
		%	13.1%	6.7%	9.2%	9.4%	6.8%
Street Lighting	Base Distribution (Excluding Rate Riders)	$/30 days	$18,225.20	$10,838.30	$9,668.80	$19,016.70	$10,055.20
		%	11.8%	6.3%	5.3%	9.8%	4.7%
	Distribution Subtotal A (Including Rate Riders)	$/30 days	$15,917.30	$12,277.10	$20,691.10	$12,135.60	$15,226.00
		%	11.0%	7.6%	11.9%	6.3%	7.4%
Unmetered Scattered Load	Base Distribution (Excluding Rate Riders)	$/30 days	$3.34	$1.78	$1.49	$3.32	$1.39
		%	10.1%	4.9%	3.9%	8.4%	3.2%
	Distribution Subtotal A (Including Rate Riders)	$/30 days	$2.96	$2.41	$2.49	$3.11	$2.01
		%	9.5%	7.1%	6.8%	8.0%	4.8%

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-20

Reference: Exhibit 1B, Tab 1, Schedule 3, Page. 6, Table 6: Capital Investment expenditures by Categories

QUESTION:

Please provide the actual Capital Investment Expenditures by Categories for the period 2020-2024.

RESPONSE:

Please refer to Appendix B to Toronto Hydro's response to interrogatory 2A-Staff-104.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-21

Reference: Exhibit 1B, Tab 1, Schedule 3, Page 7-8

QUESTION :

Please confirm that Toronto Hydro's rate increased from $4,514.8 million in 2020 to $5,596.5 in 2024. Please confirm that with the January 29, 2024 update Toronto Hydro's rate base is going from $5,900 million in 2025 to $7,590.8 in 2029. Please explain how Toronto Hydro has the capacity to increase its rate base so significantly in the forecast period relative to the prior period.

RESPONSE:

Toronto Hydro notes that the appropriate reference for 2020 rate base is the actual amount of $4,534.1 million as presented in the same table referenced in the question. The remaining references to rate base made in the question are accurate.

Please see the Staffing Evidence in Exhibit 4, Tab 4, Schedule 3 at for detailed information about Toronto Hydro's 2025-2029 workforce plan and resourcing strategy.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-22

Reference: Exhibit 1B, Tab 1, Schedule 3, Page 10

Please provide Toronto Hydro's approved and actual debt rates and costs and return on equity for the years 2020-2023.

RESPONSE:

Please find the table below:

Table1: 2020-2023 Approved and Actual Debt Rates and Costs and Return on Equity

	2020	2021	2022	2023
Approved Debt Rate	3.64%	3.64%	3.64%	3.64%
Actual Debt Rate	3.52%	3.36%	3.36%	3.63%
Deemed ROE	8.52%	8.52%	8.52%	8.52%
Achieved ROE	5.90%	7.08%	7.44%	6.80%[1]

[1] This figure is estimated. Please see the response to 9-Staff-344(c).

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-23

Reference: Exhibit 1B, Tab 2, Schedule 1

In the EB-208-0165 Decision and Order the OEB encouraged Toronto Hydro to consider an alternative rate-setting approach in the future to better balance the risk between the customers and the utility. Please provide a complete list of the Custom Rate Frameworks that Toronto considered in addition to the one proposed. Please address why these frameworks were not adopted by Toronto Hydro. Please explain how this plan would differ from a five-year cost of service approach.

RESPONSE:

The Custom Rate Framework reflects the output of a multi-year business and regulatory strategy process that evolved over a period of time in conjunction with the development of the 2025-2029 Investment Plan. This process was guided by three key considerations:

(1) The minimum funding requirements to address the asset and operational investment needs articulated in the evidence at Exhibit 2B and 4, which are reflected in the cost forecasts that underpin this application;
(2) The regulatory principles articulated in the Rate Framework evidence, which were informed by the OEB expectations and requirements as set out in the RRF and Rate Handbook; and
(3) Consideration of existing rate-setting approaches and mechanisms and how they may be deployed, innovated or evolved to achieve better alignment with the identified principles.

The result of this process was the proposed Custom Rate Framework which consists of multiple elements as outlined in the evidence at Exhibit 1B, Tab 2, Schedule 1. Other elements, mechanics and approaches that utility explored during this process were ultimately not relied upon, and are thus not relevant to the determination of the issues in this proceeding.

Please see response to 1B-Staff-3 which explains the difference between the proposed rate framework and a five-year cost of service. Please see the response to 1B-SEC-13 which shows how the incentives of the Custom Rate Framework balance risk between the utility and ratepayers.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-24

Reference: Exhibit 1B, Tab 2, Schedule 1 p. 2

Toronto Hydro has been operating using a Custom IR Framework for the past 10 years - 2015-2019 and 2020-2024. The RRFE/Rate Handbook states that Utilities are expected to demonstrate ongoing continuous improvement in their productivity and cost performance while delivering on system reliability and quality objectives. It also states that Utilities are expected to demonstrate value for money by presenting plans for delivering services that meet the needs of their customers while controlling their costs. The Handbook also states that Custom IR is not a multi-year cost of service; explicit financial incentives for continuous improvement and cost control targets must be included in the application. (Handbook to Utility Rate Applications, dated October 13, 2016). Toronto Hydro is rebasing and rates are increase by approximately 7.5% per year for residential consumers. Please explain how Custom IR has benefited Toronto Hydro's customers.

RESPONSE:

For clarity, Toronto Hydro's residential distribution bill impacts are increasing by an average of 7.0% over the 2025 to 2029 rate term, with total bill increases averaging 2.0%.

Since 2015, Custom IR has enabled Toronto Hydro to make the investments necessary to provide safe and reliable service to its customers, during a time of multi-year investment needs that exceed what can be funded through base rates – the precise business condition for which Custom IR was intended.[1] Over this period of time, the utility has made demonstrable gains in productivity and efficiency and continuous improvement in service quality performance outcomes for its customers.

[1] OEB Renewed Regulatory Framework for Electricity Distributors: A Performance-Based Approach (October 18, 2012) at page 19.

These achievements and benefits are detailed in the Historical Performance and Productivity evidence filed at Exhibit 1B, Tab 3, Schedules 2 and 3, respectively and include but are not limited to:

- 19% improvement in customer first contact resolution since 2013;
- 60% decrease in Total Recordable Injury Frequency Rate (TRIF);
- Adding over 381,000 customer on e-bills since 2013 yielding cumulative savings of $4.4 million from avoided paper, printing, and postage costs;
- A 45% decrease in the number of feeders serving large customers that are experiencing a high number of interruptions per year;
- Reduced the average duration of power outages due to defective equipment by 26 percent over the 2013-2022 period;
- Improved billing accuracy from 96.6% in 2013 to 99.1% in 2022, exceeding the OEB's minimum requirement of 98%;
- Improved service levels with respect to customer connections timelines (i.e. New Residential/Small Business Services Connected on Time) from 95% in 2013 to 99% in 2022, exceeding the OEB minimum requirement of 90%;
- Direct customer benefits (i.e. givebacks) exceeding $200 million made possible by a multi-pronged facilities consolidation strategy that reduced the square footage per employee by approximately 40 percent;
- Productivity initiatives totaling $23 million in costs that the utility expects to avoid or reduce by the end of the current rate term, in addition to delivering extensive qualitative benefits that are described in detail in the evidence;
- Effective cost performance as evidenced by total cost custom benchmarking, unit cost benchmarking, IT cost benchmarking and compensation cost benchmarking;
- Stabilizing the rapid deterioration of system health metrics that the utility faced when it embarked on its multi-year ICM before the first Custom IR; and
- Keeping up with the growth and densification of Canada's largest and one of North America fastest growing cities, and enabling the development of transit, housing and major infrastructure projects across the city.

Toronto Hydro intends to sustain the productivity, performance achievements, and improvements made over the last two Custom IR period, and drive continuous improvement with respect to new/expanded performance objectives. To that end, and in direct response to the OEB's decision in EB-2018-0165, Toronto Hydro has brought forward an innovative performance incentive mechanism (PIM) proposal to improve the balance of risk between ratepayers and the utility in this application. The PIM includes explicit financial incentives for:[2]

a) **Continuous improvement** (e.g. reduce the duration of outages, enhance system security, make progress towards grid automation in the horseshoe, track and measure new elements of post-transactional customer satisfaction, achieve and maintain certification with continually improving international standards for key management systems),
b) **Maintaining service quality performance in accordance with customer preferences** (e.g. invest no more than is necessary to maintain the frequency of outages caused by defective equipment and maintain customer service performance)
c) **Public policy responsiveness** (e.g. connect DERs in an timely manner, expand the use of non-wires alternatives for system capacity, reduce gHg emissions); and
d) **Cost control targets** (e.g. achieve quantified efficiency benefits that will provide demonstrable value to customers in the next rate period).

[2] Exhibit 1B, Tab 3, Schedule 1

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-25

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 5

Please provide examples of rate frameworks that are similar to the one being proposed by Toronto Hydro.

RESPONSE:

As noted in the evidence, Toronto Hydro's Custom Rate Framework is an evolution of the Custom IR rate frameworks approved by the OEB in other recent applications.[1] The evidence filed by Scott Madden in Exhibit 1B, Tab 2, Schedule 1, Appendix B reviews a series of jurisdictions which have implemented framework components similar to those proposed by Toronto Hydro, such as recognition of expanded utility objectives, performance incentives, modified attrition relief mechanisms (such as I-X), alternative cost recovery mechanisms for large or volatile investments, and funding for demonstration projects.

[1] Toronto Hydro (EB-2014-0116 and EB-2018-0165), Hydro One (EB-2017-0049 and EB-2021-0110), Hydro Ottawa (EB-2019-0261 and EB-2015-0004), Enbridge Gas (EB-2012-0459), Kingston Hydro (EB-2015-0083), Horizon (EB-2014-002), Oshawa PUC (EB-2013-0101)

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-26

References: Exhibit 1B, Tab 2, Schedule 1, Page 5

QUESTION:

The evidence states that the proposed X-factor is higher than the OEB-approved X-factor under standard price Cap Incentive Regulation. How will customers benefit from the X-factor if Toronto Hydro earns back the .6% through the Performance Incentive measure?

RESPONSE:

The proactive component of the X factor is a voluntary contribution by Toronto Hydro reflecting an amount that it ordinarily would be able to recover in rates as a fair return, but which Toronto Hydro has put at risk with the opportunity to earn it back upon the achievement of certain results under the Plan. As shown in Exhibit 1B, Tab 3, Schedule 1 at page 58, achievement of the targets included in the proposed scorecard will result in minimum nominal benefits over the 2025 to 2029 term of between $90.3 million and $216.3 million, with lifetime nominal benefits of $892.5 million to $1.2 billion. The proposed PIM incentive which would be awarded as a result of target achievement is $65 million on a nominal basis. Benefits for customers will exceed costs in the event Toronto Hydro achieves targets and is awarded the full PIM incentive. For a further explanation and illustration of how the PIM balances utility risk/reward and customer costs/benefits, please see the response to 1B-SEC-13.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-27

References: Exhibit 1B, Tab 2, Schedule 1, Page. 7

QUESTION:

Over the 2025-2029 rate period Toronto Hydro's operations and capital investment needs are growing by approximately 37.5% due to a number of distinct and interrelated drivers. Please attribute a percentage to each of those drivers set out in the evidence. For example, how much of the increases are related to inflationary pressures? How much s related to the aging and deterioration of Toronto Hydro's asset base?

RESPONSE:

As noted, the drivers identified on page 7 of Exhibit 1B, Tab 2, Schedule 1 are "interrelated", and thus cannot be broken down as requested. At the reference noted, each driver is accompanied by a footnote directing the reader to the evidence where detailed information, including cost breakdowns as appropriate, about each driver can be found.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-28

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 9

QUESTION:

Toronto Hydro concludes from its Customer Engagement process that 84% of the customers surveyed supported the rate increase associated with the draft plan or one that does even more to advance outcomes. In any of its customer engagement has Toronto told its customers that included in rates is a return on equity that is currently more than 9%. If not, why is this not relevant?

RESPONSE:

The materials provided to customers during customer engagement were focused on customer outcomes, customer priorities, and bill impacts, in a manner that allowed for customers to meaningfully express their priorities and speak to their willingness to pay for such priorities. Given space limitations, it did not make sense to raise topics outside the scope of Toronto Hydro's planning process

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-29

Reference: Exhibit 1B, T2, S1, p. 9

QUESTION:

The evidence states that, "an energy transition is gradually unfolding across key sectors of the economy with residents, businesses and institutions adopting electrified technologies such as electric vehicle (EVs), heat pumps, solar panels and energy storage systems. Toronto Hydro must sustain, expand and modernize the grid to be ready and equipped to serve customers' growing demand for safe and reliable electricity during this transition." Please provide all assumptions Toronto Hydro has made regarding the adoption of EV, heat pumps, solar panels and energy storge systems in its service territory for the 2025-2029. Please specify how this impacts Toronto Hydro's capital and programs in each year and provide the corresponding impact on the revenue requirement in each year.

RESPONSE:

Toronto Hydro's Peak Demand Forecast outlined in Exhibit 2B, Section D4 at page 4 provides the assumptions for the EV forecast. The capital programs that are primarily affected by the System Peak Demand Forecast are (i) Stations Expansion at Exhibit 2B, Section E7.4, and Load Demand at Exhibit 2B, Section E5.3. It is not possible to isolate the specific impact of EVs on the proposed expenditure levels in these programs because the Peak Demand Forecast and underlying investment plan, represents an aggregate view of system need. EV Demand represents just one of a combination of drivers that influence investment levels in various geographic regions of the Toronto Hydro Grid.

Given uncertainty with respect to the uptake of heat pumps, Toronto Hydro did not model heat electrification as an individual driver in its Peak Demand Forecast for this rate period.

Please see the response to 1B-CCC-13 for (i) information about the adoption of DERs, including solar panels (which are captured under renewables) and energy storage systems, and (ii) a list of the affected capital and operations work programs.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-30

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 11

Preamble:

Toronto Hydro commissioned an industry leading consumer choice modelling Future Energy Scenarios study to assess the impacts of different energy transition scenarios on Toronto Hydro's distribution system. The Future Energy Scenarios conclude that system peak demand could grow significantly or more moderately depending on technology, policy and consumers choices that will be made in the future. Toronto Hydro's evidence is that it must ensure the grid is ready ahead of when demand increases (to avoid under-served customers) and also be reasonably cautious in building new capacity for the future. Please explain how this study directly impacted Toronto Hydro's capital and operating plans for the period 2025-2029

RESPONSE:

Toronto Hydro augmented its decision-making process with the results of a Future Energy Scenarios model to understand the impact of different policy, technology and consumer behavior drivers; and used the Future Energy Scenarios to stress-test whether the utility's capacity plan can accommodate energy transition needs (e.g., building heating electrification) in the early part of the next decade, if required. The Future Energy Scenarios reveal that the impact of building electrification in the next two decades could be significant from a system peak demand perspective, but that there are notable differences (driven by policy, technology and consumer-behaviour choices) as to when and how building electrification could unfold. Practically, this meant that Toronto Hydro decided to take a "wait and see approach" to investments in new capacity for accommodating wide-scale building electrification in the mid-2030s and beyond. For more information on Toronto Hydro's capacity planning and electrification process please refer to Exhibit 2B Section D4. For more information on the Future Energy Scenarios, please refer to Appendix A and B of the same schedule.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-31

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 11

The evidence refers to Enbridge Gas Inc's Pathways to Net Zero, National Grid's Future Grid Plan and Eversources' Electric Sector Modernization Plan. Please indicate to what extend these studies has impacted or informed Toronto Hydro's capital and operating plans for the period 2025-2029.

RESPONSE:

These studies did not impact Toronto Hydro's capital and operating plans for the period 2025-2029.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-32

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 24

Please explain why a 0 percent productivity factor continues to be appropriate? How does this provide a benefit to Toronto Hydro's ratepayers.

RESPONSE:

Toronto Hydro continues to rely on the OEB policy with respect to the productivity factor of 0%. The combined X-Factor, inclusive of the productivity factor, the empirical stretch/efficiency-factor and the PIM, applies a 0.75% stretch to the utility's revenues each year over the 2026-2029 period. As detailed in the response to interrogatory 1B-Staff-03(b), the combined X-factor provides customers a total rate reduction benefit of $81.5 million over the rate term, in addition to the benefits associated with achieving the PIM targets, as set out in Exhibit 1B, Tab 3, Schedule 1 at pages 57-58.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-33

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 24

To what extent has Toronto Hydro seen the use of a Revenue Growth Factor (or a similar mechanism) - which enables year over year rate increases to fund incremental revenue requirement to both capital and OM&A investments in other performance based rate plans. Please provide examples and context.

RESPONSE:

Please refer to the expert evidence at Exhibit 1B, Tab 2, Schedule 1, Appendix A at:

- Page 6: Jurisdictions, such as UK and New York, have recognized the need to ensure adequate cost recovery of capital and OM&A costs as part of their forecasted multi-year revenue requirements.
- Page 14: The RGF, which includes forecasted capital and OM&A expenditures is generally consistent with 1) the 'building blocks' approach used in jurisdictions such as the UK, Australia, Philippines, and Malaysia, and 2) the 'stair-step' approach utilized by New York utilities.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-34

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 25

Please explain how Toronto Hydro arrived at a 2% annual inflation factor adjustment for its Revenue Growth factor.

RESPONSE:

Please refer to interrogatory 1B-Staff-92(a).

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-35

Reference: Exhibit 1B, Tab 2, Schedule 1, Table 3, Page 25

Table 3 - 2026-2029 Revenue Growth Factor sets out the proposed RGF for each year. Did Toronto Hydro consider smoothing the revenue requirement adjustments over the five-year period? If not why not? Why is the adjustment so much larger in 2028? What would be the downside of having a more consistent adjustment each year?

RESPONSE:

The Revenue Requirement for 2028 is larger than the increases in other years because of PILs/taxes. More specifically, the increase is primarily attributed to the expiration of the accelerated CCA rules on December 31, 2027.[1]

Toronto Hydro considered smoothing the revenue requirement, but ultimately decided not to pursue this option because it was able to achieve the same outcome by adjusting the clearances of Group 2 rate riders.

Smoothing rates through rate riders is the preferred solution for two reasons: (1) it is a familiar approach that has been used in previous applications, and (2) it is less burdensome (i.e. more efficient) to implement from a regulatory accounting perspective because it doesn't require new accounts to be created to reconcile timing-related difference as a result of the advancement/deferral of revenue adjustments needed to enable smoothing.

[1] Exhibit 6, Tab 2, Schedule 1 (Updated December 19, 2023), Page 5

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-36

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 22, Table 4

Please provide the actual Toronto Average Blended Salary Increase for 2023 and the forecast level for 2024.

RESPONSE:

Please see response to interrogatory 1B-Staff-93.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-37

Reference: Exhibit 1B, Tab 2, Schedule 1 p.35

Preamble:

Toronto Hydro is proposing a Demand-Related Variance Account (DRVA) to record the demand driven revenue requirement impacts arising from variances in actual versus forecast capital and operational expenditures for certain demand-based programs and the revenue impacts arising from variances in forecast versus actual billing determinants over the rate period. The Council is interested in understanding the scope of the DRVA;

QUESTION (A):

a) For each year 2020-2024 please provide the forecast and actual expenditures for the following capital and operating programs: Customer Connections, Customer Operations, Stations Expansion, Load Demand, Non-Wires Solutions, Generation Protection Monitoring and Control and Externally-initiated Plant Relocations and Expansions. Also, please provide the forecast and actual revenue requirement that would have been dealt with through the DRVA Expenditure sub-account had one been in place for that period;

RESPONSE (A):

Please see below Table 1 for Actuals/Bridge Capital Expenditures and Table 2 for Actuals/Bridge Operating Expenditures. In responding to this interrogatory Toronto Hydro has only included OM&A segments that would have been dealt with through the DRVA expenditure sub-account had one been in place for that period.

Table 1: Actuals/Bridge Capital Expenditures that would have been subject to the DRVA sub-account (in $ millions)

Programs	Actuals				Bridge
	2020	2021	2022	2023	2024
Customer Connections	35.6	92.4	76.1	86.8	78.2
Stations Expansion	18.2	50.3	47.5	10.4	16.1
Load Demand	24.0	29.7	30.8	26.7	23.2
Non-Wires Solutions[1]	1.0	0.5	0.1	0.0	0.6
Generation Protection Monitoring & Control[1]	0.8	0.8	0.1	0.2	7.8
Externally Initiated Plant Relocations & Expansions	8.7	9.3	12.9	16.0	13.0

Table 2: Actuals/Bridge Operating Expenditures that would have been subject to the DRVA sub-account (in $ millions)

OM&A Segments[2]	Actuals				Bridge
	2020	2021	2022	2023	2024
Customer Connections, Exhibit 4, Tab 2, Schedule 8, Section 5	3.7	1.6	1.6	3.1	3.6
Key Accounts, Exhibit 4, Tab 2, Schedule 8, Section 6	-	0.5	0.8	0.8	1.2
Flexibility Services, Exhibit 2B, Section E7.2	0.4	0.2	0.2	0.8	0.8

Please see Table 3 for approved Capital Expenditures and Table 4 for approved Operating Expenditures that would have been dealt with through the DRVA expenditure sub-account had one been in place for that period.

Table 3: Approved Capital Expenditures that would have been subject to DRVA sub-account (in $ millions)

Programs	Approved				
	2020	2021	2022	2023	2024
Customer Connections	40.1	40.9	41.7	42.6	43.4

[1] 94% of the Renewable Enabling portions of these investments will be provincially funded and not included in the DRVA
[2] Only includes segments associated with the DRVA

Programs	Approved				
	2020	2021	2022	2023	2024
Stations Expansion	19.5	40.0	49.3	12.5	15.2
Load Demand	11.3	11.4	18.5	22.6	23.6
Non-Wires Solutions[3]	1.0	3.7	3.8	1.0	1.0
Generation Protection Monitoring & Control[3]	3.7	2.3	2.4	2.5	2.7
Externally Initiated Plant Relocations & Expansions	11.4	20.8	4.6	4.7	4.5

As noted in Toronto Hydro's response to interrogatory 4-SEC-89(a), the total OM&A cost approved by the OEB for 2020 was $266.7 million, which was lower than the 2020 test year OM&A funding requested by Toronto Hydro.[4] The OEB approved OM&A on an envelope basis and therefore, Toronto Hydro cannot provide a breakdown by the specific programs or segments such as Customer connections. However, in order to provide a directional view of the segments that would have been dealt through the DRVA expenditure sub-account had one been in place for that period, Toronto Hydro has used its 2020 test[5] costs for Customer Connections, Key Accounts and Flexibility Services and have escalated it by the OEB approved Custom Price Cap Index ("CPCI") formula[6] for 2021-2024 using OEB's prescribed rates.

Table 4: Approved* Operating Expenditures that would have been subject to the DRVA sub-account (in $ millions)

OM&A Segments	Approved*				
	2020	2021	2022	2023	2024
Customer Connections	3.2	3.3	3.3	3.4	3.6
Key Accounts	-	-	-	-	-
Flexibility Services	0.8	0.8	0.8	0.9	1.0

[3] 94% of the Renewable Enabling portions of these investments will be provincially funded and not included in the DRVA
[4] See also 1B-SEC-8 for a discussion of adjustments for Account 4380 with respect to the OEB-approved 2020 OM&A budget.
[5] EB-2018-0165, Exhibit 4A, Tab 2, Schedule 8
[6] EB-2018-0165, Ontario Energy Board, Decision and Order (December 19, 2019)

Please see Table 5 below for Approved and Actual/Bridge Revenue Requirement that would have been dealt with through the DRVA expenditure sub-account had one been in place for that period.

Table 5: Approved and Actual/Bridge Revenue Requirement that would have been subject to DRVA sub-account ($ Millions) /C

	2020	2021	2022	2023	2024	2020-2024
Approved Revenue Requirement	7.9	14.7	21.2	33.1	45.1	122.1
Actual/Bridge Revenue Requirement	7.1	17.4	51.4	69.4	68.1	213.4
Variance	**(0.8)**	**2.7**	**30.1**	**36.3**	**23.0**	**91.4**

QUESTION (B):

b) For each year 2025-2029 please provide the proposed revenue requirement for each of the programs listed in a). In effect, what is the proposed revenue requirement that will be the subject of the DRVA Expenditure Variance sub-account?

RESPONSE (B):

Please see below table 6 for proposed revenue requirement for each of the programs: /C

Table 6: 2025-2029 Revenue Requirement associated with DRVA Programs (in $ millions)[7] /C

	2025	2026	2027	2028	2029
Customer Connections	9.7	16.4	23.8	33.0	40.8
Stations Expansion	0.3	2.2	3.6	4.1	4.3
Load Demand	2.5	5.2	8.4	12.0	15.2
Non-Wires Solutions	0.2	0.9	1.1	1.6	1.9
Generation Protection Monitoring & Control	0.0	0.0	0.1	0.1	0.2
Externally Initiated Plant Relocations & Expansions	4.6	5.3	6.5	7.9	9.0
Customer Operations	4.7	4.8	5.2	5.4	5.7
Total Revenue Requirement	**22.0**	**34.8**	**48.5**	**64.1**	**77.1**

[7] Rounding variances may exist

QUESTION (C):

c) For the period 2020-2024 please provide the forecast and actual revenue that would have been dealt with through the DRVA Variance sub-account had one been in place for that period

RESPONSE (C):

Please refer to 1B-SEC-16 -Table 2.

QUESTION (D):

d) For each year 2025-2029 please provide the forecast revenue that will be the subject of the DRVA Revenue Variance sub-account.

RESPONSE (D):

Please refer to 1B-SEC-16-Table 1.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-38

Reference: Exhibit 1B, Tab 3, Schedule 1, Pages 2-6

Toronto Hydro's position is that the Performance Incentive Mechanism (PIM) provides ratepayers a significant $65 million upfront benefit and shifts risk to the utility for delivering key outcomes that matter to customers;

QUESTION (A):

a) Please provide examples of such an approach being adopted by other utilities;

RESPONSE (A):

Toronto Hydro's expert Scott Madden provides examples of performance incentives adopted in other jurisdictions, with all associated details and references, in Exhibit 1B, Tab 2, Schedule 1, Appendix B. Jurisdictions where such incentives have been implemented include UK, Hawaii, Rhode Island, and New York.[1]

QUESTION (B):

b) How did Toronto Hydro arrive at the .6%?

RESPONSE (B):

Please Toronto Hydro's response to 1B-VECC-3.

QUESTION (C):

c) Please explain how the $65 million was calculated.

RESPONSE (C):

Please see Toronto Hydro's response to 1B-Staff-3 (c).

QUESTION (D):

d) Please provide evidence to demonstrate that the targets established for each metric reflect, challenging, but achievable outcomes;

RESPONSE (D):

The requested evidence is provided Exhibit 1B, Tab 3, Schedule 1. In section 2 of that narrative, from pages 8-56, Toronto Hydro provides a detailed explanation of each metric including historical results (where available), the rationale for featuring the metric on the Custom Scorecard and for adopting the proposed target, and a summary of the key investments in the plan that enable the utility to achieve the targets.

QUESTION (E):

e) Toronto Hydro has proposed a process whereby the finalization of the targets takes place in a second phase of this proceeding that can be run in parallel with the Draft Rate order process. If agreement cannot be reached through the "settlement-like process" parties would have an opportunity to make submissions to the OEB. Would Toronto Hydro support a discovery stage as part of this process? If not, why not?

RESPONSE (E):

At this stage, Toronto Hydro is unable to assess if and to what extent a further discovery stage would provide value to the process. Toronto Hydro trusts that if a phase 2 is granted, the OEB will contemplate the procedural steps necessary based on the specifics known at that time, and the parties will have the opportunity to make submissions in that regard.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-39

Reference: Exhibit 1B, Tab 3, Schedule 3, Page. 15

QUESTION :

Toronto Hydro has set out 2020-2024 "Productivity Achievements". The evidences states that in total, over the current rate period the utility implemented over 30 distinct productivity initiatives which yield material benefits for ratepayers. These benefits include over $23 million in costs that the utility expects to avoid or reduce by the end of the rate term, resulting in a 2025 rebasing revenue requirement that is approximately $5.7 million lower. Please provide a table setting out each of these initiatives and the associated cost avoidance/benefits where these can be quantified. Please reconcile these amounts with the $23 million and the $5.7 million. Please include all assumptions.

RESPONSE:

Please see Toronto Hydro's response to 1B-AMPCO-07.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-40

Reference: Exhibit 1B, Tab 3, Schedule 3, Page 15

Toronto Hydro has set out its Productivity Achievements for the period 2020-2024. Please provide a complete list of productivity initiatives planned for 2025-2029. Please set out the expected annual savings for each initiative.

RESPONSE:

Please see Toronto Hydro's response to interrogatory 1B-SEC-25.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-41

Reference: Exhibit 1B, Tab 4, Schedule 1, Page 6

In 2022 Toronto Hydro launched the Etobicoke Demand Response Pilot in Partnership with Power Advisory LLC and Toronto Metropolitan University Centre for Urban Energy. What was the overall cost of the pilot and how was it funded? Are there any costs associated with the pilot in 2025? If so, what are the costs?

RESPONSE:

Please see the evidence in Exhibit 2B, Section E7.2 at pages 12-13 for information about the Etobicoke Demand Response pilot. Please see the response to interrogatory 1B-CCC-42 for information about the cost of the pilot and how it was funded. There are no costs associated with this pilot beyond 2025.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-42

Reference: Exhibit 1B, Tab 4, Schedule 1, Pages 1-12

QUESTION:

Tonto Hydro has set out strategies and initiatives undertaken by Toronto Hydro during the 2020-2024 period. These include:

- Innovation @TH
- System Observability: Network Condition Monitoring and Control (NCMC)
- System Controllability: Reclosers Pilot
- Etobicoke Demand Response Pilot
- Battery Energy Storage Systems
- Future Energy Scenarios Modelling Tool
- Electric vehicles (EV) Demand Response
- Process Automation
- Customer Experience and Service Tools
- Workforce Development and Upskilling

For each of these strategies/initiatives/pilots please provide the following:

a) The cost of each and how it was funded (through rates, other sources of funding etc.)

b) An indication as to whether the strategy, initiative/pilot costs were forecast and if so, what the forecast costs were

c) An indication as to whether the strategies/initiatives/pilots will continue and if so, the expected annual cost

d) The cost reductions associated with these strategies/initiatives/pilots and whether those cost savings have been embedded in the rate plan forecasts.

RESPONSE:

Appendix A to this response includes a table with a breakdown of the initiatives by rate period. With respect to question (d), quantified efficiency benefits (i.e. cost reductions or avoidances) are provided below for the initiatives where it is possible to quantify this information. Toronto Hydro confirms that material cost reductions are embedded in the forecasts, where appropriate.

- **Etobicoke Demand Response Pilot**
  - **2020-2024:** Please see Exhibit 2B, Section E7.2.1.4 and Toronto Hydro's response to interrogatory 2B-SEC-73.
  - **2025-2029**: Please see Exhibit 1B, Tab 3, Schedule 1 at pages 51 to 52 and the response to 1B-Staff-49 for a quantification of benefits associated with Toronto Hydro's target to procure 30MW on non-wires system capacity through its Flexibility Services program as described in Exhibit 2B, Section E7.2.
- **System Observability: Network Condition Monitoring and Control ("NCMC"**)
  - **2020-2024:** Please see the evidence in Exhibit 2B Section E7.3.3 for details on benefits and cost savings seen to date as part of the NCMC program.
  - **2025-2029**: Please see the evidence in Exhibit 2B Section E7.3.3 for details on benefits and cost savings forecasted as part of the NCMC program. As a result of the implementation of NCMC, Toronto Hydro expects to reduce the number of planned vault inspections required for each network vault per year, reducing maintenance costs in that program by approximately $300 per vault starting in 2027. At the end of the NCMC program (i.e. once all vaults are commissioned), this will result in approximately $275,000 in maintenance costs avoided each year. These costs savings are reflected in the Preventative and Predictive Underground Line Maintenance program outlined in Exhibit 4, Tab 2, Schedule 2.
- **System Controllability: Reclosers Pilot**
  - **2020-2024:** The goal of the reclosers pilot was to confirm intended coordination and reliability benefits that Toronto Hydro could achieve with the piloted recloser

technologies. As the primary driver is reliability improvements, there are no specific cost reduction planned as part of the reclosers pilot.

- **2025-2029**: Although Toronto Hydro expects to continue pilots for specific recloser technologies, reclosers that have completed the pilot phase are included in the System Enhancements program.[1] As with the pilots, the reclosers planned as part of this program are driven by reliability and are intended to support Toronto Hydro's improvement target for outage duration.[2] Please refer to Toronto Hydro's response to 2B-Staff-246(a) for an estimation of economic benefits associated with the reduction of "customer minutes out" in the 2025-2029 rate period under the proposed Contingency Enhancement Program.

- **Process Automation**
  - **2020-2024** : Please see Exhibit 1B, Tab 3, Schedule 3 for evidence relating to productivity initiatives undertaken in the current rate period, many of which are tied to process automation. Please refer to Toronto Hydro's response to interrogatory 1B-AMPCO-7 for the quantified benefits per initiative.
  - **2025-2029:** Please refer to the evidence Exhibit 1B, Tab 3, Schedule 1, subsection 2.4.1 "Efficiency Achievements" at pages 41-44. As noted in the response to interrogatory 1B-SEC-25, Toronto Hydro intends to continue to focus on process automation (i.e. digitization, robotics and predictive analytics) to drive continuous improvement in productivity and to meet the proposed Efficiency Achievements target in the next rate period.
- **Customer Experience:**
  - **2020-2024**: Please refer to the evidence Exhibit 4, Tab 2, Schedule 14, subsection 4.2 "Cost Control and Productivity Measures" at pages 11-14, which discusses numerous achievements that improved customer experience and convenience through enhancements to online and self-service tools, while generating significant process

[1] Exhibit 2B, Section E7.1.
[2] Exhibit 1B, Tab 3, Schedule 1, at p. 8-15.

efficiencies and cost avoidance through the automation of manual processes and streamlining operational tasks.

- **2025-2029**: Please refer to evidence on the Customer Relationship Management segment of the Customer Care program in Exhibit 4, Tab 2, Schedule 14 at pages 34-46 (especially pages 39-41) and the Key Accounts segment of the Customer Operations program in Exhibit 4, Tab 2, Schedule 8 at pages 22-27. Through the adoption of modern technology and continuous engagement with its diverse customer base, including the unique needs of key accounts (e.g. hospitals, public service providers, and large users) Toronto Hydro intends to continue delivering strong customer service and drive continuous improvement in meeting customers' evolving expectations.

Initiative	2020-2024 Costs	Funding Source	Continuation	2025-2029 Costs
Innovation @ TH	Approximately $750,000	Self-Funded	Yes. Please see Exhibit 1B, Tab 2, Schedule 2	$16M[1]
System Observability: Network Condition Monitoring and Control (NCMC)	$56.8M	Rates	Yes. please see Exhibit 2B, Section 7.3	$6M
System Controllability: Reclosers	$19.9M	Rates	Yes. Please see Exhibit 2B, Section E7.1	$132M
Etobicoke Demand Response Pilot	$4M	Rates ($2M) + IESO Grid Innovation Fund ($2M)	Yes. Please see Exhibit 2B, Section E7.2	$5.7M
Future Energy Scenarios Modelling Tool	$1.026M[2]	Rates	Yes. Please see Exhibit 2B, Section D5.	$72,000
Workforce Development & Upskilling	Not possible to quantify as these costs are embedded in program budgets.	Rates	Yes. Please see the OM&A and Workforce evidence in Exhibit 4, Tabs 1, 2 and 4.	Not possible to quantify as these costs are embedded in program budgets.

[1] Toronto Hydro is proposing to allocate the equivalent of 0.3% of its total revenue requirement to the Innovation Fund, which is approximately $16 million based on the pre-filed revenue requirement. For more information on the Innovation Fund proposal, please refer to Exhibit 1B, Tab 4, Schedule 2.
[2] Please refer to Toronto Hydro's response to interrogatory 2B-Staff-156 part (c).

Initiative	2020-2024 Costs	Funding Source	Continuation	2025-2029 Costs
EV Demand Response	$287,000	Rates	Yes. Please see Exhibit 1B, Tab 4, Schedule 2, Appendix A.	n/a[3]
Process Automation	$32M	Rates	Yes. Please see Exhibit 2B, Section 8.4 and Exhibit 4, Tab 2, Schedule 17.	$50M[4]
Customer Experience	$28.5M	Rates		$25M[5]

[3] Pilot projects as part of the Innovation Fund will be scoped-out (i.e. designed and budgeted) once the OEB has approved the proposal. For more information on the Innovation Fund proposal, please refer to Exhibit 1B, Schedule 4, Tab 2.
[4] This is a high level estimate and may change since Toronto Hydro will assess and evaluate each individual project through its Enterprise Technology Portfolio (ETP) Framework as described in the IT Investment Strategy at Exhibit 2B, Section D8.5.3, pp. 18-21
[5] *Ibid.*

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-43

Reference: Exhibit 1B, Tab 4, Schedule 1, Pages 13-20

Preamble: Toronto Hydro has stated that Innovation has shaped its Application and the 2025-2029 investment plan that underpins it. The Council would like have a better understanding of the costs included in the Application that are related to "innovation" over and above the "Innovation Fund". Toronto Hydro refers to several innovation initiatives:

- Grid Modernization Strategy
- Local Demand Response
- Renewable Enabling Investments
- Enterprise Technology Portfolio
- Regulatory Innovation

For each of these initiatives provide the following:

QUESTION (A):

a) The annual cost of these initiatives for each year of the plan

RESPONSE (A):

Please see the summary table below for a list of the programs that map to each of the referenced initiatives with evidentiary references and a breakdown of the related annual costs.

For the Grid Modernization Strategy, this is an overarching framework that encompasses many programs and initiatives throughout the application as set out in Exhibit 2B, Section D5. As described in interrogatory 1B-CCC-44, the overall cost of this strategy is estimated to be in the range of $550-$600 million over the 2025-2029 period, representing an average annual spend of

$110-$120 million. This amount includes some of the expenditures listed in other parts of the following table.

Toronto Hydro notes that the costs reproduced below are the costs related to the program/segment overall, which in some cases include costs beyond the scope of "innovation" where it isn't possible to disaggregate innovation-specific costs from other cost drivers in the program.

Table 1: Innovation-Related Programs 2025-2029

Initiative	Relevant Programs	Annual Costs ($ Millions)				
		2025	2026	2027	2028	2029
Grid Modernization Strategy [1]	**See Exhibit 2B, Section D5** Relevant Programs include: • **System Enhancements** (2B, E7.1) • **Metering (AMI2.0)** (2B, E5.4) • **Asset & Program Management – System Planning** (4, T2, S9) • **Control Center** (4, T2, S7) • **Network Condition Monitoring and Control** (2B, E7.3)	110.0 - 120.0	110.0 - 120.0	110.0 - 120.0	110.0 - 120.0	110.0 - 120.0
Enterprise Technology Portfolio	**IT Software Enhancements** (2B, E8.4)	38.6	40.6	41.0	33.3	34.8
	IT OM&A (Cloud) (2B-Staff-263)	5	5.5	6	6.5	7
Renewable Enabling Investments[2]	**Network Condition Monitoring and Control** (2B, E7.3)	4.2	0.2	0.4	0.6	0.6
	Energy Storage (2B, E7.2)	3.6	3.6	7.5	3.8	4.0
	Station Expansion – Sheppard TS (2B, E7.4)	-	0.5	4.5	5.0	5.0
Local Demand Response	**Non-Wires Solution** (2B, E7.2)	0.2	0.9	1.1	1.6	1.9
	Asset and Program Management – Local Demand Response (4, T2, S9)					
Regulatory Innovation	**Innovation Fund** (1B, T5, S2)	2.9	3.1	3.2	3.5	3.6

[1] Average annual costs. All IT Software related investments that support Grid Modernization are included within the Enterprise Technology Portfolio.
[2] Please see Exhibit 2A, Tab 5, Schedule 1

QUESTION (B):

b) The annual benefit expected and information on the extent to which the benefits are factored into the revenue requirement for each year.

RESPONSE (B):

The table below provide a concordance to the evidence where benefits associated with the initiatives are presented. Specific projects under these initiatives and related programs will be scoped through annual planning processes as part of the execution of the 2025-2029 Investment Plan and implementation of the OEB's decision in this rate application.

Table 2: Innovation-Related Program Benefits

Initiatives	Programs	Benefits
Enterprise Technology Portfolio	**IT Software** (Exhibit 2B, E8.4)	Toronto Hydro intends to leverage technology to achieve various performance targets and benefits as outlined in the 2025-2029 Custom Scorecard at Exhibit 1B, Tab 3, Schedule 1.
	IT OM&A (Cloud) (2B-Staff-263)	
Grid Modernization Strategy	**System Enhancements** (Exhibit 2B, Section E7.1)	Please see Exhibit 2B, Section D5, page 17 for the estimated lifetime operational cost savings from the deployment of SCADA switches.
		Please see the response to 2B-Staff-246 for quantified reliability benefits. Toronto Hydro also integrated the reliability benefits associated with new SCADA switches and mid-line reclosers as part of its Reliability Projection ("RP") Methodology. A detailed description of this methodology is available in 2B-SEC-42 a) and a forecast of reliability performance for 2025-2029 is available in 2B-SEC 42 c). In addition, Toronto Hydro estimated the benefits of the implementation of FLISR across the Horseshoe region based on preliminary network simulations. Please see the quantification of anticipated improvements in 2B-Staff-162 a).
Local Demand Response	**Non-Wires Solutions**	Please see the Non-Wires Solutions metric and target in Exhibit 1B, Tab 3, Schedule 1 at page 66.

QUESTION (C):

c) An indication as to whether or not external funding was sought and/or obtained either through the OEB, IESO or NRCan

RESPONSE (C):

Please see Toronto Hydro's response to 1B-Staff-10 for list of the types of initiatives/projects that Toronto Hydro has previously sought external funding for. Toronto Hydro notes that opportunities for external funding for the next rate period must be determined on the basis of specific projects, which will be scoped through annual planning processes as part of the execution of the 2025-2029 Investment Plan and implementation of the OEB's decision in this rate application.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-44

Reference: Exhibit 1B, Tab 4, Schedule 1, Page 12

Toronto Hydro is undertaking a Grid Modernization strategy to make investments it deems necessary to ready the grid for decarbonization and energy transformation while enhancing the value that the system provides to customers through improved reliability, resilience and efficiency outcomes:

QUESTION (A):

a) What is the overall cost of this strategy and the annual costs for each year of the rate plan term?

RESPONSE (A):

The overall cost associated with the programs and initiatives that map to the Grid Modernization Strategy is estimated to be in the range of $550-$600 million over the 2025-2029 period. This includes the investments and capability building initiatives described throughout Section D5. Note that while modernization is an element of many of the investment programs discussed under the Grid Modernization Strategy, it is not the sole purpose of the programs. The same costs are responsive to other drivers, for example, failure risk and compliance (e.g., renewal of smart meters under AMI 2.0) and capacity (e.g., flexibility services).

QUESTION (B):

b) Are the ADMS, OMS and FLISR systems considered part of the Grid Modernization strategy and the overall business case?

RESPONSE (B):

Yes. All three initiatives are enabled by the broader ADMS project as described in Exhibit 2B, E8.4, Appendix A.

QUESTION (C):

c) Please explain, in detail, the extent to which Toronto Hydro collaborated with other utilities in terms of developing its Grid Modernization strategy. For example, both PUC Distribution Inc. and Elexicon Energy Inc. have undertaken similar projects. Has Toronto Hydro consulted with either PUC Distribution Inc. or Elexicon regarding their projects. If not, why not?

RESPONSE (C):

Toronto Hydro did not consult with the specified utilities in the development of the 2025-2029 Grid Modernization Strategy. However, as discussed in Exhibit 2B, Section D5.1.1, the strategy is informed by Toronto Hydro's extensive first-hand knowledge of the sector and the successes and leading examples of peer utilities in various progressive jurisdictions. Toronto Hydro regularly engages with industry peers on strategic and operational subjects, including through direct, informal engagement, as well as through engagements facilitated by consultants, industry groups and associations.

The Grid Modernization Strategy is also based on Toronto Hydro's extensive knowledge of the unique challenges and opportunities for its own system and operations. As further outlined in D5.1.1, Toronto Hydro has developed a grid modernization strategy which addresses emerging challenges and opportunities in a manner that leans first and foremost into the deployment of proven technologies (e.g., reclosers, switches, smart meters, analytics). From a materiality perspective, most of these investments are a continuation or renewal of programs that Toronto Hydro has been rolling-out at a gradual pace over the last two decades (e.g., remote-operable switches; smart meters), while others (e.g., achieving "self-healing" grid operations) represent the

culmination of transformational efforts that have been a part of the utility's long-term modernization roadmap for many years.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-45

Reference: Exhibit 1B, Tab 4, Schedule 1, Pages 15-16

Please provide the overall cost of the nine energy storage systems being put into place to enable the connection of forecasted renewable growth on nine high priority feeders. What is the definition of a "high priority feeder"? Are these being put in place primarily to enable the connection of renewable DER facilities? If so, how are they funded (through rates generally or by the owners of DER facilities)?

RESPONSE:

As described in Exhibit 2B, Section 7.2.2, over the 2025-2029 period, Toronto Hydro plans to invest $22.5 million to deploy nine Energy Storage Systems (ESS) with an aggregated capacity of 10.2MW on nine distribution feeders. These ESS installations are intended for renewable enablement, correcting destabilized grid parameters than can result from high amounts of generation on one feeder.[1] ESS can act as a load to prevent output curtailment from the renewable assets while ensuring a stable grid through controlling the minimum load to generation ratio (MLGR). "High-priority feeders" are feeders that exceed optimal MLGRs, as defined in IEEE Standard P1547.2/D6.5 and National Renewable Energy Laboratory's High Penetration PV Integration Handbook for Distribution Engineers (NREL Handbook).

Toronto Hydro confirms that its ESS program targets the enablement of REG connections and does not contemplate additional use cases to support the distribution system. As such, the utility is seeking treatment of these costs as eligible investments for provincial rate recovery under section

[1] Seguin, R., Woyak, J., Costyk, D., Hambrick, J., & Mather, B. (2016). (tech.). High-Penetration PV Integration Handbook for Distribution Engineers (pp. 4–26). Oak Ridge, Tennessee: Office of Scientific and Technical Information.

79.1 of the *Ontario Energy Board Act, 1998.*[2] For further details, please refer to Exhibit 2A, Tab 5, Schedule 1 (updated January 29, 2024).

[2] Cost Recovery re Section 79.1 of the Act, O. Reg. 330/09, at s. 1(2).

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-46

Reference: Exhibit 1B, Tab 4, Schedule 2

Toronto Hydro is proposing an Innovation Fund to support the design and execution of innovation pilot projects over the 2025-2029 rate period. The pilot projects undertaken through the Innovation Fund would be focussed on testing new technologies, advanced capabilities and alternative strategies that enable electrification grid readiness and are responsive to the OEB's expectations with respect to facilitation DER integration, as expressed in the Framework for Energy Innovation. The fund amounts to approximately $16 million over the 2025-2029 rate period:

QUESTION (A):

a) Please explain, in detail, the extent to which Toronto Hydro intends to collaborate with other utilities regarding its innovation Fund pilots;

RESPONSE (A):

As indicated in the description of the Governance Framework for the Innovation Fund at page 10 of Exhibit 1B, Tab 4, Schedule 2 , Toronto Hydro would engage with external stakeholders to inform the pilot project selection process, including other utilities as relevant. In these engagements, Toronto Hydro would canvass ideas and solutions that are being considered in the sector to help gain a better understanding of pilot projects that may be technically feasible and advisable. This feedback would be used as input into the pilot selection process, the output of which will identify the selected projects and key details about the projects, including the rationale for selecting them. Furthermore, and as noted on page 16 of the referenced evidence, in order to contribute to broader knowledge sharing with the electricity sector, Toronto Hydro intends to share its pilot project learnings with the OEB Innovation Sandbox team, so it can then be shared with industry stakeholders that include other Ontario utilities.

QUESTION (B):

b) With respect to the pilots that may prove to be less fruitful than others will ratepayers be responsible for the costs of those pilots? If so, why?

RESPONSE (B):

Toronto Hydro is requesting funding for the Innovation Fund which is purposefully not conditional on the ultimate degree of success for individual pilot projects. Inherent in the pursuit of innovative solutions, which Toronto Hydro is doing consistent with provincial and OEB policy objectives, is the risk that some efforts will be more or less successful than others, but also the understanding that there is value in the learning that comes from the efforts regardless of the outcome. Furthermore, if funding were to be conditional on the outcome of efforts to innovate, this could have a chilling effect on the pursuit of innovative solutions and is likely to encourage spending on projects that are mature, or where the beneficial outcomes are more proven or certain. These are the very aspects that the proposed Innovation Fund is designed to overcome.

QUESTION (C):

c) What specific type of projects will be prioritized?

RESPONSE (C):

The prioritization of pilot projects takes place at two stages of the Governance Framework, namely: (i) the application of defined characteristics to determine specific areas for innovation (at the conceptual level), and (ii) the pilot selection phase (at the scoping level).

As described in the referenced evidence at pages 6-8, Toronto Hydro has identified certain characteristics for the pilot projects that will be supported by the Innovation Fund. Those characteristics include that the projects will explore distribution capabilities associated with adapting to fundamental change in the energy sector, as identified in or related to certain expectations of the OEB set out in the FEI report, and the projects will have the potential to deploy solutions that are innovative because they use new technology or existing technology in new ways, they involve

innovative business practices and relationships, or they involve enhancing distribution services in ways that benefit customers.

In parallel, through its Grid Modernization Strategy, Toronto Hydro identified certain high-potential areas of innovation that present tangible opportunities to begin designing and executing projects rather than undertaking a "blank page" ideation phase. Toronto Hydro assessed these areas of innovation for the characteristics mentioned above and concluded that they are aligned with these characteristics (Exhibit 2B, Schedule D5).

The pilot project concepts identified for the 2025-2029 rate period, which would involve testing new distribution capabilities by deploying pilot projects that have the potential to be scaled up into standard capital or operational work programs, are: (a) Flexible Connections, (b) Electric Vehicle Commercial Fleet Charging, (c) EV Demand Response, and (d) Advanced Microgrids. Further details about how each of the pilot project concepts meets the defined characteristics are set out in Appendix A of the referenced evidence.

Individual projects will be selected and scoped out during the Pilot Selection and Design Phases of the Governance Framework (Section 4.1). In these Phases, the Innovation Fund team will prioritize projects that have potential business value, execution feasibility, opportunity for scalability, and opportunity to leverage external funding. The Pilot Selection phase will also be informed by external stakeholder engagement, as further described in Exhibit 1B, Tab 4, Schedule 2.

QUESTION (D):

d) Does Toronto Hydro expect there to be a prudence review of the costs and benefits of the pilots it plans to undertake? If not, why not?

RESPONSE (D):

No. As explained in the rationale for the Innovation Fund at pages 2-6 of the referenced evidence, the Innovation Fund has been designed to overcome certain challenges that act as barriers to

innovation for regulated distributors. These challenges include having to demonstrate, in rate applications, the prudency of innovation-driven pilot projects on the basis of costs and benefits which are not always certain at the outset, and which projects are early stage, exploratory and/or developmental in nature. To overcome this obstacle, Toronto Hydro is requesting approval of the Innovation Fund proposal effectively on the basis of the rigorous internal Governance Framework that will be used to ensure the associated funds are prudently deployed. Additionally, the proposal includes a variance account to track Toronto Hydro's expenditures, which will return any unspent funding back to ratepayers. See Proposed Rate Treatment (Section 5) of the referenced evidence, and Exhibit 9, Tab 1, Schedule 1 for more information on the proposed Innovation Fund Variance Account (IFVA).

QUESTION (E):

e) What type of reporting will Toronto Hydro undertake regarding the pilots that will be funded through its Innovation Fund?

RESPONSE (E):

At pages 8-16 of the referenced evidence, the Governance Framework for the proposed Innovation Fund refers to three types of reports that will be produced, for different purposes, including the pilot selection report, milestone reports, and the pilot evaluation and learnings report. The pilot selection report will identify the selection of projects and key details about the projects, including the rationale for selecting them. The milestone reports will be produced throughout the lifecycle of each project and are intended for internal management purposes to monitor progress and expenditures. Lastly, the pilot evaluation and learnings report is intended to capture the learnings, reflecting on the achievement of desired outcomes, including learning objectives, that are set at the outset of each pilot project during the design phase of the Governance Framework. Crucially, this report will assess and determine the future of each pilot project as described in Section 4.2 (Pilot Execution & Evaluation Phases) of Exhibit 1B, Tab 4, Schedule 2. The pilot evaluation and learning report will be shared with the OEB's Innovation Sandbox, and the key takeaway from this report could then be shared with industry stakeholders.

QUESTION (F):

f) Please provide copies of all of the research Toronto Hydro undertook to inform the level of funding requested;

RESPONSE (F):

Please see Toronto Hydro's response to interrogatory 1B-DRC-06 part d).

QUESTION (G):

g) Please explain how the $16 million will be recovered over the rate plan term.

RESPONSE (G):

As stated in the Innovation Fund evidence at pages 16-17, Toronto Hydro proposes to recover the funds through an Innovation Fund rate rider. For more details on the rate rider, please refer to Toronto Hydro's response to interrogatory 9-Staff-342 part a).

In addition, Toronto Hydro proposes to establish a new variance account, the Innovation Fund Variance Account, to record variances between amounts collected by the rate rider and amounts actually deployed for and used in carrying out pilot projects.

More information on the Innovation Fund Variance Account can be found in Exhibit 9, Tab 1, Schedule 1, and on the Innovation Fund rate rider in Exhibit 9, Tab 3, Schedule 1.

QUESTION (H):

h) Does $16 million represent a cap? Is it comprised of both capital and OM&A costs?

RESPONSE (H):

The $16 million does not represent a cap. As explained in the Innovation Fund evidence, the proposed Innovation Fund reflects a level of investment identified based on comparative jurisdictional research. This amount represents approximately 0.3% of the 2025-2029 revenue requirement outlined in Exhibit 6, and reflects the low end of the range of utility investment in

comparable innovation and research and development activities, with average utility spending at 0.5% to 1% of revenue. As part of the Innovation Fund proposal, Toronto Hydro proposed a *symmetrical* variance account to track actual revenue requirement (whether capital or OM&A related) against the forecasted amount that will be recovered through the Innovation Fund rate rider. Toronto Hydro intends to clear the balance in the variance account in its next rebasing application.

QUESTION (I):

i) When does Toronto Hydro expect to have its work plan for designing and implementing the selected pilot(s) completed?

RESPONSE (I):

As stated in the evidence at page 11, the completion of the work plan is marked by approval of the steering committee. Before this can happen, the pilot project owners need to compile pilot project scopes (including outcomes and milestones), budgets, and work plans for managing the process. These activities occur in the second phase of the internal Governance Framework – the design phase. It is Toronto Hydro's intention to begin undertaking the activities described in the Governance Framework, beginning with the pilot selection phase, after the OEB renders its Decision and Rate Order for the 2025-2029 Custom Rate Application. Once the pilot selection phase has been completed, Toronto Hydro will proceed with the pilot design phase. Given that pilot projects may require multiple years of testing, Toronto Hydro will endeavour to complete the design phase within the first 18 months of the rate period.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-47

Reference: Exhibit 1B, Tab 4, Schedule 2, Appendix B - NRCan letter

QUESTION:

Did Toronto Hydro seek funding from NRCan for its Innovation Fund? If not, why not? Does it expect to do so in the future? If not, why not?

RESPONSE:

As stated in the Innovation Fund evidence, Toronto Hydro intends to apply for NRCan funding to support Innovation Fund pilot projects if and when they are eligible under NRCan program rules. In January 2024, Toronto Hydro submitted an Expression of Interest to NRCan's Smart Grid Demonstration program. The EOI included submissions on two projects to be considered for funding through NRCan's Smart Grid Demonstration program. One of the projects submitted is included in the Innovation Fund. The NRCan program could provide funding for other potential pilots projects under the EV Commercial Fleet Charging or EV Demand Response areas of innovation. For a complete list of external funding that Toronto Hydro has applied for in the last few years, please see Toronto Hydro's response to interrogatory 1B-Staff-10. The referenced NRCan letter is the result of Toronto Hydro's engagement with NRCan in connection with the Innovation Fund proposal. In response, NRCan shared with Toronto Hydro the referenced letter.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-48

Reference: Exhibit 1B, Tab 5, Schedule 1, Page 4

With respect to customer engagement Toronto Hydro undertook a two-phased approach to inform its rate Application. First, prior to embarking on the business and investment planning process, it obtained a "genuine" understanding of its customers' needs and priorities and used this feedback to set strategic direction for the investment priorities of it plan. Second, after the 2025-2029 draft plan was prepared Toronto Hydro went back to its customers to obtain feedback on the draft plan. The utility considered this feedback in refining and finalizing its plan.

QUESTION (A):

a) If customers' top priorities are price and reliability, what has Toronto Hydro done to address the pricing issue in any significant way?

RESPONSE (A):

As noted in the evidence in Exhibit 2B, Section E2.1 finding balance between price and progress towards outcomes that customer expect was a key focus throughout Toronto Hydro's integrated planning process. To achieve this balance, Toronto Hydro constrained its initial capital plan by approximately $480 million from the beginning to the end of the process. Similarly, the OM&A plan detailed in Exhibit 4 was also constrained by approximately $40 million through the course of the planning process. This was primarily achieved through the iterative review of the workforce plan as described in the response to interrogatory 4-CCC-58(d). Finally, price was also a consideration in the Performance Incentive Mechanism (PIM) described in Exhibit 1B, Tab 3, Schedule 1, which provides customers an upfront rate reduction benefit of approximately $65 million over the rate term by shifting financial risk to the utility for delivering performance outcomes that customers value.

QUESTION (B):

b) Toronto Hydro states that "…on average 84% of customers surveyed supported the draft plan and the associated rate impacts." Were customers given the 7.5% annual distribution rate impact numbers? If not, why not? Does imply that they support annual increases in the revenue requirement as proposed?

RESPONSE (B):

Please see the response to interrogatory 1B-Staff-39(b). Toronto Hydro would like to clarify that the proposed average annual distribution rate impact is 7%.

QUESTION (C):

c) What specific changes did Toronto make to its investment plan in Phase 2. How did Toronto Hydro decide on a $70 million reduction to its overall plan?

RESPONSE (C):

As noted in the timeline provided in the response to interrogatory 2B-SEC-32, the last step in Toronto Hydro' integrated business planning process is the refinement and finalization of the plan based on the results of the Phase 2 engagement. The evidence in Exhibit 2B, Section E2 at pages 9-11 describes the changes that Toronto Hydro made to the plan in more detail. Please also refer to Toronto Hydro's response to interrogatory 2B-SEC-54 for a breakdown by program of the changes which were made to the draft capital plan in the last step of the process.

QUESTION (D):

d) What is the revenue requirement impact for each year and the rate impact each year for residential customers of reducing the overall capital plan by $70 million?

RESPONSE (D):

Please see Table 1 and Table 2 below for revenue requirement reduction and residential rate impact respectively for each year as a result of reducing the overall capital plan by $70 million.

Table 1: Revenue Requirement Change – CE Phase 2 Refinements to the Final Plan (in $ millions)

	2025	2026	2027	2028	2029	2025-2029
Revenue Requirement	(0.3)	(0.7)	(1.3)	(2.0)	(3.0)	(7.3)

Table 2: % Residential Customer Rate Impacts associated with CE Phase 2 Refinements to the Final Plan

	2025	2026	2027	2028	2029	2025-2029
Residential Rate Impact %	0.0%	(0.1%)	(0.1%)	0.0%	(0.1%)	(0.1%)

QUESTION (E):

e) Please define "social permission";

RESPONSE (E) – PREPARED BY INNOVATIVE:

"Social permission", as it relates to this application, is defined in Toronto Hydro's Customer Engagement Executive Summary, which is filed at Exhibit 1B, Tab 5, Schedule 1, App A at page 1. That definition is provided below:

Social permission is the percentage of customers who responded to Toronto Hydro's draft plan by indicating either: (1) they think Toronto Hydro should accelerate spending beyond the level in the draft plan to deliver better system outcomes, (2) they support the proposed rate increase that is reflected in the draft plan, or (3) they feel that the proposed rate increase in the draft plan is necessary, even though they don't like the proposed increase.

QUESTION (F):

Did Innovative discuss the Performance Incentive Mechanism as part of the customer engagement process? Were customers told Toronto Hydro would have an opportunity to "earn back" the $65 million?

RESPONSE (F):

No. The 2025-2029 Custom Scorecard and associated Performance Incentive Mechanism (PIM) was developed after Phase 2 Customer Engagement. Toronto Hydro had to finalize its plan, including making adjustments based on the results of Phase 2, in order to confirm the $65 million incentive and the scorecard measures and targets.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-49

Reference: Exhibit 1B, Tab 5, Schedule 1, Page 13

Preamble:

Toronto Hydro undertook application-specific customer engagement through Innovative Research. In addition, Toronto Hydro states that ongoing customer and stakeholder engagement activities occur in the normal course of business as part of Toronto Hydro's robust and sophisticated customer research and response model.

QUESTION (A):

a) What is expected to be the overall cost of the Innovative Research work specific to this Application? Please provide a detailed breakdown;

RESPONSE (A):

Please see table 1 below:

Table 1: Innovative Project Phase Costs

Phase	**Costs (before HST)**
Phase 1	$284,250
Phase 2*	$476,411
Total	$760,661

*As of the end of 2023.

QUESTION (B):

b) What is the annual cost of ongoing customer engagement activities included in the rate plan revenue requirements?

RESPONSE (B):

Please see the summary table below for a list of the programs that map to the on-going customer engagement initiatives referred to Exhibit 1B, Tab 5, Schedule 1 and a breakdown of the related annual costs. Toronto Hydro notes that the costs in this table are related to the program/segment overall, which include costs beyond the scope of "on-going customer engagement" because it is not possible to disaggregate customer engagement costs from other drivers in the program.

Table 2: On-going Customer Engagement

Program /Segment	Description of Activities	Annual Costs ($ Millions)				
		2025	2026	2027	2028	2029
Customer Operations – Key Accounts Segment (Exhibit 4, Tab 2, Schedule 8 at Page 22)	Proactive and responsive engagement activities with Key Account customers. Please refer to for more information.	1.5	1.5	1.7	1.8	1.9
Customer Operations – Customer Connections Segment (Exhibit 4, Tab 2, Schedule 8 at Page 16)	Communications with customers relating to connection and upgrade requests, from intake through the completion process, and general inquiries.	3.2	3.3	3.5	3.6	3.8
Customer Care - Customer Relationship Management Segment (Exhibit 4, Tab 2, Schedule 14 at Page 34)	Communications across various channels to provide customers information in relation to service offerings and the utility's operations.	14.7	15.7	16.1	16.9	17.5
Customer Care - Collections Segment (LEAP) (Exhibit 4, Tab 2, Schedule 14 at page 26).	Application of financial assistance programs such as the Low-Income Energy Assistance Program ("LEAP") and Ontario Energy Support Program ("OESP").	10.2	10.9	11.0	11.3	11.6

Program /Segment	Description of Activities	Annual Costs ($ Millions)				
		2025	2026	2027	2028	2029
Public, Legal and Regulatory Affairs – Communications and Public Affairs Segment (Exhibit 4, Tab 2, Schedule 18 at page 28)	Includes channels that facilitate two way communication with customers such as costs for surveys, focus groups, and the Customer Advisory Panel. This also includes town halls and other communications with customers regarding planned capital work.	6.6	6.9	7.1	7.3	7.6
Asset and Program Management – System Planning Segment (Exhibit 4, Tab 2, Schedule 9 at Page 12)	The utility uses the City of Toronto's development pipeline to engage large customers and developers with upcoming projects to understand their needs, determine their load requirements and timelines, provide technical guidance, explore innovation opportunities, and provide support in understanding the connection process. For more information, about development planning please see coordinate planning Exhibit 2B, Section B.	8.4	9.1	9.5	10.0	10.3
	Toronto Hydro participates in the Regional Planning process which includes community and stakeholder engagement, including webinars, led by the IESO.					

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCC-50

Reference: Exhibit 1B, Tab 5, Schedule 3, Page 1

Please file Toronto Hydro's responses to matters raised in letters of comment filed with the OEB during the course of the application.

RESPONSE:

Please see Appendix A

Re: Toronto Hydro 2025–2029 Rate Application Letters of Comment

Dear Valued Customer,

Thank you for your letter of comment regarding Toronto Hydro's 2025–2029 rate application and investment plan. Customer letters are an important part of the rate application process and we appreciate you taking the time to provide your feedback.

The Ontario Energy Board (OEB) received 22 letters of comment in total. Many of the letters focused on similar themes, including that:

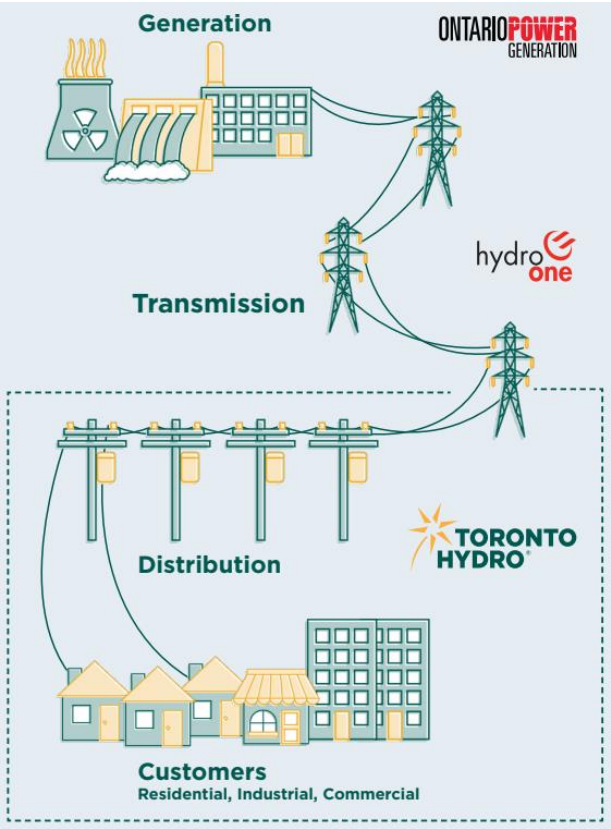
- Customers need clarity about what portion of their electricity bill goes to Toronto Hydro
- Customers believe the required electricity infrastructure already exists, so additional investment isn't required
- Customers are struggling with the cost of living and can't afford additional rate increases
- Customers want Toronto Hydro to explore other solutions rather than increasing costs

This letter represents Toronto Hydro's response to the comments raised and is divided into the following sections:

1. Electricity 101: Toronto Hydro's Role in the Electricity System
2. Toronto Hydro Bill Breakdown
3. Toronto Hydro's Investment Needs
4. Toronto Hydro's Operating Environment
5. Customer Engagement and Business Planning
6. Timing and Pace of Investment
7. Supporting Electrification
8. Affordability and Cost-of-Living Challenges
9. Our Productivity and Performance
10. Additional Resources

1. Electricity 101: – Toronto Hydro's Role in the Electricity System

Ontario's electricity system is made up of three parts: **generation**, **transmission** and **distribution**:



Generation: Generation is the process of creating electricity from sources such as nuclear power, hydroelectric, natural gas wind and solar. Ontario Power Generation, a government-owned company, generates almost half of Ontario's electricity. The other half comes from other generators contracted by the grid operator.

Transmission: Once electricity is generated, it must be sent to urban and rural areas across the province. This happens by way of high-voltage transmission lines that serve as highways for electricity. Ontario has approximately 30,000 kilometers of transmission lines, mostly owned and operated by Hydro One.

Distribution: Toronto Hydro is responsible for the last step of the journey: distributing electricity locally to customers. Toronto Hydro does not generate or transmit electricity — we own and operate the local electricity system made up of approximately 183,620 poles, 61,300 distribution transformers, 17,060 primary switches, 15,393 kilometers of overhead wires and 13,765 kilometers of underground cables.

2. Toronto Hydro Bill Breakdown

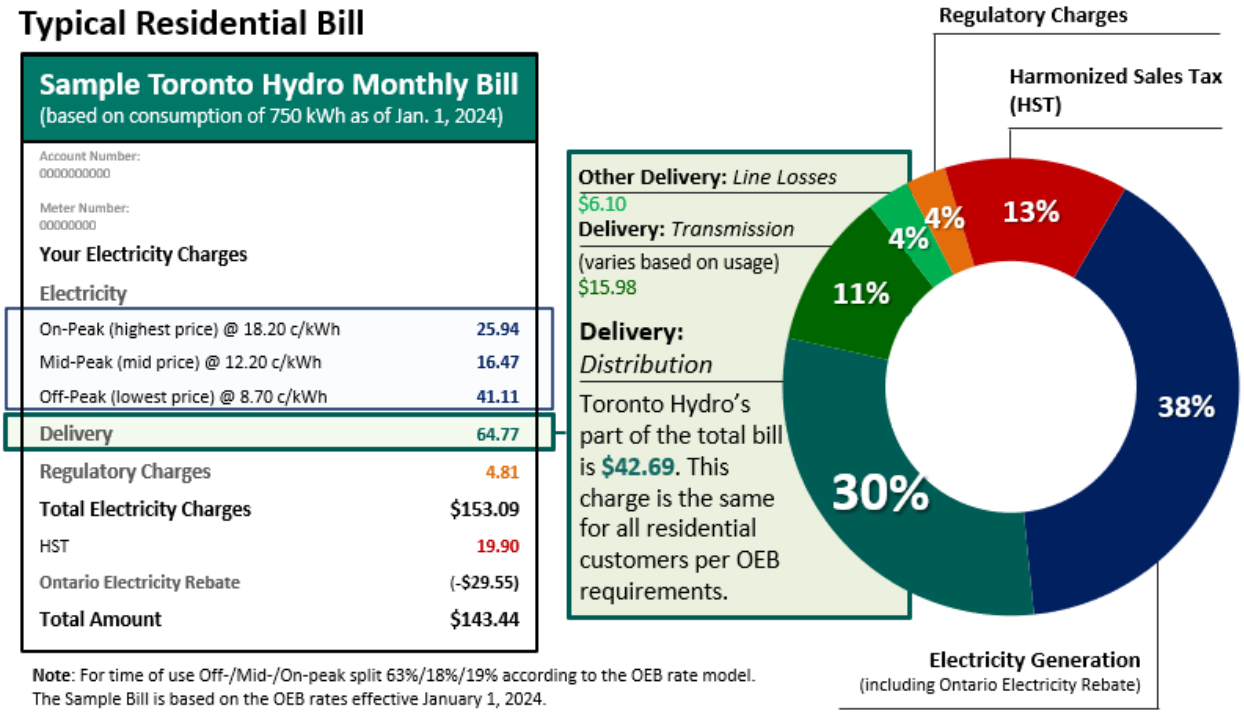
Toronto Hydro recognizes that there is some confusion among customers about how their electricity bill is distributed among the different parties involved in the electricity system, including what portion goes to Toronto Hydro and how Toronto Hydro spends the money we receive.

While the electricity bill you receive comes from Toronto Hydro, we actually collect payment for the entire electricity system. **Only about 30% of your electricity bill goes to Toronto Hydro** to pay for the local distribution grid. For example, if the typical monthly residential bill is $143.44**,** the **Delivery Charge** would be **$64.77** and would include:

- Toronto Hydro's Distribution: $42.69
- Hydro One's Transmission: $15.98
- Other Delivery including Line Losses (which is electricity lost during transmission): $6.10

The **remaining 70% of the bill** goes to generation companies, transmission companies, the federal and provincial governments, and regulatory agencies. Included in this amount is the 40% of your total bill that covers electricity generation costs. This is the part of your bill that changes based on your consumption. In other words, if you take steps to conserve energy, these actions will only impact 38% of your bill. For the typical residential customer, this amount is approximately $53.97.

The diagram below provides a breakdown of a typical residential bill:



3. Toronto Hydro's Investment Needs

The Delivery Charges found on your bill help fund Toronto Hydro's distribution system. For 2025 to 2029, we developed an investment plan to get the grid ready to serve the city's evolving electricity needs, including increased development from population and economic growth, as well as increased electrification and digitization. Our plan will help ensure that our grid and operations will remain safe, reliable and environmentally responsible.

Specifically, Toronto Hydro's 2025–2029 investment priorities include:

- **Sustainment and Stewardship:** These are investments to renew aging, deteriorating and obsolete distribution equipment to maintain the foundations of a safe and reliable grid.
- **Modernization**: These are investments to develop advanced technological and operational capabilities that will make the system better and more efficient over time
- **Growth and City Electrification**: These are necessary investments to connect customers (including distributed energy resources) and build the capacity to serve a growing and electrified local economy
- **General Plant**: These are investments in our vehicles, work centres and information technology infrastructure to keep the business running and reduce our greenhouse gas emissions

4. Toronto Hydro's Operating Environment

In developing the investment priorities that formed the basis of our 2025–2029 plan, we aimed to address certain needs and challenges of delivering safe, reliable and clean electricity, including:

- **Powering a mature and growing urban city**: We serve Canada's largest and North America's second fastest growing city (by population). We also operate in a dense urban environment, which makes it more complicated and more expensive for us to plan and build infrastructure. As Toronto continues to grow, we need to prepare the grid to power new condo towers, residential communities and businesses.
- **Fixing and replacing equipment in poor condition:** A large percentage of our grid was installed in the 1950s and 60s, and approximately a quarter of the utility's grid equipment continues to operate past useful life. We need to continue monitoring the condition of our grid and replace equipment most at risk to keep it safe and reliable for customers.
- **Keeping up with how customers use electricity:** Customers are increasingly adopting electrified technologies like electric vehicles and heat pumps for their day-to-day energy needs, and using new technologies like solar panels and battery storage to manage their energy usage. We need to upgrade our equipment and modernize our grid to keep up with these changes.
- **Responding to extreme weather and cybersecurity threats:** Extreme weather events such as extreme heat, high winds, flooding and ice storms are becoming more common due to climate change. In addition, cybercrime is on the rise across Canada. We need to invest in making our grid and operations more resilient against these emerging threats.

5. Customer Engagement and Business Planning

In preparing our plan, we recognized that we needed to balance addressing the operating challenges with price and other outcomes that customers value. Toronto Hydro has a robust planning process, which ensures that customer feedback informs our multi-year investment priorities.

During our planning process, we heard from over 37,000 customers across two phases of customer engagement:

- **Phase 1:** In 2022, we started preparing our plan by asking customers about their needs and preferences for electricity distribution services. Based on the Phase 1 Engagement and system conditions, we developed an initial plan that targeted certain short and long term goals.
- **Phase 2:** In March 2023, we went back to our customers with this draft plan — via a comprehensive online survey — to get feedback and to ask customers how the plan could better meet their needs and preferences.

With unprecedented levels of participation (more than 33,000 customers completed the survey), **84% of respondents supported our proposed plan** or one that does even more to improve services.

6. Timing and Pace of Investment

We understand that there are concerns about affordability, and questions regarding whether our proposed investments can be delayed until economic conditions improve.

Toronto Hydro's investment planning and rate application process operates on a five-year cycle. This means we only go to the OEB approximately every five years with an investment plan to ask for updated rates.

As described in this letter, there are certain investments which are necessary to renew aging equipment and prepare for increased growth in the city. These investments cannot happen quickly — particularly in a densely populated and congested city like Toronto. Building new powerlines and stations takes years of planning and construction. There are also equipment and resource constraints that limit how quickly we can build a bigger grid. That's why we need to start investing now to get the grid ready for future growth.

If we were to put off these investments, this could lead to lower reliability, lower service levels for customers looking to connect to the grid, and reduced efficiency. In addition, if we wait to make these proactive investments, we will likely have to spend even more to catch up on work that needs to be done, instead of spending more gradually. That's why we need to start investing in least-regrets investments now so as not to risk the safety, security, reliability and resiliency of the grid.

In the long term, increasing the utilization of the electricity system (through increasing the number of total users as well as the amount of electricity used by individual users) could help to bring down costs for individual customers.

7. Supporting Electrification

We understand that there are concerns that increased electricity rates will disincentivize customers from switching to electric vehicles (EVs) and heating. The rates we're proposing are necessary for making the investments needed to ensure the grid is ready when increased electricity demand materializes.

In addition, as customers increasingly turn to electricity for more of their day-to-day energy needs, it's expected that they will spend less of their income on energy over the long term as increased electricity costs are more than offset by savings from reducing or eliminating their use of fossil fuels, such as gasoline and natural gas.

Finally, there are a number of financial incentives available for EVs and electric heating, such as the Government of Canada's Incentives for Zero-Emission Vehicles Program[1] and the City of Toronto's Home Energy Loan Program.[2]

8. Affordability and Cost-of-Living Challenges

While our proposed rate increases are necessary for ensuring system safety and reliability and addressing the investment needs and challenges described in this letter, we recognize that there are some customers for whom rate increases will be particularly challenging.

[1] https://tc.canada.ca/en/road-transportation/innovative-technologies/zero-emission-vehicles/incentives-zero-emission-vehicles/program-overview

[2] https://www.toronto.ca/services-payments/water-environment/environmental-grants-incentives/home-energy-loan-program-help/help-terms-and-conditions/

A number of financial assistance programs are available to eligible customers, with support ranging from helping customers reduce their electricity usage to on-bill credits that help offset monthly charges. The following programs are available to eligible customers:

- The City of Toronto's **Emergency Energy Fund (EEF)** assists customers with energy-related emergencies to reconnect, prevent disconnection or assist in payment of energy arrears
- The OEB's **Ontario Electricity Support Program (OESP)** provides an on-bill credit each month to qualifying households
- The Independent Electricity System Operator's **Energy Affordability Program** offers support to income-eligible electricity consumers by helping them to better manage their monthly electricity costs and to increase their home comfort
- The OEB's **Low-income Energy Assistance Program (LEAP)** provides a one-time emergency grant to help customers pay their electricity bill

To learn more about these assistance programs, visit **torontohydro.com/help**.

Additionally, as part of our commitment to improving how these programs work, Toronto Hydro is requesting enhancements to the LEAP program for the 2025-2029 rate period. Through these various enhancements, we're aiming to increase the average annual number of customers assisted to approximately 1,900 per year (or more than 9,000 over the entire five-year period).

We're also committed to working with the OEB, governments and other stakeholders to find additional targeted solutions that will help customers who need it most.

9. Our Productivity and Performance

Toronto Hydro always strives to provide value to our customers. Like many companies, Toronto Hydro faces rising costs in purchasing equipment for the grid and completing construction work in the city. Despite this, we're always looking for ways to minimize costs and rate increases by finding productivity and efficiencies in our plans and work. For example, as part of reducing our facilities footprint in the city, we consolidated from seven operating centres down to four. As part of this consolidation, the utility sold properties, and are returning proceeds of close to $200 million to customers by the end of the decade resulting in an annual credit of approximately $132 on the average residential customer's bill from 2016 to 2029.

During our business planning process, we asked external experts to assess our performance, including benchmarking with respect to our productivity, reliability, and cost efficiency. The results of those studies, which were publicly filed as part of our application, demonstrate that our performance on these measures is similar or better than our peer utilities.[3]

This also applies to employee compensation. Toronto Hydro balances cost-effectiveness with the need to attract and retain the talent required to provide service in an increasingly complex and dynamic operating environment. Toronto Hydro has external consultants who benchmark our total compensation, and we've been found to be within a market-competitive range in the energy market.

[3] For more information on Productivity initiatives, please see Exhibit 1B, Tab 3, Schedule 3.

In addition, our 2025–2029 plan is focused on delivering results that matter to customers like you. To help ensure that we achieve these outcomes, we'll be holding ourselves financially accountable through a framework that tracks and reports our performance on 12 distinct measures. This performance framework provides customers with an upfront rate reduction benefit of $65 million that we will only earn back if we achieve certain objectives.

10. Additional Resources

To learn more about Toronto Hydro's 2025–2029 rate application and investment plan, please refer to the following:

- Our 2025–2029 Rate Application
- 2025–2029 Rate Application Executive Summary (PDF, 894 KB)
- 2025–2029 Rate Application Customer Summary (PDF, 1.5 MB)
- Our 2025–2029 Investment Plan

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCMBC-1

Reference: Exhibit 1B, Tab 1, Schedule 3, Page 9, Table 9: OM&A 2020-2029 Cost Drivers

QUESTION (A) :

a) Please explain the reason for the $9.5 million Distribution Operations cost driver in 2024.

RESPONSE (A):

Programs contributing to $9.5 million variance in Distribution Operation cost driver in 2024 are summarized in Table 1 below. Please refer to the program narrative for additional details.

Table 1: Distribution Operations cost driver in 2024

Distribution Operations	2024 Bridge	Reference
Preventative and Predictive Overhead Line Maintenance	0.7	Exhibit 4, Tab 2, Schedule 1
Preventative and Predictive Underground Line Maintenance	(0.2)	Exhibit 4, Tab 2, Schedule 2
Preventative and Predictive Station Maintenance	0.5	Exhibit 4, Tab 2, Schedule 3
Corrective Maintenance	0.7	Exhibit 4, Tab 2, Schedule 4
Emergency Response	2.7	Exhibit 4, Tab 2, Schedule 5
Disaster Preparedness Management Program	0.5	Exhibit 4, Tab 2, Schedule 6
Control Centre Operations	0.5	Exhibit 4, Tab 2, Schedule 7
Customer Operations	0.2	Exhibit 4, Tab 2, Schedule 8
Asset and Program Management	0.5	Exhibit 4, Tab 2, Schedule 9
Work Program Execution	0.9	Exhibit 4, Tab 2, Schedule 10
Fleet and Equipment Services	0.4	Exhibit 4, Tab 2, Schedule 11
Supply Chain Services	2.1	Exhibit 4, Tab 2, Schedule 13
Total Cost Driver	**9.5**	

QUESTION (B):

b) Please explain the reason for the $13.9 million Distribution Operations cost driver in 2025.

RESPONSE (B):

Programs contributing to $13.9 million variance in Distribution Operation cost driver in 2025 are summarized in Table 2 below. Please refer to the program narrative for additional details.

Table 2: Distribution Operations cost driver in 2025

Distribution Operations	2025 Forecast	Reference
Preventative and Predictive Overhead Line Maintenance	1.2	Exhibit 4, Tab 2, Schedule 1
Preventative and Predictive Underground Line Maintenance	0.7	Exhibit 4, Tab 2, Schedule 2
Preventative and Predictive Station Maintenance	1.0	Exhibit 4, Tab 2, Schedule 3
Corrective Maintenance	3.9	Exhibit 4, Tab 2, Schedule 4
Emergency Response	2.8	Exhibit 4, Tab 2, Schedule 5
Disaster Preparedness Management Program	0.1	Exhibit 4, Tab 2, Schedule 6
Control Centre Operations	0.4	Exhibit 4, Tab 2, Schedule 7
Customer Operations	(0.1)	Exhibit 4, Tab 2, Schedule 8
Asset and Program Management	0.2	Exhibit 4, Tab 2, Schedule 9
Work Program Execution	0.8	Exhibit 4, Tab 2, Schedule 10
Fleet and Equipment Services	0.2	Exhibit 4, Tab 2, Schedule 11
Supply Chain Services	2.7	Exhibit 4, Tab 2, Schedule 13
Total Cost Driver	**13.9**	

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCMBC-2

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 25, Table 3: 2026-2029 Revenue Growth Factor

QUESTION:

What is the main reason for the large increase in the Revenue Growth Factor from 2.62% in 2027 to 7.43% in 2028?

RESPONSE:

The primary reason for the increase in the Revenue Growth Factor from 2.62% to 7.43% is an increase in PILs. Specifically, PILS are increasing over this period primarily due to a lower Capital Cost Allowance (CCA) compared to 2027 as the accelerated CCA rules are ending as at December 31st, 2027.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 1B-CCMBC-3

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 26

Preamble:

"Substituting the labour component of the inflation factor with a Toronto-specific index is responsive to the consideration that labour is a key cost driver within the utility's plan, and a Toronto-specific labour index could be more suitable to account EB-2023-0195 Toronto Hydro Rates Application - CCMBC Interrogatories for the localized inflationary cost pressures that the utility faces in the 2025-2029 rate period."

QUESTION (A):

a) Please confirm that Toronto Hydro proposes that ratepayers bear the risk of inflation.

RESPONSE (A):

Toronto Hydro's proposed approach to inflation is consistent with standard incentive regulation under Price Cap IR, which adjust rates annually by an OEB approved inflation-factor. Rates include the impacts of each year's Inflation Factor adjustment, while the utility is responsible for managing variances between actual inflation and the rate adjustments resulting from the Inflation Factor. Toronto Hydro is also responsible for managing the impacts, and bearing the risk of revenue reductions imposed by the X-Factor during the 2025 to 2029 period.

QUESTION (B) – (D):

b) Does the Toronto-specific labour index only cover the City of Toronto, or does it cover a larger area?

c) What percentage of Toronto Hydro employees are residents of the City of Toronto?

d) Do the businesses and manufacturers operating in Toronto face the same inflationary cost pressures as Toronto Hydro?

RESPONSE (B-D):

Please see Toronto Hydro's response to 1B-Staff-93.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 1B-DRC-1

References: Exhibit 1B, Tab 5, Schedule 1, Appendix A

Exhibit 2B, Section E8.4

Preamble:

THESL engaged Innovative Research Group Inc. ("IRG") to assist in meeting THESL's customer engagement commitments and develop a comprehensive customer engagement study. The work was carried out in two phases. The first phase assessed customers' needs and preferences in relation to THESL's programs and services for the 2025-2029 rate period. During the second phase, customers provided detailed feedback on the $5.9 billion draft plan and the associated price impacts.

QUESTION (A):

Please provide a copy of all written instructions provided by THESL to IRG in relation to IRG's customer engagement mandate for the Application and the report provided in Exhibit 1B, Tab 1, Schedule 1, Appendix A.

RESPONSE (A):

Please see 1B-SEC-11 at Appendix A for the retainer that established IRG's mandate pursuant to which the customer engagement was performed.

QUESTION (B):

Please provide a copy of all written instructions provided by THESL to IRG in relation to customer engagement with respect to consumer choice in integrating technologies like distributed energy resources ("DERs"), electric vehicles ("EVs"), solar power, and battery storage.

RESPONSE (B):

Toronto Hydro did not provide written instructions to IRG beyond the retainer outlined in the utility's response to 1B-SEC-11.

QUESTION (C):

Please describe all measures undertaken by THESL and IRG to invite and ensure the participation of EV stakeholders and other DER customers (including EV drivers, owners of DERs, EV associations, and DER industry associations) in customer engagement activities.

RESPONSE (C) – PREPARED BY TORONTO HYDRO:

Toronto Hydro undertook a two-phased approach to customer engagement through which it gathered feedback from nearly 37,000 customers – the utility's largest and most comprehensive customer engagement to date. For its Phase 2 engagement specifically, customers with an email address on file received an email invitation. Toronto Hydro also informed residential and small business customers about an open access version of the survey through bill inserts, social and traditional media as well as Toronto Hydro's website. This approach resulted in a broad engagement with the opportunity for all customers, including EV stakeholders and DER customers, to participate and provide valuable input into Toronto Hydro's planning process. The success of these efforts in ensuring that EV stakeholders and DER customers were engaged is clear in the response to the question at Exhibit 1B, Tab 5, Schedule 1, Appendix A at pages 286/365, where when customers were asked if they ever considered shifting from one energy source to another (with examples given such as switching to a heat pump or an electric vehicle) 20% of residential customers and 28% of small business customers said they had either done it or were actively taking steps in this direction.

QUESTION (D):

Please provide any and all notes from IRG's customer engagement relating to EVs and DERs that are supplementary to the reports provided in Exhibit 1B, Tab 1, Schedule 1, Appendix A.

RESPONSE (D) – PREAPRED BY INNOVATIVE:

There are no additional notes from IRG's customer engagement relating to EVs and DERs that are supplementary to the reports provided in Exhibit 1B, Tab 5, Schedule 1, Appendix A.

QUESTION (E and F):

Please discuss how the outcomes and priorities of customers have changed compared to historical equivalents and discuss any trend lines in customer priorities related to the adoption and integration of technologies like DERs, EVs, solar power, and battery storage.

Please discuss how the outcomes and priorities of customers have changed compared to historical equivalents and discuss any trend lines in customer priorities related to the energy transition and THESL's net zero commitments. As part of your answer please discuss any work done by THESL or IRG on the substantive knowledge of customers and what they understand their understanding of the energy transition.

RESPONSE (E AND F):

RESPONSE – PREPARED BY INNOVATIVE:

The focus of this engagement was to understand Toronto Hydro customers' current preferences. There was no time series analysis of change in customers' views on outcomes and priorities conducted for this application.

The surveys conducted for this engagement do not presume any knowledge about the energy transition. Each question provides enough background information for customers to provide meaningful responses. The questions were tested with customers to ensure they felt there was enough information. There is a diagnostic question at the end of the survey to double check whether customers felt there was too little, too much or the right amount of information. Most customers indicated the survey had the right amount of information.

The Phase 1 survey did include two awareness questions. The first asked about customer familiarity with the primary sources of GHG emissions, and the second asked customers about their familiarity with the role of an expanded and modernized grid to implement the City of Toronto's Net Zero Strategy. The results show a wide range of knowledge about primary sources of GHG emissions, confirming other publicly released research on energy transition knowledge by INNOVATIVE. For example, on Exhibit 1B, Tab 5, Schedule 1, Appendix A at page 113 of the Phase One Residential Report, 55% of residential customers report being at least somewhat familiar with the primary sources of GHG emissions.

RESPONSE – PREPARED BY TORONTO HYDRO:

In the last five years, Toronto Hydro has observed many Key Account customers move from planning and finalizing their Environmental Social and Governance (ESG) goals to adoption of decarbonized projects. Many of these projects are either in the design/construction phase or already energized. This transition has been led by the Municipal, Academic, Schools and Social Services, and Hospitals (MASH) sector and Toronto Hydro anticipates that this will continue through the 2024-2029 period. For example, identifiable EV specific projects over the 2022-2024 period include over 400 on and off-street EV charging stations in garage lots, surface level lots and pole-mounted stations across the City of Toronto. This rate of electrification within the City of Toronto is expected to grow and increase throughout the 2024-2029 period together with ongoing new building construction electrification requirements for commercial, residential and mixed-use developments.[1]

The utility also generally anticipates growth in Renewable Distributed Energy Resources. Specifically, the utility currently projects that the total number of renewable DER connections[2] will

[1] Exhibit 2B, Section E5.1.4.1 at Page 22
[2] Renewable: consists of DER based on renewable technologies, such as solar photovoltaic, wind turbine and bio-gas generators;

grow from about 2280 connections in 2023 to nearly 4,500 by the end of 2029 – an increase of roughly 67 percent.[3]

[3] Exhibit 2B, Section E2.1.3.2 at Page 15

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 1B-DRC-2

References: Exhibit 1B, Tab 1, Schedule 1, pp.58-59

Exhibit 2B, Section E3

Preamble:

THESL notes that "[c]ustomers are showing a continued interest in participating in the electricity system as both consumers and producers of power." THESL further notes that "[e]quipment that has a high number of DER connections is more likely to experience unstable conditions that pose significant reliability and safety risks to the system and its users."

QUESTION (A):

Please elaborate on what THESL means by customers are interested in participating as both consumers and producers and that reliability and safety risks associated with equipment that has a high number of DER connections.

RESPONSE (A):

Some customers in Toronto Hydro's service territory choose to install Distributed Energy Resources (DERs), enabling them to produce electricity for their own consumption. As noted in Exhibit 2B Section E5.1.3.2, as of the end of 2022, Toronto Hydro connected 2,185 Renewable DERs, 28 Energy Storage and 116 Non-Renewable DER connections from customers and developers under a variety of technologies and applications with a total connected capacity of 304.94 MW. As noted in Exhibit 2B Section E7.2.2, an increase in generation projects can lead to a fundamental change in the power flow conditions at the distribution system and how they need to be managed. This has challenged the conventional radial nature of the grid to accommodate bi-directional power flow. Large scale deployment of renewable energy generation is known to cause issues in distribution system planning and operations such as unintentional islanding and overvoltage on feeders.

QUESTION (B):

Please provide details as to the areas in THESL's service territory experience the highest reliability and safety risks associated with DER connections (such as neighbourhood, number of DERs connected, overview of risks and reliability issues, customer concerns, etc.). If THESL is unable to provide further details, please explain why not and whether such information may be obtained in this proceeding or subsequent proceedings.

RESPONSE (B):

Please see Table 1 in Exhibit 2B, Section E3.3 for the areas that pose the highest risk for DER connections, due to the lack of fault level capacity on the bus associated with these stations. Further intake of DERs could put the stations and feeders in these areas at risk of exceeding the allowable fault limits, which could be detrimental to the equipment's rating. The safety and reliability risks associated with DER connection are detailed in the evidence at Exhibit 2B Section E3.

QUESTION (C):

What, if any, are factors that THESL believes will influence customer choice as the "key driver of DER demand", in addition to the economic and policy considerations listed, both for the period 2024-2029 and beyond.

RESPONSE (C):

Toronto Hydro believes that customers' choices regarding Renewable DER, Non-renewable DER and Energy Storage Facilities are shaped by a combination of technological, social, environmental, and policy factors. Below is a list of some of factors that can influence customer choice as the key driver of DER demand in the future.

- **Technological Advancements**: Advances in technology can make DERs more attractive and cost-effective for consumers. This includes technology that integrates DER into smart homes and buildings, allowing for better control, automation, and optimization of energy usage.
- **Energy Independence, Security and Resilience**: Consumers may choose DERs to gain greater control over their energy costs and to mitigate concerns about energy security and resilience.

This is particularly true to larger rotation-based generation facilities that could support their load or parts of it.

- **Environmental & Social Factor**: A growing awareness of climate change, along with peer influence and community norms in that respect can drive more customers to choose DERs to reduce their carbon footprints.
- **Government Incentives & New Business Models**: In addition to broader policy considerations, specific incentives, subsidies, and regulations can impact the attractiveness of DER for customers. The emergence of new business models, such as community-based energy projects, can provide customers with new options and incentives for adopting DER.

QUESTIONS (D) AND (E):

d) What are the consequences if DER growth rates exceed THESL's forecasts and more closely approximate the highest projection scenarios from the FES Report? Please include in your response a discussion on what challenges will this present in terms of THESL's ability to meet the higher demand and any consequences it may have on THESL's ability to meet demand past 2030 if demand continues to accelerate more quickly than anticipated.

e) What additional investments beyond those set out in E3.3.1 would THESL propose to accommodate the highest projections from the Future Energy Scenarios Report?

RESPONSE (D) AND (E):

It is important to note that highest level of DER uptake in FES is aligned with the Net Zero 2040 projections in TransformTO and is significantly more aggressive than any other scenario. It is based on the theoretical potential of solar generation in Toronto and hence represents an upper bound where 100% of suitable buildings install solar PV. For more information, please see Section 4.4 of Exhibit 2B Section D4 Appendix B.

Should the DER growth rate more closely resemble the highest projection scenario in the FES report, consequences would include more constrained feeders on the distribution network (due to

short-circuit capacity), issues with existing protection systems, as well as voltage regulation issues due to large amounts of DERs. As discussed in Exhibit 2B, Section E3, Toronto Hydro already faces DER hosting capacity limitations in a small percentage of areas on its system. In any scenario that involves DER growth, the number of restrictions can be expected to grow over time. Furthermore, the more rapid the uptake is of DERs, the sooner these limitations will be encountered and the more widespread they will become.

One benefit of a scenario-based model such as FES is that the utility can track developments as they occur and determine which scenario is more closely being followed, and plan the necessary investments accordingly to ensure that the utility is able to meet demand.

As summarized in Exhibit 2B, Section E3, Toronto Hydro has put forward a plan to address existing and anticipated DER hosting capacity restrictions in alignment with its DER forecast for 2025-2029. With respect to the longer-term, as discussed in detail in Section D5.2.2, an important stream of the utility's Grid Modernization Strategy is the Grid Readiness portfolio (and related innovation projects), which includes targeted investments to explore and demonstrate solutions and capabilities that could become part of Toronto Hydro's toolkit for cost-effectively facilitating and integrating a much higher penetration of DERs beyond 2030. If the rate of DER uptake significantly outpaces that reflected in Toronto Hydro's DER forecast, it will likely be necessary to increase the scope of investment in the solutions summarized and Section E3. A higher rate may also encourage a more accelerated pace of modernization and innovation investment to advance Grid Readiness capabilities.

Toronto Hydro is proposing the use of a Demand Variance Account to account for a scenario where significantly more than planned electrification drivers materialize.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 1B-DRC-3

References: Exhibit 1B, Tab 1, Schedule 1, p.50

Exhibit 2B, Section 5.5

Preamble:

THESL notes that its "investment plan makes the minimum investments necessary (the "least regrets investments" to maintain key outcomes in the near-term while also making paced and deliberate progress in readying the grid and utility operations of the future, regardless of the path the energy transition takes."

QUESTION (A):

a) Please discuss the time horizon considered by THESL in its investment plan to support its "least regrets investments" approach and explain what is meant by "near-term" and "readying the grid and utility operations of the future".

RESPONSE (A):

In the context of making "least regrets" investment decisions, the "near-term" refers to Toronto Hydro's 2025-2029 Distribution System Plan period (and the utility's decision to largely prioritize modernization investments that will have immediate benefits to customers in this period), while "readying the grid and utility operations for the future" means making investments in the 2025-2029 period that will build toward certain more advanced capabilities that will be required in the next decade and beyond as the pace of change related to the energy transition is expected to accelerate.

For more information about the least regrets planning approach, please refer to Exhibit 2B, Section D4 starting on page 9. Please also refer to the response to interrogatory 1B-PP-05-part (a) for more context on "readying the grid and utility operations of the future".

QUESTIONS (B):

b) Please discuss the disadvantages and downside risks to THESL's distribution system, customers, investments in DERs, infrastructure, and/or workforce of underinvesting in electric vehicle infrastructure and DER connection and adoption infrastructure if a higher electrification scenario materializes compared to the one relied upon in the Application and THESL's investment plan. Please also discuss the implications of underinvestment over the rebasing period (2025-2029), mid-term (2030-2040), and long-term (2040 onwards).

RESPONSE (B):

Toronto Hydro's "least regrets" investment plan for 2025-2029 is designed to prepare the grid and operations for the level of growth anticipated in the utility's 10-year Peak Demand Forecast and its DER forecast. The utility is also proposing a Demand-Related Variance Account ("DRVA") to protect ratepayers, the utility and its shareholder, from structural unknowns in forecasted costs and revenues related to demand growth in a time of unprecedented change and transformation in the economy and energy system. Please see Exhibit 1B, Tab 2, Schedule 1 starting on page 35 for detailed evidence with respect to the need and scope of the proposed DRVA.

Hypothetically, if a much higher electrification scenario occurs and Toronto Hydro fails to make the necessary investments in a timely manner, this would have negative impacts on the various topics listed in DRC's question. Some of the key impacts are summarized below by time period.

<u>Rebasing Period (2025-2029)</u>

1. **Distribution System:** Underinvestment in infrastructure to support EVs, DERs and various other drivers of demand could lead to increased strain on the system. This could result in more frequent outages, reduced reliability, and lower service quality. Toronto Hydro could face higher operational costs and emergency repairs due to the inadequacy of the current infrastructure to handle peak loads.
2. **Customers:** Lack of access to adequate EV charging capacity could slow down the adoption of electric vehicles.

3. **Investments in DERs:** Underinvestment could hinder the integration of DERs, affecting local energy generation and storage solutions. This could result in lost opportunities for customers to reduce energy costs and emissions, and for the broader grid to benefit from more distributed energy production.
4. **Workforce:** Insufficient investment could result in a workforce that is ill-prepared for the evolving energy landscape, lacking skills in new technologies and customer service demands associated with EVs and DERs, as well as missed opportunities to build and apply efficiency-enhancing digital solutions including data analytics.

Mid-Term (2030-2040)

1. **Distribution System**: Continued underinvestment could lead to chronic underperformance of the grid, with aging infrastructure unable to cope with the growing electrification needs. This may necessitate costly, large-scale emergency upgrades to prevent system failures.
2. **Customers**: As electrification demands increase, customers could face significant power quality issues, such as voltage fluctuations and reliability problems. This could lead to public dissatisfaction and loss of trust in Toronto Hydro.
3. **Investments in DERs**: A lack of robust DER-supporting infrastructure could result in missed opportunities for reducing peak loads and improving grid resiliency, leading to higher operational costs and electricity rates. Toronto Hydro would find itself turning away large volumes of prospective DER projects.
4. **Infrastructure**: Persistent underinvestment could make the grid increasingly vulnerable to extreme weather events and cyberattacks, jeopardizing security and reliability at the same time that customer expectations for service reliability would be increasing.
5. **Workforce**: A workforce not scaled or trained to meet the demands of a rapidly evolving energy sector could lead to inefficiencies and increased costs, further impacting Toronto Hydro's ability to meet customer needs and regulatory requirements.

Long-Term (2040 Onwards)

1. **Distribution System:** The long-term consequences of underinvestment could include a severely degraded and unreliable grid, unable to support the electrification needs of the city, resulting in economic and social impacts.
2. **Customers:** Long-term underinvestment could lead to significant disparities in service quality, with some customers having access to reliable and modern energy services while others do not.
3. **Investments in DERs**: Failure to invest adequately could result in a significant lag in the adoption of clean energy technologies, impacting environmental goals and leading to higher greenhouse gas emissions.
4. **Infrastructure:** The gap between the infrastructure needs and the actual state could widen, making it increasingly difficult and expensive to catch up with necessary upgrades and innovations.
5. **Workforce:** A long-term lack of investment in workforce development could result in a significant skills gap, undermining Toronto Hydro's ability to innovate in the evolving energy market.

QUESTION (C):

c) Similarly, please discuss any disadvantages where a lower electrification scenario materializes.

RESPONSE (C):

In the case where a significantly lower electrification scenario materializes, accompanied by overinvestment along various time horizons as highlighted above, the central disadvantage would be the risk of underutilized or stranded assets and technological obsolescence leading to increased electricity rates for customers. These risks, as well as the risks discussed in response to parts (b) and (c) of this question emphasize the importance of flexibility, accurate demand forecasting, and adaptive planning in Toronto Hydro's investment strategies to mitigate financial risks and system

performance risks, ensure customer satisfaction, and align with broader environmental and policy objectives.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 1B-DRC-4

Reference: Exhibit 1B, Tab 1, Schedule 1, pp. 12-13

Preamble:

THESL is seeking to grow its workforce by approximately 25 percent "to have the required resourcing capacity and capabilities to sustain foundations of a safe and reliable grid and meet the imperatives of an urban city and customers who are increasingly relying on electricity to expand, digitize and decarbonize their footprint."

QUESTION (A):

a) Please identify in the record THESL provides details of how technological advancement will require training their workforce over the course of years to ensure THESL is able to sustain a safe and reliable grid as the energy transition accelerates.

RESPONSE (A):

Please see Exhibit 4, Tab 4, Schedule 3, Pages 8-13.

QUESTION (B):

b) Please confirm and comment on whether the anticipated widespread adoption of DERs and EVs over the next five years and beyond will require investments in THESL's workforce and please discuss what will be involved in training the workforce for your proposed approach (timeframes, new approaches, etc.)

RESPONSE (B):

Please see part a) above and Exhibit 4, Tab 4, Schedule 3, pages 22-25.

QUESTION (C):

c) Please comment on what training, programs, and investments will be needed if a more ambitious energy transition and DER adoption scenario occurs over the next five years and beyond. In your response, please comment on what training and upgrading of workforce skills will be needed to ensure that THESL's workforce is able to meet the challenges of an accelerated energy transition in this and the next decade and how does this compare to THESL's current approach and the approach proposed in the Application.

RESPONSE (C):

Please see response to part b above.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 1B-DRC-5

References: Exhibit 1B, Tab 2 – 4

Exhibit 2B, Section E7.2

Preamble:

THESL notes that the Investment Plan optimizes near-term system capacity through, among others, the targeted use of non-wires solutions including grid-side technologies such as renewable enabling energy storage systems. THESL notes that for the proposed Non-Wires Solutions Program will focus on developing a scalable, demand-driven, energy storage system ("ESS") strategy that is responsive to distribution system needs and supports THESL's pathway to renewable integration and electrification.

QUESTION (A) :

Please indicate whether EV batteries are expressly and/or implicitly, included in THESL's definition of ESS and, if so, how?

RESPONSE (A):

Toronto Hydro's ESS strategy focuses on Toronto Hydro owned and operated, front-of-the-meter assets. As such, customer owned EV batteries are not part of this particular strategy. However, as a non-wires solution, EV batteries could play a role in the future. Please see the response to part (b).

QUESTION (B) :

Please explain how THESL proposes to optimize efficiencies from the many EV batteries and charging infrastructure in its systems?

RESPONSE (B):

The non-wires solutions (NWS) considered for the 2025-2029 rate period have been outlined in detail in Exhibit 2B Section E7.2. Toronto Hydro's use of NWS is targeted and focuses on credible capital deferral opportunities, and thus, the application of these solutions is limited to instances where such deferral opportunities can be identified and measured.

The use case identified at this time is limited to bus-level load transfer deferral or avoidance. This can be achieved through the procurement of dispatchable demand response from aggregators or customers. Toronto Hydro is agnostic to the technology (type of DER) or approach (load curtailment) utilized by aggregators or customers to deliver this demand response capacity. Participants are compensated based on measured and verified performance, utilizing the methodology outlined in IESO's Market Manual 12 – Issue 16.

When Toronto Hydro runs its LDR procurements, aggregators are invited to offer capacity. If the volume of electric vehicles (EVs) with bi-directional chargers reaches levels where the capacity could be aggregated to provide meaningful capacity, aggregators will be welcome to bid this capacity into the LDR process. If the cost of such capacity is competitive, Toronto Hydro will work with these aggregators to leverage the devices mentioned.

QUESTION (C) :

Please itemize all of the benefits that an EV ESS may have and provide THESL's rationale for not pursuing any specific EV ESS projects at this time given the stated benefits.

RESPONSE (C):

Toronto Hydro is open to procuring services from EV ESS if and when such devices can be aggregated to provided meaningful capacity to the grid. Toronto Hydro runs open DR procurements and invites interested aggregators to provide capacity from such devices if and when it is available.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 1B-DRC-06

Reference: Exhibit 1B, Tab 4, Schedule 1

Exhibit 1B, Tab 4, Schedule 2

Preamble:

THESL indicates that its innovation activities include integrating DERs, preparing for electrification by augmenting the capacity planning process with new scenarios-based modelling, launching an internal sandbox initiative, conducting an EV "smart charging" pilot with both Plug 'n' Drive and Elocity. THESL is also proposing to establish a $16 million Innovation Fund to support the design and execution of innovative pilot projects over the 2025-2029 rate period.

QUESTION (A):

a) Please comment on whether the Innovation Fund will be dedicated solely to DER-related projects and whether there will be opportunities for further stakeholder participation regarding the allocation of funding for projects under the Innovation Fund.

RESPONSE (A):

The Innovation Fund will not be dedicated solely to DER-related projects. Rather, it will be dedicated to pilot projects that are aligned with the OEB's expectations for electricity distributors as set out in the FEI report and the Filing Requirements, including but not limited to developing capabilities to prepare for the impact of DERs on distribution systems. For more information on the types of projects that the Innovation Fund will focus on please see the Areas of Innovation (Section 3) and Pilot Selection and Design Phases (Section 4.1) of the Innovation Fund evidence found in Exhibit 1B, Tab 4, Schedule 2. Please also refer to Toronto Hydro's response to interrogatory 1B-CCC-46.

Decisions with respect to selection of projects and resulting allocation of funding under the Innovation Fund will be overseen by the Innovation Fund steering committee. As noted in the Pilot

Selection and Design Phases (Section 4.1) of the referenced evidence, stakeholder participation will inform the Pilot Selection phase by canvassing ideas and solutions to help Toronto Hydro gain a better understanding of what is feasible, what has potential business value, and what presents opportunities for scalability to leverage external funding.

QUESTION (B):

b) How does the proposed allocation of $16 million the Innovation Fund compare with total dollar amount funding in comparable jurisdictions?

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 1B-DRC-06 part (d).

QUESTION (C):

c) What types of projects will be eligible for funding under the Innovation Fund and what types of projects will be unable to access funding as a result of allocating only 0.3% of revenue as opposed to up to 1%?

RESPONSE (C):

Toronto Hydro would like to clarify that funding for the proposed Innovation Fund is not an allocation of revenue. Rather, Toronto Hydro has determined the amount of funding requested for this proposal, based on the top-down assumption of 0.3% of revenue requirement. This amount reflects the low end of the range identified in the utility's research as noted above and will be recovered through a rate rider as explained in the response to interrogatory 9-Staff-342.

The types of pilot projects to be supported by the proposed Innovation Fund will be determined based on the parameters set out in the evidence, as applied through the Governance Framework. For information on how Toronto Hydro will select and prioritize projects, see response to 1B-CCC-46 and Sections 3 (Areas of Innovation) and 4.2 (Pilot Selection and Design Phases) of the Innovation Fund proposal found in Exhibit 1B, Tab 4, Schedule 2.

QUESTION (D):

d) Please provide any and all analysis, reports, studies, presentations, data or other documentation with respect to developing the proposal for the Innovation Fund, including all THESL's research regarding utility investments across comparable innovation initiatives and research and development activities (i.e., the range from 0.3 to 1 percent of revenues).

RESPONSE (D):

Please see the detailed evidence in Exhibit 1B, Tab 4, Schedule 2. Attached as an appendix to this response, Toronto Hydro has provided a table summarizing the research conducted with respect to the Innovation Fund. Internal documentation relating to the development of the proposal is not relevant because it reflects considerations that are draft in nature, and which provide no further probative value to assessing the merits of the Innovation Fund proposal detailed in the evidence.

QUESTION (E):

e) Please discuss the findings of THESL's research regarding comparable innovation investments including which jurisdictions were considered, the types of projects that received funding, and any lessons learned from these projects and broader innovation funding and investments.

RESPONSE (E):

Toronto Hydro summarized the findings of its jurisdictional research in pages 5-6 (Rationale for the Innovation Fund) of Exhibit 2B, Tab 4, Schedule 2. Additionally, please see response to part (d) above for a description of Toronto Hydro's analysis.

QUESTION (F):

f) When selecting projects to fund through the Innovation Fund, will THESL look at what pilots and program successfully implemented by comparable utilities and then propose pilots that potential partners could assist with as part of THESL's services? If not, why not.

RESPONSE (F):

Please see Toronto Hydro's response to interrogatory 1B-CCC-46 part (a).

QUESTION (G):

g) Please discuss and elaborate on why pilots specific to THESL are necessary or helpful as opposed to considering the outcomes of innovation projects by comparable utilities (Ontario or otherwise) then applying the outcomes and learnings to THESL's services.

RESPONSE (G):

As stated in the Innovation Fund evidence, adopting solutions implemented by other utilities is not a "cut-and-paste" exercise as it requires further in-depth exploration and testing. Each distributor and each distribution system have different operating characteristics, and this is particularly true for Toronto Hydro and its urban distribution system which serves a diverse customer base and reflects the amalgamation of six different municipal utilities. In the Pilot Selection and Design Phases (Section 4.2), Toronto Hydro intends to engage external stakeholders to inform pilot selection. Included in the list of external stakeholders are other Ontario distributors, who will be canvassed on their experience and knowledge.

QUESTION (H):

h) Why were these specific attributes for DERs selected?

RESPONSE (H):

As stated in the referenced evidence, the need for the Innovation Fund proposal is driven by multiple imperatives, including meeting the OEB's expectations for electricity distributors to be prepared for the impacts of DERs on the distribution system. Other imperatives that more broadly underpin the need for the Innovation Fund include developing capabilities to adapt to the changing energy landscape, such as the energy transition and electrification of key economic sectors utilizing space heating and transportation.

QUESTION (I):

i) Please identify the senior utility leaders who will oversee the Innovation Fund and the selection of projects and discuss how interested stakeholders will be able to assist with generating creative and innovative projects and whether funding will be available to ensure adequate stakeholder participation?

RESPONSE (I):

The Innovation Fund evidence indicates the four-phase process outlined in the Governance Framework will be overseen by a steering committee of senior utility leaders and managed by pilot project 'owners' whose business responsibilities correspond to the Area of Responsibility of the pilot project that has been designated by the steering committee. The senior leaders and project owners will be determined upon approval of the Innovation Fund proposal and other material requests outlined in this rate application.

The evidence further outlines that the steering committee will have a supervisory role over the management of the pilot project team, as it will be responsible for making key decisions such as approving project scopes and budgets. The project owners will be responsible for managing the day-to-day activities of designing, executing, and reporting on the pilot projects.

Since stakeholder participation is embedded into the pilot selection phase, it is part of the Innovation Fund and will be allocated resources to support undertaking stakeholder engagement activities. The format and other specifics of stakeholder engagement will be determined upon approval of the Innovation Fund proposal. For details on the role of stakeholder participation in the Governance Framework, please see Toronto Hydro's response to interrogatory 1B-CCC-46 part (a).

QUESTION (J):

j) Please discuss and provide further examples of what the ideas and projects put forward through the Sandbox and what information and data are being shared with THESL employees overseeing the operation and implementation of the Sandbox. Please also

discuss how the outcomes of the Sandbox are being communicated and shared with relevant and interested stakeholders. If information is not readily available or shared with stakeholder, please explain why not and what mechanisms exist (or should exist) to share such information in a timely and meaningful way.

RESPONSE (J):

Examples of ideas that have been submitted are detailed in Exhibit 1B, Tab 4, Schedule 1 at pages 2 and 3. The outcomes of projects are shared through internal communications channels, including but not limited to: employee roadshows, employee intranet, electronic notice boards and through other employee engagement avenues. For more information about how Toronto Hydro is leveraging its experience and learnings with the sector in terms of developing DER integration capabilities for peak management purposes, please also see Toronto Hydro's response to 1B-Staff-40(b).

Jurisdiction	Innovation Investments	Level of Funding
NV-RME (Norwegian Energy Regulatory Authority)	Targets projects that test out new, innovative solutions connected to flexibility, aggregation, and new tariffs to improve pricing signals.[i]	0.3% of asset base[ii]
Ofgem	Eligibility requirements include: (1) facilitate energy system transition and/or benefit consumers in vulnerable situations; (2) potential to deliver a net benefit to customers; (3) Involve research, development or demonstration (e.g. new technology, new methodology, novel arrangement or operational practice); (4) develop new learning; (5) must be innovative (e.g. unproven business case entailing a degree of risk); (6) not lead to unnecessary duplication.[iii]	0.5%-1% of base revenues - Network Innovation Allowance[iv]
New York Public Services Commission (NYPC)	Reforming Energy Vision (REV) projects that explore reshaping utility business practices to encourage new roles and business models for electric utilities, including:[v] • DER integration and consumer behaviours and expectations around distributed generation and other new types of technologies such as energy efficiency and demand response; • Advance the concept of the utility as a distribution platform company, which through incentives and price signals encourages technological innovation; • Leveraging collaboration and experts to understand specific technology challenges and identify potential solutions to address them.	0.5% of total revenue requirement or $10 million annually - Reforming Energy Vision (REV) Demonstrations[vi]
Australia Energy Regulator	Researching, developing or implementing demand management capability or capacity. Eligible projects must be innovative, meaning: new or original concepts, including new or original ways of building or developing capability and capacity to undertake, facilitate or utilize demand management; or	0.75-1% of Annual Revenue Requirement (ARR) under Demand Management Innovation Allowance Mechanism[viii]

Jurisdiction	Innovation Investments	Level of Funding
	technology not previously implemented; or focused on customers in a market that has not been exposed to the technology[vii]	
California Public Utilities Commission	EPIC-4 funding streams include: accelerate advancements in renewable generation technologies; create a more nimble grid to maintain reliability for 100% clean energy; increase value of DER; improve customer value of energy efficiency and electrification technologies, etc.[ix]	$13.61 USD per customer annually – EPIC (Electric Program Investment Charge)[x]
Minnesota Public Utilities Commission	Remove barriers to entry for renewable energy technologies, including economic barriers from competing against conventional energy sources, targeting areas of energy productions, research and development projects, and educational research initiatives[xi]	$9.12 USD per customer annually – Renewable Development Fund (RDF)[xii]
Massachusetts Department of Public Utilities	Utilities to propose projects focused on testing, piloting, and deploying RD&D projects that modernize the grid and employ new technologies including for optimizing system performances through grid visibility, command and control, and self-healing, optimize system demand, and interconnection and integrate DERs as part of Grid Modernization Plan.[xiii]	Eversource: $14.26 USD per customer annually[xiv]
Enbridge Energy Transition Technology Fund (Proposed in EB-2022-0220)	Advance research, development, and commercialization of low-carbon technologies that reduce GHG emissions, including RNG and low-carbon fuels; emissions reduction through end-use (including hydrogen); Carbon Capture Utilization & Sequestering (CCUS)[xv]	$5 million CAD annually / $25 million total over 5 years; approx. 0.4% of revenue requirements proposed for test year (2024)[xvi]
Hydro-Quebec	n/a	Spends 1% of total revenues on R&D[xvii]
Ontario Power Generation	n/a	Spends 0.7% of total revenues on R&D[xviii]

[i] Mechanisms to support innovation in Norwegian electricity networks – R&D funding and the Norwegian regulatory sandbox framework, available at: https://www.nve.no/media/13166/regulatory-mechanisms-to-support-innovation.pdf.
[ii] *Ibid.*
[iii] RIIO-2 NIA Governance Document, available at: https://www.ofgem.gov.uk/publications/riio-2-nia-governance-document-0.
[iv] Coyne, J.M., Yardley, C.Y., Pryciak, J., and Yachtew, A., "Should Ratepayers Fund Innovation?" in *Energy Regulation Quarterly,* Volume 6, Issue 3 (September 2018), available at: https://energyregulationquarterly.ca/articles/should-ratepayers-fund-innovation#sthash.vqAJd1el.L7VqGOUc.dpbs.
[v] National Association of State Utility Consumer Advocates, et al. "The Role of Innovation in the Electric Utility Sector," *Future Electric Utility Regulation,* Report No. 13 (April 2022), available at: https://eta-publications.lbl.gov/sites/default/files/feur_13_-_innovation_20220511final.pdf.
[vi] *Supra* note iv.
[vii] Australia Energy Regulatory, Decision – Demand Management Innovation Allowance Mechanism expenditures (July 2023), available at: https://www.aer.gov.au/system/files/AER%20-%20Decision%20to%20approve%20DMIAM%20expenditures%20FY20%20FY21%20FY22%20-%20July%202023_0.pdf.
[viii] *Supra* note iv.
[ix] California Energy Commission, The Electric Program Investment Charge 2021-2025 Investment Plan (EPIC 4 Investment Plan), available at: https://www.energy.ca.gov/publications/2021/electric-program-investment-charge-proposed-2021-2025-investment-plan-epic-4.
[x] *Supra* note iv.
[xi] *Ibid.*
[xii] *Ibid.*
[xiii] *Ibid.*
[xiv] *Ibid.*
[xv] EB-2022-0220 at Exhibit 1, Tab 10, Schedule 7.
[xvi] *Ibid.*
[xvii] "Canada's Top 100 Corporation R&D Spenders in 2022", available at: https://researchinfosource.com/top-100-corporate-rd-spenders/2022/list.
[xviii] *Ibid.*

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 1B-ED-1

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 10

QUESTION (A):

a) Enbridge's Pathways to Net Zero forecasts a tripling of demand whereas Toronto Hydro and the IESO forecast demand doubling. Please explain why Enbridge comes up with a significantly different figure and discuss which one Toronto Hydro believes is correct.

RESPONSE (A):

Toronto Hydro's Future Energy Scenarios ("FES") should not be confused with a forecast. The outputs of FES are based on contrasting future scenario worlds (essentially "what if" scenarios), implemented via technology uptake and consumer behaviour models, and applied geospatially to Toronto Hydro's unique service territory, customer base, and distribution network. These scenario worlds were chosen with the intention of demonstrating a reasonable range of potential outcomes over the long-term, at the network level of Toronto Hydro's distribution system (as opposed to the Ontario bulk system in the IESO's study, for example).

In general, it is important to bear in mind that these studies are approaching different subjects (e.g., peak demand ranges in FES vs. costed GHG reduction pathways in Enbridge's study), at different levels of granularity (e.g., Toronto vs. provincial), using distinct modelling approaches, assumptions and data sources. For these reasons, a simple comparison between Toronto Hydro's Future Energy Scenarios and the referenced Enbridge and IESO studies is not feasible. The analysis in the Future Scenarios provides a reasonable outlook into the future possible system demands the utility faces in a range of credible energy transition scenarios.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 1-ED-02

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 34

QUESTION (A):

a) Toronto Hydro states that its proposed Innovation Fund "is the low end of a range found in research of comparable ratepayer-funded initiatives aimed at facilitating innovation by utilities and regulatory bodies in other jurisdictions, as well as general data on utility spending for research and development activities." Please provide this analysis.

RESPONSE (A):

Please see Toronto Hydro's response to interrogatory 1B-DRC-06 part d).

QUESTION (B):

b) If Toronto Hydro were to set its Innovation Fund budget at the mid-range of comparable initiatives, what would the budget be?

RESPONSE (B):

If Toronto Hydro was to fund its Innovation Fund through a rate rider based on the mid-range of what it found in its research, Toronto Hydro would calculate an amount equal to 0.5% of its Revenue Requirement instead of 0.3%, which would result in approximately $27 million of funding for the Innovation Fund.

QUESTION (C):

c) What additional activities would Toronto Hydro undertake with a mid-range Innovation Fund budget?

RESPONSE (C):

The activities described in the four phases of the Governance Framework present a methodology, which is flexible with respect to budget, since it provides a roadmap for implementation rather than setting the scope of work. In contrast, the areas of innovation that can be addressed and the pilot projects that can be undertaken in connection with areas of innovation are affected by budget. Since Toronto Hydro has proposed the Innovation Fund to be at the low end of the range of funding found in its research, it has not considered what additional activities it might be able to undertake with a mid-range budget. However, the effect of a larger budget would likely be that Toronto Hydro could propose more areas of innovation and/or more pilot projects or larger scale pilot projects within the planned areas of innovation.

QUESTION (D):

d) How will the Innovation Fund rate rider be charged to residential customers - variable or fixed?

RESPONSE (D):

The Innovation Fund Rate Rider will be charged to residential customers as a fixed charge, consistent with the Distribution Revenue rate design for these classes. For a breakdown of how the Innovation Fund Rate Rider will be collected over the rate period, see Exhibit 9, Tab 3, Schedule 1 (Rate Rider Table).

QUESTION (E):

e) Is Toronto Hydro open to other Ontario utilities participating in its Innovation Fund pilots and benefiting from the results?

RESPONSE (E):

Please see Toronto Hydro's response to interrogatory 1B-CCC-46 part a).

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 1B-ED-3

Reference: Exhibit 1B, Tab 3, Schedule 1, Page 38

QUESTION (A):

a) Please provide a table listing each building owned by Toronto Hydro, how they are heated, their approximate annual gas consumption, the age of any fossil fuel heating equipment, the approximate life left in any fossil fuel heating equipment, the annual fossil fuel costs (all inclusive, including commodity, delivery, and fixed charges), and the annual incremental electricity costs that would arise were the fossil fuel equipment with an appropriate electric heat pump.

RESPONSE (A):

All of Toronto Hydro's station buildings rely on electric heating and therefore, the following information relates to the utility's four work centres only, which rely on a mix of fuel sources, including fossil fuel. Please refer to the appendix to this response, which lists the fossil fuel heating equipment currently in service in the utility's 4 work centres, remaining useful lives of the assets, annual fuel costs, and gas consumption.

Toronto Hydro is unable to reliably estimate incremental electricity costs from replacing fossil fuel equipment with electric heat pumps since asset replacements may not be always like for like. For example, capacity limitations might require replacing one fossil fuel unit with multiple electric heat pumps or the addition of supplemental heating sources such as electric baseboard heaters. Moreover, heating system efficiencies vary across assets and work centres, adding to the difficulty of estimating incremental electricity costs.

QUESTION (B):

b) If any of its fossil fuel heating equipment reaches the end of its life within the rate term, will Toronto Hydro replace it with electric or fossil fuel equipment?

RESPONSE (B):

Yes, Toronto Hydro plans to replace poor condition end of life fossil fuel heating equipment in its buildings with electric or hybrid equipment, in accordance with prudent asset management practices under the utility's Facilities Asset Management Strategy[1] and with a view to successfully executing the Net Zero 2040 Strategy.[2]

As shown in the response to part (a), the majority of fossil fuel heating equipment coming at end of life in the 2025-2029 rate period are located at the 500 Commissioners work centre, where the utility expects to focus most of its investments.

[1] Exhibit 2B, Section D6.
[2] Exhibit 2B, Section D7.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 1B-ED-4

Reference: Exhibit 1B, Tab 3, Schedule 1, Page 47

QUESTION (A):

For historic and planned LDR, please indicate (i) the percent which also provides demand response for provincial capacity purposes, (ii) the percent that involves gas-fired generation, (iii) the percent that involves storage, (iv) the percent that involves the purchase of DR from a pre-existing DER.

RESPONSE (A):

(i) Historically and currently, the capacity that has been utilized by Toronto Hydro for its LDR program has not been, and is not, simultaneously committed to the IESO's Capacity Auction. The LDR program only simulates providing demand response for provincial capacity purposes for the purposes of the Grid Innovation Fund pilot project as described in Section E7.2.1.4. of the Non-Wires Solutions program found at Exhibit 2B, Section E7.2.

(ii) Between 2018-2020, 87% of the demand response capacity committed to Toronto Hydro's LDR program involved the use of gas-fired generation. From 2020-2024, 0% of the demand response capacity committed to Toronto Hydro's LDR program relies on gas-fired generation.

(iii) Toronto Hydro has not yet received any DR capacity from storage resources, despite the fact that storage resources are eligible for participation.

(iv) All of the DERs that have been involved in provided DR capacity to Toronto Hydro existed prior to the launch of the procurements.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 1B-ED-5

Reference: Exhibit 1B, Tab 3, Schedule 1, Page 50

QUESTION (A):

Please quantify the benefits of the proposed NWAs to electricity customers as a whole on a best-efforts basis.

RESPONSE (A):

The rate-payer benefits associated with the NWS program is outlined in detail in Exhibit 1B, Tab 3, Schedule 1 at pages 49-55.

QUESTION (B):

Please provide the underlying calculation spreadsheets for the benefits-cost analysis of the proposed LDR Flexible System Capacity, including any DCF spreadsheets. Please include the lifetime savings.

RESPONSE (B):

Please see the response to interrogatory 1B-Staff-49.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 1B-ED-6

Reference: Exhibit 1B, Tab 4, Schedule 1, Page 15

QUESTION (A):

a) How many and what percent of Toronto Hydro customers are unable to connect a DER to the system due to capacity constraints?

RESPONSE (A):

Currently, there are five station buses unable to host DERs. This represents approximately 5 percent of Toronto Hydro's system. Please refer to Table 1 of Exhibit 2B, Section E3.3.

QUESTION (B):

b) Please estimate how many and what percent of Toronto Hydro customers will still be unable to connect a DER to the system due to capacity constraints by 2029 after additional investments by Toronto Hydro?

RESPONSE (B)

Toronto Hydro's proposed investments in Generation Protection, Monitoring and Control (GPMC) (Exhibit 2B, Section E5.5) and Stations Expansion (Section E7.4) target all system restrictions preventing the connection of DERs to the system. In addition, system capacity investments through the Load Demand (Exhibit 2B, Section E5.3) and Non-Wires Solutions (Section E7.2) programs are intended to alleviate expected system constraints to connecting DERs by 2029, such as improving minimum generation to load ratio (MLGR).

QUESTION (C):

c) Please provide a table showing the Toronto Hydro feeders, whether they are constrained, how many customers are attached to each, whether the constraint is short-circuit or thermal, and whether the constraint will be eliminated or lessened within the rate term.

RESPONSE (C):

Please see Table 1 in Exhibit 2B, Section E3.3.

QUESTION (D):

d) The application states: "Toronto Hydro plans to deploy nine energy storage systems, with an aggregate capacity of 10.2 MW, to enable the connection of forecasted renewable growth on nine high-priority feeders." Approximately how many customers will be impacted by this investment? Please list the relevant feeders, the nature of the restriction, and how many customers will be able install DERs due to the lifting of the restriction.

RESPONSE (D):

Please refer to Exhibit 2B Section E7.2 Table 20 for the nine planned ESS projects at respective priority feeders with an aggregate capacity of 10.2MW, intended to enable an aggregate renewable generation capacity of 6.12MW. The planned investments do not directly correlate to an impacted number of customers, which will depend on the size of the DERs as they materialize. Toronto Hydro's proposed investments will relieve minimum load to generation ratio (MLGR) restrictions.

QUESTION (E):

e) Does Toronto Hydro provide flexible hosting capacity? If not, when will it do so?

RESPONSE (E):

At this time, Toronto Hydro does not provided flexible connections. However, this is a capability that the utility has put forward as a pilot project concept that could be supported by its proposed Innovation Fund (see Exhibit 1B, Tab 4, Schedule 2, Appendix A, pages 2-3 for more details). Toronto Hydro also notes that flexible hosting capacity arrangements have been proposed as part

of the OEB's Distributed Energy Resources (DER) Connections Review. On January 29, 2024, the OEB introduced a proposal for a new section 6.2.4.1A of the Distribution System Code, which will outline how distributors can establish specific system or operating conditions and/or contractual terms that will require the output or operation of the proposed embedded generation facility to be varied.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-1

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 2.3.2 Complex Operating Conditions, Table 1: Ontario Cities Population Density

Preamble:

The population density of Etobicoke, North York, and Scarborough is similar to the population density of Mississauga, Brampton, Vaughan, Richmond Hill, Markham, Pickering, Whitby, and Oshawa.

QUESTION (A):

a) Please expand Table 1 to show the population densities of Etobicoke, North York, Scarborough, Mississauga, Brampton, Vaughan, Richmond Hill, Markham, Pickering, Whitby and Oshawa and file it.

RESPONSE (A):

Cities	Population (People)	Land Mass (km^2)	Population Density (People/km^2)
Toronto[1]	2,794,356	631.1	4,428
Ottawa	1,017,449	2788.2	365
Mississauga	717,961	292.74	2,453
Brampton	656,480	265.89	2,469
Hamilton	569,353	1118.31	509
Richmond Hill	202,022	100.79	2,004
Vaughan	323,103	272.44	1,186
Markham	338,503	210.93	1,605
Pickering	99,186	231.10	429

[1] Toronto Hydro notes that the municipality of City of Toronto already includes the boroughs of Etobicoke, North York, and Scarborough.

Cities	Population (People)	Land Mass (km^2)	Population Density (People/km^2)
Whitby	138,501	146.69	944
Oshawa	175,383	145.72	1,204

QUESTION (B) :

b) Please confirm that there are large areas of agricultural land within city limits of Hamilton and Oshawa.

RESPONSE (B):

Toronto Hydro is familiar with the characteristics of its service territory and the boundaries of the City of Toronto, but does not have similar detailed data regarding the municipal boundaries and service territories applicable to all other utilities.

QUESTION (C) :

c) What is the population density of Mississauga if the land occupied by Pearson Airport is excluded.

RESPONSE (C):

Please see part b) above.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-2

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 2.3.2 Complex Operating Conditions and Table 2

Preamble:

"The density of Toronto Hydro's service territory is unique even within an international context due to the ever-increasing number of high-rise buildings."

QUESTION (A):

a) Please provide Toronto Hydro's definition of a high-rise building.

RESPONSE (A):

Please see footnote 28: "High-rise building is a multi-floor building of at least 12 stories or 35m in height. As per data from SkyscraperPage, Global Cities & Buildings Database https://skyscraperpage.com/cities/#notes".

QUESTION (B):

b) Table 2 indicates that there are 2,598 high rise buildings in Toronto. How many of those buildings use natural gas for space and water heating? How many of those buildings have a natural gas or diesel emergency power generator?

RESPONSE (B):

Toronto Hydro does not track this type of data.

QUESTION (C):

c) Please list the cost impacts that construction of high-rise buildings imposes on Toronto Hydro.

RESPONSE (C):

High-rise buildings are not tracked distinctly from other types of connection projects. Customer connections costs are evaluated in accordance with DSC Section 3 Connection and Expansions, and evaluated based on the new customer's connection and expansion asset requirements. If new facilities must be constructed to the main distribution system in order to connect the Customer, those facilities (expansion) are evaluated via the prescribed economic evaluation in DSC Appendix B. The economic evaluation determines the amount of capital contribution that will be required by the Customer for the expansion work. The customer is responsible for the connection asset costs (connection from the main distribution system to the customer's demarcation point) less the basic connection allowance.

QUESTION (D):

d) Does Toronto Hydro believe that existing ratepayers should subsidize developers of high-rise buildings? Please explain your answer.

RESPONSE (D):

Toronto Hydro is licensed by the Ontario Energy Board ("OEB") to supply electricity to Customers as described in the Electricity Distribution License issued to Toronto Hydro on October 17, 2003 by the OEB. Additionally, there are requirements imposed on Toronto Hydro by the various codes referred to in the Distribution License and by the *Electricity Act, 1998* and the *Ontario Energy Board Act, 1998*, including the Distribution System Code. As a licensed distributor of electricity, Toronto Hydro is obligated to connect customers to its distribution system and must adhere to the laws, regulations, and codes to effect customer connections. This includes cost allocation and treatment of service connections in a manner compliant with the laws, regulations and codes.

QUESTION (E):

e) Are developers of high-rise buildings required to pay contributions in aid of construction to offset the costs they impose on Toronto Hydro? If the answer is yes, please explain how these contributions are assessed and the total amount collected by Toronto Hydro in the most recent

year for which a total amount is available. If the answer is no, please explain why not.

RESPONSE (E):

Please refer to Toronto Hydro's response to parts c) and d) above.

With regards to the total amount of contributions collected by Toronto Hydro, by year, please refer to Exhibit 2B, Section E5.1, Table 9, pages 18-19.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-3

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 2.3.2 Complex Operating Conditions

Preamble:

"In addition to high-rise buildings, this growth is also driving the development of sustainable new housing communities through the redevelopment of areas such as Downsview, the Golden Mile and the Port Lands, some of which are planned as net zero communities and to meet the highest performance measures of the Toronto Green Standard."

QUESTION (A):

a) Please provide Toronto Hydro's definition of "sustainable new housing communities."

RESPONSE (A):

Sustainable new housing communities in this context refers to new developments that have been approved by the City of Toronto Planning that conform to current and future versions of the Toronto Green Standard (TGS).

QUESTION (B):

b) Please file the Toronto Green Standard and identify the "highest performance measures."

RESPONSE (B):

The Toronto Green Standard (TGS) is owned and managed by the City of Toronto. More information may be found on the City of Toronto website - https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/. Performance targets are established based on type of development, this framework can be found on the above website.

QUESTION (C):

c) Does Toronto Hydro audit claims of measurement of highest performance under the Toronto Green Standard?

RESPONSE (C):

The Toronto Green Standard is audited and enforced by the City of Toronto. More information may be found on the City of Toronto website - https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/.

QUESTION (D):

d) Do sustainable new housing communities impose additional costs on Toronto Hydro than do existing communities?

RESPONSE (D):

Sustainable new housing communities do not incur additional costs nor are they treated differently from other customers. The supply of electricity or related services by Toronto Hydro to any customer are subject to the same assessment and requirements outlined in Toronto Hydro's Conditions of Service, which comply with the requirements of the Distribution System Code.

QUESTION (E):

e) Does Toronto Hydro believe that ratepayers in existing communities should subsidize ratepayers in new sustainable communities? Please explain your answer.

RESPONSE (E):

There is no cross subsidy, please refer to response d) above. As a licensed distributor of electricity, Toronto Hydro is obligated to connect customers to its distribution system and must adhere to the laws, regulations, and codes to effect customer connections. This includes cost allocation and treatment of service connections in a manner compliant with the laws, regulations and codes.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-4

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 2.3.4 Extreme Weather

Preamble:

"Extreme weather amplifies the challenge of distributing electricity to a mature, dense and rapidly growing urban city. Heat, high winds, heavy rainfall, freezing rain and heavy snowfall can cause major system damage and result in prolonged power outages. As evidenced by recent events (outlined in Table 3 below), extreme weather has become a regular operating condition that the utility must consider and manage in its day-to-day operations and long-term planning activities. With the frequency and intensity of adverse weather increasing due to climate change, Toronto Hydro's grid and operations must become more resilient to this challenge."

QUESTION:

Please provide Toronto Hydro's definitions of "extreme weather," "averse weather," "climate change" and "prolonged power outage."

RESPONSE:

Toronto Hydro defines "extreme weather" and "adverse weather" as rain, ice storms, snow, winds, extreme temperatures (heat and cold), freezing rain, frost, or other extreme weather conditions that are likely to affect grid operations.

The utility uses the Intergovernmental Panel for Climate Change's ("IPCC") definition of climate change as "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/ or the variability of its properties and that persists for an extended period, typically decades or longer."[1]

[1] https://www.ipcc.ch/site/assets/uploads/sites/4/2022/11/SRCCL_Annex-I-Glossary.pdf

Prolonged power outage refers to an interruption in electric service that lasts longer than typical outages at the distribution level and can extend from several hours to days or even weeks.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-5

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 2.3.1 Technology Advancements

Preamble:

"Integrating DERs into the grid provides customers more tools to actively manage their energy needs and enables the grid to be supplied by locally-generated renewable electricity resources. To advance these outcomes, Toronto Hydro must address the significant challenge of accommodating electrons that flow bidirectionally within a grid that was not built for this type of supply and demand. Equipment that has a high number of DER connections is more likely to experience unstable conditions that pose significant reliability and safety risks to the system and its users. Toronto Hydro monitors all DER connections closely for these factors to ensure that the grid remains safe and reliable for customers, and is building advanced grid capabilities to mitigate against these risks and enable DER adoption by customers in the future."

QUESTION (A):

a) Please confirm that customers who own DER's impose additional costs on Toronto Hydro.

RESPONSE (A):

Confirmed. There are additional costs associated with enabling DER connections. Some of these costs are eligible investments for provincial rate protection pursuant to *Ontario Regulation 330/09*, as outlined in Exhibit 2A, Tab 5, Schedule 1.

QUESTION (B):

b) Does Toronto Hydro require new customers who are installing DER's to pay a contribution to offset the costs they impose on Toronto Hydro?

RESPONSE (B):

Yes. Toronto Hydro complies with the requirements of the Distribution System Code to determine the capital contributions that must be paid by DER customers connecting to the grid.

QUESTION (C):

c) Does Toronto Hydro believe that customers who do not own DERs should subsidize customers who own DERs? Please explain your answer.

RESPONSE (C):

It is not within Toronto Hydro's purview to comment on the cost allocation rules in the Distribution System Code, or the OEB's policy objectives with respect to DER integration. Toronto Hydro notes that investments in Grid Modernization to develop advanced grid capabilities that can support and enable DER adoption by customers in the future, also provide value to load customers in terms of reliability, resiliency and efficiency benefits. Please see Exhibit 2B, Section D5 for more information.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-6

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 2.3.2 Workforce Challenges

Preamble:

"Over this period, as Toronto Hydro's replenished a large wave of retirements, it also right-sized its workforce through continuous improvements in productivity, including harmonizing key jobs to create a more agile compliment of staff, and automating manual processes to increase employee output levels"

QUESTION (A):

a) Please provide Toronto Hydro's definition of "right-sized."

RESPONSE (A):

Please refer to 1B-CCC-14 (b)

QUESTION (B):

b) Does the quoted paragraph indicate that Toronto Hydro has increased or decreased the total number of its employees? Please explain your answer.

RESPONSE (B):

Please refer to 1B-CCC-14 (b)

QUESTION (C):

c) On the average, is the compensation of a newly hired young and inexperienced employee higher or lower than of an old and experienced employee who is retiring? Please explain your answer.

RESPONSE (C):

Please refer to 4-CCMBC-18.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-7

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 3.3 Plan Validation and Finalization, Table 4: Summary of 2025-2029 Proposed Distribution Rate Change

QUESTION (A):

a) Are the amounts shown in Table 4 up to date? If the answer is no, please file the table with the current amounts.

RESPONSE (A):

Toronto Hydro confirm the amounts in Table 4 are up to date.

QUESTION (B):

b) Please expand Table 4 to show percentage rate increases (not bill impacts as shown in Exhibit 1B, Tab 1, Schedule 3, Page 1, Table 1 or Page 3, Table 3 which mask rate increases with other factors) for each year and the average. If such a table is elsewhere in the filing, please provide the reference.

RESPONSE (B):

Please refer to Exhibit 8, Tab 1, Schedule 1, Page 14-16, Table 5.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-8

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 4.2 Growth and City Electrification, Table 6: City Growth and Electrification Capital Programs

QUESTION (A):

a) Is Toronto Hydro charging developers for the costs of relocations to accommodate new high-rise developments? Please discuss.

RESPONSE (A):

If a customer requests that a Toronto Hydro owned asset be relocated, Toronto Hydro applies Distribution System Code Section 3.1.10 – "Where a customer requests the relocation of a distributor-owned asset, the distributor shall recover from that customer the cost of relocating that asset, except to the extent recovery is limited under law."

QUESTION (B):

b) Is Toronto Hydro sharing the costs of relocations for road widening, LRT construction, waterfront reconstruction construction with the City of Toronto, Metrolinx, Waterfront Toronto, and other agencies? Please discuss.

RESPONSE (B):

Please refer to Exhibit 2B, Section E5.2, pages 5-8 for details of cost apportionment between Toronto Hydro and third parties requesting relocation of utility assets to accommodate the maintenance and improvement of public infrastructure.

QUESTION (C):

c) Is Toronto Hydro following the OEB's Distribution System Code in determining the need for contributions for new loads? Please discuss.

RESPONSE (C):

Yes, please refer to Toronto Hydro's response to interrogatory 1B-EP-2 parts (c) and (d).

QUESTION (D):

d) Are the amounts shown in Table 6 net of contributions or are the gross amounts?

RESPONSE (D):

Toronto Hydro confirms that the amounts shown in Table 6 are net of contributions. Please refer to Exhibit 2B, Section E5.1.4.1, Table 9 for the gross, contribution and net Customer Connections expenditures and Exhibit 2B, Section E5.2.4, Table 4 for Externally Initiated Plant Relocations & Expansions expenditures.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-9

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 4.3 Grid Modernization

Preamble:

"The system provides a holistic view of the grid and encompasses advanced applications such as Outage Management System (OMS), Fault Location Isolation and Service Restoration (FLISR), Volt/Var Optimization, which allow swift detection and response to outages and grid disturbances, and enable reliable and efficient management of DERs by optimizing voltage levels and reactive power flows throughout the distribution system."

QUESTION (A):

What percentage of expenditures on OMC, FLISR, and Volt/Var Optimization are required to enable reliable and efficient management of DERs and what percentage of expenditures are required for other reasons? Please explain your answer.

RESPONSE (A):

Toronto Hydro's investments in Outage Management System (OMS), Fault Location Isolation and Service Restoration (FLISR), and Volt/Var Optimization applications are intended to reduce the frequency and duration of outages, improve grid resiliency, enhance the efficiency of outage response, and optimize the distribution system. As such, they are independent of the uptake of DERs or the need to enable DER management.

QUESTION (B):

Are customers who own DER's required to pay a contribution to offset the expenditures that are required to serve them? If the answer is yes, please provide the total amount that is expected to be collected in 2025 from customers who own or rent DER's. If the answer is no, please explain why not.

RESPONSE (B):

No. Customers are only required to pay a capital contribution for project expenses and operational costs to facilitate the DER connection. Toronto Hydro recovers the cost of this connection in accordance with the Distribution System Code.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-10

Reference: Exhibit 1B, Tab 1, Schedule 3, Page 5, Table 5: Customer and Load Growth Changes for 2018-2029

QUESTION (A):

a) Please confirm that Toronto Hydro's evidence as presented in Table 5 shows that electrification will result in a reduction in load. Please explain your answer.

RESPONSE (A):

Toronto Hydro does not confirm that the evidence in Table 5 proves electrification will lead to a decrease in load. Please see response to interrogatory 1B-PP-18.

QUESTION (B):

b) Please confirm that Toronto Hydro is proposing to spend more and more money to deliver less and less electricity. Please explain your answer.

RESPONSE (B):

Toronto Hydro does not confirm this statement. Exhibits 2B and 4 contain detailed evidence of the needed and prudent investments for Toronto Hydro to sustain the distribution system, modernize the grid, connect new customers and DERs, and invest in its workforce in order to provide safe and reliable service in an increasingly complex environment. Further, Toronto Hydro's multi-variate regression analysis forecasting customer and load growth, which explicitly includes historical and forecast CDM assumptions, shows modest growth in system-wide consumption and demand. This customer and load forecast is a separate exercise from Toronto Hydro's peak demand forecast for system planning purposes. That peak demand forecast informs "the planning of capital work programs mainly at the distribution station level (e.g., feeder level) to meet capacity need. The

peak demand forecast considers localized growth and density intensification from new high-rise developments, EVs, and other large connections that are driving the need for investments."[1]

[1] Exhibit 3, Tab 1, Schedule 1, p.18

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-11

Reference: Exhibit 1B, Tab 1, Schedule 3, Page 10, Table 10: Proposed Capital Structure and Cost of Capital Parameters

QUESTIONS (A) AND (B):

a) Is Toronto Hydro proposing to use the same 40% deemed equity thickness as the other 57 distributors regulated by the OEB? Please explain your answer.

b) Is Toronto Hydro proposing to use the same 9.36% deemed return on common equity as the other 57 distributors regulated by the OEB? Please explain your answer.

RESPONSE (A) AND (B):

Please see the response to interrogatory 5-Staff-315. Toronto Hydro intends to update the deemed return on equity rate at the time of the DRO based on the Cost of Capital parameters which will be issued by the OEB in the fall of this year.

QUESTION (C):

Does the recent OEB decision in the EB-2023-0143 Getting Ontario Connected Variance account that allowed.

RESPONSE (C):

Toronto Hydro cannot respond because this question is incomplete.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-12

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 2

Preamble:

"The current custom rate framework, which was established in the 2015-2019 Rate Application (EB-2014-0116), provided stability and flexibility as Toronto Hydro grappled with the significant challenge of renewing a rapidly deteriorating distribution system. The 2025-2029 Custom Rate Framework detailed in this schedule is structurally consistent with the rate framework approved by the OEB in past applications, with purposeful evolutions to achieve the objectives summarized below.

Provide multi-year funding certainty and flexibility for Toronto Hydro to:

(i) continue to sustain a reliable grid and safe and effective operations; and

(ii) address current and emerging (externally-driven) needs and challenges that the utility faces in delivering its services and preparing the grid for the energy transition."

QUESTION (A):

a) Please explain why the current rate framework should be changed if it provided "stability and flexibility." Does Toronto Hydro no longer need stability and flexibility?

RESPONSE (A):

As noted in the referenced evidence, Toronto Hydro maintained various components of its prior Custom IR rate framework which facilitate the continuation of stability and flexibility. For a detailed explanation of the rationale for evolving the current rate framework please refer to section 2 of the referenced evidence starting on page 12. With respect to funding implications specifically, Table 2 of the evidence outlines the ROE implications of continuing with the current rate framework.

QUESTION (B):

b) Does Toronto Hydro still have a "rapidly deteriorating distribution system"? If the answer is yes, why has Toronto Hydro management failed to stop the deterioration since the current custom rate framework was established?

RESPONSE (B):

Please refer to Exhibit 2B, Section E2.2.1, which provides an overview of the current condition and reliability performance of Toronto Hydro's distribution asset populations. While the current state of different asset classes varies, in the broadest terms, Toronto Hydro's significant capital investments since 2015 have resulted in stable or improving asset condition and age demographics, and improvements in reliability. Toronto Hydro's 2025-2029 System Renewal plan is built from the bottom up to ensure the utility will continue to make the minimum investment necessary to maintain current levels of asset risk and recent historical reliability performance.

QUESTION (C):

c) Please explain what is meant by the term "structurally consistent" and how it differs from the meaning of the word "consistent"?

RESPONSE (C):

"Structural consistency" generally refers to the uniformity, coherence, or stability of a system, or framework concerning its underlying structure. In the noted reference, "structural" refers to foundational components of the 2025-2029 custom rate framework. Please refer to pages 5 and 6 of the Rate Framework evidence (Exhibit 1B, Tab 2, Schedule 1) for a summary the components of the proposed rate framework, a comparison to the 2020-2024 custom rate framework and an explanation of how the proposed rate framework aligns with the RRF and OEB Rate Handbook.

QUESTION (D):

d) Does the 2025-2029 Custom Rate Framework meet the OEB Filing Requirements for Electricity Distribution Rate Applications, Chapter 3, Incentive Rate Setting Applications? If

the answer is no, please explain why not.

RESPONSE (D):

The premise of this question not consistent with the Chapter 3 Filing Requirements which state at page 1: "*These filing requirements set out the OEB's expectations for electricity distributors' annual rate adjustment applications in between cost of service (CoS) applications under Price Cap IR, or the Annual IR Index, also known as IRM applications.*"

QUESTION (E):

e) Does "multi-year funding certainty" provide more funding certainty than Price Cap IR used by most Ontario Distributors? If the answer is yes, why should Toronto Hydro have more funding certainty than other distributors? If the answer is no, please explain why not?

RESPONSE (E):

Relative to the funding that is available to Toronto Hydro specifically under Price Cap IR, the proposal in this application provides adequate funding certainty. Please refer to 1B-Staff-12 for a breakdown of the revenue differences between Price Cap IR and the proposed custom index. Please refer to the response to 1B-Staff-15 for the implications of Price Cap IR on utility financial performance (ROE).

Toronto Hydro is unable to comment on the funding adequacy of Price Cap IR for other utilities. Such a determination needs to be made on the specific facts and circumstances of each utility in question.

QUESTION (F):

f) Does the proposed 2025-2029 Custom Rate Framework increase or decrease the earnings risk of Toronto Hydro compared to its current rate framework? Please explain your answer.

RESPONSE (F):

The structure of the proposed 2025-2029 Custom Rate Framework places more risk on the utility than the structure of the 2020-2024 Custom Rate Framework. This is because, considering Toronto

Hydro's total cost benchmarking results relied on in this Application, the X-factor applicable under the 2020-2024 Custom Framework would have been approximately 0.45 % (i.e. 0.15% empirical stretch plus a 0.3% incremental stretch factor applied to capital), which is less than the 0.75% combined X-factor proposed in the 2025-2029 Custom Framework. Furthermore, the net difference between the two stretch factors (i.e. 0.3%) represents an amount that the utility would have been able to recover in rates under the 2020-2024 Custom Framework. However, under the 2025-2029 Custom Framework, Toronto Hydro has placed that amount at risk (as an upfront discount for ratepayers for the 2025-2029 rate period) pending the achievement of target performance objectives as outlined in the Custom Scorecard and accompanying PIM evidence in Exhibit 1B, Tab 3, Schedule 1.

QUESTION (G):

g) Does the proposed 2025-2029 Custom Rate Framework allow Toronto Hydro to have a higher or a lower earnings risk than Ontario distributors who use the Price Cap IR rate setting method? Please explain your answer.

RESPONSE (G):

For the reasons noted in part (f), all other things equally considered, Toronto Hydro assumes a greater level of earnings risk.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-14

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 12

Preamble:

"As illustrated in Figure 1 below, the continuation of a custom-rate setting approach is necessary for Toronto Hydro as funding derived from the OEB's standard Price Cap and IRM framework is insufficient to fund the plan's imperatives of system stewardship, growth and electrification, and modernization."

QUESTION (A):

a) Does Toronto Hydro believe that OEB's standard Price Cap IRM framework is inadequate to fund "imperatives of system stewardship, growth and electrification, and modernization" of electricity distributors and should be changed? Please explain your answer.

RESPONSE (A):

Within the context of Toronto Hydro's investment needs, Price Cap IR is inadequate to fund "imperatives of system stewardship, growth and electrification, and modernization." Please see the response to 1B-Staff-3(b) as it relates to funding under Price Cap IR.

The RFF provides a Custom IR approach for utilities that are in Toronto Hydro's circumstance, for whom Price Cap IR is insufficient. Toronto Hydro declines to comment on whether Price Cap IR should be changed, as the question is not relevant to this Custom IR proceeding.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-15

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 13

Preamble:

"Under a standard IRM scenario, Toronto Hydro's 2025-2029 capital investment plan would be underfunded by approximately 35 percent or $1.5 billion. Adoption of a plan constrained by this funding envelope would force the utility into a sustainment plan that would be almost entirely reactive in nature, resulting in roughly an 8 percent deterioration in system reliability by the end of the rate period, along with increases in safety and environmental risks and reactive replacement costs due to increasing numbers of asset failures."

QUESTIONS (A):

a) Please file the calculation that shows the derivation of the "8 percent deterioration in system reliability".

RESPONSE (A):

The 8 percent deterioration in system reliability was calculated as the percentage difference between 2018-2022 SAIDI (Excluding Loss of Supply, Major Events, and Scheduled Outages) of 48.16 and the projected 5-year rolling average at the end of the rate period under the IRM scenario of 51.91 minutes (see Figure 1 in Exhibit 1B, Tab 3, Schedule 1). For more details on Toronto Hydro's reliability projection models, please refer to interrogatory 2B-SEC-42.

QUESTION (B):

b) Would the "8 percent deterioration in system reliability" be experienced throughout the Toronto Hydro service area? If the answer is no, please provide the percentage of deterioration in each area.

RESPONSE (B):

Toronto Hydro's reliability projection methodology is not currently designed to forecast reliability for sub-divisions of the system. The eight percent deterioration is a system-wide average.

QUESTION (C):

c) Is Toronto Hydro claiming that only unconstrained spending can prevent a deterioration in system reliability?

RESPONSE (C):

No. Toronto Hydro's 2025-2029 Investment Plan establishes the necessary level of funding to manage System Reliability over the next rate period. It is not unconstrained. Key investments in expanding, modernizing, and sustaining the foundations of the grid will be critical for System Reliability, supporting the utility's objective of improving Outage Duration and maintaining Outage Frequency measures (see Exhibit 1B, Tab 3, Schedule 1, Pg. 8 to 21).

QUESTION (D):

d) If $1.5 billion spending is required to prevent any deterioration in system reliability, what would be the percentage of deterioration if only $1.0 billion was spent?

RESPONSE (D):

Toronto Hydro has not assessed this specific scenario, as doing so would require a complete re-evaluation of the 2025-2029 Investment Plan, program by program. However, based on similar 'envelope funding' scenarios requested by Intervenors, Toronto Hydro has produced additional reliability scenario projections (Outage Duration and Outage Frequency) over the 2025-2029 period for comparison purposes. Please refer to Toronto Hydro's response to interrogatory 1B-SEC-21.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-16

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 21

Preamble:

"Toronto Hydro proposes a shift in its rate-setting approach from price-cap to a revenue-cap model. Rather than escalate rates themselves each year, and use a simplistic g-factor to account for expected billing determinant growth, Toronto Hydro proposes to escalate revenue requirement each year, and design rates for each revenue requirement on the basis of forecasted customer and load growth over the rate term."

QUESTION (A):

a) Please confirm that under a price-cap model, a utility bears the load forecast risk while under a revenue-cap model a utility does not bear the load forecast risk. Please explain your answer.

RESPONSE (A):

Under a Price Cap model and the Revenue Requirement Cap applied for by other utilities regulated by the OEB, both the utility and ratepayers bear any risk or reward associated with variances in billing determinants. To the degree billing determinants exceed forecast, customers bear this risk and the utility experiences reward. Should billing determinants fall short of forecast, the utility bears the risk and customers experience reward.

However, under a true revenue cap model as proposed by Toronto Hydro, actual revenues collected are trued-up against forecast revenue requirement, as determined via annual CRCI escalations inclusive of the RGF values approved in the rebasing year. The true-up is completed on the basis of weather-normalized billing determinant variances.

QUESTION (B):

b) Please confirm that the proposed revenue cap model lowers the business risk of Toronto Hydro compared to the Ontario distributors that use the standard OEB price-cap model. Please explain your answer.

RESPONSE (B):

No. For information about the business risks that Toronto Hydro faces, please see the response to interrogatory 5-Staff-315.

The use of a revenue cap model inclusive of a true-up mechanism addresses uncertainty associated with billing determinants growth for *both* ratepayers and the utility. Conversely, this approach also neutralizes the opportunity for either party to benefit from billing determinant variances. The inclusion of this mechanism is an important component of Toronto Hydro's rate framework "…*to protect ratepayers, the utility and its shareholder, from structural unknowns in forecasted costs and revenues related to demand growth in a time of unprecedented change and transformation in the economy and energy system*."[1]

[1] Exhibit 1B, Tab 2, Schedule 1, p.4

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-17

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 23

Preamble:

"The C-factor is an attrition relief mechanism that implements additional rate escalations 1 each year, beyond those provided for through base rates escalated at inflation less productivity, to account for the utility's growing capital-related revenue requirement as a result of implementing the multi-year capital investment plan known as the DSP."

QUESTION:

The term "attrition relief mechanism" is not commonly used by the OEB. The noun attrition means a decrease in number size or strength. What is decreasing at Toronto Hydro that would require a relief mechanism?

RESPONSE:

As described in the reference above, attrition relief refers to a mechanism (such as the C-Factor or the Revenue Growth Factor) which mitigates the attrition of funding in rates relative to the utility's prudent and necessary costs (i.e. revenue requirement).

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-18

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 29

Preamble:

"In addition to the efficiency-factor, Toronto Hydro's rate framework proposes a proactive 0.6 percent performance incentive factor that further reduces revenues by approximately $65 million over the rate term, providing customers an additional upfront rate reduction."

QUESTION (A):

a) Why would a reduction in revenues provide customers a rate reduction in a revenue-cap plan or does Toronto Hydro actually mean a reduction in revenue requirement?

RESPONSE (A):

Through the Custom Revenue Cap Index, the X-factor reduces the revenue (and thus rates) that the utility is able to collect through rates over the 2026 to 2029 period. Toronto Hydro's revenue requirement remains unaffected by this input, as it reflects Toronto Hydro's costs to fund the 2025-2029 Investment Plan featured in Exhibits 2B and 4. Please see the response to 1B-Staff-3 for more information about the revenue reduction/deficiency imposed by the rate framework.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-19

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 32

Preamble:

"To implement the PIM, Toronto Hydro proposes a new deferral account - the Performance Incentive Mechanism Deferral Account (PIM-DA) - to record the PIM earnings. This account would be brought forward for review and disposition in the utility's next rebasing application, based on known (or forecasted) performance results for the 2025-2029 rate period."

QUESTION:

Will the entries in the PIM-DA be audited by an independent external auditor? If the answer is no, please explain why not.

RESPONSE:

As with all other DVAs, entries in the PIM-DA would be reviewed by an external auditor to obtain reasonable assurance that the financial statements are free from material misstatement.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-20

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 34

Preamble:

"In alignment with the OEB's statutory objective to facilitate innovation in the electricity sector, Toronto Hydro proposes to establish an Innovation Fund to support the design and execution of innovative pilot projects over the 2025-2029 rate period."

QUESTION (A):

a) Please provide Toronto Hydro's definition of "innovative pilot projects."

RESPONSE (A):

A pilot project is an exploratory project designed to test the feasibility, viability, and effectiveness of a particular concept, strategy, technology, or process before full-scale implementation. The goal of a pilot project is to gather data, identify potential challenges, and assess the practicality of the proposed solution or idea. As stated on page 7 of the referenced evidence, Toronto Hydro employs the same definition of innovation as the OEB does in section 2.1.7 of the Filing Requirements. Thus, "innovative pilot projects" refers to exploratory projects that have the potential to deploy innovative solutions in line with the considerations and parameters described in the Innovation Fund evidence, particularly in section 3 (Areas of Innovation).

QUESTION (B):

b) Please confirm that ratepayers will bear the risk that innovative pilot projects might deliver no benefits to ratepayers.

RESPONSE (B):

Please see Toronto Hydro's response to interrogatory 1B-CCC-46 part (b).

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-21

Reference: Exhibit 1B, Tab 2, Schedule 1, Pages 35 to 37

Preamble:

"Subject to OEB approval, Account 1508 - Demand-Related Variance Account (DRVA) would record: (i) the demand-driven revenue requirement impacts arising from variances in actual versus forecast capital and operational expenditures for certain demand-based programs (the Expenditure Variance Sub-Account); and (ii) the 1 revenue impacts arising from variances in forecast versus actual billing determinants over the rate period (the Revenue Variances Sub-Account)."

QUESTION (A):

a) Does the proposed Demand Related Variance account increase or decrease the business risk of Toronto Hydro? Please explain your answer.

RESPONSE (A):

As noted in the DRVA evidence filed at Exhibit 1B, Tab 2, Schedule 1 starting on page 35, this rate application is being filed during a time of unprecedented change and transformation, as customers, communities and governments at all levels are actively embarking on an energy transition to mitigate the existential and economic impacts of climate change. Decarbonization is expected to create new roles for electricity, including as an energy source for transportation and building heating systems. While there is certainty that fundamental change is ahead, there are degrees of uncertainty about how that change will unfold (e.g., the pace and adoption of electrified technologies such as EVs and heat pumps; the role of low-emission gas; and the scale of local vs. bulk electricity supply).

The DRVA mitigates the impact of heightened uncertainty and associated forecasting risk associated with forecasting customer demand during this period of unprecedented change and transition. In doing so, the DRVA negates the prospect of either ratepayers or the utility losing or benefiting from

structural unknowns (i.e. changes in policy, technology and consumer behaviour related to the energy transition) that may lead to material demand-related variances in costs or revenues in the next rate term.

As noted in the response to interrogatory 5-EP-34(c), a variance account does not lower utility risk because the recovery of any amounts tracked in a variance account is subject to regulatory prudence review upon disposition of the account.

QUESTION (B) :

b) Is Toronto Hydro assuming that all capital project variances including variances caused by poor project management would be recorded in the DRVA?

RESPONSE (B):

Toronto Hydro respectfully notes that the premise of this question is unfounded by evidence. Over the last two custom incentive rate period, the utility has demonstrated prudent delivery of its capital work program within reasonable margins of variance on total in-service additions (see 9-Staff-339). As noted above, and as is the case with any DVA that tracks variances from forecasted costs, the disposition of DRVA balances would be subject to a prudence review in the 2030 rebasing application.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-22

Reference: Exhibit 1B, Tab 2, Schedule 1, Pages 46, Demand-Related Revenue Variance Subaccount

QUESTION:

Does the proposed Demand-Related Revenue Variance account increase or decrease the business risk of Toronto Hydro? Please explain your answer.

RESPONSE:

Please see response to 1B-EP-21(a) with respect to the impact of the DRVA on business risk.

With respect to the DRVA – Revenue Variance Sub-Account, Toronto Hydro notes in the evidence at Exhibit 1B, Tab 2, Schedule 1 page 46: "*With this subaccount, Toronto Hydro's CRCI becomes a true revenue cap model (subject to weather-driven variances) … with the revenue variance sub-account operating similar to a decoupling true-up mechanism.*"

Please see the response to 1B-Staff-37(a) for a further explanation of how the Revenue Variance subaccount operates as a decoupling mechanism. Please see the response to 1B-EP-16 for a discussion of the difference in risk between a price cap and a revenue cap.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 1B-EP-23

Reference: Exhibit 1B, Tab 2, Appendix A and Appendix B, Scott Madden Report

QUESTION (A):

a) The report refers to a few US states. Should the OEB assume that regulatory commissions in the remaining US states have not approved any incentive rate plans that are similar to the plan that Toronto Hydro is proposing. Please explain your answer.

RESPONSE (A) - PREPARED BY SCOTTMADDEN:

No. The OEB should not assume US regulatory commissions not mentioned in the report have not approved rate plans that are similar to the plan that Toronto Hydro is proposing because the report was not intended to be a jurisdiction-by-jurisdiction scan of rate plans. Nor was the report intended to examine changes in ratemaking frameworks and practices over time.

Rather, the report identified ratemaking frameworks and practices of electric utilities that support a clean energy transition, similar to Toronto Hydro. The report focused in large part on electric utilities in jurisdictions leading clean energy transitions, such as Hawaii, New York, and the United Kingdom.

QUESTION (B):

b) Please confirm that regulatory regimes in the United Kingdom, Australia, Philippines, and Malaysia are quite different from the North American cost of service/ rate of return on rate base form of regulation. Please explain your answer.

RESPONSE (B) - PREPARED BY SCOTTMADDEN:

Australia, Philippines, Malaysia and the UK utilize a building blocks method to setting rates. The building blocks method is based on a cost of service (e.g., operating expenses, return on investment, depreciation, and taxes).

QUESTION (C):

c) Please confirm that the Revenue Growth Factor proposed by Toronto Hydro is actually a revenue requirement growth factor.

RESPONSE (C):

Toronto Hydro does not confirm the statement. While the mathematical basis for the Revenue Growth Factor (RGF) is the difference in forecasted revenue requirement from year to year during the rate term, the RGF is subject to the revenue reductions imposed by the X-Factor through the custom index. As noted and shown in the response to 1B-Staff-03(c), through the application of the X-factor, the custom index yields a revenue deficiency of approximately $81.5 million over the rate term, relative to the revenue requirement for the Investment Plan.

The custom index (inclusive of the RGF) does not fund the entirety of the revenue requirement (i.e. costs) that the utility requires to deliver the 2025-2029 Investment Plan; therefore, it is not accurate to characterize the RGF as a revenue requirement growth factor.

QUESTION (D):

d) Please explain how Toronto Hydro's proposed custom IR differs from a multi-year cost of service rate plan.

RESPONSE (D):

Please see response to 1B-Staff-03.

QUESTION (E):

e) Based on Scott Madden's research, is Toronto Hydro's proposed custom IR plan simple or complex?

RESPONSE (E) - PREPARED BY SCOTTMADDEN:

ScottMadden did not evaluate Toronto Hydro's proposed custom IR plan for its relative complexity or simplicity. ScottMadden evaluated Toronto Hydro's proposed custom IR plan for its consistency with other electric utility ratemaking frameworks and practices that support a clean energy transition.

QUESTION (F):

f) Based on Scott Madden's research does Toronto Hydro's proposed custom IR plan provide more or less incentive for productivity improvements than OEB's standard price-cap plan that is used by most Ontario distributors?

RESPONSE (F) - PREPARED BY SCOTTMADDEN:

ScottMadden did not evaluate Toronto Hydro's proposed customer IR plan for its relative incentive for productivity improvements as compared to OEB's standard price-cap plan. ScottMadden evaluated Toronto Hydro's proposed custom IR plan for its consistency with other electric utility ratemaking frameworks and practices that support a clean energy transition.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-5

Preamble:

Toronto Hydro indicates that the Energy Transition is already underway and that it needs to get ready for this electrified future now by preparing its grid and operations.

QUESTION (A):

a) What has THESL already done to ready its grid and operations and what is still outstanding?

RESPONSE (A):

Toronto Hydro has been readying its grid and operations through a number of investment programs over the past years. A few examples of what has been done and what needs to be done are provided below. For full details, please refer to Exhibit 2B, Sections D4 and D5.

The utility has been steadily modernizing its Horseshoe distribution system for many years through both its System Renewal efforts and complimentary System Service programs including the Contingency Enhancement segment (Section E7.1). A primary focus of these efforts has been the deployment of SCADA-operated switches which allow control room operators to remotely transfer load and isolate feeder sections under fault conditions or on a planned basis. These existing switches, combined with the switches and reclosers to be installed through 2025 to 2029, will form the physical basis for Toronto Hydro's self-healing grid in 2030 and beyond. Specifically, Toronto Hydro is aiming to have 90 percent of feeders in the Horseshoe system ready for automation by 2030. This will be accomplished in part through the Contingency Enhancement segment, which will install SCADA- controlled switches and reclosers on at least 34 feeders to bring them to the minimum optimal number of switching points per feeder of 2.5, which is required to enable an effective self-healing automation scheme.

Over the last decade, Toronto Hydro has strived to be a leader in Ontario when it comes to exploring and implementing technologies and solutions for facilitating, leveraging, monitoring and forecasting distributed generation ("DG") and distributed energy resources ("DERs") more broadly. Toronto Hydro has been a leader in the procurement of demand response services from customers. The utility's Local Demand Response program ("LDR") was the first utility-driven NWS program in Ontario and has been deployed successfully since the 2015-2019 rate period. In the 2020-2024 period, the utility has been pursuing similar DR services in the areas of Manby TS and Horner TS, and, through the OEB Grid Innovation Fund and Innovation Sandbox program, is working with the IESO, Power Advisory, and Toronto Metropolitan University's Centre for Urban Energy to implement a Benefit Stacking Pilot, which explores the procurement and deployment of DR resources to address overlapping distribution and transmission system level needs. In 2025-2029, Toronto Hydro is planning to expand its Local Demand Response program into a more diverse Flexibility Services program and procure up to 30 MW of demand response capacity at target six stations (Finch TS, Manby TS, and Leslie TS, Cecil TS, Strachan TS, and Copeland TS)." For more details on Toronto Hydro's Non-Wires Solutions programs, refer to Section E7.2.

Further, Toronto Hydro undertook enhanced capacity and connections capability assessments to monitor capacity related risks within its system. The enhancements include the preparation of the System Peak Demand Forecast with additional inputs for electric vehicles ("EVs"), data centers and Municipal Energy Plans, assessment of spare feeder positions, identification of system constraints that impact generation connections, and identification of unique drivers for demand growth. Toronto Hydro also augmented its decision-making process with the results of long-term scenario modelling tool known as Future Energy Scenarios.

QUESTION (B):

b) Does THESL have a long-term roadmap (or equivalent) for Grid modernization out to 2040 or beyond. If yes, please provide a copy.

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-48.

QUESTION (C):

c) THESL outlines that the Energy Transition will continue to progress over the next few decades. This timeframe exceeds the 2025-2029 rate period. Please provide the analysis and documents THESL has available that show the temporal requirements to make the required grid and operational changes of the next few decades and what portion of these are required to be done over the 2025-2029 period (vs. in future rate periods).

RESPONSE (C):

The specific capabilities that Toronto Hydro will require over the longer duration of the energy transition are highly dependent on when, where and how the transition itself unfolds. In this context of uncertainty, the utility's complimentary growth and modernization strategies stem from a "least regret" planning approach, focusing on investments that will provide the utility with the capacity and flexibility to cost-effectively navigate whatever scenario unfolds in 2030 and beyond, while delivering immediate benefits to customers from those same investments in 2025-2029. For more information, please refer to Exhibit 2B, Sections D4 and D5.

QUESTION (D):

d) Please indicate which Energy Transition demands THESL grid and operations are currently not able to deliver on (e.g. EV charging, embedded generation/storage, etc.) and indicate how THESL identified that its system was not able to meet those needs (e.g. customer complaints, rejecting DER requests, third-party analysis and reports, etc.).

RESPONSE (D):

As noted in response to part (c), the capacity and operational capabilities that Toronto Hydro will require in order to avoid becoming a barrier to a cost-effective energy transition are highly dependent on when, where and how the transition itself unfolds. Toronto Hydro expects that as

the energy transition accelerates, especially in 2030 and beyond, the pressures of electrification and DER proliferation will require greater system capacity and more operational and analytical sophistication. The 2025-2029 investment plan takes appropriate steps toward this future state, without overcommitting to technologies and solutions that may not be necessary or may become obsolete in the long-run (i.e., least regrets investments). Without the investments outlined in Sections D4 and D5 of Exhibit 2B, Toronto Hydro believes it will ultimately find itself reacting in an unsophisticated and inefficient manner to the eventual demands of the energy transition, resulting in potentially higher costs, worse reliability, more significant delays and barriers to connection, and limited ability to leverage DERs at scale as a grid solution.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-6

QUESTION (A)—(B) :

a) Has THESL assessed what portion of the demand increases over the coming decades could be mitigated by CDM (including enhanced efficiency and design for new buildings)? If no, please explain why not. If yes, please provide a copy of the analysis, reports, presentation and other related materials.

b) Please provide details on incremental CDM programs, activities and forecasted results (demand and energy reduction). THESL intends to undertake during the rate term (2025 - 2029). Please indicate which are to be led by THESL and which are supporting others programs (e.g. IESO, OEB, City, etc.).

RESPONSE (A) AND (B):

Toronto Hydro relies on the IESO's assessment of CDM potential and CDM forecasts, which is in-progress in the current cycle of IRRP. The non-wires solutions considered for the 2025-2029 rate period have been outlined in detail in Exhibit 2B Section E7.2. Please refer to Toronto Hydro's responses to 1B-Staff-88 and 1B-Staff-89 for more information about the utility's non-wires strategy, investments and proposed incentives.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-7

Reference: Exhibit 1B, Tab 1, Schedule 1, Section 2.2

"However, market evolution and public policy are changing this trajectory, driving customers to adopt advanced electrified technologies - such as electric vehicles (EVs), solar panels, home energy storage, heat pumps and electric water boilers - which are increasing customer demand and expectations for outcomes." [Investment Plan Section 2.2]

QUESTION (A) AND (B):

a) Please explain why the following require increasing system demand capacity, rather than enabling system peak demand to be decreased.
   - electric vehicles (EVs) with bi-directional charger
   - solar panels and/or related on-site battery storage
   - home energy storage
   - heat pumps (particularly in mitigating AC load)

b) Please explain what THESL would need in place to leverage DERs (including those above) to reduce system peak demand and related traditional poles-and-wires investments.

RESPONSE (A) AND (B):

Toronto Hydro's System Peak Demand Forecast is a gross forecast which means that behind-the meter-energy distributed energy resources (DER) are not considered as negative energy load or energy generation to reduce peak. In order for these resources to be able to be relied upon to reduce the peak demand forecast they would have to be reliability aggregated and dispatched through demand response as non-wires solutions. Toronto Hydro has considered non-wires solution for the 2025-2029 rate period as outlined in Exhibit 2B Section E7.2. Please refer to

Toronto Hydro's responses to 1B-Staff-88 and 1B-Staff-89 for more information about the utility's non-wires strategy, investments and proposed incentives.

QUESTION (C):

c) Please provide the scorecard metrics and results related to DER (including CDM) that THESL is committing to over the 2025-2029 rate period.

RESPONSE (C):

Please see Exhibit 1B, Tab 3, Schedule 1 at sections 2.2.1 (New Services Connected on Time), 2.2.2 (Customer Satisfaction) and 2.4.3 (System Capacity Non-Wires).

QUESTION (D):

d) Please indicate how THESL has included decentralization of electricity supply (including storage) and distribution into its planning for the future and what those changes mean compared to the historical centralized generation and distribution of electricity.

RESPONSE (D):

As described in Exhibit 2B, Section E7.2, Toronto Hydro has been actively pursuing and deploying non-wires solutions since 2018 (at Cecil TS) and continues to build on this experience with the Etobicoke program. Toronto Hydro is also pursuing a target to procure 30 MW of NWSs in 2025-2029 – triple the target of past rate periods. The history of this work, as well as the future plans are outlined in detail in the referenced evidence. Please also refer to interrogatory responses 1B-Staff-88 and 1B-Staff-89 for more information about the utility's non-wires strategy, investments and proposed incentives.

Regarding the longer-term, as Toronto Hydro's Future Energy Scenarios demonstrate (Exhibit 2B, Section D4, Appendix A and B), it is yet to be determined how quickly and to what extent the electricity system within the City of Toronto will decentralize. Rates of adoption of distributed energy resources are highly dependent on policy, economic conditions, technology advancements,

physical constraints, and consumer behaviour. The Grid Modernization Strategy (Section D5), and the *Grid Readiness* portfolio in particular, speaks to the "least regrets" capability-building investments Toronto Hydro is making in the 2025-2029 period to prepare itself for increases in electrification and decentralization over the longer-term.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-8

QUESTIONS (A) – (C) :

a) Please explain what role (if any) THESL has to proactively plan the Energy Transition and to inform, incent and enable customers (and related enabling stakeholders) to execute in line with that plan as opposed to THESL reacting to the Energy Transition drivers and demands.

b) Please explain what actions and outcomes THESL has undertaken already plus will undertake over the 2025-2029 rate term to proactively define Energy Transition pathways in its service territory and lead customers/stakeholders to adopt those pathways via communications, programs, incentives, etc.

c) Please explain what initiatives and activities THESL intends to undertake to provide net zero or low carbon energy solutions as required to support the Energy Transition, while acknowledging that the proposed IESO grid mix estimate is indicating higher carbon emissions for electricity generation.

RESPONSE (A) – (C):

Toronto Hydro believes that its role is to ensure that the distribution grid and utility operations are ready and equipped to safely, reliably and efficiently support the realization of an energy transition via electrification in alignment with customer needs, requirements and public policy objectives. Fulfilling this role is an important consideration that underlies the 2025-2029 Investment Plan and related requests for approval which are set out in this application. To that end, the application includes numerous investments, initiatives and proposals (which are summarized in the table below) that inform, incent and enable the utility, customers and stakeholders to pursue energy transition goals via electrification. In addition to these specific areas of investment, Toronto Hydro notes that maintaining the foundation of a safe and reliable grid, effective processes, systems and operations, and a highly-skilled, engaged and productive workforce are also critical objectives for success in enabling an orderly energy transition.

1 **Table 1 – Initiatives Enabling Energy Transition via Electrification**

Initiative	Enabling Energy Transition via Electrification
Grid Modernization Strategy	Toronto Hydro is accelerating strategic investments in specific field and information technologies to improve the grid's ability to integrate customer loads and resources, and serve the increasingly complex demands on the utility's system assets and operations. Toronto Hydro's central concern is to not act as a barrier to the adoption of electrification technologies (e.g. EV and heat pumps) by being able to connect customers on time and continue to maintain system reliability of an increasingly dynamic distribution system by equipping the grid with the necessary tools and processes to do so. For a complete list of Grid Modernization investments, please see Exhibit 2B, Section D5.
Future Energy Scenarios Modelling	Toronto Hydro engaged UK consultant Element Energy to develop a bottom-up modelling tool (FES) to understand the range of possible changes to future peak demand based on the interplay of different policy, technology and consumer behaviour assumptions. This tool provides a range of peak demand scenarios that could materialize depending on how different drivers unfold but does not attach probability to the scenarios. This tool helps Toronto Hydro understand the different possible capacity requirements of its system to help inform capacity planning by ensuring that investments are designed to prepare for a multitude of energy transition scenarios. This means that system planning can be done on a "least regrets" basis where sufficient grid capacity is planned to support growth of electrification technologies without over-building, while having the flexibility to respond to changing grid needs in the face increasing uncertainty. For more information on Future Energy Scenarios, please refer to Exhibit 2B, Section D4.
Hosting Capacity Map	Over the 2025 to 2029 period, Toronto Hydro intends to develop and implement a Hosting Capacity Analysis with a customer-facing interface such as a map. This is intended to provide customers with visibility into where there is available capacity to support new or upgraded connections on the distribution system. In addition to streamlining the connection and upgrade process for customers adopting electrification technologies, this tool will provide Toronto Hydro with information to enable more granular system analysis and improve capacity planning to

	ensure the system can support customers' electrification needs. More information on the Hosting Capacity Analysis is provided in the Grid Modernization Strategy referenced above.
Renewable Enabling Investments	Toronto Hydro is making necessary investments (i.e. Renewable Enabling Investments) to ensure that the distribution system can support renewable energy connections, which are forecast to grow over the rate period. The REI are meant to address three different constraints that act as barriers to renewable connections – short circuit capacity, anti-islanding, and system thermal limits and load transfer capability. For more information, please see Exhibit 2B, Section E3 and Exhibit 2A, Tab 5, Schedule 1.
Local Demand Response	Toronto Hydro plans to expand its Local Demand Response program to procure 30 MW of flexible non-wires system capacity from customer and/or third-party owned DERs. For more information on the LDR program, please refer to the Non-Wires Solutions evidence at Exhibit 2B, Section E7.2 and please see Toronto Hydro's response to 1B-Staff-88.
AMI 2.0	Toronto Hydro was among the first utilities in Ontario to implement smart meters (AMI 1.0), having deployed them between 2006-2008. By 2025, approximately 70% of Toronto Hydro's residential and small commercial meters will have surpassed their expected useful life. As a result, the utility plans to replace approximately 680,000 meters, with next generation AMI 2.0 meters between 2023-2028. These meters, once paired with IT infrastructure, will act as a network of sensors improving observability and insight into system operation, energy consumption patterns, and grid performance. By having improved asset and outage management capabilities and possessing more granular visibility and monitoring capability over the secondary network will enable Toronto Hydro to better manage the needs of the energy transition in terms of connections and grid operations.
System Capacity Investments	Toronto Hydro has identified the electrification of transit, electric vehicles, hyperscale data centers, and Municipal Energy Plans as key drivers within the System Peak Demand forecast. This forecast informs demand-related capacity investments made through the Station Expansion, Load Demand and Non-Wires Solutions programs. For more

	information on Capacity Planning and Electrification, please refer to Exhibit 2B, Section D4.
System Standardization	Legacy 4kV stations and feeder equipment present challenges to connecting large loads and accommodating DERs. These assets must be converted to contemporary standards not only to improve safety, reliability outcomes but also importantly to keep pace with growing and changing customer demand due to electrification.
Innovation Fund	Toronto Hydro proposed an approximately $16 million Innovation Fund to support the design and execution of pilot projects that test new distribution capabilities, which includes capabilities that are needed to adapt to the changing energy landscape (e.g. supporting customers' electrification objectives). For the 2025-2029 rate period, the Innovation Fund proposal includes four pilot project concepts. Specifically, the Flexible Connections and EV Demand Response/Commercial Fleet Charging pilot project concepts are intended to support the connection and management of DERs. Flexible Connections will explore operational arrangement for connecting DERs in constrained areas that would otherwise require capital investments. EV-focused pilots will explore the role of the utility in managing EV charging to optimize grid operations. For more information on the Innovation Fund proposal, please refer to Exhibit 2B, Tab 4, Schedule 2.
System Planning	Please see Toronto Hydro's response to interrogatory 4-Staff-309 for a detailed discussion about how System Planning functions support and enable energy transition objectives.
Control Center	Since 2019, Toronto Hydro has been developing an Energy Centre (also known as DERMS) and gaining experience with managing DERs on the distribution system. This initiative is driven by a recognition that DER growth necessitates a shift in the way that distribution systems are operated. Rather than being geared primarily towards energy delivery, distributors must also consider the importance of energy management as it relates to safety and reliability. This requires more active management of short circuit levels, system voltages, and advanced protection schemes. Toronto Hydro has been exploring emerging functions such as

	scheduling, dispatching, aggregation, and settlement. For example, the DERMS platform is currently used to directly operate Toronto Hydro-owned battery energy storage systems and to monitor and manage grid-level impacts of customer DERs. As Toronto Hydro improves its capabilities to actively manage DERs on its system, it will be able to support an increased customer demand for DER connections. For more information see Exhibit 4, Tab 2, Schedule 7.
Customer Operations	Toronto Hydro is making investments in key areas of its customer operations. The customer connection teams are being expanded to support the increasing volume and complexity of both low and high voltage connections. These investments in headcount are being undertaken to support the increased growth and electrification in the City of Toronto. Additionally, the Key Account team is expanding to provide direct and tailored service to critical load customers, many of which are embedded into the economic and social fabric of the city. Many of these customers consider Toronto Hydro a trusted advisor in their efforts to achieve ESG targets through actions such as adopting BTM energy solutions and other peak and demand management measures. Toronto Hydro is investing in ensuring it has sufficient capacity and expertise to support its customers through the energy transition. For more information see Exhibit 4, Tab 2, Schedule 8.
Customer Care	Toronto Hydro is investing in its customer care teams to ensure sufficient capacity and knowledge to provide timely, effective, and efficient customer services. This includes being able to respond to and adequately address evolving customer needs and preferences affected by broad societal developments and industry trends such as new public policies, electrification, and increased adoption of EVs and DERs. Toronto Hydro is preparing for numerous changes in customer expectations, including demands for greater information on and control over electricity usage and expenditures, greater choice to purchase renewable power or self-generate for sale back to the grid, and ESG goals in energy use. In turn, Toronto Hydro is undertaking initiatives such as automation in customer self-service, upskilling in workforce, and acquiring additional specialized resources. For more information see Exhibit 4, Tab 2, Schedule 14.

Public Legal & Regulatory Affairs (PLRA)	Through this program Toronto Hydro ensures that there is sufficient organizational capacity to provide expert legal, regulatory, communications, policy and government relations, and public affairs services to respond to the changes in the energy sector driven by public policy, technological advancement and customer driven evolutions. This includes legal and regulatory support for offers to connect, arrangements with developers and operating agreements, as well as new policy changes. As well as communications with customers who have questions about electrification and new technologies. The PLRA program has been closely tied to and significantly driven by the nature – including volume and complexity – of the capital program. Given the focus of the capital plan on growth and electrification in the city, the PLRA program must reflect a workforce with a multidisciplinary skillset. For more information see Exhibit 4, Tab 2, Schedule 18

Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is also playing a proactive role in supporting the realization of the City's Net Zero Strategy by facilitating and stimulating the growth of emerging local cleantech markets. For more information, please see the latest Climate Action Plan status report.[1]

[1]Toronto Hydro, *Climate Action Plan 2023 Status Report*

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-9

References: Exhibit 1B, Tab 1, Schedule 1, Section 2.3.1

Preamble: Approximately a quarter of the utility's grid equipment continues to operate past useful life. [Investment Plan Section 2.3.1]

QUESTION (A):

a) Please provide how THESL defines "useful life".

RESPONSE (A):

In the context of this reference, Toronto Hydro refers to the useful life as the mean service life of the asset. Please see Toronto Hydro's response to interrogatory 2B-Staff-131, part (a) for the basis of the useful lives used.

QUESTION (B):

b) Please provide a summary by major category of the equipment that THESL has defined as 'beyond its useful life' and include for each category what percentage and value the portion is that THESL indicates is 'beyond its useful life'.

RESPONSE (B):

Please see the requested breakdown by category of Assets Past Useful Life in Table 1 below.

Table 1: Asset Count for Assets Past Useful Life

System	Non-Linear Assets (Units)	Percentage of Non-Linear Assets	Linear Assets (km)	Percentage of Linear Assets
Overhead	46,928	9.9%	1,301	29.7%
Underground	20,454	4.3%	3,082	70.3%
Network	846	0.2%	Not Applicable	Not Applicable

System	Non-Linear Assets (Units)	Percentage of Non-Linear Assets	Linear Assets (km)	Percentage of Linear Assets
Stations	1,219	0.3%	Not Applicable	Not Applicable
Civil	10,698	2.3%	Not Applicable	Not Applicable
Meters	393,024	83.1%	Not Applicable	Not Applicable
Total	**473,169**		**4,383**	

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-10

Reference: Table 1: Ontario Cities Population Density [Investment Plan] THESL indicates that the population density in Toronto is higher than the comparator municipalities listed.

QUESTION (A-B) :

a) Please explain how increased density would enable more capital and O&M efficiency compared to more disperse municipalities and related systems. If THESL does not believe this is correct, please explain why.

b) Has THESL done analysis of the Capital and/or O&M cost per customer correlated to population density (per km) compared to other utilities. If not, why not. If yes, please provide a copy of the analysis, reports, presentations or other materials pertaining to this analysis and its conclusions.

RESPONSE (A-B):

Toronto Hydro does not believe increased density to the degrees seen in the City of Toronto enables more capital and O&M efficiency relative to less dense, non-urban service areas. Please see the response to 2B-Staff-121, the pre-filed evidence in Exhibit 1B, Tab 3, Schedule 3 at pages 2 through 9, and the expert empirical evidence in Exhibit 1B, Tab 3, Schedule 3, Appendix A, which explicitly includes a congested urban variable to account for the impacts of highly dense urban environments on capital and operating costs.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-11

Reference: **"In this process, Toronto Hydro employed the principle of least regrets investment. Through the use of a new tool - the Future Energy Scenarios model - the utility modelled the grid impacts of a range of possible future peak demand scenarios based on the interaction between different policy, technology and consumer behaviour assumptions."**

QUESTION (A):

a) Please provide the definition of "least regret" as defined by THESL and the methodology/criteria/weighting used to determine which options result in a higher or lower regret. If the process uses THESL human decisions rather than an imperial approach, please explain.

RESPONSE (A):

The Investment Plan makes the minimum investments necessary (the "least regrets" investments) to maintain key outcomes in the near term while also making paced and deliberate progress in readying the grid and utility operations for the future, irrespective of the path the energy transition takes. The term "least regrets" refers to a strategic planning approach anchored in the decision-making theory of anticipating and minimizing regretful choices/outcomes when faced with uncertainty. This enables the utility to meet emerging challenges without having to wait for future variables with high levels of uncertainty to stabilize.

For example, Exhibit 2B Section D4.2 (Capacity Planning and the Energy Transition) identifies "least regret" investments by including additional drivers, augmenting its decision-making process with the results of a Future Energy Scenarios model, and using the Future Energy Scenarios to stress-test the utility's capacity plan. This meant Toronto Hydro acted with a higher degree of caution in terms of building new capacity to prepare the distribution grid for wide-scale building electrification in

the next two decades, as the policy and consumer behaviour drivers of this type of demand remain uncertain, and technology advancement could offer more cost-effective solutions in the future. Practically, this meant that Toronto Hydro decided to take a "wait and see approach" to investments in new capacity for accommodating wide-scale building electrification in the mid-2030s and beyond.

QUESTION (B):

b) Please provide the guide, user manual or equivalent for the Future Energy Model. If such documents do not exist, please explain how the model and its intended use is documented.

RESPONSE (B):

Future Energy Scenarios user training is provided as Appendix A to this response. Please refer to Exhibit 2B, Section D4, Appendix B for additional information on the FES model, including all assumptions, methods, and outputs.

QUESTION (C):

c) Is the Future Energy Model a Monte Carlo simulator or an NPV model? If neither, please explain.

RESPONSE (C):

The FES model is neither a Monte Carlo simulator nor an NPV model. See Section 2 and 3 of Exhibit 2B, Section D4, Appendix B for a description of the FES model.

QUESTION (D):

d) Please confirm how the inputs to the Future Energy Model are determined, e.g. THESL employee judgement, external data source, etc.

RESPONSE (D):

Please refer to Section 4 of Exhibit 2B, Section D4, Appendix B.

QUESTION (E):

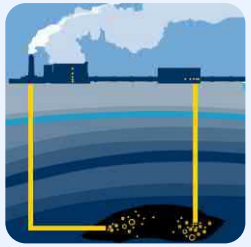
e) Where does THESL get the cost estimates for each scenario in the Future Energy Model.

RESPONSE (E):

The Future Energy Scenario model does not associate costs with any of the scenarios.

Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
1B-PP-11
FILED: March 11, 2024
33 Pages







FES Model Documentation

User Training Session

Toronto Hydro

29 June 2023

elementenergy
an ERM Group company

Madhushan Perera
Ivan Antonov
Ian Walker

Context

- Ontario's energy system is set to become increasingly **decarbonized**, **decentralized**, and **digitized.** Toronto Hydro must ensure the distribution system enables decarbonization but remains reliable & resilient, and that rates remain affordable. **Long-term, scenarios-based geospatial forecasts** will play an increasingly significant role as different areas within Toronto decarbonize at different rates, allowing us to plan efficiently and **strategically deploy targeted solutions.**

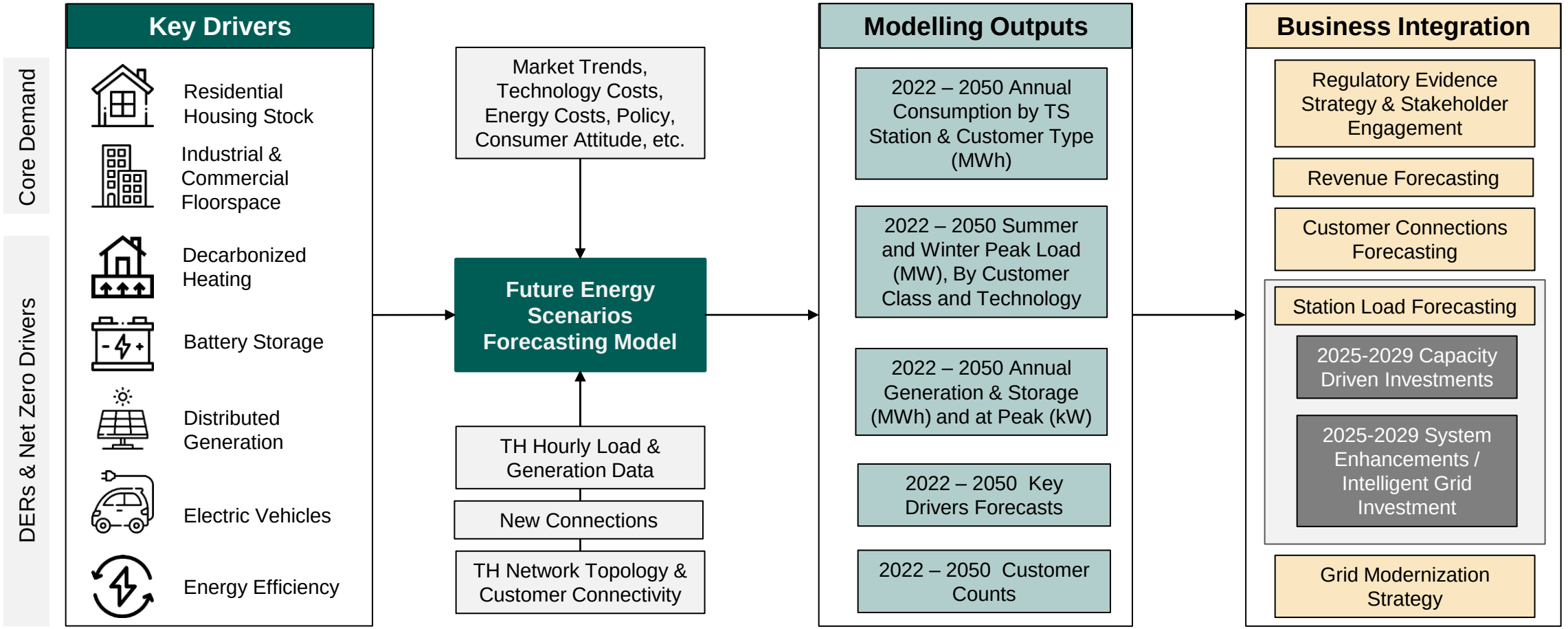


TARGETTED BENEFITS OF THE FUTURE ENERGY SENARIOS

- Efficient Growth-related Investment Plans
- Aligned and Strategic Decision Making
- Single TH Vision on the Future Energy System
- Support Utility of the Future Planning
- Enhance Customer Engagement

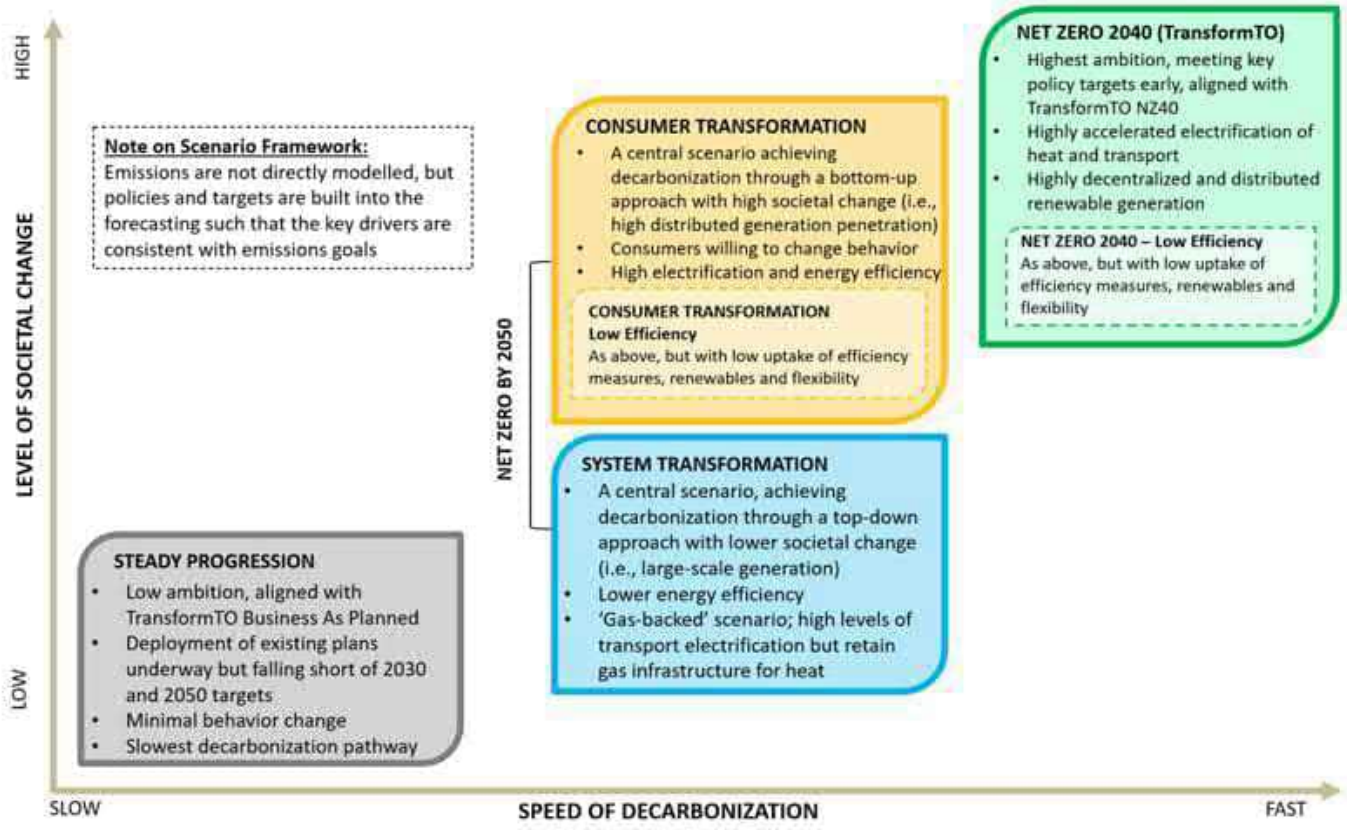
Project Scope

- The key difference vs. other public studies is that FES forecasts plausible pathways to Net Zero 2050 based on **bottom-up consumer choice modelling,** informed by current and future industry and policy developments, **not based on top down change required to achieve GHG reductions**.



Scenario Worlds Mapping

- The FES outlines **four different future 'worlds'** (and **two sensitivities**) with different assumptions around degree of decarbonization and societal change and how that translates to the uptake of low carbon technologies.
- To build these worlds, individual scenarios (i.e. low/medium/high) have been created to describe the evolution of drivers of demand/generation (incl. building stock, electrification of transport, decarbonized heating, etc.).



Parameter	Steady Progression	System Transformation	Consumer Transformation		Net Zero 2040	
			Standard	Low	Standard	Low
Net zero by 2050?	No	Yes	Yes		Yes (by 2040)	
Core Demand						
Electrical efficiency	Low	Medium	High	Low	High	Low
Building stock growth	Single Projection					
Low-Carbon Transport						
Cars and light trucks	Low	Medium	Medium		High	
Medium/heavy trucks and Buses	Low	Medium	Medium		High	
Rail	Single Projection					
Smart charging / V2G	Low	Medium	High	Low	High	Low
Decarbonized Heating						
Heat pumps	Low	Medium plus hybrid HPs	High		Early High	
Thermal Efficiency	Low	Medium	High	Low	Very High	Low
Gas heating in 2050	High	Medium due to hybrid HPs	Zero		Zero	
Gas grid availability	Remains at current availability	Reduced utilization	Decommissioned by 2050		Decommissioned by 2040	
Gas grid composition	Mainly natural gas, with potential for biogas, SNG, or other renewable natural gas	Shift to biogas, SNG, or other renewable natural gas	Mainly natural gas, with potential for biogas, SNG, or other renewable natural gas until 2050		Mainly natural gas, with potential for biogas, SNG, or other renewable natural gas until 2040	
Distributed Generation						
Solar PV	Low	Medium	High	Low	Very High	Low
Onshore wind	Low	Medium	High	Low	High	Low
Biogas	Low	Medium	High	Low	High	Low
Other non-renewable generation	High	Medium	Medium	High	Low	High
Battery Storage						
Domestic battery storage	Low	Medium	High	Low	Very High	Low
I&C behind-the-meter battery storage	Low	Medium	High	Low	High	Low

Note: each driver is modelled separately on a Low / Medium / High basis and then mapped onto the scenario worlds that represent a single coherent view of a potential future world.

Overview

FES Model Overview

Accessing the FES Model

Model Functionality

Online Platform

- Landing Page
- Scenario worlds
- Single Asset Analysis

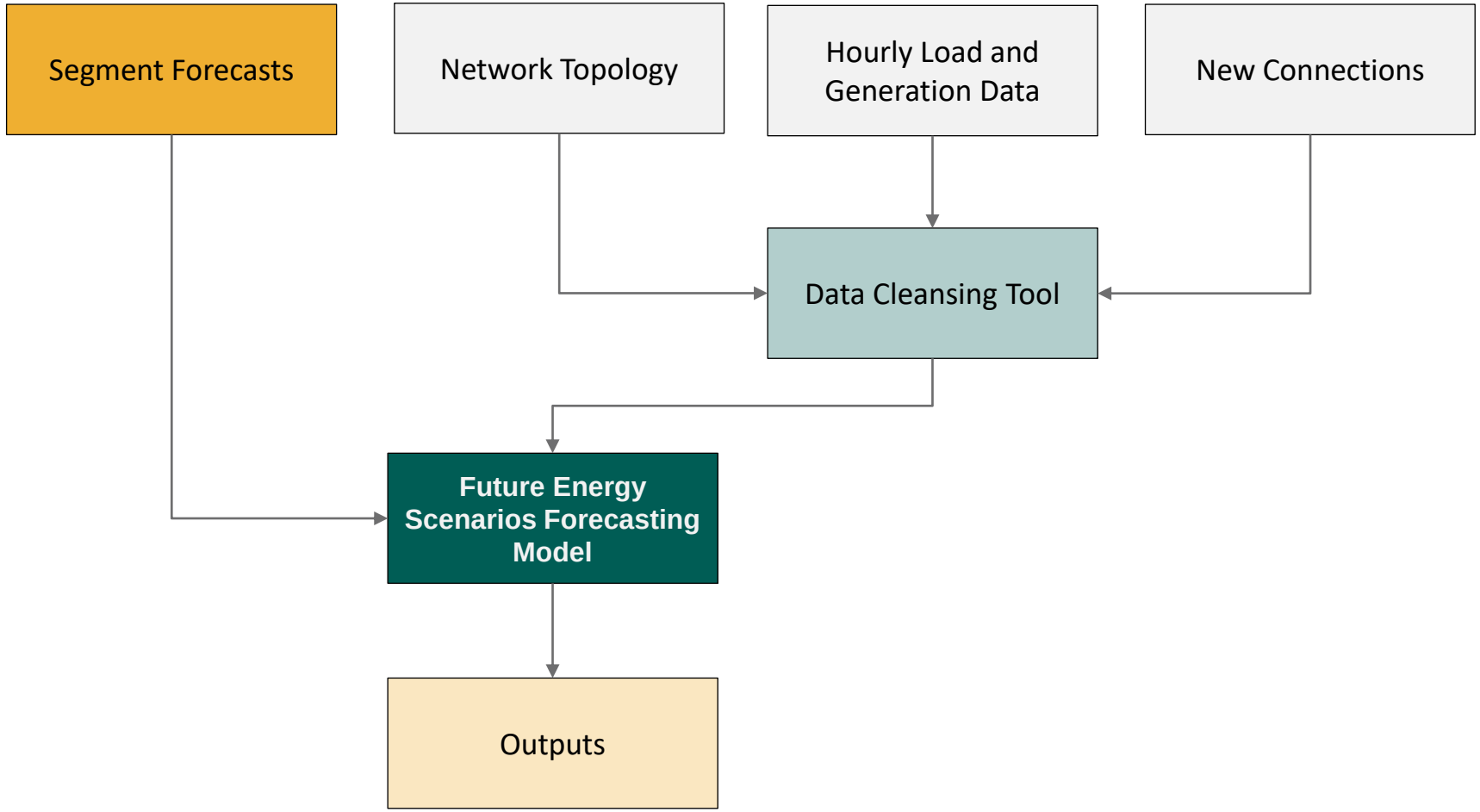
Review of functionality

Business problem statement – Future Energy Scenarios Model

- This project has been undertaken in response to the ***increasing complexity*** of distribution system load forecasting in Ontario and globally, due to factors such as decarbonization, decentralization, digitization, changing customer behaviours and evolving economic and policy conditions.
- New demands emerging from the ***electrification of heat and transport***, growing levels of ***distributed generation*** including variable renewable generation, and new sources of ***load flexibility*** (including energy storage) mean that local electricity distribution companies, such as Toronto Hydro, are facing increasing levels of ***uncertainty***.
- In this context, Toronto Hydro is looking to develop a more detailed understanding of how these various drivers will change and interact over time in order to plan investment in an efficient and timely manner and ***act as a key enabling organisation for the transition to a net zero energy system***. In particular this will feed into Toronto Hydro's ***grid modernization plan*** to enable increasing uptake of low carbon technologies in an efficient manner while maintaining system ***reliability*** and ***resilience***.
- As a result Element Energy are working with Toronto Hydro to generate the ***Future Energy Scenarios*** which provides scenario-based forecasts out to 2050 for peak load (MW), generation (MW), and energy consumption (MWh), generated from Element Energy's network load forecasting ***Future Energy Scenarios model*** and ***suite of bottom-up consumer-choice models*** for predicting uptake of low carbon technologies.

Future Energy Scenarios (FES) Model Overview

The FES Model is being delivered by Element Energy onto Toronto Hydro's on-premises systems.

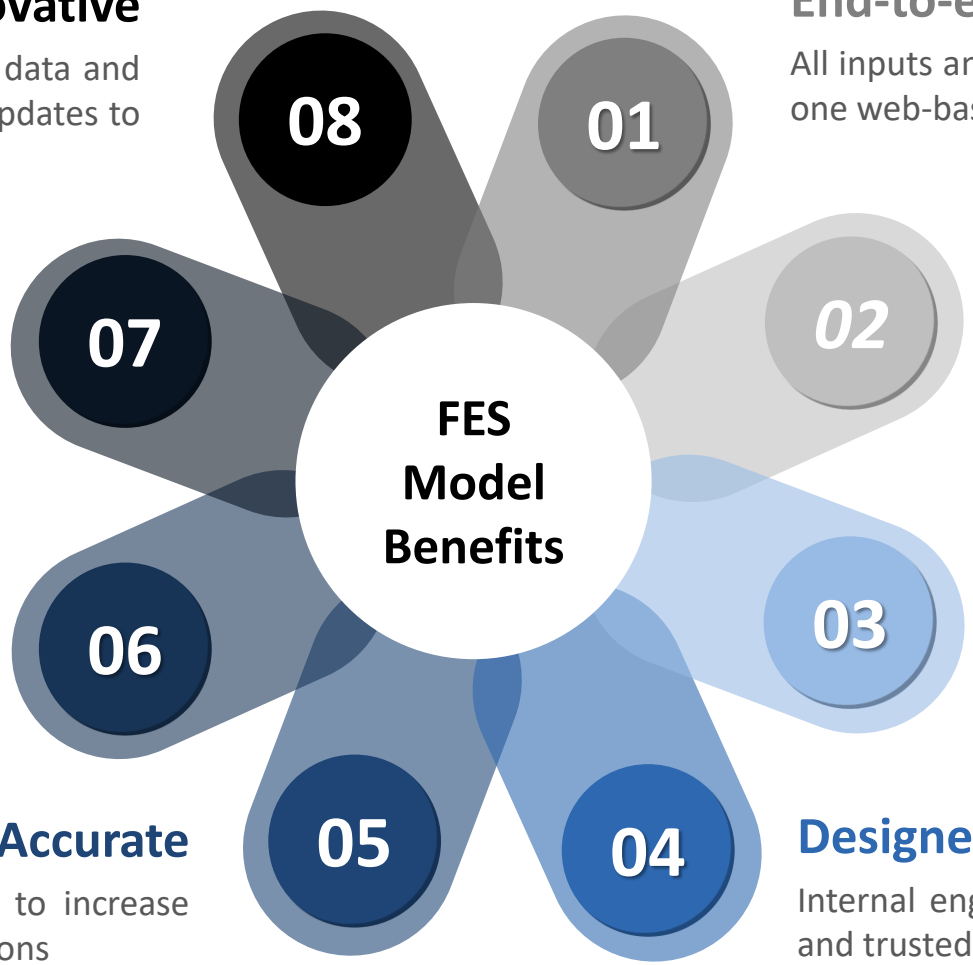


Core platform functionality is being hosted on TH internal servers.

Legend

- FES model input data
- Phase 1: Segment forecasts
- **Phase 2: FES model**
- Separate tool
- Outputs

FES Model Benefits



End-to-end system

All inputs and outputs accessed through one web-based user interface

Python-based

Enables quick run time

Modular

To allow competition, driving innovation & low cost

Designed for users by users

Internal engagement to develop robust and trusted outputs.

Accurate

High data granularity aims to increase accuracy of load on substations

Scenario based

Enables uncertainty of forecasts to be understood, and risk based planning of interventions

Validated & tested

To gain trust in model and direct continuous improvement

Flexible & innovative

Allows for periodic updates of data and additional innovative feature updates to increase capabilities

Overview

FES Model Overview

Accessing the FES Model

Model Functionality

Online Platform

- Landing Page
- Scenario worlds
- Single Asset Analysis

Review of functionality

Accessing the FES Model

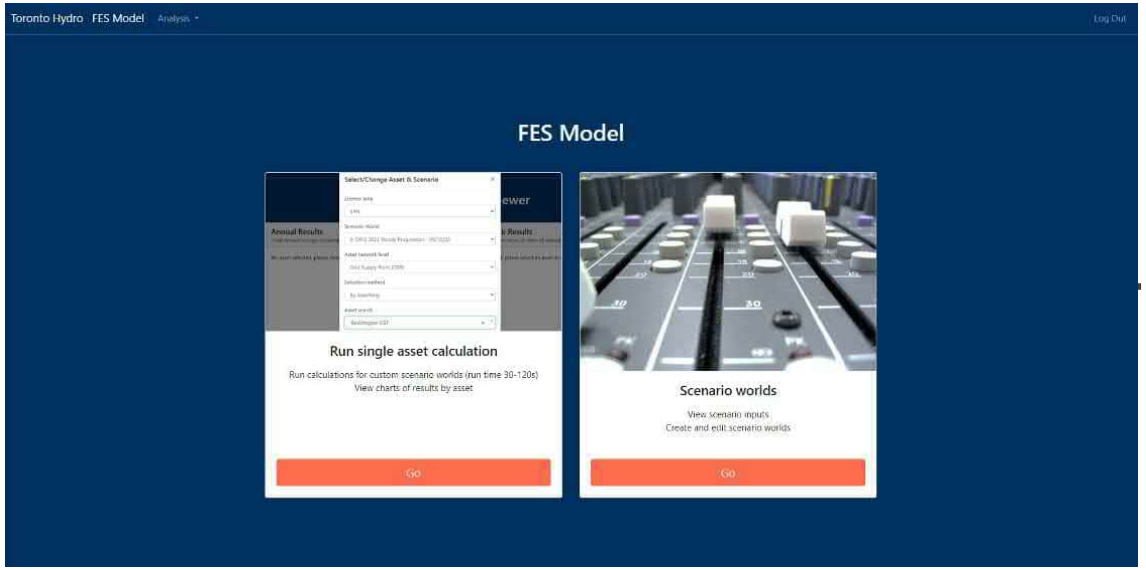
- You will be able to access the Toronto Hydro FES Model through the url: redacted
- You will be able to automatically sign-in to the system via your existing Toronto Hydro Microsoft credentials – i.e. if you are already signed into Microsoft (e.g. a different Microsoft app), you should not need to re-enter your password.
- You will then be redirected to the home page *(see right image).*

Access via the provided URL using your TH Microsoft credentials

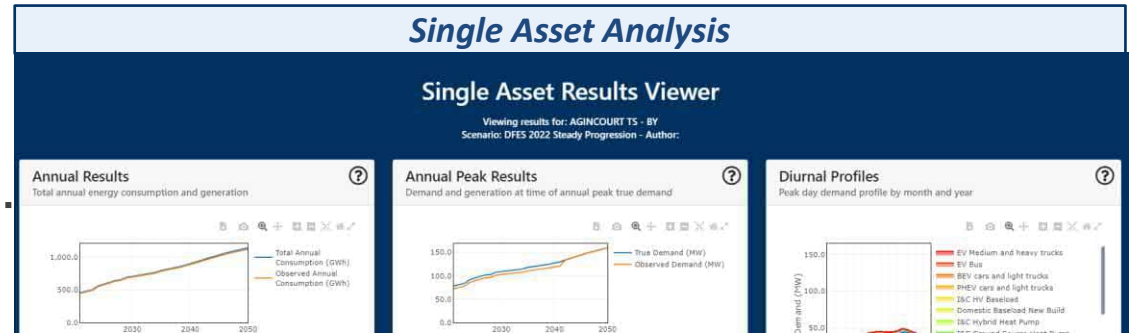


By the end of this training session, FES Model users should understand how to configure scenarios and run single asset calculations.

As part of the FES Model Go-Live, users will be able to access and utilise the online platform to configure scenarios (Scenario worlds) and run load forecasts for a single assets (Single Asset Analysis).







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FES Model Overview

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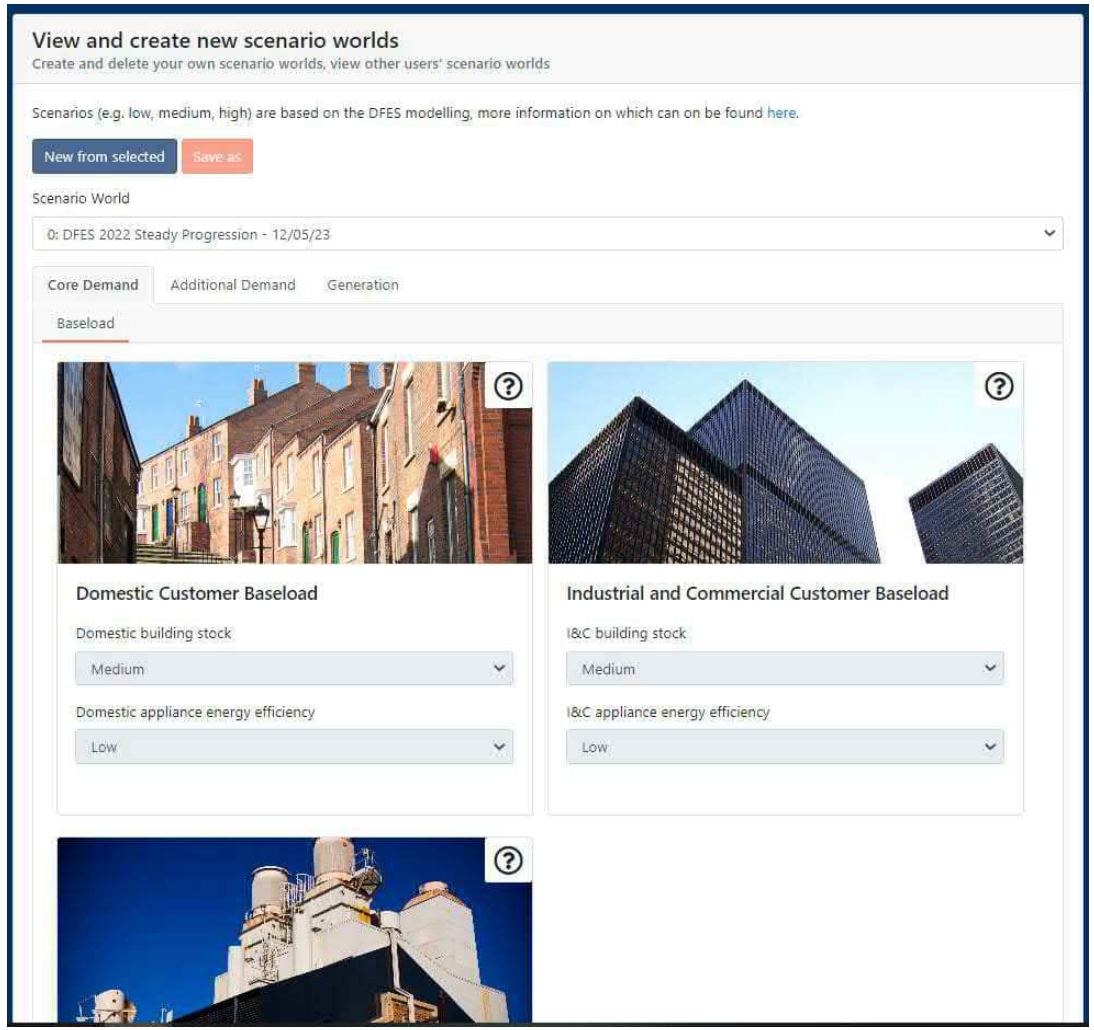
- Scenario worlds
- Single Asset Analysis

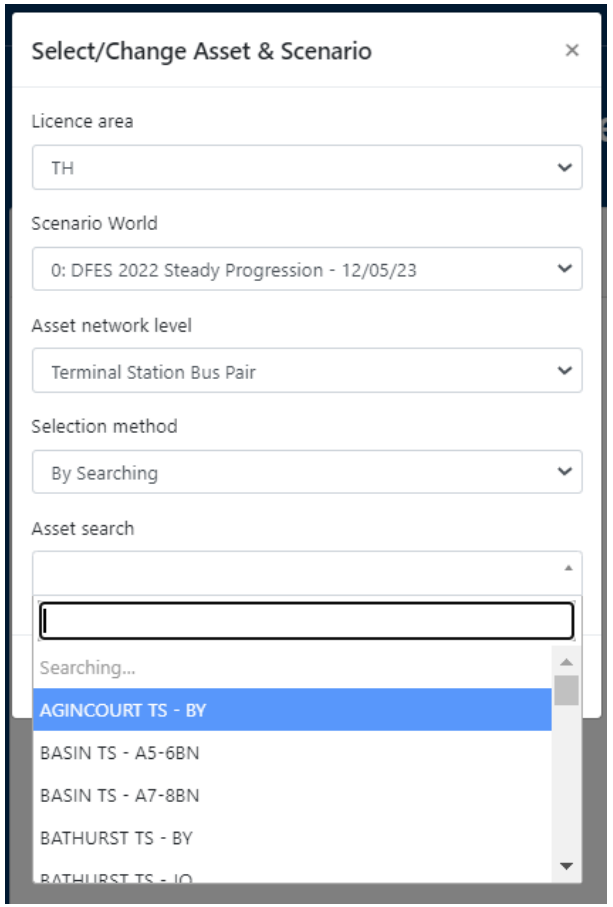
Review of functionality

The model includes demand forecasting with scenario configuration and single asset model runs at the network level or TSBP level.

Configure and save new scenarios



Run demand forecasts with new scenarios

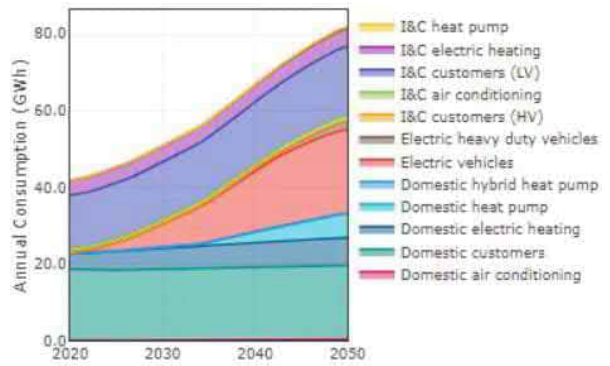


Can run for a chosen scenario and single asset (network or TSBP) by selecting from the list or searching.

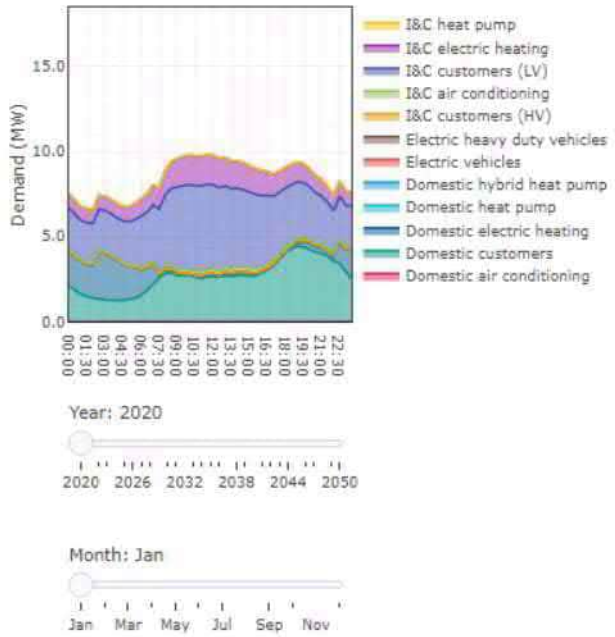
The model includes demand forecasting with scenario configuration and single asset model runs at the network level or TSBP level.

View single substation results in interactive graphs

Annual consumption and annual peak true demand forecast

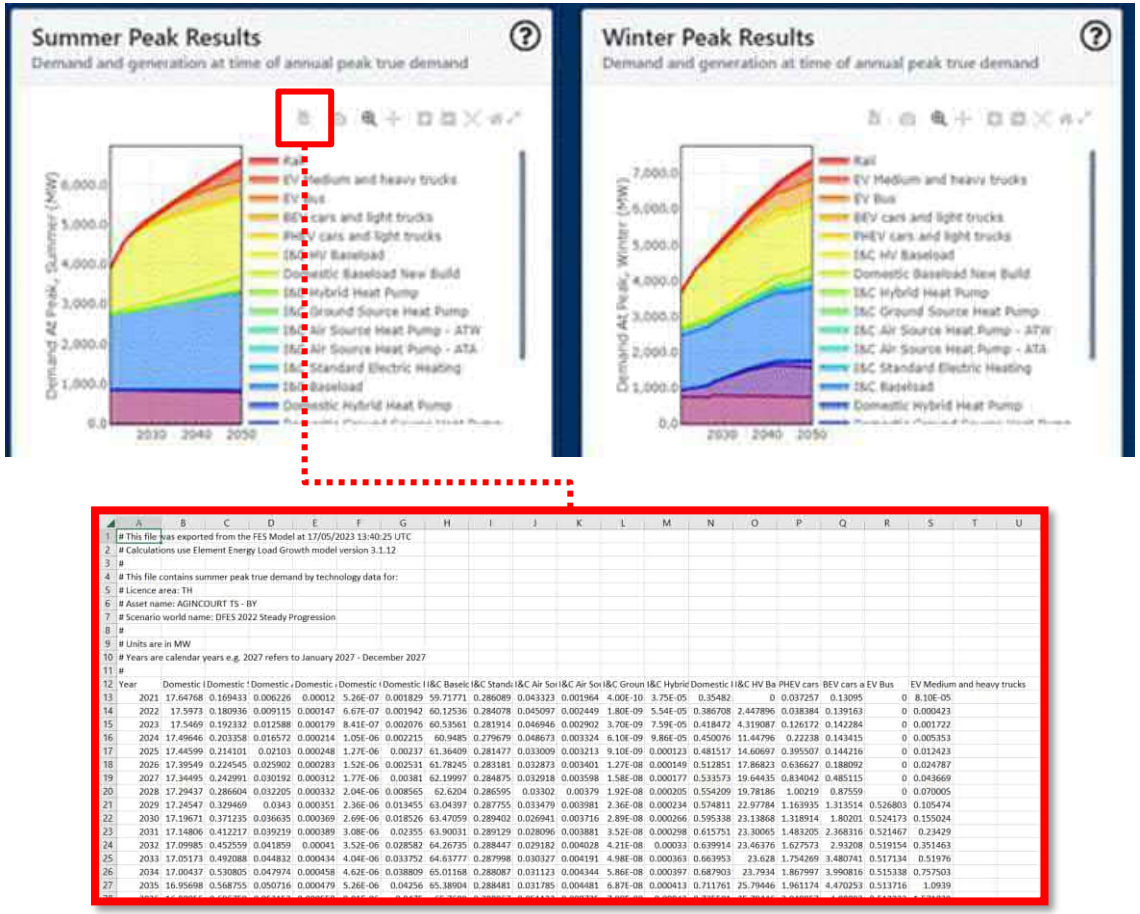


Peak day diurnal profiles



Download results to CSV files

Can download results to CSV files for single asset model runs.



Overview

FES Model Overview

Accessing the FES Model

Model Functionality

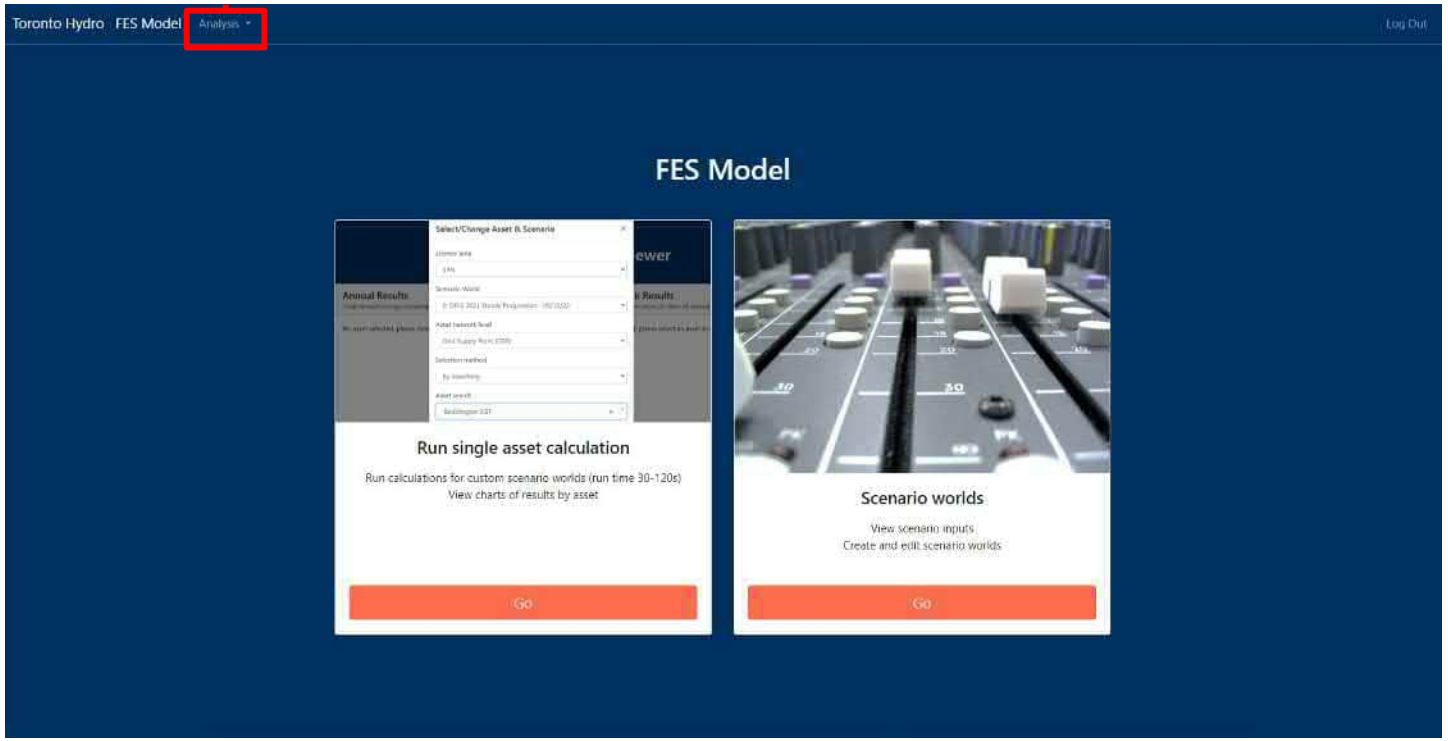
Online Platform

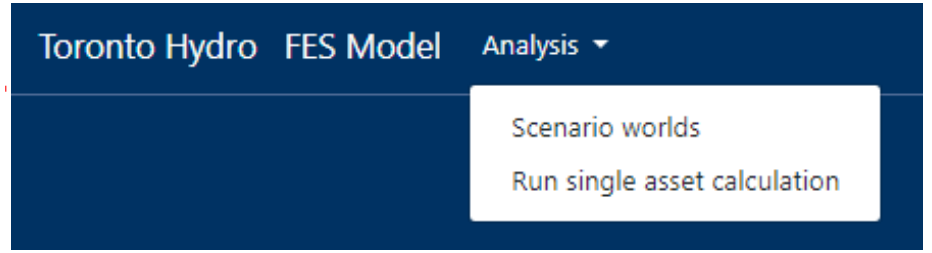
- **Landing Page**
- Scenario worlds
- Single Asset Analysis

Review of functionality

Online Platform – Landing page

The main FES model landing page has two primary options (Run single asset calculation, Scenario worlds). Additionally, users may navigate the landing platform through the use of the “Analysis” tab at the top left of the page.





Under the “Analysis” tab, users may select the same two load forecasting options.

Overview

FES Model Overview

Accessing the FES Model

Model Functionality

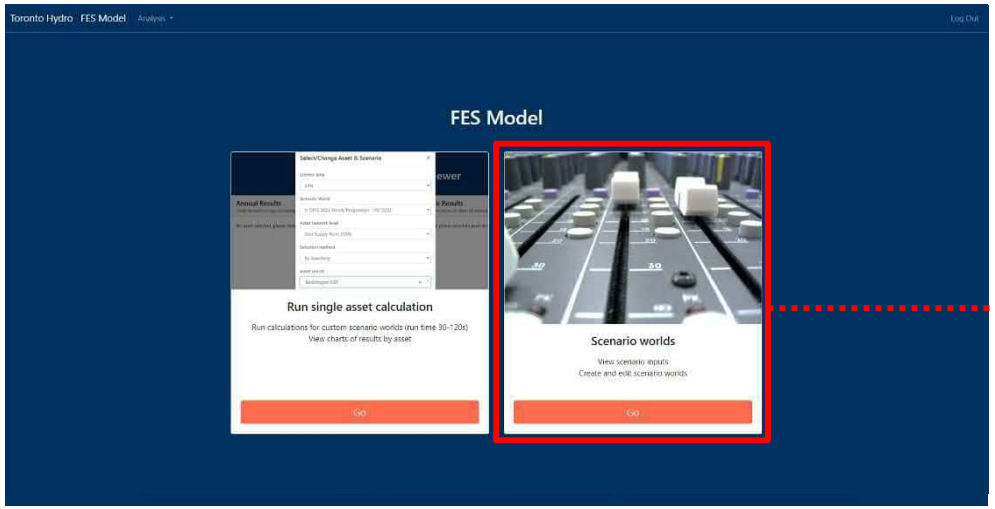
Online Platform

- Landing Page
- **Scenario worlds**
- Single Asset Analysis

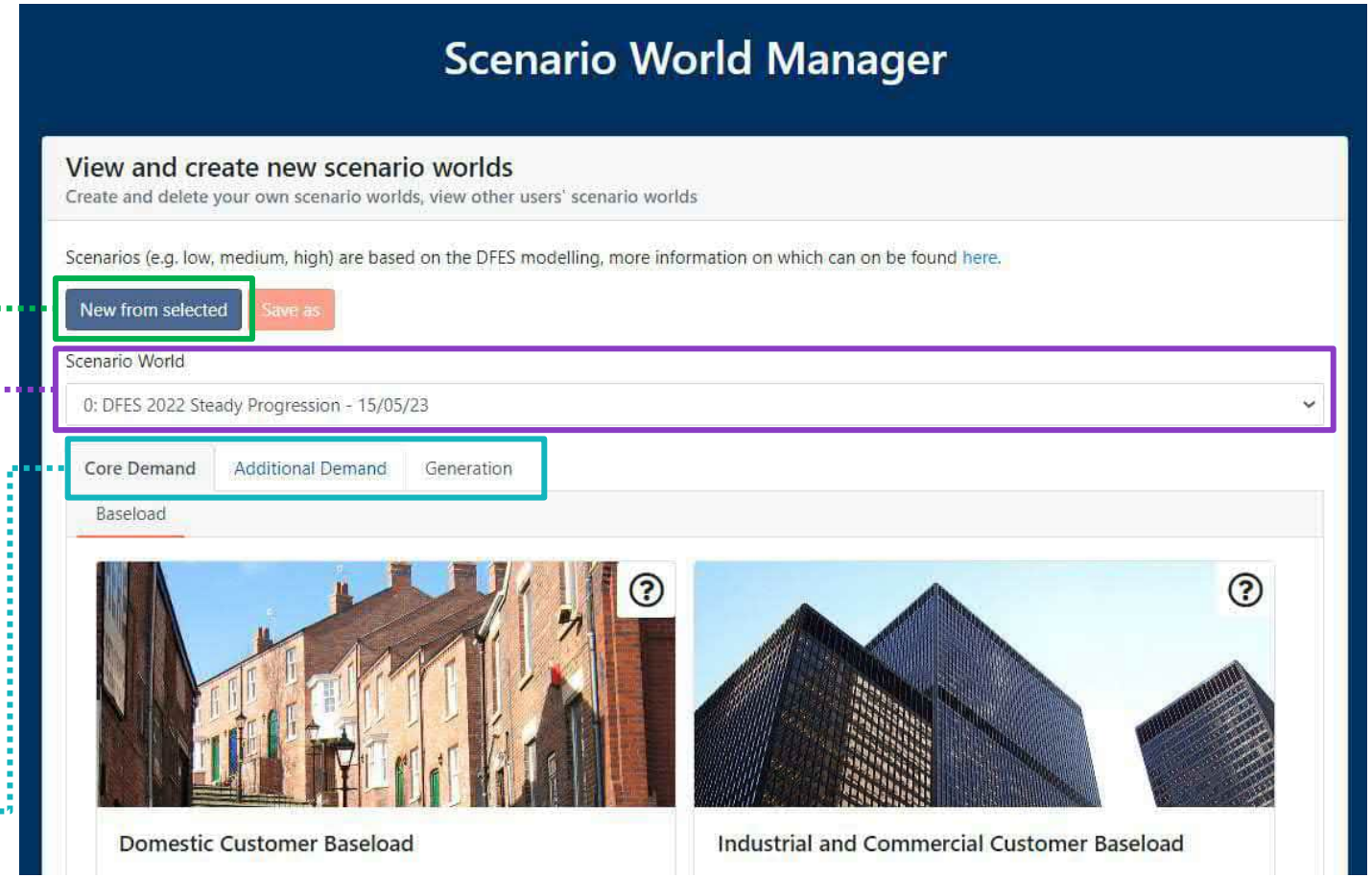
Review of functionality

Online Platform – Scenario worlds

From the main landing page, select the Scenario worlds option (or via the “Analysis” tab).



The Scenario worlds page allows users to view scenarios (e.g. the four DFES scenarios) and create new custom scenarios by varying core demand (e.g. domestic load) or low carbon technologies (e.g. electric vehicles).

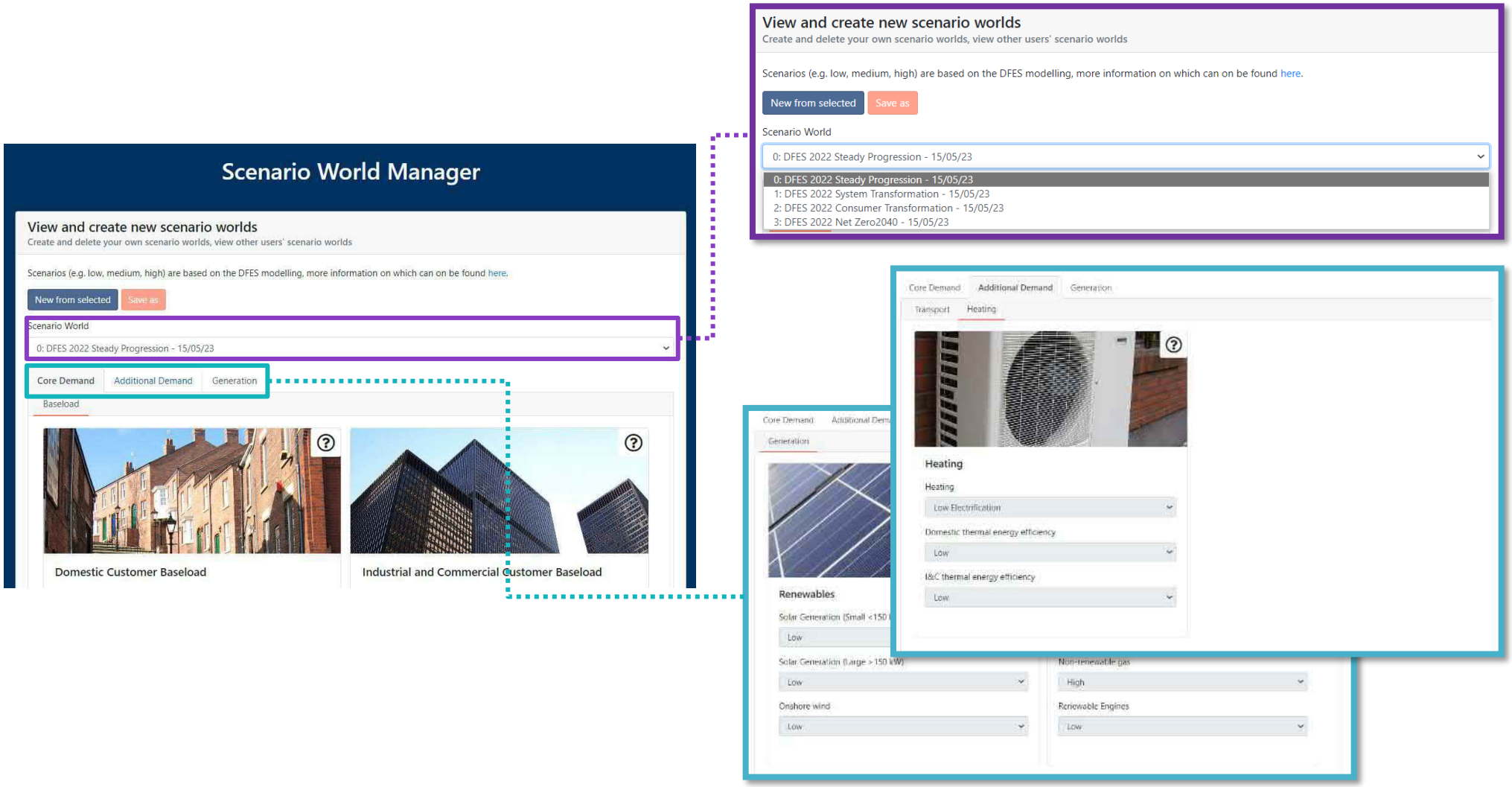


Users use an previously saved scenario as a base for a new custom scenario.

Saved scenarios can selected in this drop-down.

Assumptions for core and additional demands can be controlled via these three tabs.

Online Platform – Scenario worlds



Saved global scenarios can be viewed in the drop down.

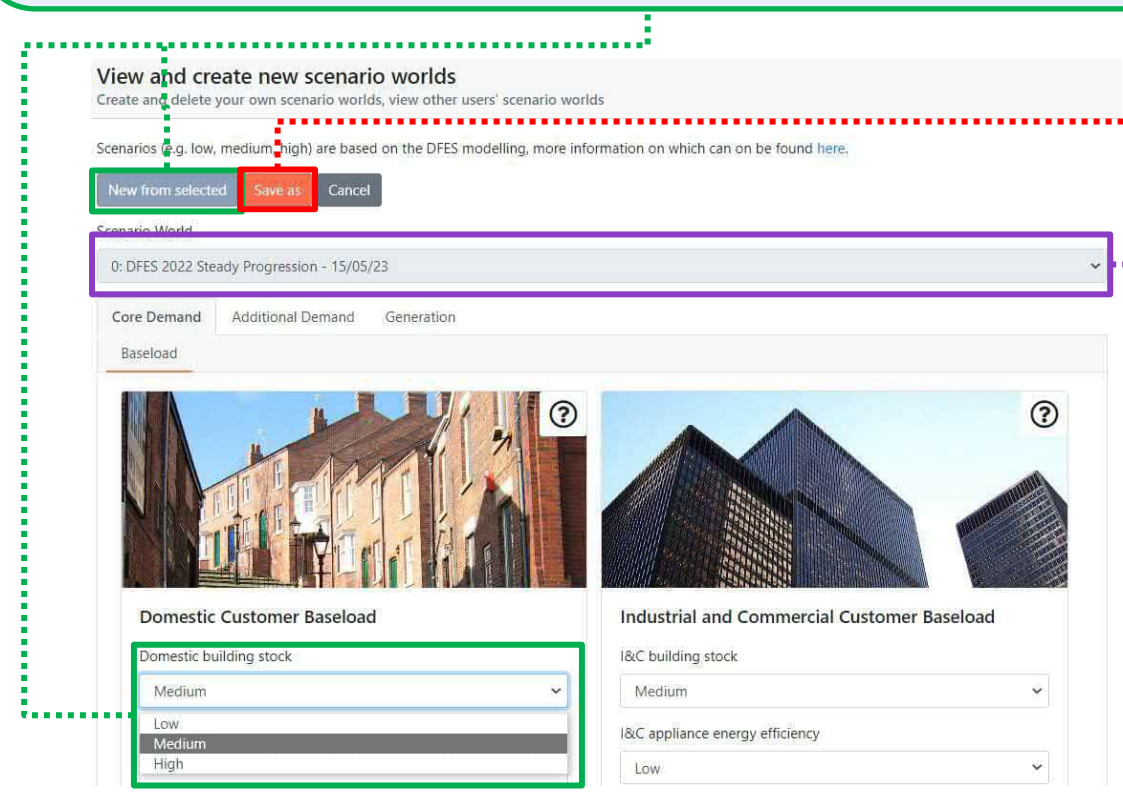
For the selected scenario, users can view the input driver-level assumptions (e.g. medium domestic building stock growth, high EV uptake) across core and additional demands.

Online Platform – Scenario worlds

2

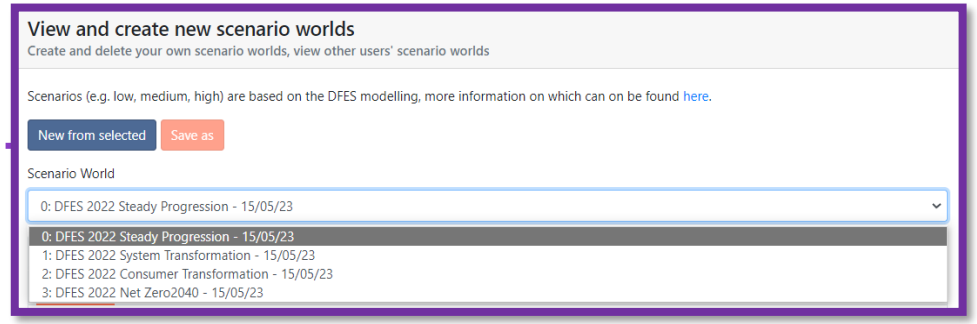
(i) To begin the setup of a new scenario, click “New from selected”. Select an existing scenario to view the scenario’s input assumptions across the core and additional demand tabs.

(ii) To modify the input assumptions, go through each of the drop-down menus and select from the available options (e.g. Low, Medium, High).



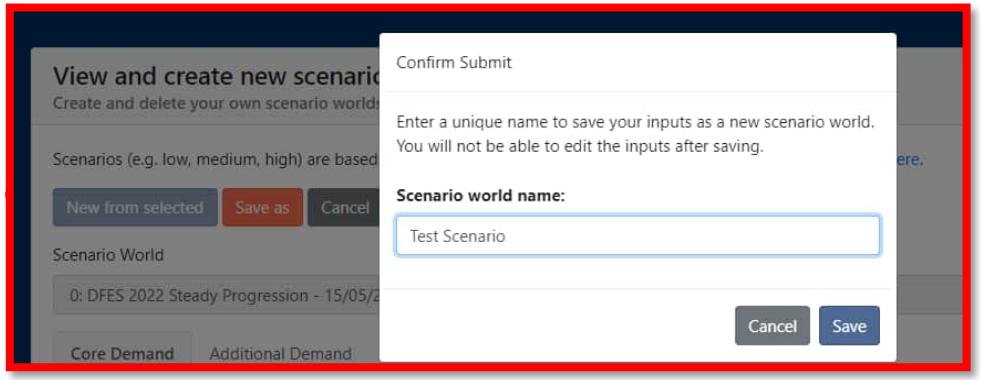
1

To create a new scenario, select the “---” to start fresh or a saved scenario to start from its settings.



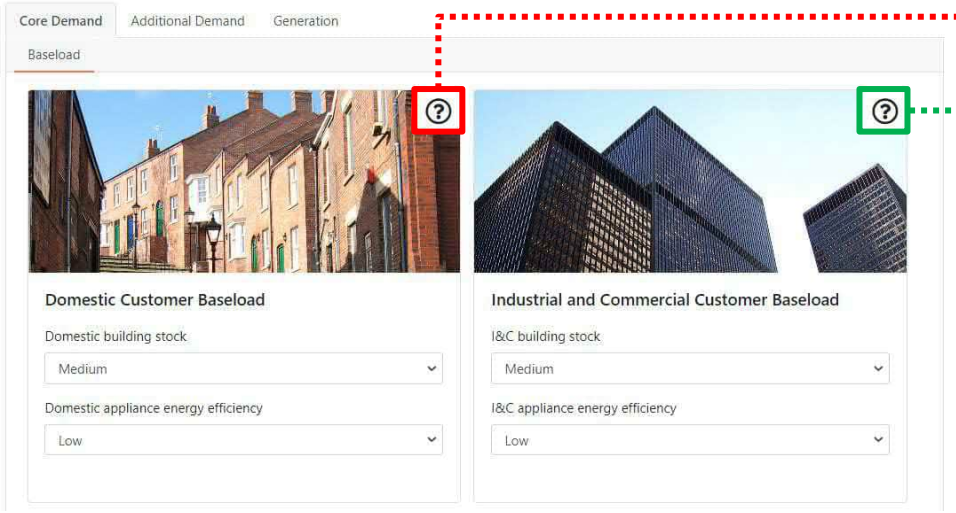
3

To save a scenario, click “Save as” and name the global scenario in the window that pops up. Then click “Save” on the pop-up to confirm.



Online Platform – ? symbol – to learn more

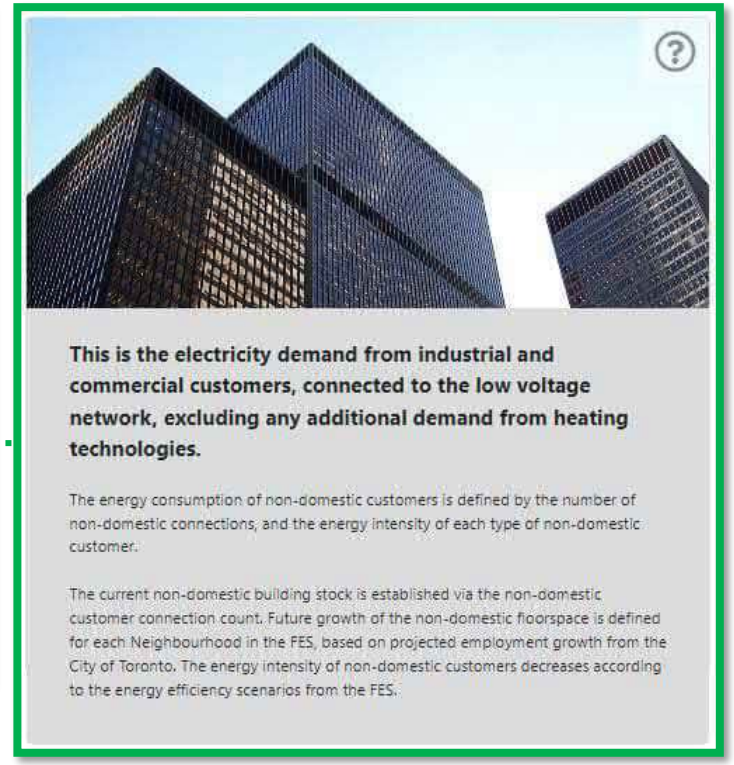
Throughout the FES model, the ? symbol is placed where there is an opportunity to learn more information about something. Users can simply hover their mouse over the symbol and explanatory text will come up.



For example, hovering over the "Domestic Customer Baseload" brings up the below text.



For example, hovering over the "Industrial and Commercial Customer Baseload" brings up the below text.



Overview

FES Model Overview

Accessing the FES Model

Model Functionality

Online Platform

- Landing Page
- Scenario worlds
- **Single Asset Analysis**

Review of functionality

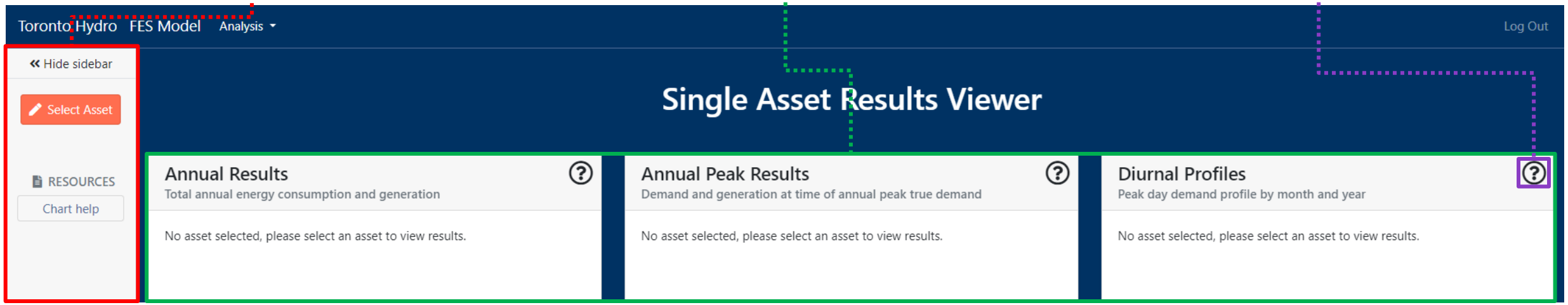
Online Platform – Single asset analysis

Via single asset analysis, users can run the FES model to get a load forecast for a specific asset for a given (custom) scenario. This asset can be a TSBP or the whole network. Results are broken down by technology and can be easily downloaded to CSV files.

The sidebar allows users select an asset (via search or selection) and scenario as well as view supporting information (e.g. chart explanation, category definitions).

The results viewer displays interactive plots including the annual consumption forecast, peak forecast, and demand profiles, all broken down by technology.

Like other pages, the ⓘ symbol is placed where there is an opportunity to learn more information about something. Users can simply hover their mouse over the symbol and explanatory text will come up.



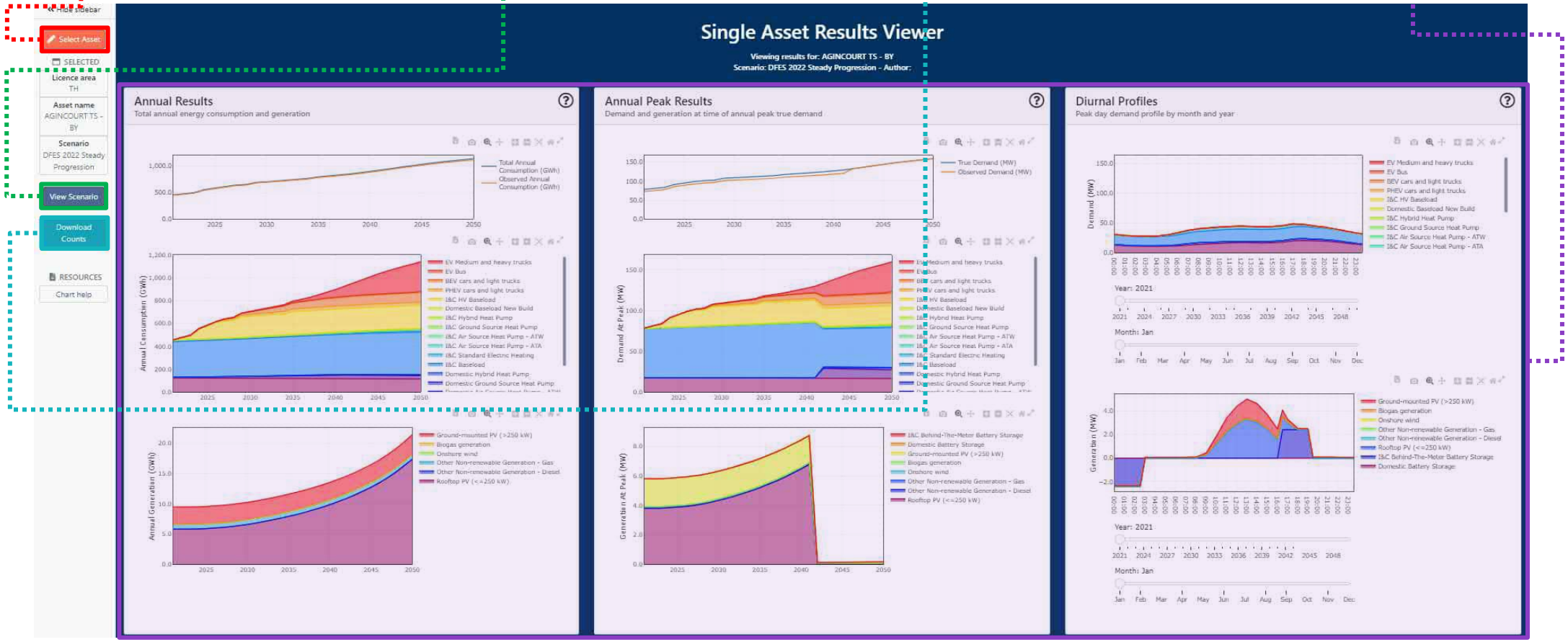
Online Platform – PLE Viewer

Select a substation and scenario to view

View scenario assumptions

Download connection counts by technology

Plots of annual consumption, peak demand, and peak day demand profiles; additional seasonal peak graphs are also available.

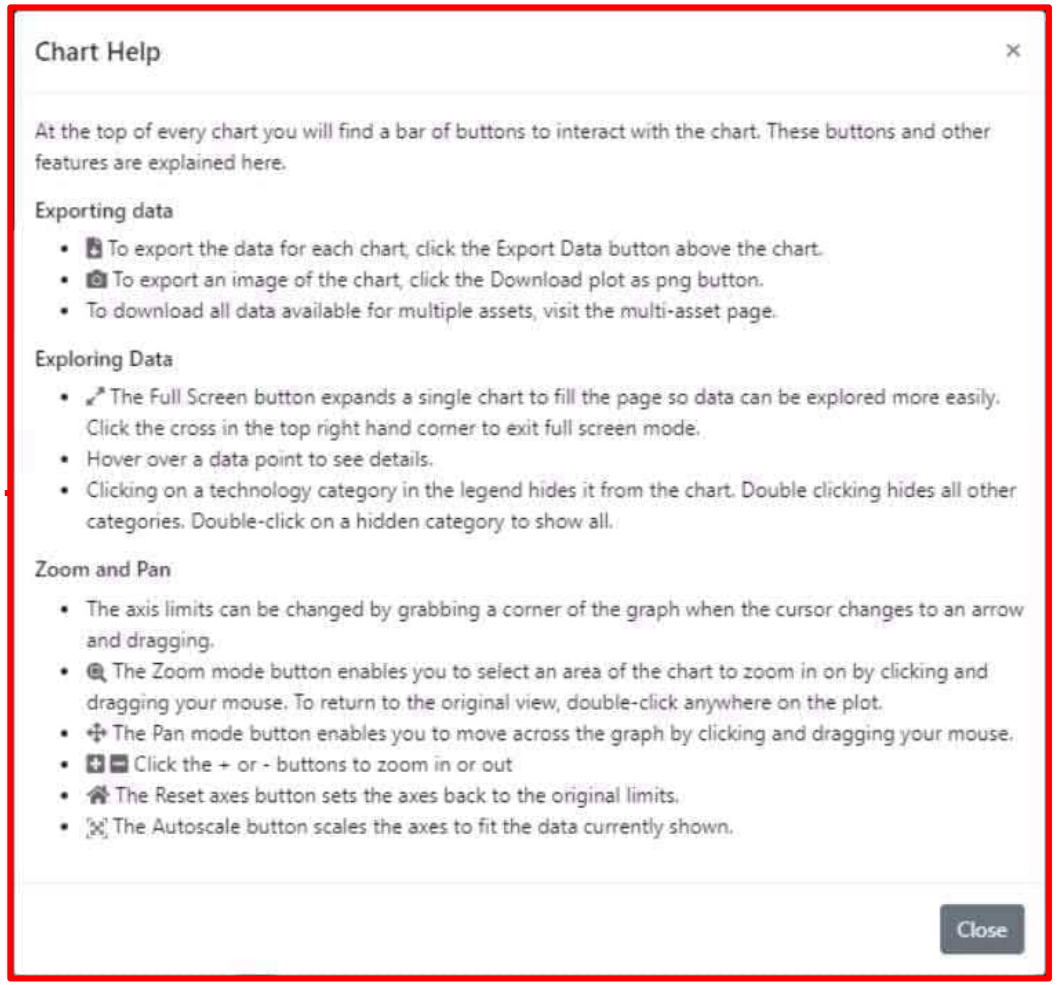


Online Platform – Resources

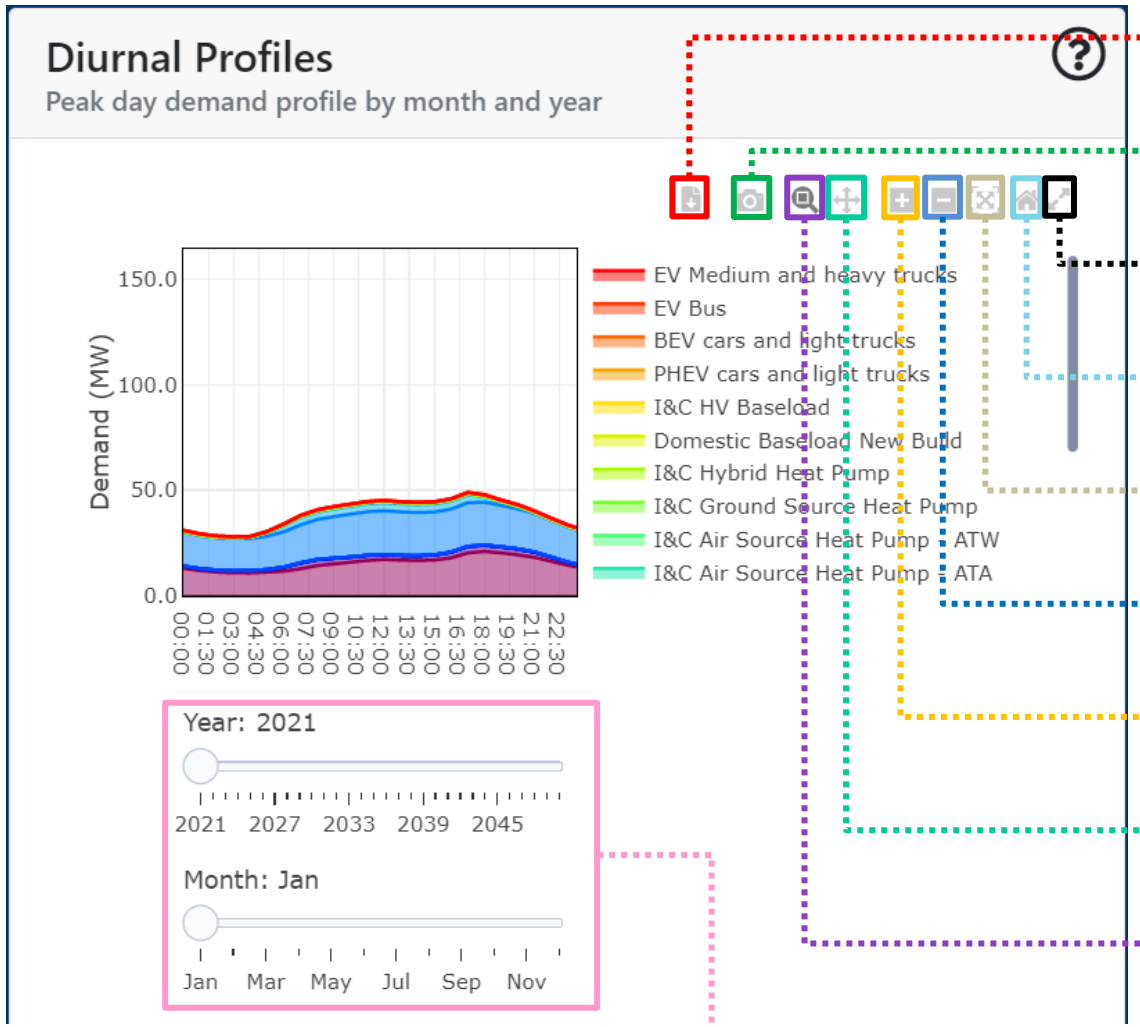
Users can use the sidebar resources as a source of reference when interpreting results.



The “Chart help” describes how to export data, explore the results data in the viewer once produced, and how to manipulate the page via zooming or panning.



Online Platform – Graph options



"Export data" – download data to CSV

"Download plot as png image" – save graph image

"Full screen" – extend the graph to the full screen

"Reset axes" – set axes back to original scale

"Autoscale" – scale axes based on data in graph

"Zoom out" – increase axes scale to show larger range

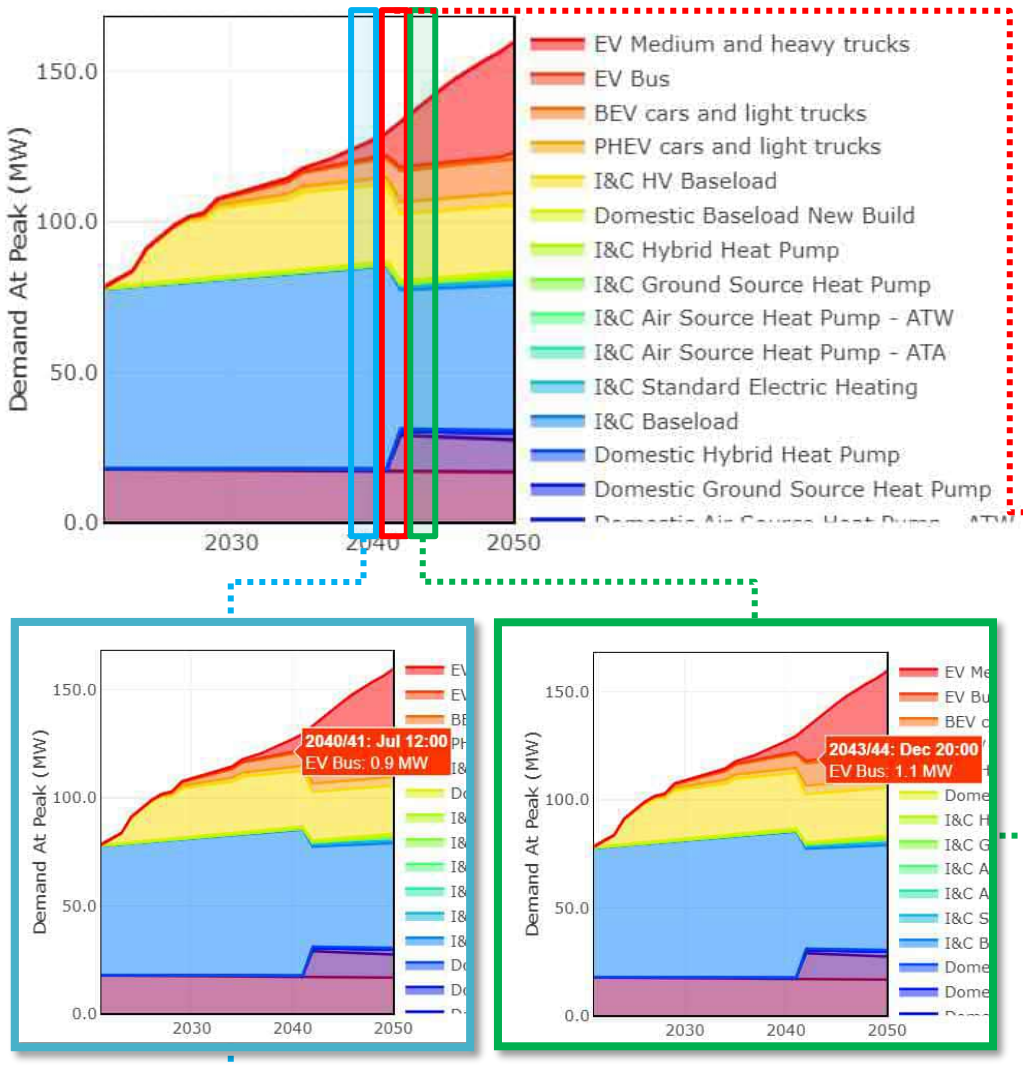
"Zoom in" – decrease axes scale to show smaller range

"Pan" – change mouse tool to scroll through graph

"Zoom" – change mouse tool to highlight to zoom

"Year" and "Month" sliders – slide to show data at different times

Online Platform – Time of peak changes



Users may sometimes see a step-change in certain loads within the annual peak results. These step-changes are due to change in the time of day and/or month of peak demand, and differing contributions of each load type at those different times.

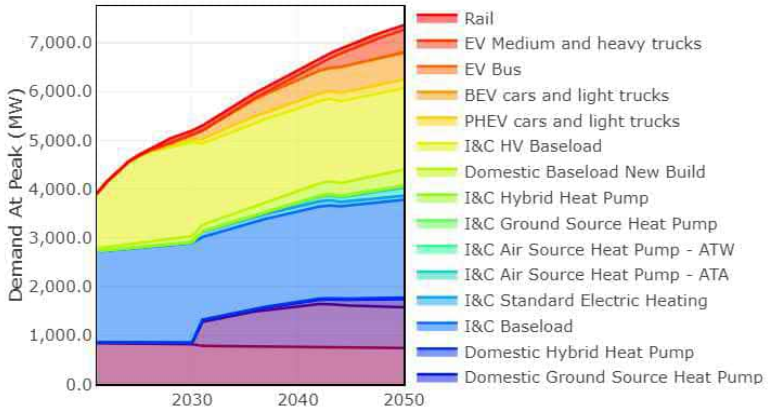
Users can see the step-change in certain load types here.

As an example, hovering over the EV Bus segment, to the **right** of the step-down shows that the peak is in **December at 20:00**.

In contrast, hovering over the EV Bus segment, to the **left** of the step-down, shows that the peak is in **July at 12:00**.

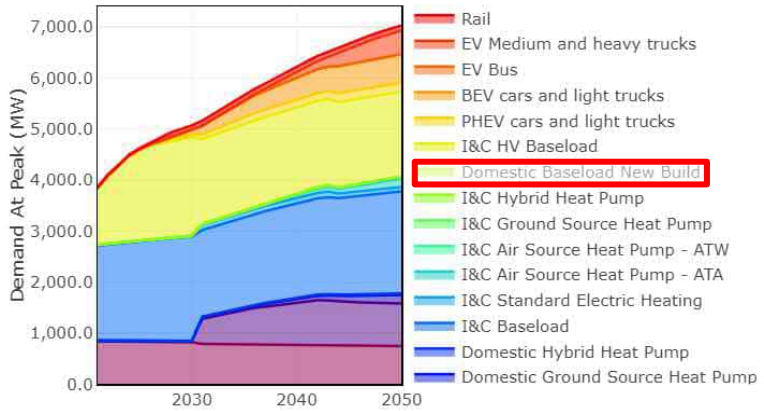
Online Platform – Graphical single- & double-click functions

Standard graphical output



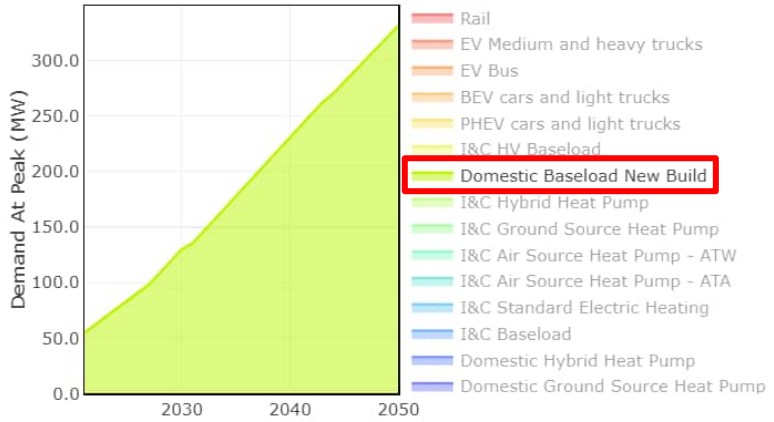
The standard graphical output displays interactive plots broken down by technology.

After a single-click on "Domestic Baseload New Build"



A single-click on one of the technologies displayed in the legend removes that technology from the plot.

After a double-click on "Domestic Baseload New Build"



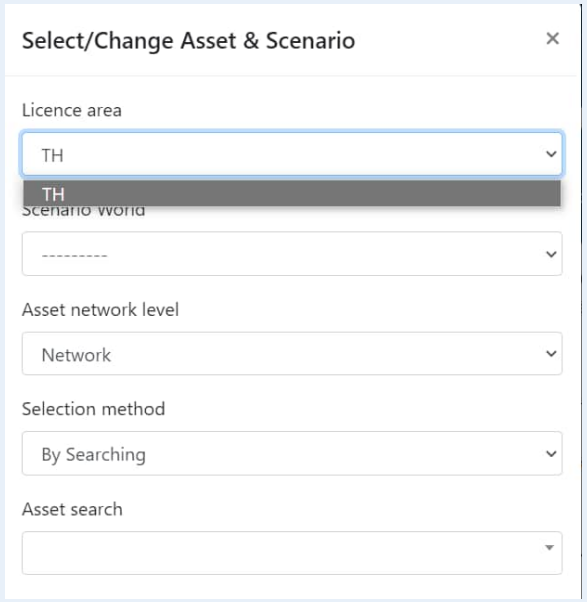
A double-click on one of the technologies displayed in the legend removes all other technologies, focusing on the chosen technology.

Online Platform – Asset Selection

Users can select/change the asset to view in the Single Asset Analysis by going through a list of dropdowns to narrow down to the desired asset for a selected scenario.

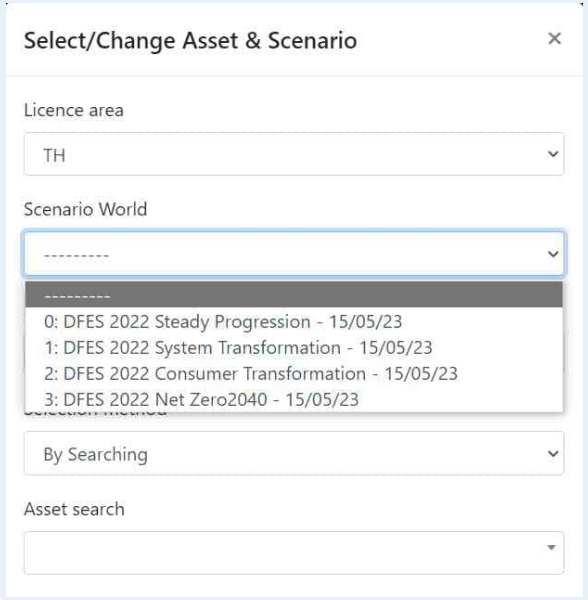
1

Select the licence area (Only TH in this case).



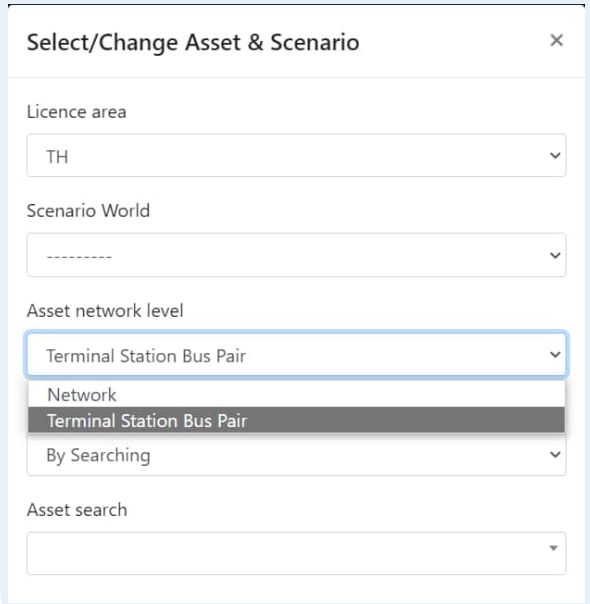
2

Select the scenario world (e.g. one of the DFES scenarios).



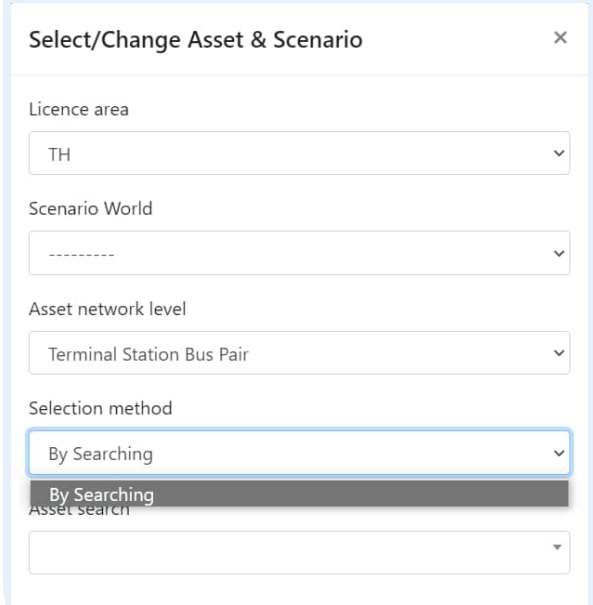
3

Select the asset network level.



4

Select the asset selection method (In this case only by searching).



Overview

FES Model Overview

Accessing the FES Model

Model Functionality

Online Platform

- Landing Page
- Scenario worlds
- Single Asset Analysis

Review of functionality

By now, FES model users should understand how to configure scenarios and run single asset calculations.

Functionality	Details
Scenario configuration	– Ability to load FES model parameters and modify them to create new custom scenarios. – Ability to view user-saved scenarios.
Single asset calculation	– Ability to run the load model for a specific asset for a given (custom) scenario. This asset can be a TS Bus Pair or the TH network. – Ability to display and manipulate interactive plots, including annual consumption forecast, peak forecast, and profiles forecast, with some broken down by technology. – Ability to download a CSV with technology counts/capacities via button.

General Information and System Availability

General Information

- TH users can access the FES model platform on **Google Chrome** or **Microsoft Explorer**.
- TH users can access the FES model via sign-in using their existing Toronto Hydro Microsoft credentials.

System Availability

- The FES model will operate continuously rather than on a start up/shut down schedule.

Contact

If you have any questions, please don't hesitate to get in touch:

Mark Hughes
Partner
+61285868792
redacted

Madhushan Perera
Principal Consultant
+442032065486
redacted

Ian Walker
Partner
+442032065382
redacted

Ivan Antonov
Senior Software Developer Consultant
+442032065299
redacted

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-12

Reference: "the majority of Key Account customers surveyed have goals to reduce their net GHG emissions to zero, and expect Toronto Hydro to support them in meeting their climate objectives by ensuring that the system has capacity for growth and by providing them advisory services to support their decarbonization-through-electrification journey" [Investment Plan Section 3.1] Please provide any references that support this observation (e.g. THESL key account interactions, survey questions, etc.).

RESPONSE – PREPARED BY IRG:

Customers were asked "Does your organization have a carbon reduction program in place? Page 31 of Exhibit 1B, Tab 5, Schedule 1, Appendix A, - Customer Engagement Report, Appendix.06 – Key Accounts shows that a majority (64%) of Toronto Hydro's key account customers had "net zero" targets or carbon reduction initiatives in place at the time of the Phase I Needs and Preferences Survey consisting of:

- 38% reporting carbon reduction targets currently in place, and
- 26% reporting "net zero" targets.

Additionally, page 28 of Appendix.01 – Qualitative Research documents that many key account participants interviewed in Phase I "shared their hopes that Toronto Hydro would increase their support in helping them transition to lower or non-emitting carbon energy sources, building out more distributed energy resources (including battery storage), and enabling grid modernization, such as microgrids technologies".

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-13

Reference: Table 4 Summary Of 2025-2029 Proposed Distribution Rate Change.

QUESTION:

Please confirm that the amounts in each column of the table are incremental, i.e. incremental to previous amount changes and not a cumulative amount.

RESPONSE:

Toronto Hydro confirms the amounts in each column of the table are incremental.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-14

Reference(s): Ontario has announced plans to build 1.5 million additional homes.

PollutionProbe_IR_AppendixA_CanmetReport (Table 1, Page 10)

QUESTION (A):

a) What portion of the 1.5 million homes Ontario announced are expected to be in the THESL service territory?

RESPONSE (A):

Toronto Hydro is unable to provide a response as it cannot speculate the portion of homes to be within its service territory.

QUESTION (B) AND (C):

b) Does THESL encourage new buildings to be self-sufficient (i.e. not connect to the grid), Net Zero or net exporters to the grid? If yes, please provide the information/incentives that THESL uses to encourage this. If not, please explain why not given that it would reduce future system demand.

c) Best available information for Toronto from the Canmet ENERGY Report noted above indicate that new energy efficient home design required 78% less energy (2.6kW compared to older homes at 11.6kW). Please outline what THESL is doing to ensure that new homes align with energy efficient design and technologies.

RESPONSE (B) AND (C):

Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is playing a proactive role in supporting the realization of the City's Net Zero Strategy by

facilitating and stimulating the growth of emerging local cleantech markets. For more information, please see the latest Climate Action Plan status report.[1]

QUESTION (D):

d) Please provide an estimate of the additional demand that would occur on the THESL system if traditional design and technologies are used for new homes and buildings instead of best practice energy efficiency design and technologies.

RESPONSE (D):

Toronto Hydro is unable to undertake the detailed hypothetical analysis that is required to answer this question within the discovery timelines in this proceeding. Furthermore, Toronto Hydro notes that this analysis is not relevant and does not provide probative value to deciding the issues in this proceeding.

[1] https://www.torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-15

Reference: Investment Plan Section 4.4

"Toronto Hydro is committed to reducing its direct GHG emissions (referred to as Scope 1 emissions) in order to mitigate the impacts of climate change and reach "net zero" by 2040"

QUESTION (A):

a) Has THESL committed to a Net Zero target? If no, please provide a copy of the actual commitment and related plan. If yes, please provide a copy of the commitment and related plan.

RESPONSE (A):

Yes, Toronto Hydro has committed to achieving Net Zero by 2040. Please refer to the Net Zero 2040 Strategy in Exhibit 2B, Section D7 and information on the Emissions Reduction measure proposed for the utility's 2025-2029 custom scorecard in Exhibit 1B, Tab 3, Schedule 1.

QUESTION (B):

b) Please explain why THESL is only counting Scope 1 emissions, particularly when Scope 2 emissions are also directly related to THESL operations.

RESPONSE (B):

Toronto Hydro's Net Zero 2040 Strategy only counts Scope 1 emissions because the variability of Scope 2 emissions is influenced by factors outside of Toronto Hydro's control, such as the greenhouse gas ("GHG") emissions associated with electricity generation. For example, although Toronto Hydro reduced the amount of electricity lost from its system during distribution in 2023, net Scope 2 emissions nonetheless increased as more emissions were released during the generation of electricity in Ontario than the previous year.

Nevertheless, Toronto Hydro quantifies, reports on, and actively implements mitigation measures to reduce the portion of Scope 2 emissions the utility can influence. For example, Toronto Hydro is reducing the Scope 2 emissions associated with distribution losses by making the system more efficient through the replacement of legacy outlets and construction standards, including 4 kV distribution assets. Toronto Hydro has also implemented energy efficiency measures such as LED lighting and building automation upgrades in its work centres to minimize Scope 2 emissions associated with electricity consumption.

QUESTION (C):

c) Does THESL use lifecycle carbon (GHG) emission to analyses any of its decisions or operations? If yes, please specify.

RESPONSE (C):

Please refer to subpart (d).

QUESTION (D):

d) Please explain what specific criteria are included in the THESL procurement policies, processes and templates to consider supplier Net Zero commitment and product carbon intensity.

RESPONSE (D):

As part of competitive bidding, Toronto Hydro requires suppliers to provide information related to the efficient use of resources and energy throughout the life cycle of the goods being procured, as well as any energy, water, or fuel-saving features. Additionally, Toronto Hydro assesses new products prior to use with a view to the product's impact on the environment, identification of environmentally preferable alternatives, and end-of-life treatment. The environmental impacts to be compared across the product/service lifecycle include:

i. Waste to landfill
ii. Greenhouse gas emissions

iii. Natural resource use (i.e. if product is made of recycled materials or sustainably harvested resources)

iv. Hazardous waste generation

v. Energy use

vi. Water consumption

vii. Biodiversity (i.e. does the product/service have a negative impact on plants and animals).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-16

Reference: Figure 6: FTE per GWh of Load Served [Investment Plan]

QUESTION:

Please provide a version of Figure 6 that also includes 2023 through 2029 forecasted data. Please also provide the input data (via Excel or other format used)

RESPONSE:

Please see below an analysis of Toronto Hydro FTE per GWh from 2015 through 2029. The data inputs relied on for FTE can be found in Toronto Hydro's Appendix 2-K, while weather normalized GWh inputs can be found on page 1 of Exhibit 3, Tab 1, Schedule 1. Toronto Hydro cannot provide a version of Figure 6 which goes beyond 2022 because this figure relies on historical RRR data for the peer group. Toronto Hydro does not have a forecast of FTE or GWh for the members of the utility peer group.

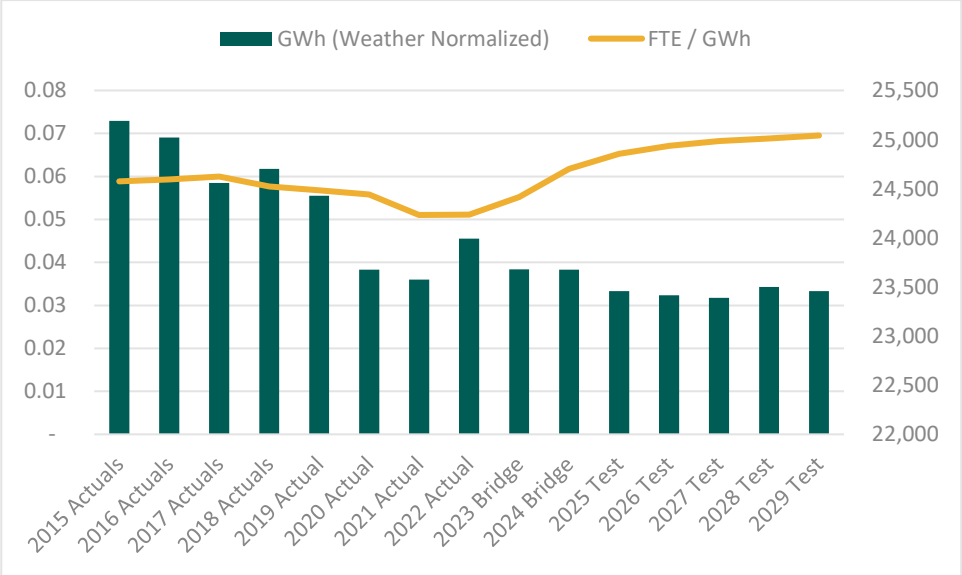


Figure 1: FTE per GWh 2015 to 2029

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-17

QUESTION:

Please explain how the proposed Advanced Distribution Management System is different than the Toronto Hydro Asset and Program Management function which are already supported and budgeted separately. Also, please provide a comparative list of the function, tasks and outcome related to each identifying which are the same or different.

RESPONSE:

The Advanced Distribution Management System ("ADMS") is a software solution that integrates and consolidates functionalities from several systems, such as Toronto Hydro's Outage Management System ("OMS") and Distribution Management System ("DMS"), which handle a wide array of mission-critical outage management and system management functions; Supervisory Control and Data Acquisition ("SCADA"), which enables real-time distribution system monitoring and control; and the Distributed Energy Resources ("DER") Management System or DERMS, which monitors and controls DERs. The primary role of ADMS is to provide power system controllers a platform to efficiently operate the distribution system and to provide the utility with a comprehensive and unified view of the state of the distribution system at any given time by acting as a central hub which pulls data from, and interacts with, this constellation of software and systems. Additional details regarding Toronto Hydro's plans for a ADMS platform are provided in Exhibit 2B, Section D5.2.1.2, and Section E8.4.

In contrast, Asset and Program Management are organizational functions that are primarily focused on strategic sustainment and development of Toronto Hydro's electricity distribution system, and oversight of work program delivery. Additional details regarding Toronto Hydro's Asset Management system are provided in Exhibit 2B, Section D1 and the OM&A expenditures to deliver on this function are discussed in Exhibit 4, Tab 2, Schedule 9.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-18

Reference: Exhibit 1B, Tab 1, Schedule 3, Page 5, Table 5

THESL has indicated that it expects significant growth due to decarbonization, the Energy Transition and related changes. However, Table 5 indicates decreasing load out to 2029. Please reconcile.

RESPONSE:

As outlined in Executive Summary, Exhibit 1, Tab 1, Schedule 1, Toronto Hydro stated that the application is being filed during a time of unprecedented change and transformation, as customers, communities and governments at all levels are actively embarking on an energy transition to mitigate the existential and economic impacts of climate change. This, by definition, requires the utility to invest ahead of load materializing.

Since 2006, Toronto Hydro has experienced a significant decrease in total consumption, including due to conservation activities – both program-driven and naturally occurring. In the early stages of the energy transition, electricity consumption is forecasted to continue to decline, then plateau, and then rise.

To protect both ratepayers and the utility from structural unknowns in forecasted costs and revenues related to demand growth in a time of unprecedented change in the economy and energy system, Toronto Hydro proposes to reconcile the demand-related program and revenue variances as part of the DRVA. As the question and Toronto Hydro both anticipate, the energy transition is more likely to lead to greater revenues, and through the DRVA, those incremental revenues will be tracked and cleared to the benefit of customers.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-19

Reference: **ScottMadden management consultant report, page 6. The report indicates that the UK and New York have created separate cost recovery mechanisms for utilities to fund innovation.**

QUESTION (A):

a) Please provide a copy of the exemplar mechanism summary/documentation links, reports or other information for the UK and New York examples referenced.

RESPONSE (A) - PREPARED BY SCOTTMADDEN:

Please refer to the links below for the UK.

1. RIIO-2 Framework Decision:

https://www.ofgem.gov.uk/sites/default/files/docs/2018/07/riio2_july_decision_document_final_300718.pdf

2. RIIO-ED2 Final Determinations :

https://www.ofgem.gov.uk/publications/riio-ed2-final-determinations

Please refer to the link below for New York.

https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BF3E72300-3F69-442A-A86D-02EB3C3E2890%7D

QUESTION (B):

b) Please provide a table comparing the main similarities and differences between the proposed THESL Innovation Fund and those of the comparator utilities mentioned in the report.

RESPONSE (B) - PREPARED BY SCOTTMADDEN:

Please refer to the table below.

Innovation Fund	Objectives	Characteristics	Cost Recovery Mechanism
THESL Innovation Fund	Facilitate innovation in the electricity sector	Innovative pilot projects over the 2025-2029 rate period that test new technologies, advanced capabilities and alternative strategies that enable electrification grid readiness and are responsive to the OEB's expectations with respect to facilitating DER integration, as expressed in the Framework for Energy Innovation (FEI) report.	Rate Rider
UK RIIO	Deliver a sustainable energy sector. Deliver value for money over the long-term for existing and future customers	**Strategic Innovation Fund**: Ambitious and Innovative projects that help shape the future of the energy networks and accelerate the transition to net zero, at lowest cost to consumers **Network Innovation Allowance**: Innovative projects that facilitate energy system transition and/or benefit customers in vulnerable situations	Included in allowed revenues in RIIO ED-2 price control period
New York REV	Test new business models and partnerships with third parties. Harness the utility platform, expertise, and brand to reduce clean energy costs and barriers while potentially providing new utility value streams	Demonstration Projects that include partnerships between utilities and third-party service providers; deploying advanced distribution systems and explore opportunities to work with various types of customers.	Rate Rider
Nova Scotia	Allow for testing to provide valuable data and learnings, or aid in the development of business cases, prior to full-scale deployment	Projects that provide customer value in some or all of the following areas: 1) Reduce upward pressure on revenue requirement; 2) Provide reliability and grid stability; 3) Support environmental and other government policy compliance; 4) Improve customer experience	Rate Rider
California EPIC	Fund public investments in research to create and advance new energy solutions, foster regional innovation, and bring ideas from the lab to the marketplace	Projects that support one or more of the following goals: 1) Transportation electrification; 2) Distributed energy resource integration; 3) Building decarbonization; 4) Achievement of 100% net-zero carbon emissions and coordination of the role of natural gas; 5) Climate Adaptation	Rate Rider

Toronto Hydro's proposed Innovation Fund is similar to the electric utilities referenced in the report, including the objectives, characteristics, and cost recovery mechanisms.

QUESTION (C):

c) Please confirm that there are no Ontario or Canadian utilities examples that the consultant has identified for comparison. If there are, please provide details.

RESPONSE (C) - PREPARED BY SCOTTMADDEN:

The report includes Nova Scotia. Please refer to Exhibit 1B, Tab 2, Schedule 1, Appendix B, p. 41.

QUESTION (D):

d) Have the example jurisdictions/utilities noted above been used for any of the other benchmarking reports THESL filed in this application? If yes, please indicate which ones.

RESPONSE (D) - PREPARED BY SCOTTMADDEN:

ScottMadden did not review the other benchmarking reports THESL filed in this application.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-20

Reference: Exhibit 1B, Tab 3, Schedule 1, Page 7, Table 1: 2025 - 2029 Performance 1 Incentive Scorecard Measures

QUESTIONS (A) – (B):

a) Please provide a copy of Table 1 noted above and include extra columns to indicate:

- Is the metric existing or new.
- If it is an existing metric, please provide the previous target and actual.
- If it is a new metric, please indicate the average actual based on the current term (2020-2024) data.
- The total $ payout per item if THESL hits the target
- The total net benefit ($) per item if the target is achieved (i.e. the total net benefit before the THESL payout)

b) Please confirm if the proposed payout per metric is 'all or nothing' based on hitting the target or some sort of sliding scale.

RESPONSE (A) – (B):

Please see the responses to 1B-Staff-46, 1B-Staff-52 and 1B-Staff-54.

QUESTION (C):

Will THESL commit to a third-party audit of results prior to any scorecard payout? If not, why not?

RESPONSE (C):

Toronto Hydro does not believe that a third-party audit of results is necessary because (1) the utility has mature processes for reporting performance as part of RRR and the EDS and (2) OEB Staff and

interested parties will be able to test the results through the discovery process in the utility's next rebasing application.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-21

Reference: Exhibit 1B, Tab 3, Schedule 1

Preamble:

For the benefits that can be quantified however, the Investment Plan and Custom Scorecard that underpin the PIM, yields nominal customers benefits that range from approximately $90 million and $216 million over the 2025 to 2029 period, and lifetime benefits in the range of $890 million to over $1.23 billion, as detailed in section 3 below.

QUESTION:

Please provide the breakdown of values and math used to calculate the customer benefit ranges of:

- $90 million
- $216 million
- $890 million to $1.23 billion

RESPONSE:

Please see Table 21 at page 57 of Exhibit 1B, Tab 3, Schedule 1.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-22

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix C

QUESTION (A):

a) Please provide a copy of the following graphs with the specific utilities labelled for each bar on the x-axis (i.e. only Toronto Hydro is noted and not the specific utilities being compared in the graphs)

i. Figure II-1: Customer Density

ii. Figure II-2: IBEW Average Annual Wage

RESPONSE (A) PROVIDED BY UMS GROUP:

Acknowledging that this information was not used as normalizers in the quantitative benchmark, the following charts are provided (See Figure 1 and 2 below). In consideration of our commitment to anonymity to the study participants (as a condition of participation), we must adhere to the alphabetical designations used throughout the study.

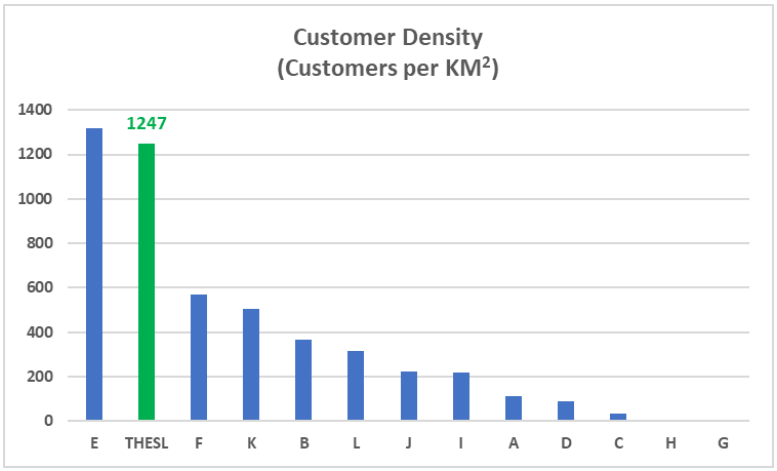


Figure II-1: Customer Density

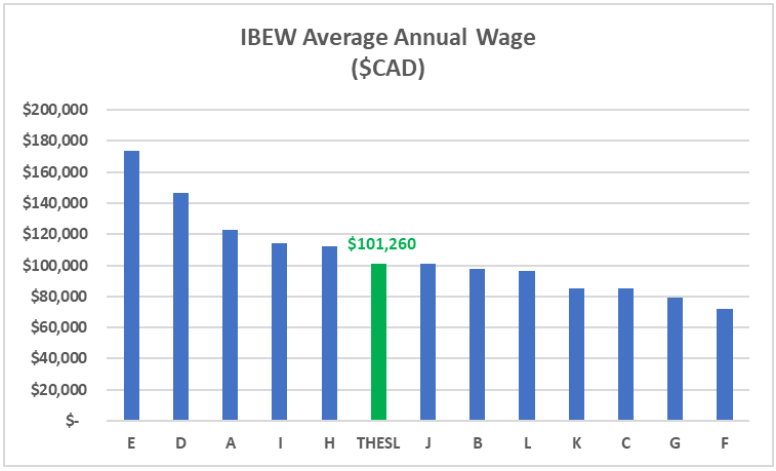


Figure II-2: IBEW Average Annual Wage

QUESTION (B):

b) Please explain how the Peer Group Panel was selected and what characteristics (e.g. population size, rate base, capital envelope, number of assets, etc.) the Peer Group shares with Toronto Hydro.

RESPONSE (B) PROVIDED BY UMS GROUP:

As stated in the Section III – Project Approach (Peer Group Panel) of the referenced UMS Group Benchmarking Study, UMS Group sought to provide comparisons that would be relevant to THESL's operating environment:

- Focusing first on other Province of Ontario electric distribution systems / organizations, we narrowed our consideration to those serving more than 75,000 customers, thus providing nine candidates for further review. UMS Group then compared these utilities relative to 10 data sets presented in the Ontario Energy Board ("OEB") data provided as part of the Activity and Program-based Benchmarking Initiative. (Refer to Appendix B, Figure B-3, and prefacing discussion for a listing of the 10 data sets and a summarization of the analysis). In so doing, we identified Alectra Utilities, Hydro Ottawa, Elexicon Energy, and London Hydro as possible comparators. All four were invited to participate, with Elexicon Energy and London Hydro providing input.

- In parallel, UMS Group reached out to the utilities that had participated in the previous application (EB-2018-0165) and was successful in enlisting the participation of eight (the remaining balance of nine cited varying more pressing priorities amidst constrained resources as their reason for declining participation). Two additional utilities that had been invited but declined last time accepted this time around: Avista Utilities and a Canadian utility that requested anonymity as a precondition to participation. As stated in the Executive Summary of the referenced benchmarking study, these utilities were deemed as valid comparators based on demographics (customer density, vegetation, and weather / climate), and factors that add complexity to field execution (e.g., technical, legislative, regulatory, and bargaining unit constraints / mandates).

To substantiate the appropriateness of the resulting Peer Group Panel, Table III-1 in Section III – Project Approach of the referenced benchmarking study shows that THESL aligns with most members of the Peer Group across four of five external factors that our experience deems most impactful to worker productivity.

QUESTION (C):

c) UMS indicates that Hydro One was excluded because it is not a representative peer for Toronto Hydro. Please confirm and explain why London Hydro is a more appropriate peer than Hydro One for Toronto Hydro.

RESPONSE (C) PROVIDED BY UMS GROUP:

With respect to electric distribution, Hydro One is viewed as predominantly rural, not subject to issues of utility, building, and population congestion, nor the same types of ordinances that can affect productivity. However, we wanted to include other Ontario Utilities, so solicited participation from others deemed as better comparators, notably Alectra, Elexicon, London Hydro, and Hydro Ottawa. Neither Alectra nor Hydro Ottawa were able to support the effort, citing resource constraints due to other overriding priorities.

QUESTION (D):

d) Please explain why Ontario peer utilities (most comparable to Toronto Hydro like Alectra) were not included in the study.

RESPONSE (D) PROVIDED BY UMS GROUP:

Please see the response to part c above. Other Ontario Utilities were solicited, but two (including Alectra) opted out, citing resource constraints due to other overriding priorities.

QUESTION (E):

e) Please explain why UMS included one Anonymous peer in the study analysis rather than excluding that utility, given that there would be no ability to ensure an Anonymous utility is an appropriate benchmark.

RESPONSE (E) PROVIDED BY UMS GROUP:

Though one step further than the norm in maintaining confidentiality (utilities typically accept the notion of an alphabetic designation as sufficient), we did not view the Anonymous Utility as an invalid data point for the task at hand. In fact, it corresponded quite well to the criteria described above and provided us with another Canadian Utility.

QUESTION (F):

f) Please confirm how the study finding would be impacted if the Anonymous utility peer is excluded.

RESPONSE (F) BY UMS GROUP:

While we consider it appropriate to include the anonymous utility, we have assessed the impact of excluding it, as requested. As changes are noted within each Asset Category and Maintenance Program, the general theme underlying Table II-1 in Section II – Executive Summary of the referenced benchmarking study remains intact with the following highlighted (underlined in italic) adjustments:

Generally, THESL is positioned within each of the categories and programs between approximately *2.3% above (previously 1.9% above)*, the Median (barely third quartile) to negative 12.2% below the Median (well-embedded in the second quartile) when combining both benchmarking perspectives.

Table II-1: Benchmark Comparisons ($CAD)

Applying Conversion and Accounting Adjustments Only (Less Anonymous Utility)

			Median	Percent from Median
Asset Categories				
Wood Pole	Each	$8,317	8,134	2.3%
UG Cable (XLPE)	Per Meter	$131	128	2.0%
Pole Top Transformer	Each	$18,691	18,691	0.0%
Pad mount / UG Transformer	Each	$37.373	36,643	2.0%
Network Transformer / Protector	Each	$127,649	129,169	-1.2%
Breaker	Each	$37,983	40,722	-6.7%
Cable Chambers / Manholes	Each	$136,409	135,579	0.6%
Maintenance Programs				
Vegetation Management	Per Line KM	$2,175	2,175	0.0%
Pole Test and Treat	Each	$17	18	-2.0%
Overhead Line Patrol	Per Line KM	$23	26	-12.2%
Substation Maintenance	MVA	$1,712	1,681	1.9%
Building Vault Inspection	Each	$258	268	-3.9%

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 1B-PP-23

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix C, Table D-1

QUESTION (A):

a) Does the list of utilities in Table D-1 represent the full list of current utility data sets UMS has available? If not, please provide the full list.

RESPONSE (A) PROVIDED BY UMS GROUP:

UMS Group does not maintain datasets for unit costs, and those from previous studies are outdated and not reflective of the new market realities resulting from inflation, supply chain challenges, and COVID-related restrictions (only recently being lifted across the industry). Therefore, in embarking on "one-off" studies like that performed for THESL, UMS Group leverages (1) existing relationships (formed over the past 34 years since its inception) to recruit a Peer Group Panel, and (2) the tested and industry accepted comparative modeling and supporting methodologies.

QUESTION (A):

b) Please explain why ATCO Electric was not included as a Peer utility.

RESPONSE (B) PROVIDED BY UMS GROUP:

We contacted ATCO Electric to no avail. We understand that resource constraints amidst other more urgent priorities precluded their participation.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-01

Reference: Exhibit 1B

Please update the following to include 2023 actuals:

a. Ex.2A-1, p.2, Table 1 and 2
b. Appendix 2-AA
c. Appendix 2-AB
d. Ex.2A-1-1, Appendix A
e. Appendix 2-BA
f. Appendix 2-H
g. Appendix 2-IB
h. Appendix 2-JC

RESPONSE:

a) Please see Table 1 for updated 2023 actuals and 2024 forecast. Toronto Hydro intends to file an update to 2025-2029 forecasts for Table 2 prior to the Technical Conference.

Table 1: 2020-2024 Rate Base Summary ($ Millions)

	OEB Approved	Actuals				Bridge
	2020	2020	2021	2022	2023[1]	2024
Opening PP&E NBV	4,229.4	4,233.2	4,419.2	4,628.1	4,893.9	5,227.4
In-Service Additions[2]	527.4	447.9	485.2	554.4	594.7	619.8

[1] Includes a preliminary estimate of Working Capital Allowance. The finalized amount will be filed for the 2023 reporting year on April 30, 2023 per RRR Filing Guide
[2] Includes disposal of properties

Depreciation	(265.4)	(262.0)	(276.2)	(288.7)	(261.2)	(277.8)
Closing PP&E NBV	4,491.3	4,419.2	4,628.1	4,893.9	5,227.4	5,569.4
Monthly Avg PP&E NBV	**4,298.6**	**4,284.3**	**4,457.7**	**4,686.3**	**4,960.0**	**5,327.0**
Working Capital Allowance	216.2	249.8	217.2	220.7	216.8	230.3
Rate Base	**4,514.8**	**4,534.1**	**4,674.9**	**4,907.0**	**5,176.8**	**5,557.3**

b) Please see Toronto Hydro's response to interrogatory 2A-Staff-104, Appendix A, for updates for 2023 actuals and updated 2024 forecast in Appendix 2-AA.

c) Please see Toronto Hydro's response to interrogatory 2A-Staff-104, Appendix B, for updates for 2023 actuals and updated 2024 forecast to Appendix 2-AB.

d) Please see Appendix A to this response for updates to Exhibit 2A, Tab 1, Schedule 1, Appendix A for 2023 actuals and 2024 forecast update

e) Please see Appendix B to this response for updates to Appendix 2-BA for 2023 actuals and updated 2024 forecast.

f) Please see Appendix C to this response for updates to Appendix 2-H for 2023 actuals.

g) The request entails complex modelling to update the load forecast to include 2023 as a historical actual year and the regression equations to forecast 2024 to 2029. Toronto Hydro is unable to undertake the detailed modelling required to update the OEB model within the interrogatory timelines. However, as noted in the letter filed with its Evidence Update on January 29th, Toronto Hydro intends to update this model to reflect 2023 actuals and the updated 2025-2029 forecast on April 2nd prior to the Technical Conference.

h) Please refer to Toronto Hydro's response to interrogatory 4-SEC-89, subpart (c).

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-2

Reference: Exhibit 1B

QUESTION:

Please provide a copy of Toronto Hydro's most recent business plan.

RESPONSE:

The requested information is provided as part of the response to 1A-CCC-04.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-3

Reference: Exhibit 1B

QUESTION:

Please provide a copy of Toronto Hydro's corporate scorecard for each year between 2020 and 2024 and provide the year-end result for each measure.

RESPONSE:

Please see Tables 1-4 below. Please note that Toronto Hydro's performance metric definitions and scope may differ from those outlined in regulatory and/legislative reporting. Furthermore, the scorecard for 2024 has not been provided as the year end results are not yet available.

Table 1: 2020 Corporate Scorecard

Key Performance Indicator	2020 Target	2020 Result
New Services Connected on Time	97.7%	99.7%
Estimated Time of Restoration	60%	89%
First Contact Resolution	86%	92%
Total Recordable Injury Frequency (TRIF)	1.3	0.58
Employee Engagement	5.5	9.0
SAIFI (number)	0.50	0.40
SAIDI (minutes)	26.47	21.82
In-Service Assets ($M)	423.1	438.0
Consolidated Net Income ($M)	146.9	156.0
Cash Flow Management ($M)	1,000.0	360.0

Table 2: 2021 Corporate Scorecard

Key Performance Indicator	2021 Target	2021 Result
New Services Connected on Time	98.0%	99.9%
Estimated Time of Restoration	75%	90%
First Contact Resolution	86%	91%
Total Recordable Injury Frequency (TRIF)	1.15	0.56
Employee Engagement	7.0	9.4
SAIFI (number)	0.50	0.46
SAIDI (minutes)	26.47	21.35
In-Service Assets ($M)	420.8	452.3
Consolidated Net Income ($M)	140.2	156.8
Cash Flow Management ($M)	469.0	325.0

Table 3: 2022 Corporate Scorecard

Key Performance Indicator	2022 Target	2022 Result
New Services Connected on Time	98.0%	99.9%
Estimated Time of Restoration	85%	94%
First Contact Resolution	86%	92%
Total Recordable Injury Frequency (TRIF)	1.1	0.47
Employee Engagement	7.5	10.9
SAIFI (number)	0.50	0.46
SAIDI (minutes)	26.47	20.38
In-Service Assets ($M)	460.0	450.5
Consolidated Net Income ($M)	156.0	165.7
Cash Flow Management ($M)	532.0	655.0
Fleet Electrification	5%	9%
Building Emissions Reduction	2213.6	2001.2

1 **Table 4: 2023 Corporate Scorecard**

Key Performance Indicator	2023 Target	2023 Result
New Services Connected on Time	98.0%	99.9%
Estimated Time of Restoration	85%	96%
First Contact Resolution	86%	92%
Total Recordable Injury Frequency (TRIF)	1.00	0.30
Employee Engagement	8.0	10.5
SAIFI (number)	0.50	0.33
SAIDI (minutes)	26.47	15.07
In-Service Assets ($M)	499.7	507.1
Consolidated Net Income ($M)	133.0	139.9
Fleet Electrification	13%	20%
Building Emissions Reduction	2191.5	1657.2

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-4

Reference: Exhibit 1B

Please provide a copy of all materials provided to the Toronto Hydro's Board of Directors' in seeking approval of the application and the underlying budgets.

RESPONSE:

Please see the Toronto Hydro's response to 1A-CCC-01.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-5

Reference: Exhibit 1B

QUESTION:

Please provide a copy of all third-party benchmarking analyses, studies, reports, and/or similar documents, undertaken for, by, or that include Toronto Hydro, since 2020, that are not already included in this application, regarding any aspect that directly or indirectly relates to a material aspect of Toronto Hydro's budget or aspect of its business.

RESPONSE:

Please see the table below for a list and description of the requested information. Toronto Hydro is filing the following reports as appendices to this response.

Third-Party Benchmarking	Description	Appendix
THESL Fleet Benchmarking Findings and Recommendations	METSCO performed an industry research scan to help THESL determine how its indicators compared to other electric utilities across North America as well as determine if there are any additional metrics it should be tracking.	A
THESL Fleet EV Benchmark Addendum	June 2023 Addendum completed by METSCO of THESL's fleet benchmarking.	B
Toronto Hydro - Executive Compensation Review Summary Results	Mercer (Canada) Limited assessed the competitiveness of Toronto Hydro's executive compensation.	C

Third-Party Benchmarking	Description	Appendix
SGIN-Utility-Scorecard-Results_2023-12-19	Smart Grid Innovation Network (SGIN) smart energy bookmarking initiative benchmarked 12 electric utilities' current state (baseline year 2021) in the clean energy transition.	D

Toronto Hydro is in the process of obtaining disclosure consent from the third parties that authored the reports referenced below, and will file the reports as appendices to this response as soon as reasonably possible.

Third-Party Benchmarking	Description
2021 Utility Grid Modernization Benchmark Study	Accenture developed a benchmarking study for another utility to understand the current grid modernization maturity landscape. As a participant in the benchmarking study, Toronto Hydro received a copy of the report.
Grid Modernization Benchmarking Results	Accenture developed a benchmarking study for another utility to understand the current grid modernization maturity landscape. As a participant in the benchmarking study, Toronto Hydro received a copy of the report and Toronto Hydro's responses to the survey.
Final Report May 2022 Toronto Hydro Fleet Vehicle Key Metric Benchmarking Study	Fleet Challenge Canada Inc. completed a fleet vehicle key metric benchmarking study to explore new and additional key metrics to accelerate, expand and build on Toronto Hydro's capacity to measure the performance of its fleet.
THESL Auto FLISR Assessment – Presentation	TRC Companies, Inc. completed an assessment to identify key aspects, risks and mitigations for fault location, isolation, and service restoration (FLISR), with a final report and presentation.
THELS Auto FLISR High-Level Assessment	TRC Companies, Inc. completed an assessment to identify key aspects, risks and mitigations

Third-Party Benchmarking	Description
	for fault location, isolation, and service restoration (FLISR), with a final report and presentation.
Toronto Hydro ESG Disclosure Maturity Assessment	PwC Canada conducted a review to help Toronto Hydro understand its overall ESG disclosure maturity, including a current state assessment and comparative analysis of disclosed leading practices.

METSCO
MAKING IT POSSIBLE

Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
1B-SEC-5
Appendix A
FILED: March 11, 2024
(37 Pages)

THESL Fleet Benchmarking

April 2023



METSCO
MAKING IT POSSIBLE

AGENDA

- Executive Summary
- Ontario Peer Fleet Benchmark
- North America Benchmark

DRAFT

Summary

Need: THESL relies on its vehicle fleet to perform electricity distribution activities safely and efficiently. The Fleet & Facilities team justifies the prudency of the program, with the aim of ensuring reliable vehicle operation and managing assets at the lowest overall lifecycle costs.

Analysis: METSCO performed an industry research scan to help THESL determine how its indicators compared to other electric utilities across North America as well as determine if there are any additional metrics it should be tracking.

Output: The output of the analysis was structured within four categories: utility service metrics, fleet maintenance/utilization metrics, fleet expenditure metrics and additional supporting metrics. METSCO's conducted research was unable to conclusively determine whether THESL's fleet program is suitable for its intended purpose. However, the research suggests that THESL's fleet size may be insufficient to efficiently serve its entire circuit line compared to other similar companies.

Next Steps: THESL's fleet management team can consider the analysis and output of the benchmark into its upcoming CIR narrative in order to justify the prudency of its overall fleet program.

DRAFT

Project Approach

- In collaboration with THESL, utility characteristics were identified for THESL to inform selection of peer utilities.

- The count of peer utilities and grouping was established at the beginning of the project. Peer utilities were separated into two regions:
  - **Ontario region**: Hydro Ottawa, Hydro One, Alectra, and Elexicon.
  - **North America region** (excluding Ontario): Three anonymized utilities (two from Canada and one from the United States).

- METSCO categorized its analysis to the following KPI categories:
  - **Utility Service Metrics:** such as number of customers, number of fleet vehicles, customer growth projections and general service characteristics such as size of service territory, customer density, vehicle density, and length of underground cables.
  - **Fleet Maintenance / Utilization Metrics:** such as maintenance and repair timelines, average lifecycle per vehicle type, optimal lifecycle per vehicle type, and average kilometers driven per vehicle type.
  - **Fleet Expenditure Metrics:** such as annual fleet OM&A expenditure, OM&A per vehicle, annual CAPEX, CAPEX per vehicle, and forecast comparisons.
  - **Additional Support Metrics:** additional support metrics identified through the research that did not fit with the above categories. These KPIs are utilized by other peers that THESL may consider as part of its Fleet Management program.

DRAFT

Benchmark Limitations

- There were challenges encountered while attempting to find fleet management programs to compare with THESL's fleet:
  - Limited standardization of disclosed metrics across utilities. This was more evident across North American peers versus Ontario peers.
    - The evidence presented in the last DSPs of HONI and Hydro Ottawa indicates that there are variable fleet benchmarks, and the metrics favor their own performance.
  - Ontario DSPs are filed at different time periods so fleet programs are captured at different time snapshots
  - Utility methodologies are not standardized or publicly available.
  - Little information available with respect to fleet metrics across North American utilities, which limited selection of peers to those who had statistics available.
  - Limited information available in terms of annual OM&A expenditures.
  - Large range of benchmark statistics a result of limited analytical capacity outside the utilities selected.

- The benchmark limits additional factors in the analysis, though they can be inferred through the presented information:
  - Climate/weather impacts on vehicles.
  - Road conditions and the associated impacts on vehicle wear and tear.

METSCO
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Utility Service Metrics

DRAFT

Taking into consideration THESL's fleet size, customer count, service area and underground line:

- THESL's fleet serves the most customers per vehicle compared to peers.
  - This may indicate THESL's fleet size is undersized for the customer count.
- THESL's fleet has the highest vehicle density among its peers.
  - It is possible that the fleet size of THESL is larger than necessary for the area covered by the fleet program.
- THESL's fleet serves the highest underground cable (and total circuit length) per vehicle compared to the average of peers.
  - This may indicate THESL's fleet size is undersized for servicing it's system.

Grouping	Customers per Vehicle	Sq. KM per Vehicle	UG Cable (KM) per Vehicle	Total Circuit Length (KM) per vehicle
THESL	2,030.1	1.6	35.4	75.2
Ontario Peer Average (excluding HONI)	1,519.4	42.4	31.3	48.5
Ontario Peer Average (including HONI)	1,183.3	32.6	23.8	40.2
Select North American Peers	1,041.2	142.0	5.2	-

Note: values include all vehicle types

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Maintenance/Utilization Metrics

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The following observations are made for THESL's maintenance metrics:

- Peers use a 'Medium Duty' class whereas THESL does not and is absent from the table.
- Peers outside Ontario disclose only year values versus kilometer.
- THESL's light and heavy vehicle class has a high year-low kilometer pairing whereas its peers exhibit the reciprocal.
    - No evidence was found to indicate which pairing is optimal for managing a fleet program or identifying if a fleet program is right-sized for its intended system.

Grouping	Light Duty		Heavy Duty	
	Yrs	KM	Yrs	KM
THESL	8.6	136,000	12.5	200,000
Ontario Peer Average (excluding HONI)	7.3	183,000	11.8	300,000
Ontario Peer Average (including HONI)	7.5	182,500	11.8	312,500
Select North American Peers	8.2	-	10.8	-

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Fleet Expenditure Metrics

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Taking into consideration THESL's annual CAPEX program for its fleet:

- THESL has the highest CAPEX intensity among its peers, excluding HONI, and this CAPEX has the most significant impact on its customers.
- Compared to utilities outside of Ontario, THESL has a lower CAPEX impact on its customers. However, the annual CAPEX programs of these peers are almost three times higher than THESL's due to the larger customer and service area they serve.
  - It is uncertain whether THESL's fleet CAPEX is excessive or insufficient, but the presented averages suggest that THESL's program may be somewhat higher than that of its Ontario counterparts.

Grouping	Annual CAPEX	CAPEX per Customer (Forecast)	CAPEX per Vehicle (Forecast)
THESL	$8,900,000	$11.33	$22,998
Ontario Peer Average (excluding HONI)	$4,131,000	$7.93	$12,222
Ontario Peer Average (including HONI)	$9,658,000	$10.50	$9,963
Select North American Peers	$25,504,500	$19.25	$7,029

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Additional Support Metrics

- METSCO's research revealed various fleet metrics and KPIs, but it is unclear whether all of them are reported or utilized to inform fleet management programs.
- METSCO has suggested a set of KPIs for THESL to consider incorporating, but it may not be feasible to compare THESL's performance against its peers using these KPIs.

	Cost	Safety	Environmental	Service
Peer Identified	- Annual OM&A	- Route Adherence (comparing routes driven with optimal routes) - Mean Km Between Defect - Preventative Maintenance Compliance	- Avg. Fuel Efficiency per Vehicle Type (L/ 100km) - Avg. Energy Efficiency (kWh/km)	- Duty Cycle – average daily mileage and maximum daily mileage of existing fleet - Total Charging Energy Requirement - Summer vs. Winter kWh/km - Vehicle Equivalency: Weighting factor based on expected labour hour requirements

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Recommendations

Based on the aforementioned metrics, it is inconclusive with the available information that THESL's current fleet program is fit-for-purpose. The following has informed this opinion:

- However, the research suggests that THESL's fleet size may be insufficient to efficiently serve its entire circuit line compared to other similar companies.
- Although THESL has a high density of customers and customer count per vehicle, their service territory is relatively small and contiguous, which suggests that their vehicles may accumulate less mileage. This is supported by the fact that they have a lower number of square kilometers per fleet vehicle compared to other utilities.
- When compared to North American peer utilities, THESL's capital expenditure per fleet vehicle is relatively high, which is likely due to necessary fleet replacement, upgrading, and procurement from the varying traffic patterns THESL is exposed to versus its peers.

At the same time, our analysis suggests THESL can consider the following:

- Some peers have different lifecycles for their vehicles compared to THESL. THESL's optimal lifecycle configurations may need revision or re-examination through annual equivalent cost metrics considering their fleet replacement strategy.
- To improve their fleet asset lifecycles, it may be beneficial for THESL to reevaluate their fleet maintenance and replacement schedules, as they currently have longer timelines than most of their Ontario peers. Shortening these timelines could potentially have a positive impact.
- It may be beneficial for THESL to explore the feasibility of incorporating additional KPIs in order to enhance and optimize their fleet management program to better serve their unique operating area.

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Ontario Peer Fleet Benchmark

Ontario Utility Baseline Analysis

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	# of Vehicles	# of Customers
THESL	387	785,667
Hydro Ottawa	277	353,315
Hydro One	8,227	1,439,974
Alectra	560	1,069,683
Elexicon	125	171,564

- Note: Hydro One stats cover both distribution and transmission.
- THESL's fleet count is 30% lower than the highest distribution-only utility - Alectra.
- THESL's customer count is third lowest of the Ontario peers.

Source: **2021 Electric Utility Yearbooks / DSP Submissions**
Ontario Energy Board. (2023). *Natural gas and electricity yearbooks* [Data]. https://www.oeb.ca/ontarios-energy-sector/performance-assessment/natural-gas-and-electricity-utility-yearbooks

Ontario Utility Service Analysis

	Service Area (Sq. KM)	Urban Service Area (%)	Customers per Sq. KM	Customers per Vehicle	Sq. KM per Vehicle
THESL	630	100%	1247.09	2030.1	1.63
Hydro Ottawa	1,116	40.7%	316.59	1275.5	4.03
Hydro One	961,154	0.1%	1.50	175	3.4
Alectra	1,923	42.8%	556.26	1,910.1	6.3
Elexicon	788	79.6%	217.72	1,372.5	116.8

- THESL has the highest density of customers (2.25 x higher than Alectra, almost 4x higher than HOL)
- THESL is only utility with a 100% urban service area – Elexicon is second with urban service area of 79.6%
  - One could argue that stop-and-go traffic occurs more frequently in urban areas than in rural areas.
  - The performance of a vehicle is more affected by stop-and-go traffic.
  - Higher maintenance costs can result from the impact of stop-and-go traffic on vehicles.
- THESL has the highest customers per vehicle - 71% more than the average of peers, 34% higher if Hydro One is excluded.
- THESL has lowest service area per vehicle (excluding Hydro One, outperforms peer average by 57%)

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Source: **2021 Electric Utility Yearbooks**
Ontario Energy Board. (2023). *Natural gas and electricity yearbooks* [Data]. https://www.oeb.ca/ontarios-energy-sector/performance-assessment/natural-gas-and-electricity-utility-yearbooks

Ontario Utility Service Analysis

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- THESL's underground cable circuit length is second highest (2.6x more on average than peers).
  - Second highest length of underground cable per vehicle
- A similar observation can be made with the total circuit length per vehicle – THESL is on the higher end of the spectrum which may indicate its fleet is undersized to meet the requirements of the system.

	UG Cable Circuit Length (KM)	Total Circuit Length (KM)	Underground Line (KM) per Vehicle	Total Circuit Length (KM) per Vehicle	Underground / Total Line (%)
THESL	13,681	29,087	35.4	75.2	47%
Hydro Ottawa	3,234	6,000	11.7	21.7	54%
Alectra	37,104	51,872	66.3	92.6	72%
Elexicon	1,970	3,919	15.8	31.4	50%
Hydro One	10,432	124,556	1.3	15.1	8%

Source: **2021 Electric Utility Yearbooks**
Ontario Energy Board. (2023). *Natural gas and electricity yearbooks* [Data]. https://www.oeb.ca/ontarios-energy-sector/performance-assessment/natural-gas-and-electricity-utility-yearbooks

Ontario Utility Service Analysis

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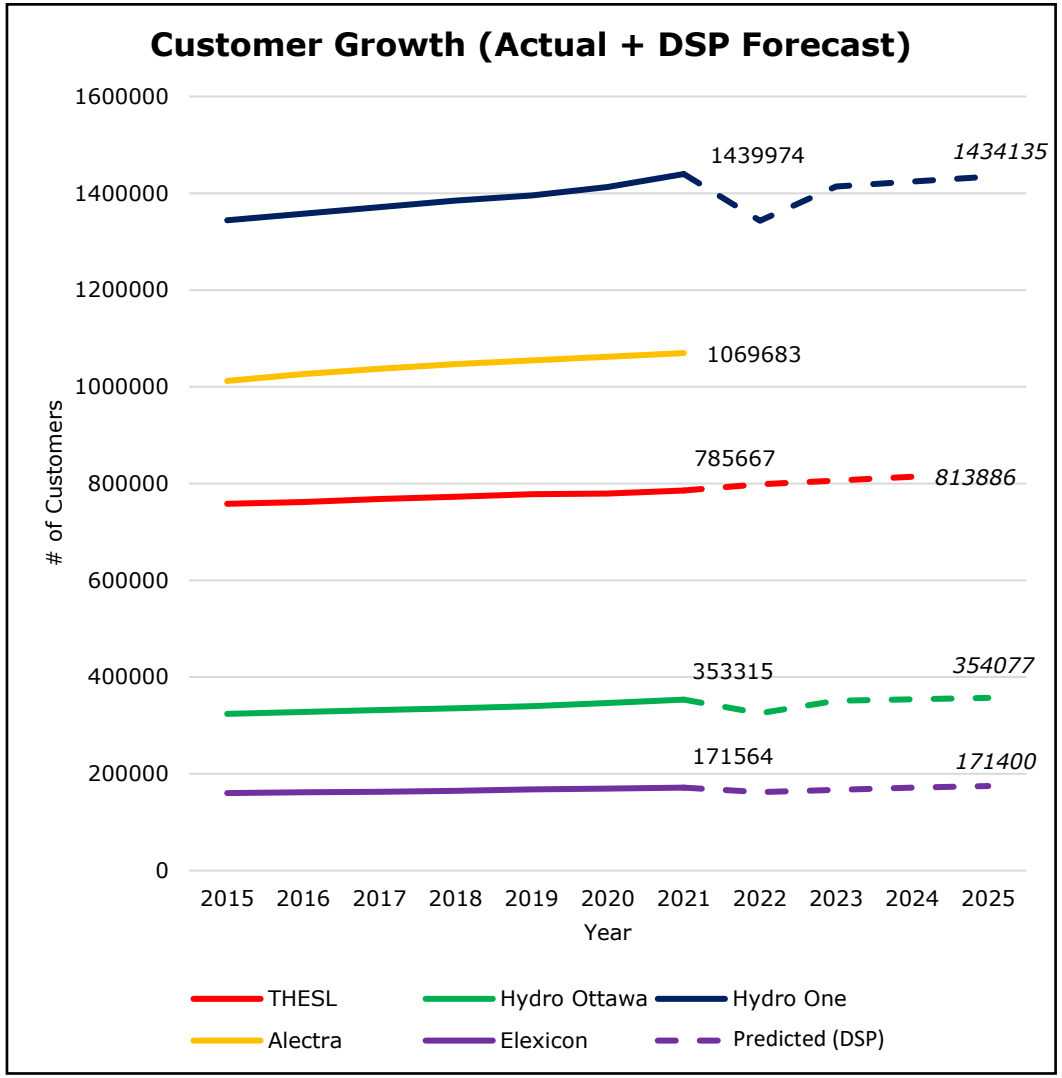
- THESL had lowest average annual growth of all peer utilities
- Based on DSP forecasts, THESL's customer per vehicle ratio would increase to 2103 without the addition of extra vehicles
  - THESL vehicle count would need to rise to 400 (+13) to maintain current customer per vehicle ratio.



	Bridge Year	Yearly Average Growth (Actual)	Forecasted Customer per Vehicle (2024)
THESL	2018-2019	0.59%	2103
Hydro Ottawa	2020	1.46%	1278
Alectra	2019	0.93%	N/A
Elexicon	2021	1.14%	1371
Hydro One	2022	1.15%	173

Source: **2021 Electric Utility Yearbooks / DSP Submissions**

Ontario Energy Board. (2023). *Natural gas and electricity yearbooks* [Data]. https://www.oeb.ca/ontarios-energy-sector/performance-assessment/natural-gas-and-electricity-utility-yearbooks

Ontario Fleet Maintenance Analysis

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- THESL fleet incorporates 15 types of vehicles and trailers
  - 6 light vehicle types and 9 heavy vehicle types
  - Unlike other peer utilities, THESL does not identify any vehicles as "medium-class"
- Light vehicles are assessed at 8.6 years and 136,000km, on average.
- Heavy vehicles are assessed at 12.5 years and 200,000km, on average
  - Midpoint is used to determine average for vehicle categories with a range of values.
- Vehicles considered "medium" at other utilities include step vans, walk-through body trucks, dump trucks and flatbed trucks.

THESL Maintenance Characteristics (LCA/DSP)	Vehicle Class (DSP)	Life Cycle (Years)	Life Cycle (KM)
Car	Light	9	120,000
Cargo Minivan	Light	7	140,000
Passenger Minivan	Light	9	120,000
Full Size Van	Light	10	135,000
Pick-Up	Light	9	180,000
SUV	Light	8	120,000
Cube Van	Heavy	12-15	180,000
Single-Bucket Van Mount Aerial Device	Heavy	11	210,000
Cable Truck	Heavy	11-14	240,000
Crane Truck	Heavy	10-14	210,000 or 240,000
Dump Truck	Heavy	8-12	210,000
Line Truck	Heavy	13	195,000
Double Bucket Aerial Device	Heavy	14	210,000
Digger-Derrick	Heavy	13	195,000 or 210,000
Trailers	Heavy	20	N/A

Source: THESL **- LCA Report** / THESL **- DSP**

Ontario Fleet Maintenance Analysis

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Utility	Light-Duty	Medium-Duty	Heavy-Duty	Trailers	Other
THESL*	8.6 yr/ 136,000 km	Not Available	12.5 yr./ 200,000 km	20 yr.	Not Available
Hydro Ottawa	10 yr./ 150,000 km	12 yr./ 150,000 km	12-15 yr./ 200,000 km	Not Available	15 yr.
Hydro One**	8 yr./ 180,000 km	Not Available	11.5 yr./ 350,000 km	Not Available	Not Available
Alectra	7 yr./ 250,000 km	10 yr./ 250,000 km	12 yr./ 500,000 km	15 yr.	Not Available
Elexicon	5 yr./ 150,000 km	Not Available	10 yr./ 200,000 km	12 yr.	15 yr.

- THESL can be seen as maintaining their fleet more frequently/sooner than its Ontario peers.
- THESL's light and heavy vehicle class has a high year-low kilometer pairing whereas its peers exhibit the reciprocal.
  - This may be contributed by the various operating conditions the fleet is in (for example THESL is in a 100% urban-based that can experience more wear and tear on vehicles versus other peer service areas).
  - No evidence was found to indicate which pairing is optimal for managing a fleet program or identifying if a fleet program is right-sized for its intended system.
- Unlike other peer utilities, THESL does not identify any vehicles as "medium-duty". This can present an opportunity to THESL to introduce a new class to their fleet with supporting maintenance programs.

*Averages based on Vehicle Classes presented in Section E8.3 of 2018 DSP
** THESL Vehicle Classes applied to HONI Vehicles

Source: OEB.ca – **Utility DSPs**

Ontario Fleet CAPEX Analysis

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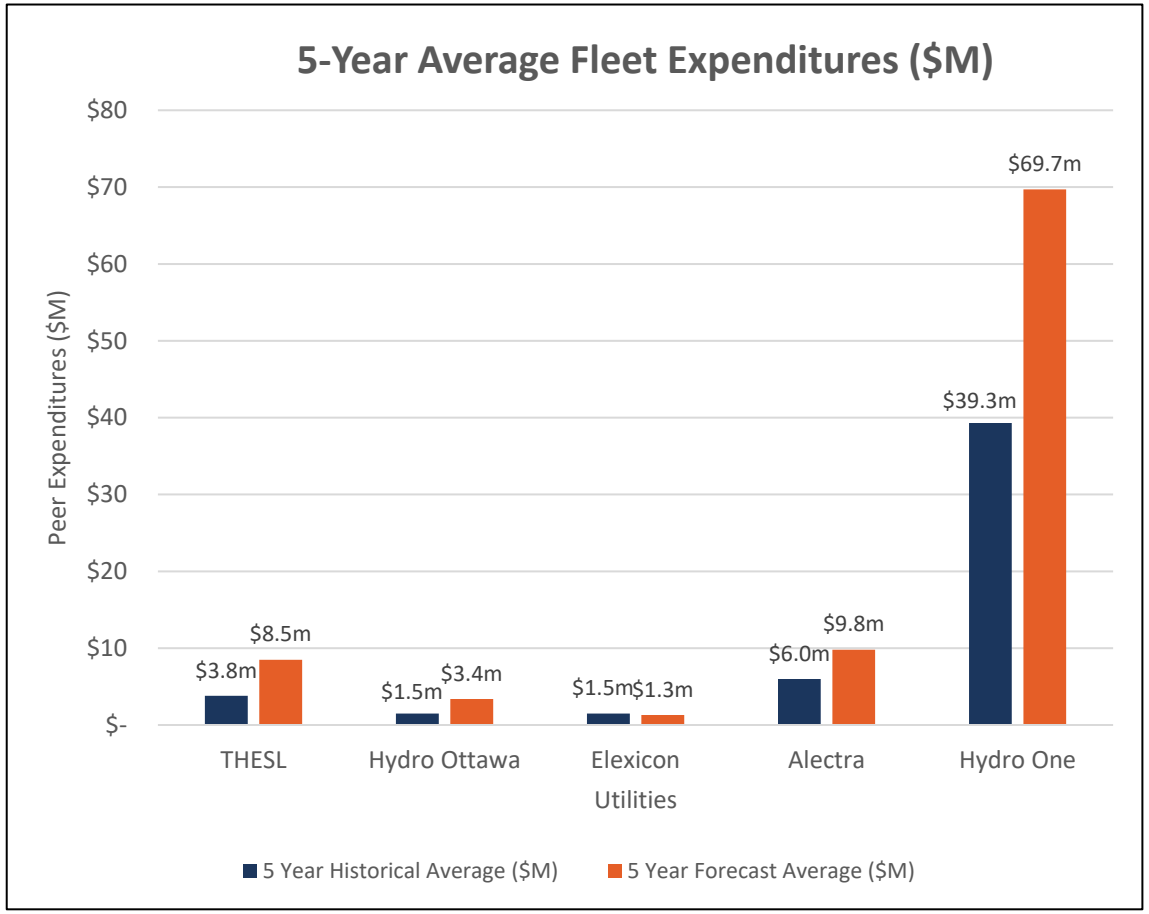
Grouping	Average 5-Year Historical Expenditure	Average 5-Year Forecast Expenditure
THESL + Peers	$ 10.42 million per year	$ 18.54 million per year
THESL + Peers (Excluding HONI)	$ 3.2 million per year	$ 5.75 million per year
THESL Average Differential (Excluding HONI)	19% above average	47% above average



Source: OEB.ca – **Utility DSPs**

Ontario Fleet CAPEX Analysis

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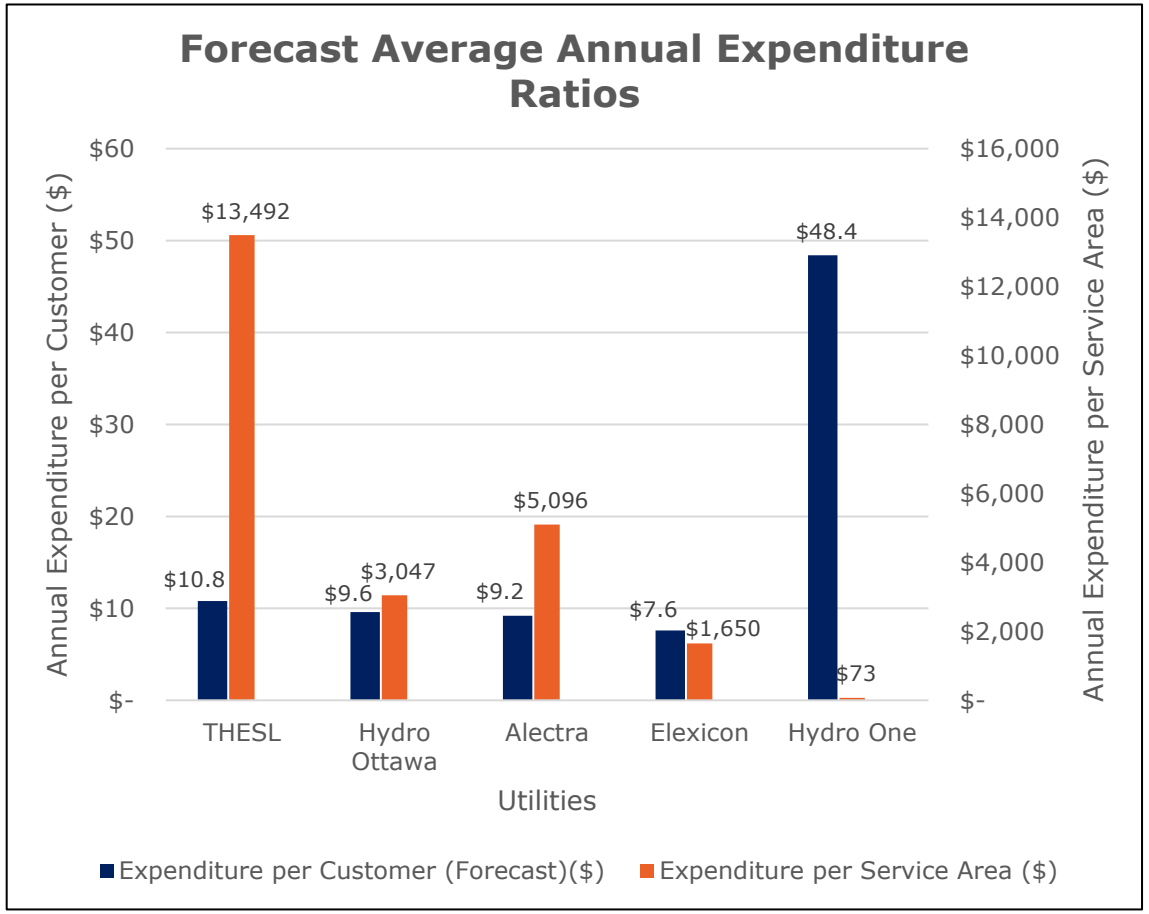
Grouping	Forecast Average Annual Expenditure Per Customer	Forecast Average Annual Expenditure per Service Area
THESL + Peers	$17.20 per year	$4,671 per year
THESL + Peers (Excluding HONI)	$9.30 per year	$5,821 per year
THESL Average Differential (Excluding HONI)	16% more than average	132% more than average

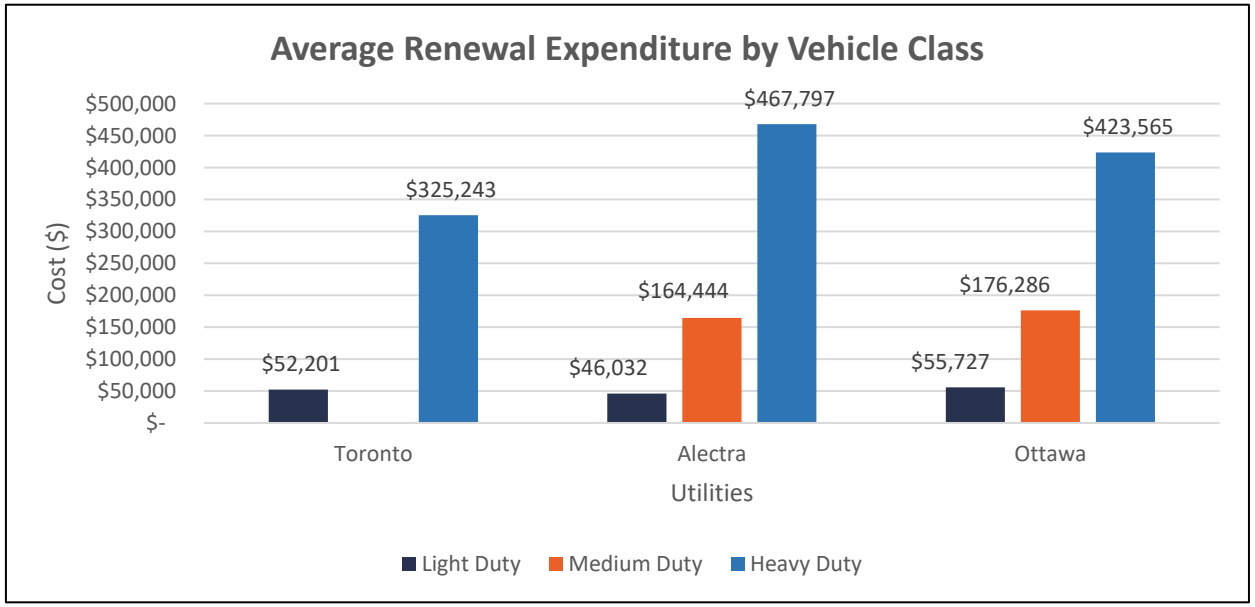


Source: OEB.ca – **Utility DSPs**

Ontario Fleet Expenditure Analysis

- Light Duty Average Procurement Price
  - $51,320 average across three Ontario utilities with available procurement data
    - THESL, Alectra, Hydro Ottawa
- Heavy Duty Average Procurement Price
  - $405,535 average across three Ontario utilities with available procurement data
    - THESL, Alectra, Hydro Ottawa
- Note: THESL CAPEX includes "all up-fitting necessary for the job, such as storage bins, partitions, racking, lighting, additional power supply; and any other aftermarket additions required in a particular vehicle"

	Bridge Year	Light	Med.	Heavy	Other	Total	CAPEX ($000)
THESL	2018-2019	159	N/A	103	N/A	262	$41,800
Hydro Ottawa	2020	77	14	23	2	116	$16,780
Alectra	2019	189	45	59	65	358	$48,800
Hydro One	2022	Breakdown Unavailable				3277	$112,438
Elexicon	2021	Unavailable					



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Source: OEB.ca – **Utility DSPs**

Ontario Additional Support Metrics

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- THESL is at parity with other Ontario peers for most important fleet management KPIs
  - Age, Mileage, Fuel Efficiency, Utilization Rate, and Cost Metrics
- THESL has opportunity to incorporate more advanced metrics
  - Vehicle Equivalency as a measure of efficiency
    - Enables more powerful comparisons between disparate vehicle types and fleet compositions

	THESL	Hydro Ottawa	Hydro One	Alectra	Elexicon

Common KPIs	• Customer Ratio – Customers per Vehicle
	• Service Area Ratio – KM per Vehicle
	• Age
	• Mileage - Average KM travelled per year
	• Fuel Efficiency - Average Fuel Cost
			• Utilization Rate
			  • Availability
			  • Average Downtime
			• Repair and Maintenance Costs
			  • Per Vehicle Class
			  • Per KM
			  • Preventive Maintenance Costs / Reactive Maintenance Costs
			  • Idle Time
			  • Vehicle Condition: Graded A, B, C		

Unique KPIs	• At-Fault Accident Rate • GHG Intensity: (GHG in tonnes / KM travelled) • Cost Recovery: (Billable Hours / Actual Operating Expenses)	None discovered through research	• Vehicle Equivalency: Weighting factor based on expected labour hour requirements	None discovered through research	• # of Vehicle Trips

Source: THESL- **LCA Report** / THESL- **Fleeting Benchmarking** / OEB.ca – **Utility DSPs**

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North America Peer Fleet Benchmark

North American Utility Baseline Analysis

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	# of Vehicles	# of Customers
THESL	387	785,667
Utility A (Man)	3,675	608,554
Utility B (BC)	3,600	5,000,000
Utility C (SMUD)	927	1,500,000

- THESL's fleet count is in the lowest of the North American peers studied (41% the fleet of Utility C, which is the closest comparator of the utilities shown).
- THESL's customer count is lowest of the NA peers studied (52% the population of Utility C.

North American Utility Service Analysis

	Service Area (Sq. KM)	Urban Service Area (%)	Customers per Sq. KM	Customers per Vehicle	Sq. KM per Vehicle
THESL	630	100%	1247.09	2030.1	1.63
Utility A	650,000	N/A	0.94	116.59	176.87
Utility B	888,000	N/A	5.63	1,388.89	246.67
Utility C	2,331	37.9%	643.50	1,618.12	2.51

- Utility C remains is the closest comparable utility to THESL.
- THESL is the only utility with 100% urban service area (while no statistics available for Utility A and Utility B, METSCO can confirm they service both rural and urban areas).
- From analysis, the following characteristics are attributable to THESL:
  - Smallest service area (approx. 27% the service area of Utility C).
  - Largest density of customers per square km of service area (approx. 194% higher than Utility C).
  - Largest density of customers per vehicle (approx. 20% higher than Utility C).
  - Lowest area per vehicle (approximately 65% of average area per vehicle of Utility C).
- In short, THESL is operating within a unique service area that cannot be fairly compared to other municipal-owned utilities and that have publicly available information.

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North American Utility Service Analysis

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- THESL's **underground cable circuit length** is highest (1.4x more on average than peers).
- THESL has, by far, the highest length of underground cable per vehicle (4x higher on average than peers)
- THESL has the second highest % of total underground cable

	UG Cable Circuit Length (KM)	Total Circuit Length (KM)	Underground Line (KM) per Vehicle	Total Circuit Length (KM) per Vehicle	Underground / Total Line (%)
THESL	13,681	29,087	35.4	75.2	47%
Utility A	10,000	82,000	2.7	22.3	12%
Utility B	9,040	55,000	2.5	15.3	16%
Utility C	9,521	15,800	10.3	17	60%

North American Municipal Utilities Utility Service Analysis

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Utility	Service Area km²	Total Customers	Customers per km²
Seattle City Light	340.1	447,578	1316.02
L.A. Department of Water and Power	1225.06	1,547,815	1263.46
THESL	630	785,667	1247.09
Glendale Water and Power	80.29	90,079	1121.92
Saskatoon Light and Power	69	60,875	638.25
Burlington Electric Department	33.67	21,490	638.25
Alameda Municipal Power	59.05	34,979	592.36
ENMAX Power (AB)	1089	510,000	468.32
Austin Energy	1131.82	520,727	460.08
Kissimmee Utility Authority	220.15	90,000	408.81
Long Island Power Authority	3185	1,100,000	345.37
Sacramento Municipal Utility District	2331	644,723	276.59
Cedar Falls Utilities	74.46	18,000	241.74
Nashville Electric Service	1812.99	430,000	237.18
CPS Energy	4060	907,526	223.53
Memphis Light, Gas and Water	2848.99	439,828	154.38
Brownsville Public Utilities Board	344.47	51,406	149.23
Salt River Project	7510.97	1,112,683	148.14
City Utilities of Springfield	826.8	117,075	141.60

- Analysis shows a range of service area sizes and total customers.
- THESL scores relatively high in terms of density of customers, when compared to the other North American municipally-owned utilities, analyzed.

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North American Municipal Utilities Utility Service Analysis

Utility	Total Service Area (km²)	Total Customers	Customers per km²	Vehicle Fleet Size	Customers per vehicle
THESL	630	785,667	1247.09	387	2030.15
ENMAX Power (Alberta)	1089	510,000	468.32	348	1465.52
Sacramento Municipal Utility District	2331	644,723	276.59	927	695.49
Seattle City Light	340.1	447,578	1316.02	1000	447.58
Los Angeles Department of Water and Power	1225.06	1,547,815	1263.46	8000	193.48

- When analyzing for customer density per fleet vehicle, we narrowed our search to municipalities that had a comparable customer population and relatively comparable service area.
- In this case, while THESL has a similar customer density per sq. km to Seattle City Light and L.A. Department of Water and Power, but a much higher density of customers per vehicle.
- Overall, THESL has the highest density of customers per vehicle out of all NA utilities studied (inclusive of Utility A, Utility B, and Utility C).

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North American Peers – Utility A Fleet Utilization

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THESL

	Car	Bucket Truck	Crane Truck	Cube Van	Derrick Truck	Dump Truck	Line Truck	Pickup Truck	SUV	Van
# of Utilized Units	10	79	10	30	7	4	5	74	27	100
KMs travelled	3238.08	19,834.48	1,100.66	7,844.10	1,427.29	212.59	1,274.04	35,526.61	8,077.99	30,390.20
KMs/ vehicle	323.81	251.07	110.07	261.47	203.90	53.15	254.81	480.09	299.18	303.90

Utility A

*Utility A does not publicly provide the number of KMs traveled per vehicle, but they do provide a breakdown of fleet vehicle type and volume. It should also be noted that vehicle categories by volume are different than vehicle types by depreciation.

	Cars/ SUVs	Light Fleet	Aerial	Trailer	Digger	Line Truck	Off-Road	Forklift/ Manlifts
# of Utilized Units	106	1090	147	918	52	229	561	162

- Utility A's utilization results are inconsequential without access to statistics like kilometers travelled as the number of a certain type of vehicle is not indicative of how many kilometers it drives each year
- THESL utilizes their pick-up trucks the most (as they have the highest average kilometers travelled per vehicle)
- THESL is more granular in terms of vehicle categorization

North American Peers – Utility C Fleet Utilization

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THESL

	Car	Bucket Truck	Crane Truck	Cube Van	Derrick Truck	Dump Truck	Line Truck	Pickup Truck	SUV	Van
# of Utilized Units	10	79	10	30	7	4	5	74	27	100
KMs travelled	3238.08	19,834.48	1,100.66	7,844.10	1,427.29	212.59	1,274.04	35,526.61	8,077.99	30,390.20
KMs/ vehicle	323.81	251.07	110.07	261.47	203.90	53.15	254.81	480.09	299.18	303.90

Utility C

	Light-Duty	Bucket Trucks	Pickup Trucks & Vans	Heavy-Duty	Service Trucks	Construction Equip.
# of Utilized Units	106	93	294	68	141	225
KMs travelled	65,522.11	133,186.2	327,065.60	43,949.98	153,381.90	1,328.58
KMs/ vehicle	618.13	1,432.11	1,112.47	646.32	1,087.81	5.90

- It should be noted that Utility C is a urban-based utility.
- Utility C's most utilized vehicle is its bucket truck (a medium-duty vehicle). THESL's most utilized vehicle is a pickup truck (a light-duty vehicle), while their bucket trucks are somewhere in the middle.
- Utility C uses approx. 3x the vehicle that THESL uses and has a service area that is 3.7x larger. Their average kms travelled per vehicle are also approx. 2.3 x higher than THESL. Utility C has fewer vehicle categories than THESL (6 compared to 10)

*No statistics were available for Utility B

North American Peers – Utility A Lifecycle Planning

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THESL

*AEC = Annual Equivalent Cost

	Car	Cargo Van	Passenger Minivan	Full Size Van	Pickup	SUV	Cube Van	Single Bucket	Single Bucket VM	Cable Truck	Crave Truck	Dump Truck	Line Truck	Double Bucket	Digger Truck	Trailer	Avg.
Planned Life (yrs)	6	7	6	9	6	12	12	14	8	16	14/ 16	14	13	14	13-14	20	**11.59**
Optimal AEC* (yrs)	9	7	9	10	9	8	12-15	12-16	11	11-14	10-14	8-12	13	14	13	20	**11.56**

Utility A

	Passenger Vehicles	Light Trucks	Heavy Trucks	Construction Equipment	Large-Soft-Track-Equip.	Trailers	Misc. Vehicles	Average
Service Life (yrs)	10	11	17	20	25	30	10	**17.57**

- While there are no statistics available for Utility A's optimal lifecycle for fleet efforts, they have a higher average service life than THESL
- On average, THESL's light-duty vehicles have an average life of 9.2 years (compared to Utility A's 10 years), while THESL's heavy-duty vehicles have an average life of 13.95 years (compared to Utility A's 18.83 years)

*No statistics were available for Utility B

North American Peers – Utility C Lifecycle Planning

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THESL

*AEC = Annual Equivalent Cost

	Car	Cargo Van	Passenger Minivan	Full Size Van	Pickup	SUV	Cube Van	Single Bucket	Single Bucket VM	Cable Truck	Crave Truck	Dump Truck	Line Truck	Double Bucket	Digger Truck	Trailer	Avg.
Planned Life (yrs)	6	7	6	9	6	12	12	14	8	16	14/ 16	14	13	14	13-14	20	**11.59**
Optimal AEC* (yrs)	9	7	9	10	9	8	12-15	12-16	11	11-14	10-14	8-12	13	14	13	20	**11.56**

Utility C

	Light-Duty	Bucket Trucks	Pickup Trucks & Vans	Heavy-Duty	Service Trucks	Construction Equip.	Average
Current Economic Lifecycle (yrs)	3-6	10-15	3-6	10-15	10-15	10-15	**9.83**
Future (Optimal) Economic Lifecycle (yrs)	3-6	12-18	3-6	12-15	12-18	12-18	**11.25**

- THESL scores well against Utility C in terms of the currently planned lifecycle of their vehicle fleet as well as optimal lifecycle (which, for the purposes of this study, we are comparing against Utility C's "Future Economic Lifecycle" projections) with higher actual and optimal lifecycles for each.
- THESL scores higher in every vehicle category (i.e. has a higher average lifespan).
- While Utility C uses the same categories for utilization and life-cycle planning, THESL has added more categories for their life-cycle planning than in utilization). Utility C also has far fewer categories (7 compared to 26).

*No statistics were available for Utility B

North American Fleet Maintenance Analysis

Utility	Light-Duty	Medium-Duty	Heavy-Duty	Trailers	Other
THESL	8.6 yr/ 136,000 km	Not Available	12.5 yr./ 200,000 km	20 yr.	Not Available
Utility A	10 yr./ 250,000 km	10 yr./ 250,000 km	10 yr./ 10,000 engine hours	30 yr.	As Necessary
Utility B	10 yr.	10 yr.	10 yr.	10 yr.	10 yr.
Utility C	3-6 yr.	10-15 yr.	10-15 yr.	Not Available	Not Available

- THESL's fleet maintenance and repair timelines are on par if not slightly ahead of the peers studied.
- Based on the information available, the following conclusions can be drawn with respect to THESL:
  - THESL lies in on the middle-to-high-end of the spectrum in terms of vehicle maintenance timelines
  - Light-Duty maintenance is performed more frequently than Utility B (by approx. 1.4 years), but much less frequently than Utility C (by approx. 4.1 years)
  - Trailer maintenance is performed more frequently than Utility A (by 10 years) and less frequently than Utility B (by 10 years)
  - There could be room for improvement in terms of heavy-duty maintenance, as both Utility A and B tend to maintain these vehicles more frequently (by approx. 2.5 years each)

DRAFT

North American Fleet Expenditure Analysis

Utility	Annual OM&A	OM&A/ Vehicle	Annual CAPEX	CAPEX/ Vehicle	Owned Vehicles
THESL	Not Available	Not Available	$8,900,000/ $11.33 per cust.	$22,997.42	100%
Utility A	$30,104,000/ $49.47 per cust.	$8,191.56	$19,609,000/ $32.22 per cust	$5,335.78	99%
Utility B	$45,300,000/ $9.06 per cust	$12,583.33	$31,400,000/ $6.28 per cust.	$8,722.22	Not available

- Despite not having OM&A statistics available for THESL, there is a broad range in terms of OM&A per customer (Utility A is nearly 5.5x more than THESL) and OM&A per vehicle (with utility has 65% the CAPEX per vehicle in relation to Utility B)
- THESL's annual CAPEX per customer lies in the middle (considerably lower than Utility A, but considerably higher than Utility B), while THESL's annual CAPEX per vehicle is by far the highest (more than double that of Utility B, and more than 4x that of Utility A)
- THESL owns 100% of their fleet, while Utility A leases around 1% of their fleet.
- While there were no statistics available in terms of Utility's B owned vehicle fleet, they did note that they outsource maintenance and repair of approximately 46% of their fleet vehicles, which represents all of their light-duty vehicles

*No statistics were available for Utility C

DRAFT

North American Additional Support Metrics

DRAFT

	Cost	Safety	Environmental	Service
THESL Identified	• Fuel Usage/ Total Cost of Fuel (L/ 100km) • Operating Expenses per Vehicle • Downtime Cost per Day/ Period • Cost per KM	• At-Fault Accident Rate • Current Planned Life	• Tailpipe GHG emissions • Fleet Net-Zero Goal Year • % of Vehicles with Electric/ Hybrid Application • Idling Hours • GHG intensity	• Total Kms Travelled • Avg. Lifetime Kms/ unit • Driving Range/ Driving Time • Percentage - Utilization • Charging Rate (driving range/ time for full charge) • Battery Size/ Capacity per Unit • Return-to-Base Battery Levels • Vehicle Availability (%) • Average Time Outside of Homezone • Service area ratio • Downtime (days) • Unit Age • Vehicle Life Expectancy
Peer Identified	• Annual OM&A	• Route Adherence (comparing routes driven with optimal routes) • Mean Km Between Defect • Preventative Maintenance Compliance	• Avg. Fuel Efficiency per Vehicle Type (L/ 100km) • Avg. Energy Efficiency (kWh/km)	• Duty Cycle – average daily mileage and maximum daily mileage of existing fleet • Total Charging Energy Requirement • Summer vs. Winter kWh/km

*No statistics were available for Utility C

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Appendix

Electric Vehicle Management

Appendix: Ontario Electric Vehicle Management

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	THESL	Hydro Ottawa	Hydro One	Alectra	Elexicon
Philosophy	• Prioritize replacement of ICE units with BEV that would maximize return on investment • Pause purchases of new ICE vehicles in short term • Conduct pilot projects to assess capabilities of different types of EVs	• Hydro Ottawa is committed to the acquisition of vehicles with hybrid technology where there is an operational and financial business case for doing so.	• Committed to transforming a portion of its fleet to plugin electric or hybrid vehicles by 2030, devoting 5% of its capital budget for EV purchases in 2021 and 50% by 2030 • 50% of sedans and SUVs to electric or hyrbrids by 2025	• Contributes to Alectra Utilities' environmental performance by reducing GHG emissions associated with fleet fuel consumption by utilizing hybrid and electric vehicles where possible	• Unavailable
Fleet	• 8 2018 Chevy Bolts • 5 2021 Chevy Bolts • 1 2010 Diesel/Electric Single Bucket Truck	• 2 Chevy Volts • 2 hybrid cars • 1 hybrid bucket truck • 17-20 devices with battery technology, • 14 flex-fuel vehicles • 10 aerial devices converted to biopure, biodegradable oil	Unavailable		

Source: THESL - **EV Phase-In Plan (2021)** / OEB.ca – **Utility DSPs**

Appendix: North American Electric Vehicle Management

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While all three North American peers studied mention the need to electrify their fleet, all except for Utility C are in the very earliest stages of fleet electrification (awareness of the need to electrify, but lacking in an electrification strategy). THESL has begun to establish their Fleet Electrification Strategy, which puts them ahead of Utility A and Utility B.

North American peer EV philosophies are as follows:

Utility A
- Mentions 24 % of their emissions come from fleet vehicles
- They have plans to implement electrification of their fleet – no further details given in this regard

Utility B:
- Vehicle fleet contributes to 1.3% of utility's GHG emissions
- 93 % of Utility B's light-duty and sedan vehicles are either zero-emissions or hybrid electric
- 70% of GHGs emitted from fleet come from non-light-duty vehicles
- Utility has a GHG reduction program

Utility C:
- Utility C has a detailed fleet electrification plan; goal is to be 100% electrified by 2030, which puts them slightly ahead of THESL, who has a 100% electrification goal of mid to late 2030s)
- 13 % of Utility C's vehicle fleet was electrified as of 2020

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Toronto Hydro-Electric System Limited
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Appendix B
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(4 Pages)

THESL Fleet Benchmarking

Electric Vehicle Addendum – June 2023

Hydro Ottawa

Finding	Source
"[Hydro Ottawa]'s immediate focus will be on minimizing our own footprint to the lowest feasible level [and] moving as much of our vehicle fleet as possible to zero-emissions technology."	2021-2025 Strategic Direction
"Hydro Ottawa also continues to invest in green fleet vehicles and technology, where it is available for commercial fleets, and to replace vehicles, as per the established fleet replacement schedule with…hybrid or more energy efficient vehicles, where available	Updated 2021-2025 DSP Attachments
"There is currently low market availability of hybrid vehicles. However, Hydro Ottawa keeps up to date on possible hybrid options for lighter vehicles such as pick-up trucks."	
“To date, Hydro Ottawa has converted more than 40 per cent of its fleet to flex-fuel, battery and hybrid technology, and lowered energy use at 52 of its 91 substations through the installation of building automation systems to control lighting and heating.”	Cision News Article (Source is Hydro Ottawa) dated April 2023

Hydro One

Finding	Source
"Hydro One is proceeding with an electric fleet strategy to help reduce fuel and maintenance costs, as well as its environmental footprint... Hydro One will continue replacing current internal combustion engine vehicles with electric vehicles or plug-in hybrid electric vehicles equivalent to electrify its fleet.“ "Investment will be channeled to expand EVs in multiple categories. The methodology is to track productivity saving in fuel spend for full EV conversion and hybrid conversion.”	Undertaking JT-5.01 - Filed: 2022-01-05
"[Goal to] convert 50% of sedan and SUV fleet to EVs by 2025." "14% of fleet converted from 2018 baseline as of 2021."	Sustainability Report 2021
"Fleet Management Services has begun a gradual adoption of EVs, devoting 5% of its capital budget for EV purchases in 2021 and 50% by 2030.” “As a member of the Edison Electric Institute, HONI has committed to transforming a portion of its fleet to EV or hybrid vehicles by 2030.”	2021 GSP
“Hydro One is committed to achieving net-zero GHG emissions by 2050. We have established a target to achieve a 30% GHG reduction by 2030.” “We Plan to convert 50% of out fleet of sedans and SUVs to electric vehicles or hybrids by 2025 and 100% by 2030.”	Notice of 2023 Annual Meeting of Shareholders

Alectra

Finding	Source
"Fleet management is developing a long-term vehicle electrification strategy plan. The potential for cost and GHG savings is significant, and fleets that plan proactively for electrification can maximize benefits to all stakeholders.	2021 Sustainability Report
"Global supply chain issues, higher costs and inflation have slowed Alectra's efforts, causing a delay in the company's plans to electrify its fleet."	2022 ESG Report
"[Fleet Electrification] contributes to Alectra Utilities' environmental performance by reducing GHG emissions associated with fleet fuel consumption by utilizing hybrid and electric vehicles where possible	2020-2024 DSP

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Appendix D
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SMART GRID
INNOVATION NETWORK

Smart Energy Benchmarking

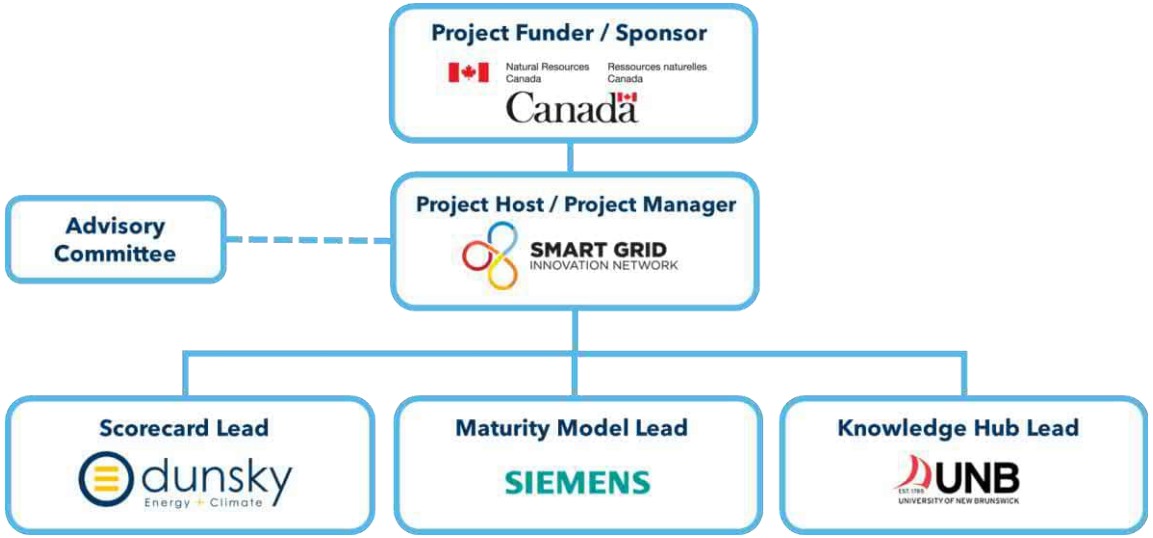
UTILITY SCORECARD RESULTS

June 2023

About the Project Team

The Smart Grid Innovation Network (SGIN) supports Canada's clean energy transition by advocating for the smart energy sector. SGIN promotes, identifies, and helps drive smart energy solutions in Canada. Our mission is to foster Canada's transition to a clean energy future.

The Smart Energy Benchmarking initiative project team includes SGIN, Dunsky Energy + Climate Advisors, Siemens Canada Ltd, & University of New Brunswick (UNB). The project is guided by an Advisory Committee that includes representatives from government, utilities, academia and subject matter experts.



About the Authors

Dunsky Energy + Climate Advisors supports leading governments, utilities, corporations and others across North America in their efforts to accelerate the clean energy transition, effectively and responsibly.

With deep expertise across the Buildings, Mobility, Industry and Energy sectors, we support our clients in two ways: through rigorous Analysis (of technical, economic and market opportunities) and by designing or assessing Strategies (plans, programs and policies) to achieve success.

Dunsky is proudly Canadian, with offices and staff in Montreal, Toronto, Vancouver, Ottawa and Halifax. Visit **www.dunsky.com** for more information.

List of acronyms

AB	Alberta
ADMS	Advanced Distribution Management System
AMI	Advanced Metering Infrastructure
BC	British Columbia
BIPOC	Black, Indigenous and People of Color
CCAB	Canadian Council of Aboriginal Business
DEI	Diversity, Equity, Inclusion
DERs	Distributed Energy Resource
DERMS	Distributed Energy Resource Management System
DSM	Demand-Side Management
DSO	Distribution System Operator
DR	Demand Response
EDTI	EPCOR Distribution & Transmission Inc.
EE	Energy Efficiency
ESG	Environmental, Social, Governance
EV	Electric Vehicle
FLISR	Fault Location Isolation and Service Restoration
GIS	Geographic Information Systems
GWh	Gigawatt-hours
IESO	Independent Energy System Operator (Ontario)
kW / kWh	Kilowatt / Kilowatt-hour
2SLGBTQI+	Two-Spirit, Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, and additional sexual orientations and gender identities
MW	Megawatt
NB	New Brunswick
NRCan	Natural Resources Canada
NWAs	Non-Wires Alternatives
ON	Ontario
PAR	Progressive Aboriginal Relations
QC	Quebec
SCADA	Supervisory Control and Data Acquisition
SGIN	Smart Grid Innovation Network
SK	Saskatchewan
SREP	Smart Renewables and Electrification Pathways
TCFD	Task-Force on Climate-Related Financial Disclosures
T&D	Transmission & Distribution
UNB	University of New Brunswick



Executive Summary

Introduction

A clean, electrified economy is central to achieving Canada's net zero emissions goals by 2050. The accelerated rate to decarbonize the last 20% of our electricity grid and expand electricity energy use places us in uncharted territory creating significant challenges, as well as new opportunities.

Electric utilities play a pivotal role in the clean energy transition across three broad categories:

1. **Clean Energy Supply.** Shifting away from fossil fuel-based generation to clean or non-emitting sources such as solar, wind, hydro, geothermal and nuclear. This requires clear targets, comprehensive strategies and bold leadership that is mission driven, willing to take risks and determined in their actions.
2. **Modern Grid.** Building a modern, dynamic and resilient grid to optimize the integration of clean energy sources, manage greater electrification and prepare for a changing climate while maintaining a reliable and stable electricity supply.
3. **Customers and Society.** Taking a customer-centric, equitable approach in all decisions related to products, services and experiences that will enable all customers to participate in, and benefit from the energy transition.

The Smart Energy Benchmarking Initiative aims to help Canadian electric utilities acquire the knowledge, skills and tools to incorporate renewable energy, modernize the grid, and support equity, diversity and inclusion activities.

The project is divided into three phases:

Smart Energy Scorecard | **Capability Model** | **Knowledge Hub**

The scorecard benchmarks 12 electric utilities' current state (baseline year 2021) in the clean energy transition – the starting line. The scorecard will help utilities understand their baseline, work to their strengths, identify solutions in areas that are still developing and set standards against which they can measure progress.

The project is non-judgmental focused on fostering utility collaboration, building capabilities, celebrating successes and finding solutions. Each utility and the environment in which they operate is unique. The goals are the same, and we can learn from one another, but the path each utility takes will be their own.

"Your present circumstances don't determine where you can go, they merely determine where you start."

- Nido Qubein

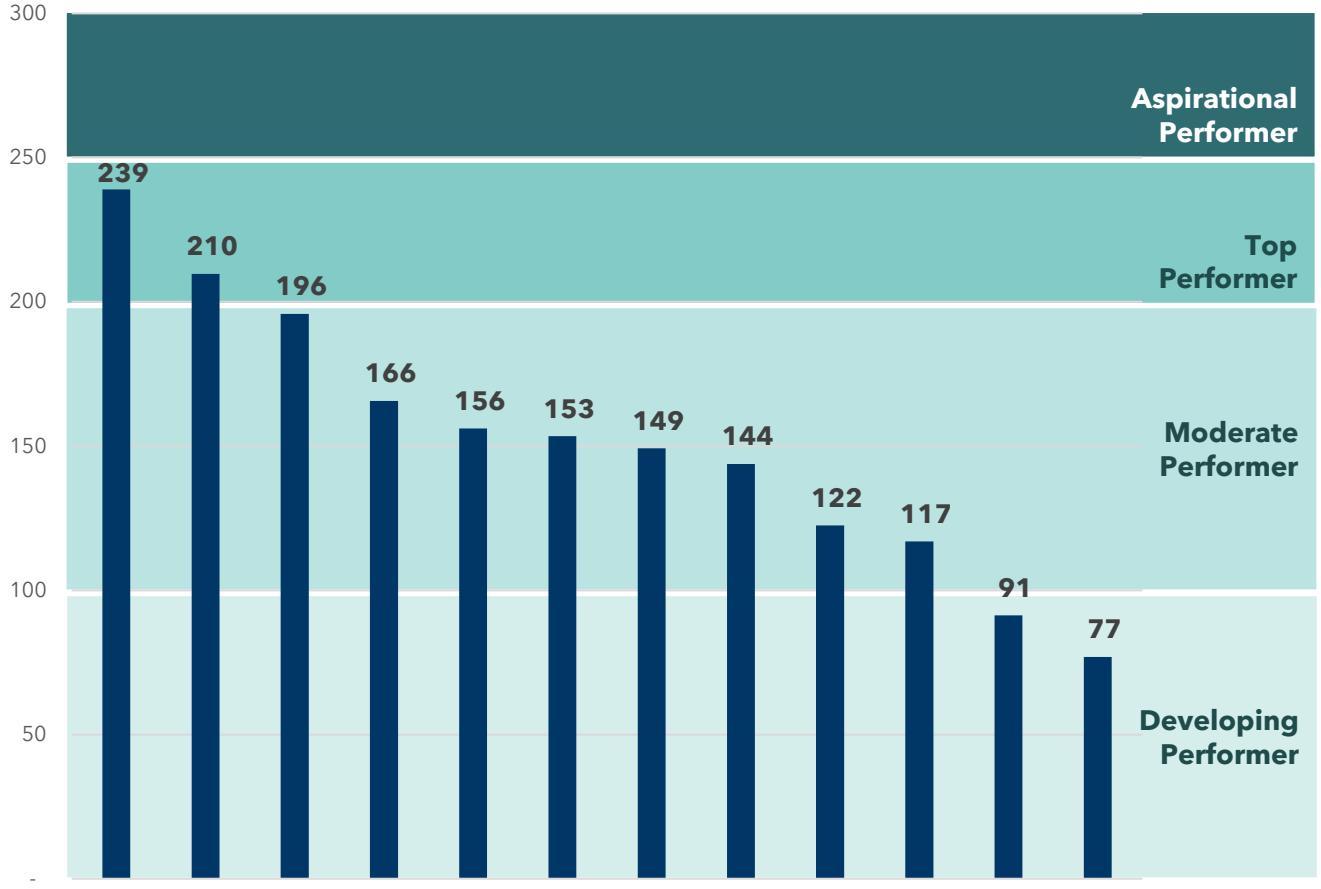
2021 Scorecard Results: The Baseline

Canadian electric utilities are at varying stages of preparedness for the energy transition.

While no utility achieved aspirational performance, three utilities are recognized as top performers and are showing leadership across all three categories (Clean Energy Supply, Modern Grid and Customers & Society).

Most utilities fall within the middle of the band. In many cases, utilities' actions are constrained by the boundaries of their regulatory and/or policy environment.

While the overall score is important, understanding how utilities scored across indicators that contributed to the total score tells a more complete story.



Clean Energy Supply: Key Findings

1 Clean Energy Supply

1.1 Planning & Designing to Decarbonize the Grid	1.2 Clean Energy Procurement & Deployment	1.3 Integration of Clean Energy Supply	1.4 Corporate Leadership

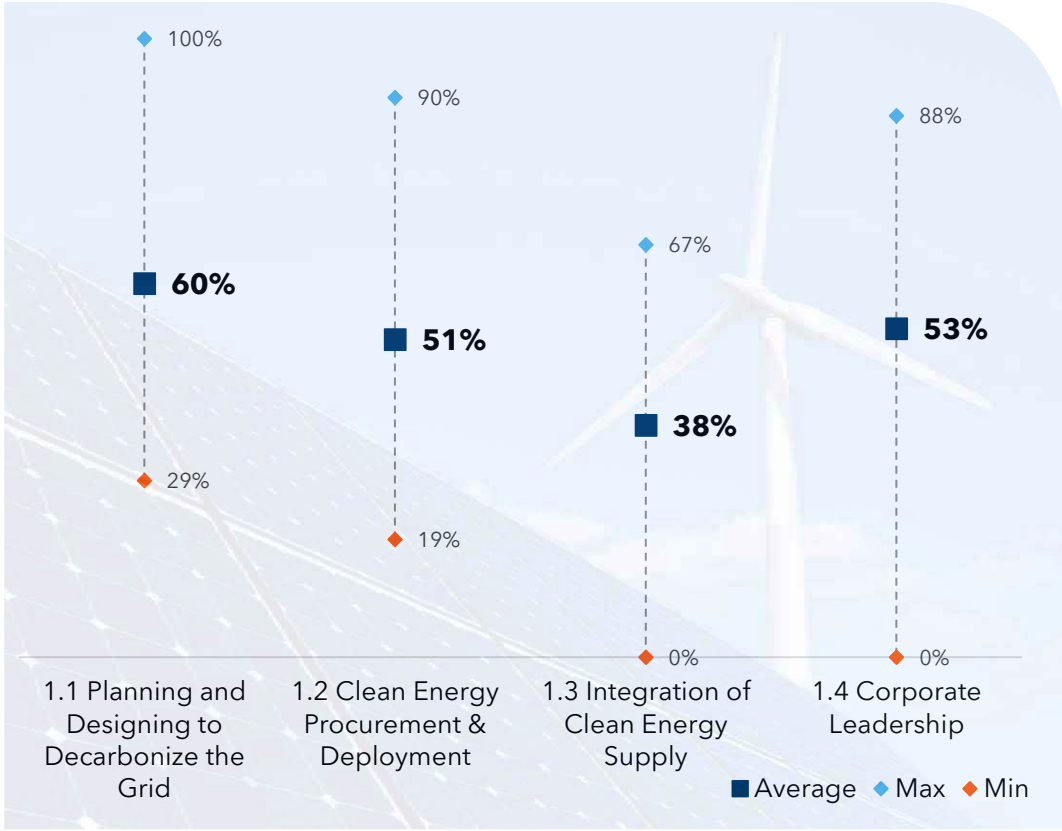
Benchmarked utilities were at different stages of their decarbonization journeys, levels of commitment, degree of control over their supply and experience integrating clean resources at scale. While some benefited from existing non-emitting resources, others had only begun the transition. Without bold leadership and accountability, utilities may be challenged to meet their corporate and community goals.

1.1 Goals & Plans: While most of the country was covered by varying clean grid goals, few jurisdictions had comprehensive (costed, timed) plans to achieve these. Ontario, the largest Canadian province, stood out for not having a defined clean grid goal.

1.2 Clean procurement: Two thirds of utilities and jurisdictions actively procured renewable generation and removed barriers to deployment, with the remaining third taking a passive approach and in some cases adding more fossil-fuel based electricity generation.

1.3 Clean resource integration: Most utilities had limited experience with large-scale renewable projects (> 5MW), or with enabling/valuing ancillary services for distributed resources.

1.4 Corporate leadership: Most utilities had sustainability initiatives and commitments to decarbonize their operations, but the depth of those commitments and the quality of reporting varies. Few utilities tied executive compensation to the achievement of decarbonization targets.



Modern Grid: Key Findings

2 Modern Grid

2.1 Enhanced Grid Planning & Management	2.2 DER Enablement & Integration	2.3 Visibility & Control Capabilities	2.4 Innovation & Emerging Technologies	2.5 Climate Resiliency

Canadian electric utilities were in the process of upgrading their grids and grid capabilities. Most followed incremental pathways, with only a few pursuing transformational visions. Overall, there was a gap between roadmaps, pilots, and control system investments, and limited amount of Distributed Energy Resources (DER) enablement and integration.

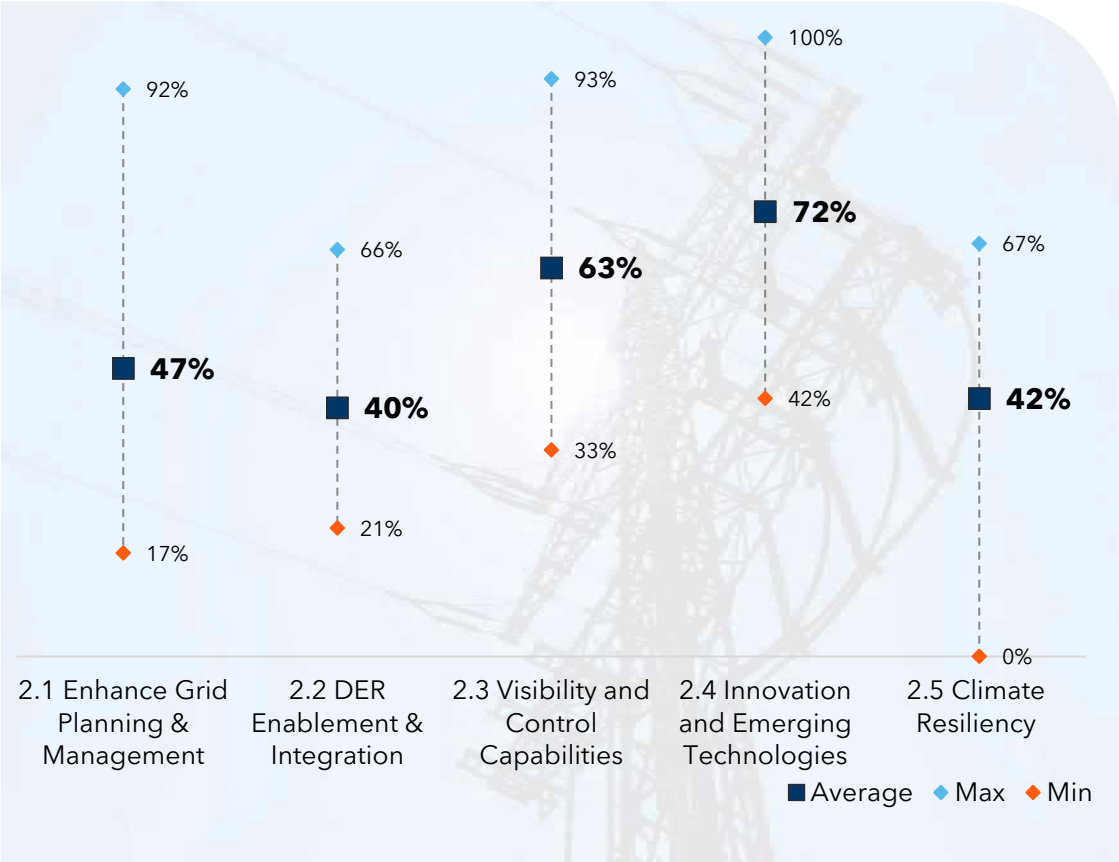
2.1 Grid planning: Most utilities were actively working to modernize their load forecasting and DER management processes. Capabilities varied in terms of data availability, model sophistication (top-down vs. bottom-up) and specificity (system-level annual vs. localized hourly forecasts).

2.2 DER enablement & integration: Most utilities had a DER strategy or roadmap, but DER's potential remained underutilized in 2021 (e.g., for ancillary services, non-wires alternatives, demand response, etc.). This was principally due to regulatory or market-based constraints.

2.3 Visibility & control: By 2021 utilities had invested significantly in visibility and control capabilities, with Advanced Metering Infrastructure (AMI), Advanced Distribution Management Systems (ADMS) and Supervisory Control and Data Acquisition (SCADA) deployed in most cases. DER Management Systems (DERMS) deployment remained nascent but was growing.

2.4 Innovation & technologies: Most utilities had innovation funds, resources, and pilot projects, often supported by government funding. Most were testing operational or technological upgrades, and a few utilities were planning for fundamental business model transformations.

2.5 Climate resiliency: Most utilities were upgrading their grid infrastructure and operations to face more adverse climate events, but few had systematically incorporated climate change scenario analysis into their planning processes.



Customers & Society: Key Findings

3 Customers & Society

3.1 Changing Customer Preferences	3.2 Enabling Transportation, Building and Industrial Electrification	3.3 Being Intentional about Diversity, Equity and Inclusion	3.4 Aligning Actions and Engagement

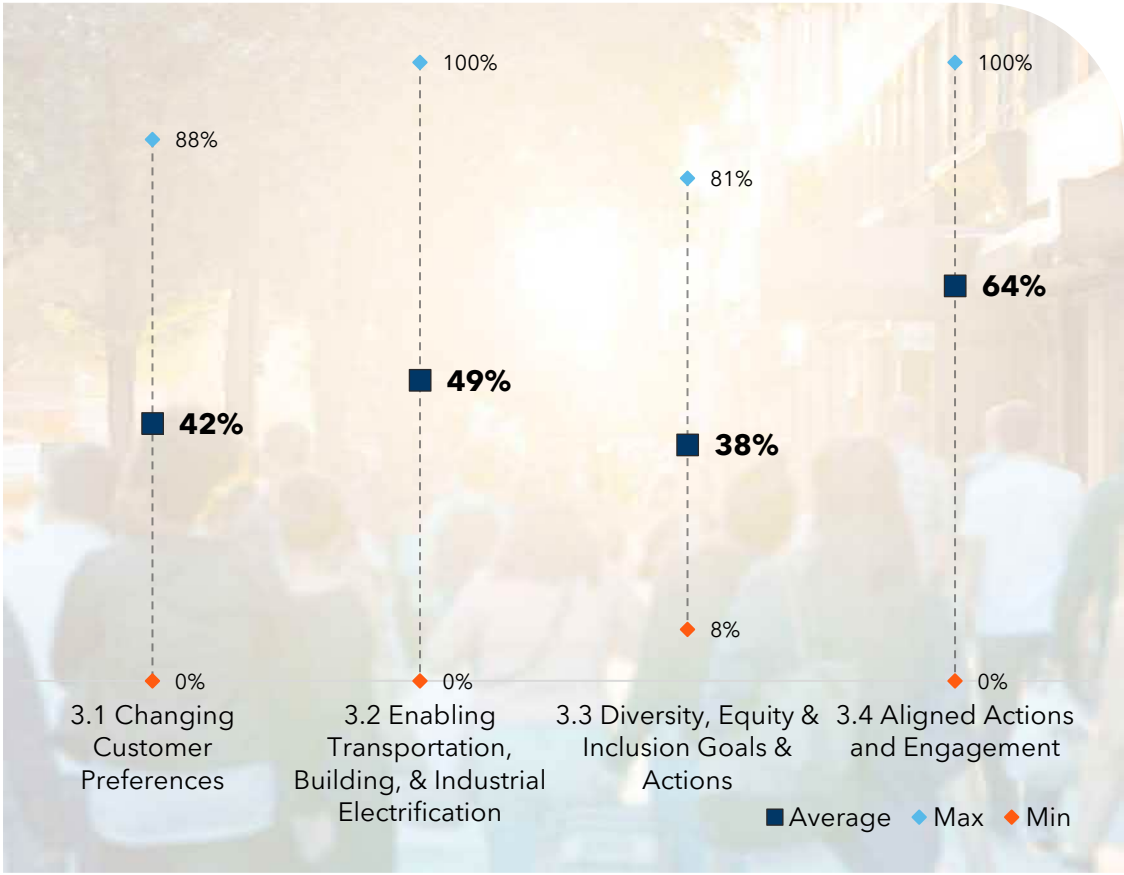
Utilities were increasingly engaging with multiple stakeholder groups to transform the electricity system. While few had developed comprehensive electrification strategies, many considered it for specific sectors. Utilities considered equity to varying degrees; vulnerable community groups will need to be prioritized to ensure an equitable transition.

3.1 Customer preferences: Most utilities offered services and solutions to encourage efficiency, decarbonization and/or electrification, such as incentives for DERs, Electric Vehicles (EVs), charging infrastructure, energy storage, efficient technologies, and, in some cases, rate-based solutions. Digital platforms to engage customers were common, although the level of sophistication varied.

3.2 Electrification: Few utilities had comprehensive electrification strategies, with most focused on a single sector (e.g., transportation) versus economy-wide solutions or perspectives.

3.3 Diversity & Equity: Many utilities had internal Diversity, Equity and Inclusion (DEI) strategies and/or initiatives for their organization and workforce. Community-oriented DEI strategies were less common, and principally addressed through income-eligible and First Nations programs. Benchmarked utilities were spending less than leading US-based jurisdictions on such programs.

3.4 Alignment & Engagement: Several utilities were completely or partially aligned with government climate goals, while some were constrained by a lack of such goals. Utilities were increasingly proactive in collaborating with governments, efficiency organizations, electricity systems operators and regulators to advocate for, and/or advance the energy transition.

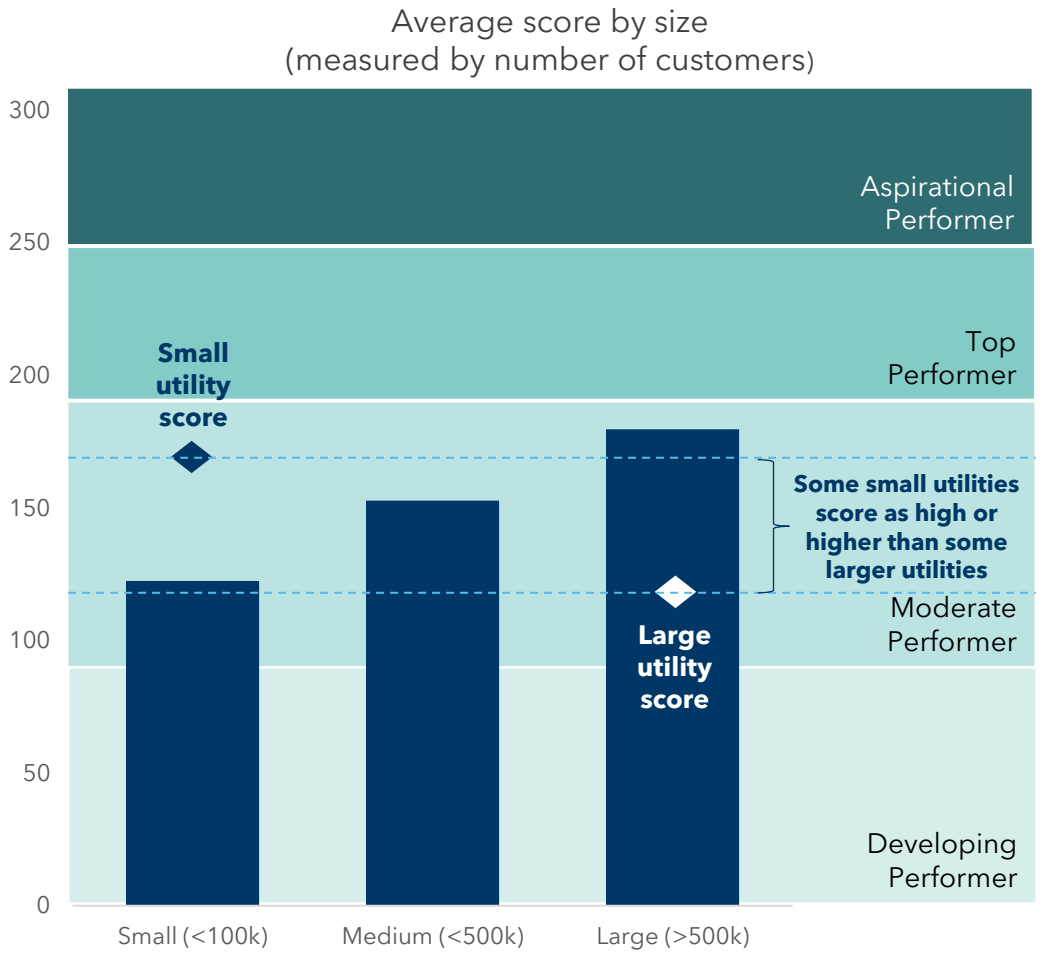


Scorecard Results by Utility Size

Utilities' average scores can be influenced by size, how clean the grid is, and ownership structure; however, these variables are not always indicators of success. Each utility is demonstrating leadership in various metrics and across the three main categories.

Size: Larger utilities tend to score more points, as they have more financial and non-financial resources to plan, execute, innovate and adopt best practices. However, some small utilities outperform their larger peers due to a combination of local innovation, jurisdictional opportunities and leveraging external funding sources. For example, one of the four small utilities achieves the fourth-best overall score.

Other factors that can influence scores are the **grid** and **ownership**. Those with already clean grids have a natural advantage in the "Clean Energy Supply" category. In turn, crown corporations and municipally owned utilities are organically aligned with government and community objectives in the "Customers & Society" category.

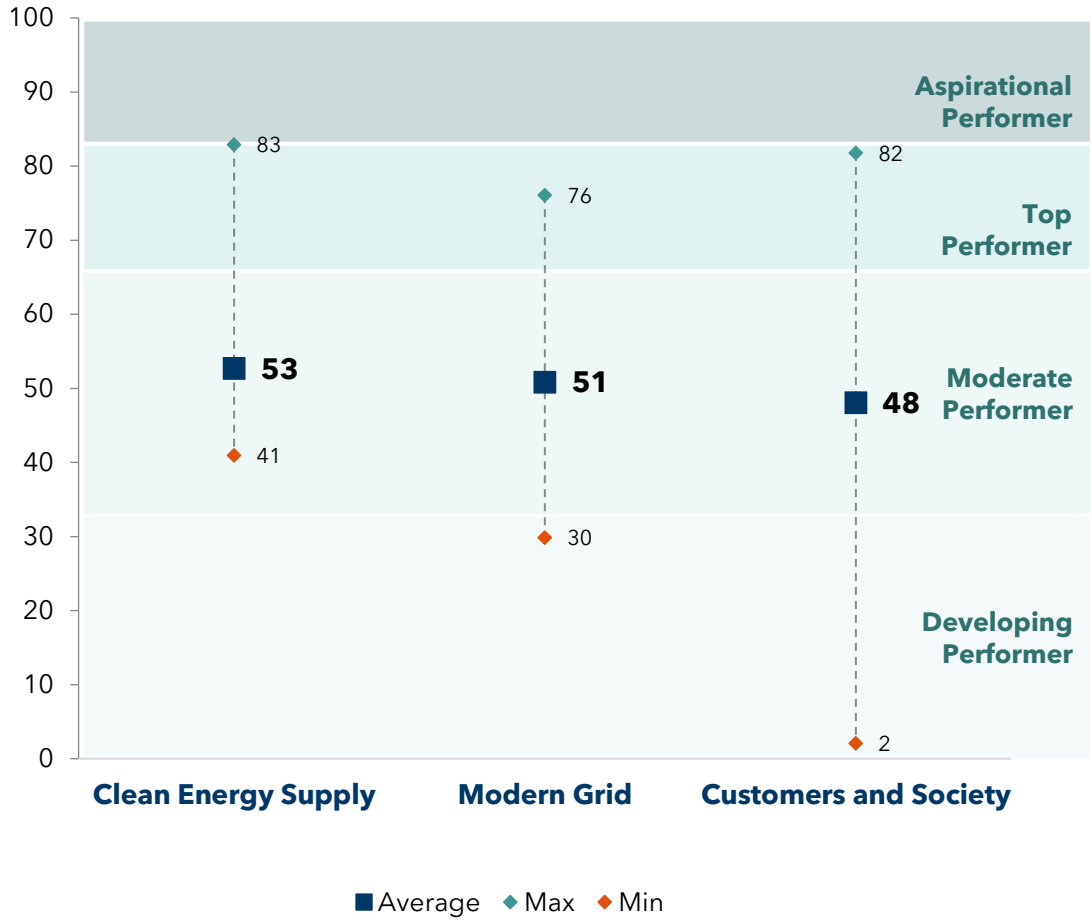


Note: given the limited number of participating utilities, no statistically significant conclusions can be drawn about correlations or causations between performance and any utility characteristics.

Scorecard Results Across Three Major Categories

On average, electric utilities performed **moderately** across the three dimensions crucial to a net zero pathway.

Average, low and high scores across the three major scorecard categories



Ten Key Insights from the Results

INSIGHT 1	**Canadian utilities have embarked on the energy transition journey**. They recognize the climate emergency and have established plans to reduce emissions. While utilities are at various stages in the transition, every benchmarked utility demonstrated leadership in certain areas.
INSIGHT 2	**More effort is needed.** The pace and scale required to meet our net zero goals by 2050 and avoid the worst climate change impacts, requires greater leadership and ambition, comprehensive decarbonization and electrification strategies, detailed inclusive roadmaps, and the tools and resources to act. The clock is ticking; without accelerated action, several actors will be challenged to achieve their targets.
INSIGHT 3	**Utilities are a diverse group, which must be considered when comparing scorecard results, opportunities and solutions.** Utilities vary in terms of size, structure, services, context, and control over their environment. We must recognize this diversity when interpreting the results and crafting policy and/or regulations that will affect utilities. Where possible, utilities and others can leverage diversity of thought and approaches to adapt innovative solutions to their unique context. Jurisdictions with less clean grids will require substantial and coordinated support to quickly live up to their own goals, and in some cases, even more ambitious federal targets.
INSIGHT 4	**Utilities are facing a massive transformation**. An already complex electricity system is under greater pressure to continue to deliver safe, affordable and reliable electricity along with being clean, resilient and equitable. If not managed carefully, this transformation could leave some groups – including some utilities and their communities – behind.
INSIGHT 5	**Utilities can't do it alone and current government commitments and regulatory structures have constrained some utilities**. Government and regulators must give utilities concrete climate targets, direction and support to guide their net-zero pathways. Utilities need latitude to implement needed action and support to make significant investments to balance DER integration, facilitate greater electrification and resiliency, and enable customers to contribute to, and benefit from, the transition. In many cases, legislation and regulation needs to evolve to enable utilities and financial support is needed to complement utility investment.

Ten Key Insights from the Results

INSIGHT 6	**Utilities need a comprehensive strategy that covers all three dimensions of this transition**. All the scanned utilities are making progress and demonstrating leadership in certain areas, but more work is needed to effectively address and coordinate actions across all elements of the clean energy transition.
INSIGHT 7	**Distribution-oriented utilities have historically not been the main drivers of grid innovation but will become increasingly important as gateways for the integration of DERs into the grid**. As such, utilities will require considerable support (policy, regulatory, financial, technological) to increase deployment of, and leverage, DERs, including valuing DERs in ancillary services. Canada lags American and European jurisdictions in enabling and leveraging distributed grid flexibility.
INSIGHT 8	**Utilities are anchored in their communities and are thus valuable partners to relay information both ways**. It will be important for utilities to communicate messaging related to the energy transition to partners and customers and provide diverse services and solutions to help customers participate in, and contribute to, the transformation. Vice-versa, utilities can communicate customer needs, expectations and reactions to policy-makers to inform future policy.
INSIGHT 9	**More attention needs to be paid to equity implications of the transition**. Utilities are actively considering equity in the workplace to ensure that it is diverse and inclusive, but internal action has not yet translated to community-wide equity impacts and strategies (e.g., several utilities have set internal diversity targets and implemented actions, but most have yet to study community needs and establish comprehensive strategies to measure and mitigate the transition's impact on those most vulnerable).
INSIGHT 10	**Ultimately, the clean energy transition presents a significant opportunity for electric utilities and society**. Utilities' core service – deliver clean, safe, reliable and affordable electricity – is at the heart of the energy transition and set for significant growth. By becoming more sustainable, resilient, and efficient, electric utilities can contribute to communities' as well as to their own prosperity.

Considerations

"If you're walking down the right path and you're willing to keep walking, you will eventually make progress"
- Barack Obama

The clean energy transformation requires collaboration and cooperation across stakeholders. Each has a unique role to play in promoting the adoption of cleaner energy sources and transitioning towards a sustainable energy future. We outline key considerations for utilities, SGIN, and government, regulators and system operators.

Utilities	• Participating utilities can use their scorecard results to **inform internal discussion**, diagnosis, planning and prioritization, as well as to **engage external partners** whose support is needed for progress, including regulators, governments, and others. They can also draw on the **community of practice** created by this initiative to share insights, good practices and lessons learned. • Other utilities in Canada can **review this scorecard to situate themselves,** obtain guidance for their own transition and consider participating in future scorecards.
SGIN	• SGIN should **publicize the scorecard** to promote its takeaways and raise awareness of the smart utility concept. • Phase B of this initiative – the Maturity Model – will **support select participating utilities** to build on their scorecard results and improve their specific capabilities. • Phase C of this initiative – the Knowledge Hub – will make smart energy benchmarking trends, and good practices **available to a broader audience**, such as other utilities across Canada as well as policy makers, regulators, system operators, and service providers. • SGIN intends to **repeat the scorecard** to monitor progress from existing utilities and include additional utilities. Future scorecards should include indigenous and northern utilities, and may consider other relevant metrics (e.g., cybersecurity).
Government, Regulators, and System Operators	• **Governments** can use this scorecard to help inform energy- and climate-policies, regulations and goals. They must guide, support, and as needed aid utilities in undertaking necessary actions, as well as support research and public engagement. • **Regulators** ensure that utilities comply with government policies and regulations. They can use the scorecard to set regulatory frameworks and observe the impact on utilities' abilities to accelerate the energy transition. Regulatory innovations are needed to enable required investments, accelerate the adoption of new technologies, processes, tariffs and programs, and ensure that no one is left behind. • **System operators** can use this scorecard to pinpoint barriers to the integration of DERs and intermittent generation assets into the grid and wholesale markets. They play key roles in outlining clear standards and pathways for decarbonization, and in some cases, in implementing demand response and demand side management programs.



Main Report

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1. Introduction

Context

To avoid the worst climate change impacts and benefit from the economic opportunity climate action presents, Canada has set a target to achieve net-zero emissions by 2050. To ensure Canada delivers on its targets, this commitment was enshrined in legislation under the Canadian Net-Zero Emissions Accountability Act.[1]

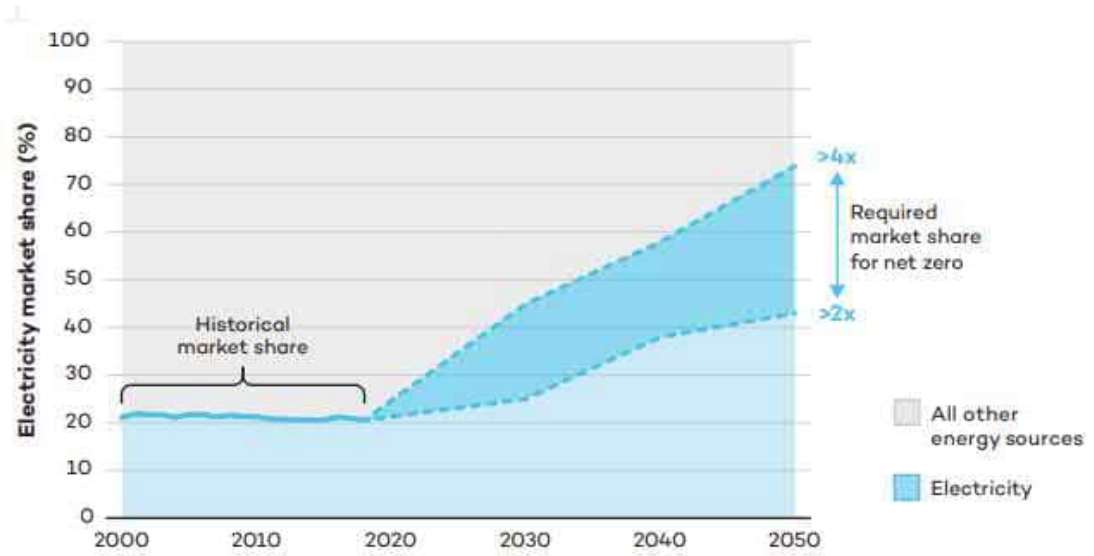
Substituting fossil fuels with clean, non-emitting electricity and electrifying our economy is vital to achieving net-zero emissions in Canada. To lay the groundwork, Canada has committed to net-zero electricity by 2035 through the Clean Electricity Regulation.[2]

Canada is fortunate where over 80% of our electricity is currently non-emitting; however, electricity only accounts for approximately 20% of energy demand. To achieve net-zero by 2050, Canada must increase the supply of clean, non-emitting electricity and ensure more parts of the economy are connected to the electricity system. This will require that Canada produce 2-3 times as much clean power as it does today.[3]

Utilities are at the center of climate targets and action plans. They have a key role in meeting clean electricity commitments by generating, procuring and integrating electricity from clean and non-emitting sources, and enabling, supporting and delivering on initiatives that will optimize the grid and help all customers electrify, including those most vulnerable.

THE CLEAN ELECTRIFICATION CHALLENGE

To achieve net-zero by 2050, Canada must increase the supply of non-emitting electricity and ensure more parts of the economy are electrified. Growing building, transportation, and industry electrification could increase Canada's electricity share by up to four times within the next 30 years.



Source: Produced by Dunsky Energy + Climate Advisors for Electrifying Canada, 2022

1. Canadian Net-Zero Emissions Accountability Act S.C. 2021, c. 22. Accessed at https://laws-lois.justice.gc.ca/eng/acts/c-19.3/fulltext.html
2. Government of Canada Clean Electricity Regulations. Accessed at https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/clean-electricity-regulation.html
3. 2030 Emissions Reduction Plan: Clean Air, Strong Economy. Accessed at https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030.html

Project Overview

In 2022, Smart Grid Innovation Network (SGIN) launched the Smart Energy Benchmarking Initiative to help Canadian electric utilities prepare for the clean energy transition. The initiative is funded by Natural Resources Canada's (NRCan) Smart Renewables and Electrification Pathways (SREP) Capacity Building stream. SREP supports projects that can transform our electricity sector to the 2050 net-zero economy, and help organizations acquire the knowledge, skills, and tools to incorporate renewable energy, modernize the grid, and support equity, diversity, and inclusion activities.

WHAT IS A SMART ENERGY SYSTEM?

A smart energy system is one that supports decarbonization in an affordable, safe, sustainable, resilient, and equitable way. It includes the whole energy system (gas, thermal, and electricity grids) that integrates clean energy, through a smart, dynamic, and customer-centric approach.

The Smart Energy Benchmarking initiative focuses on the role of electric utilities within the broader smart energy system.

The Smart Energy Benchmarking initiative has six objectives:

1. Stimulate the development of clean energy and grid modernization projects.
2. Increase Canadian utilities' capacities to meet emerging customer needs, modernize their grids, prepare for greater electrification and renewables integration.
3. Celebrate utility leadership in the energy transition and nudge those getting started through healthy competition.
4. Develop a body of knowledge that serves as a resource for utilities and others across Canada as they work to decarbonize.
5. Create a healthy ecosystem for collaboration between stakeholders.
6. Be intentional about equity, diversity, and inclusion goals and impacts

Smart Energy Benchmarking: A Phased Approach

This report summarizes results of Phase A: Smart Energy Scorecard.

Phase A



Scorecard

Benchmark **12 electric utilities'** current smart energy development and identity performance relative to peers and best-in-class practices

June 2022 – April 2023

Phase B



Maturity Model

Work with **a subset of utilities** to build on their strengths and develop their capabilities to improve preparedness and performance

April 2023 – September 2023

Phase C



Knowledge Hub

Share findings, trends, and best practices to a **broader audience** to support industry capacity-building

September 2023 – December 2023

Phase A: Smart Energy Scorecard

Electric utilities are responsible for generating, transmitting and distributing electricity to end users. In the context of the clean energy transition, the scorecard assesses utilities across three main functions:



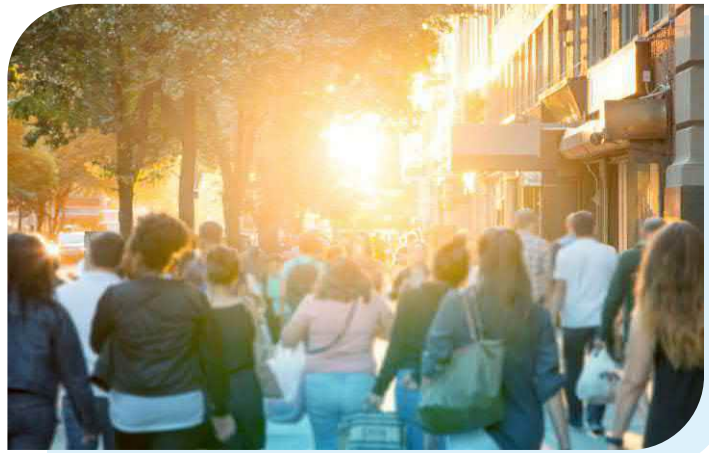
1 Clean Energy Supply

To reduce greenhouse gas emissions and meet renewable energy targets, electric utilities must shift away from fossil fuel-based generation to clean or non-emitting sources such as solar, wind, hydro, geothermal, and nuclear.



2 Modern Grid

The electricity grid is complex system of generating stations, transmission lines, substations, and distribution networks that deliver electricity to end users. The grid must be managed to ensure a reliable and stable supply of electricity, and to optimize the integration of more variable clean energy sources.



3 Customers & Society

Utilities can offer programs and services to encourage and enable customers to electrify their buildings, transportation and industries and adopt clean energy technologies. Utilities must also consider impacts to those most vulnerable so that all customers can benefit from the transition.

The Smart Energy Scorecard

The Smart Energy Scorecard assesses participating Canadian electric utilities' efforts and progress in the clean energy transition across 3 categories, 13 metrics and 140+ indicators (baseline year 2021).

Electric utilities play a critical role in enabling the transition to a clean energy future by ensuring a reliable and sustainable supply of electricity from renewable sources while also meeting the needs of end users. Utilities plans, actions and abilities were benchmarked across 140+ indicators that are deemed crucial to facilitate a clean energy system that continues to be safe, affordable, and reliable, as well as **clean, resilient, and equitable**.

The following four guiding principles influenced the final scorecard metrics:

1. Align with NRCan's SREP objectives and the net zero emissions goal
2. Measure performance against best-in-class practices within Canada and abroad
3. Be relevant, measurable, and flexible, and focus on what utilities can control & influence
4. Develop in collaboration with utilities and other relevant industry stakeholders

1 Clean Energy Supply

- 1.1 Planning & Designing to Decarbonize the Grid
- 1.2 Clean Energy Procurement & Deployment
- 1.3 Integration of Clean Energy Supply
- 1.4 Corporate Leadership

2 Modern Grid

- 2.1 Enhanced Grid Planning & Management
- 2.2 DER Enablement & Integration
- 2.3 Visibility & Control Capabilities
- 2.4 Innovation & Emerging Technologies
- 2.5 Climate Resiliency

3 Customers & Society

- 3.1 Changing Customer Preferences
- 3.2 Enabling Transport, Building & Industry Electrification
- 3.3 Being Intentional About Diversity, Equity & Inclusion
- 3.4 Aligning Actions & Engagement



2. Approach

Project Approach and Timeline

Developing the smart energy scorecard was an iterative, collaborative approach that involved the project team, an advisory group and participating utilities.

Develop Preliminary Scorecard	Form & Engage Advisory Group	Recruit Utilities	Consult Utilities	Create Roadmap & Collect Data	Refine Data	Present Results
• Develop preliminary scorecard and metrics	• Form advisory group and gather input on project and approach	• Host information webinar • Invite electric utilities across Canada • 18 utilities enrolled	• Gather input to refine scorecard • Consult on data collection process • (2 utility workshops)	• Create utility roadmap • Collect scorecard inputs & supporting documents • 12 final utilities	• Address data questions • Refine scorecard inputs • Generate utility scores	• Present preliminary results • Create summary report & custom utility reports
Jul – Sep 2022	**Sep 2022**	**Oct 2022**	**Nov 2022 – Jan 2023**		**Feb – Mar 2023**	**April 2023**

Data for each indicator was provided by the utilities through a standardized data request form. Dunsky reviewed utility inputs for quality and consistency and assigned a score for each indicator against a pre-determined scoring grid. All 144 indicators are outlined in the appendix, along with scores and weights.

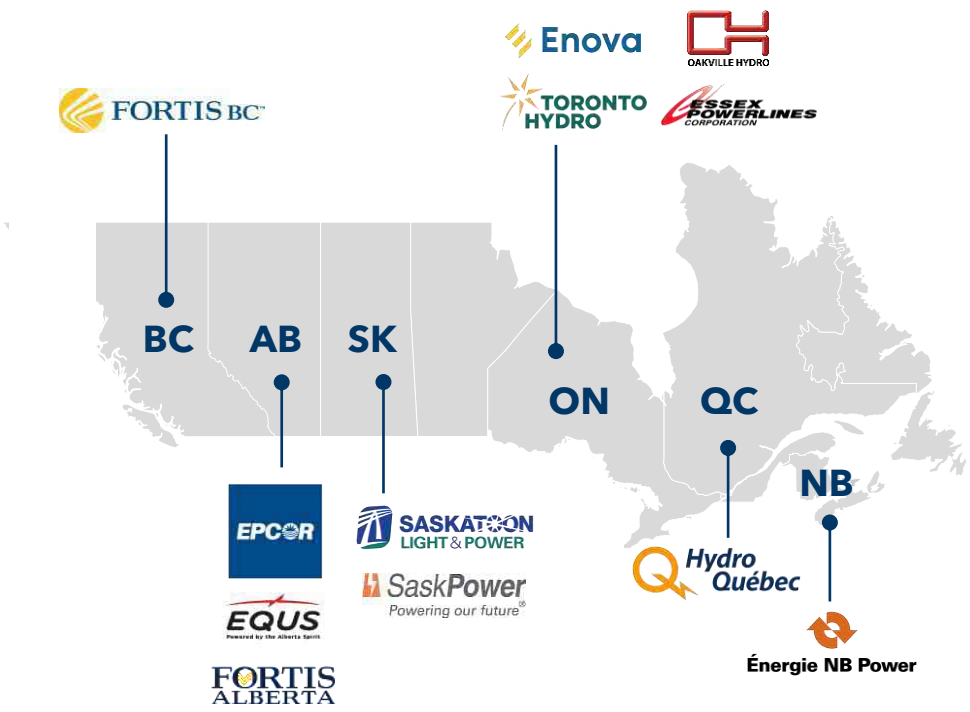
Overview of benchmarked utilities

The project team aimed to attract up to 20 utilities that represented the diversity across Canada in terms of utility size, type, ownership, and geography, clean vs not-so-clean grids and regulatory/policy environments. We summarize the targets set out at the beginning of the project and what was achieved. Additional comparisons are made on the following page.

Target	Achieved
Up to 20 electric utilities	• 18 utilities expressed interest • 12 electric utilities completed the scorecard
Focus on small, but include a range of utility sizes	• 4 small (<100K customers) • 4 medium (100K – 500K) • 4 large (>500K)
A range of utility types	• 4 vertically integrated utilites • 1 Transmission & Distribution (T&D) utility • 7 distribution-only utilities
A range of ownership structures, including indigenous owned	• 3 crown corporations • 6 municipally owned • 3 privately owned • 0 indigenous owned (one initially enrolled but could not complete the process due to resource constraints)
Geographic spread	• West (1 BC) • Prairie (3 AB, 2 SK) • Central (4 ON, 1 QC) • Atlantic (1 NB)

Overview of benchmarked utilities

Six provinces



Twelve utilities serving close to 7.5 million customers (presented West to East)

Utility	Type	Ownership	Nb. of customers	Provincial Electricity Market: Retail	Clean grid	¢/kWh[1]
Fortis BC	Generation, Transmission, Distribution	Private	< 100k	Regulated retail	>90% clean	11.4
FortisAlberta	Distribution	Private	≥ 100K to ≤ 500k	Competitive	<50% clean	19.9
EPCOR (EDTI)	Transmission, Distribution	Municipal	< 100k	Competitive	<50% clean	19.9
EQUS REA	Distribution	Coop	< 100k	Competitive	<50% clean	19.9
Sask. Light & P.	Distribution	Municipal	< 100k	Regulated retail	<50% clean	16.5
SaskPower	Generation, Transmission, Distribution	Crown corp.	≥ 100K to ≤ 500k	Regulated retail	<50% clean	16.5
Enova Power	Distribution	Municipal	< 100k	Hybrid	>90% clean	13.9
Essex Powerl.	Distribution	Municipal	< 100k	Hybrid	>90% clean	13.9
Oakville Hydro	Distribution	Municipal, Private	< 100k	Hybrid	>90% clean	13.9
Toronto Hydro	Distribution	Municipal	> 500k	Hybrid	>90% clean	13.9
Hydro-Québec	Generation, Transmission, Distribution	Crown corp.	≥ 100K to ≤ 500k	Regulated retail	>90% clean	7.6
NB Power	Generation, Transmission, Distribution	Crown corp.	≥ 100K to ≤ 500k	Regulated retail	>50% clean	13.9

Generation · Transmission · Distribution · Crown corp. · Municipal · Private · Coop

>90% clean · >50% clean · <50% clean · < 100k · ≥ 100K to ≤ 500k · > 500k

1 Electricity rates. Source for pricing data: Hydro-Québec, Comparison of Electricity Prices in Major North American Cities 2022 (2021 data for average residential prices in Vancouver, Edmonton, Regina, Toronto, Montréal, Moncton). Data is indicative only and may not represent the actual prices charged by the benchmarked utilities or others to consumers in their specific service areas in 2021.

This scorecard comes with several caveats



It is not a complete picture of Canadian utilities. While it covers 12 utilities from 6 jurisdictions of various sizes and ownership types, which collectively serve around 7.5 million customer accounts, it was not designed to be a representative sample.

Scores represent 2021 data, to the best of utilities' and SGIN's abilities. Utility plans, actions and contexts may have evolved since then, and will be captured in future scorecards.

Data was reviewed with care, but some limitations apply. Data for certain indicators or utilities was difficult to obtain, due to its confidential nature, or to varying definitions across organizations and jurisdictions. Dunsky exercised judgement to assign scores and, in some cases, modified utilities' self-ratings to ensure consistent scoring across all entities.

Utilities face different contexts and cannot be compared one-to-one, given differences in sizes, jurisdictions, ownership type, etc. Several utilities do not control their own generation assets or other factors that may influence their score. The scorecard is most useful when used as a tool to support utilities' own engagement and learning with their internal and external stakeholders and does not purely measure 'performance'.



3. Scorecard Results

Aggregate Results

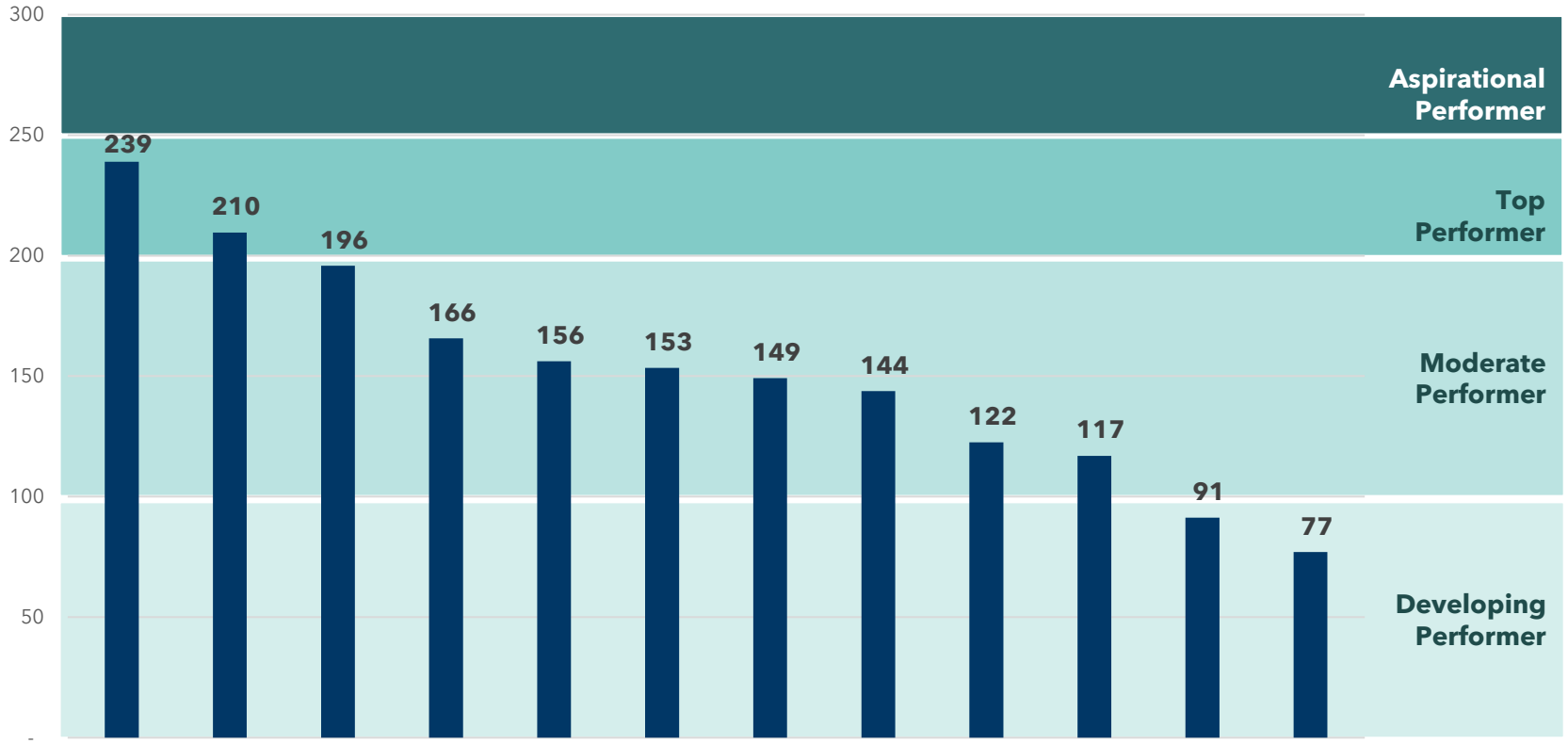
Canadian electric utilities are at varying stages of preparedness for the energy transition.

While no utility achieves aspirational performance, three utilities are recognized as top performers demonstrating leadership across all three categories (Clean Energy Supply, Modern Grid and Customers & Society).

Most utilities fall within the middle of the band.

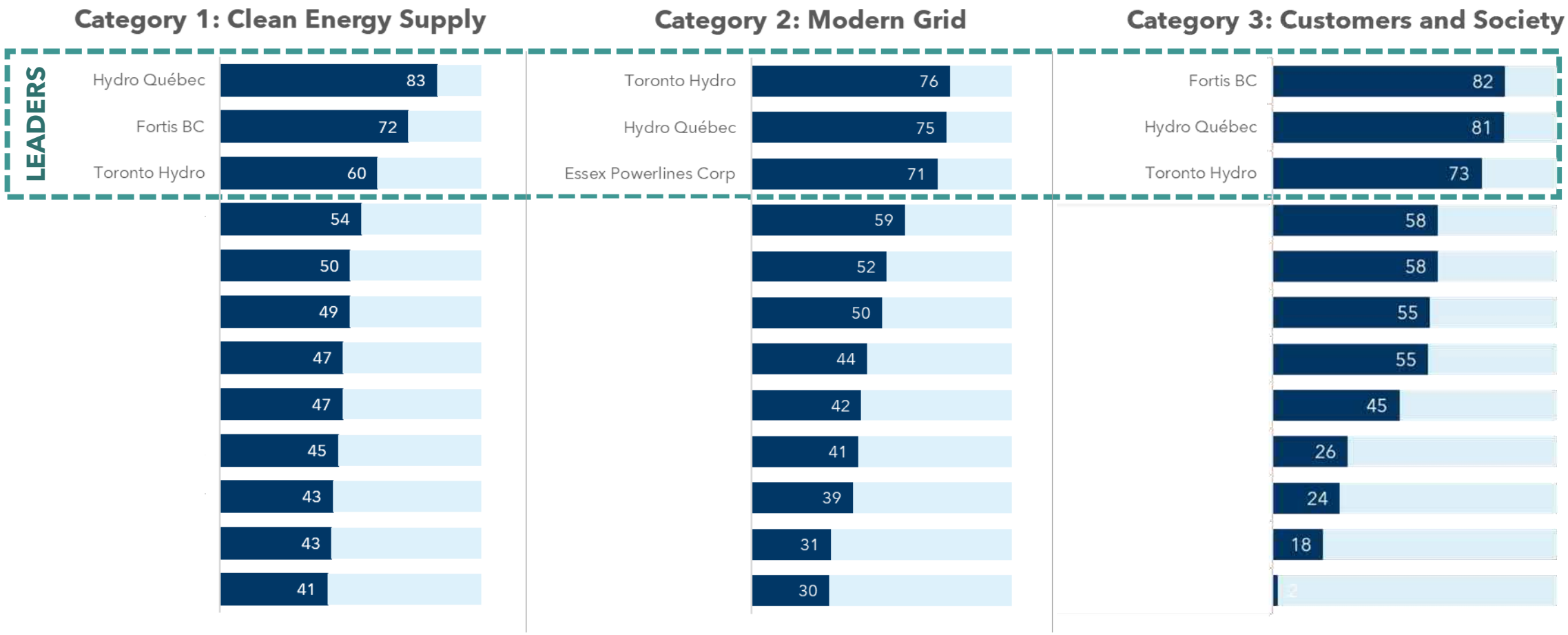
In many cases, utilities' actions are constrained by the boundaries of their regulatory and/or policy environment.

While the overall score is important, understanding how utilities scored across indicators that contributed to the total score tells a more complete story. We discuss this in more detail next.



Results by Category

There are 100 total possible points in each category and a different utility takes the top spot across each of the three major categories.



Clean Energy Supply: Overview

1 Clean Energy Supply

1.1 Planning & Designing to Decarbonize the Grid	1.2 Clean Energy Procurement & Deployment	1.3 Integration of Clean Energy Supply	1.4 Corporate Leadership

Planning, procuring and deploying clean energy is key to the clean energy transition. The current share of clean energy, the pace and approach to further decarbonize and corporate leadership is critical to transform our electricity sector to net zero by 2050.

Under Clean Energy Supply, we assess utilities on the following:

1.1. Planning & Designing to Decarbonize the Grid. Explicit clean energy commitments, the depth of those commitments, the timeframe to achieve them, and if utilities have a comprehensive plan to do it.

1.2 Clean Energy Procurement & Deployment. Utilities' current share of non-emitting supply and procurements for clean energy

1.3 Integration of Clean Energy Supply. Where ancillary markets exist, do clean energy resources have access to ancillary services payments and what are utility DER interconnection times and processes.

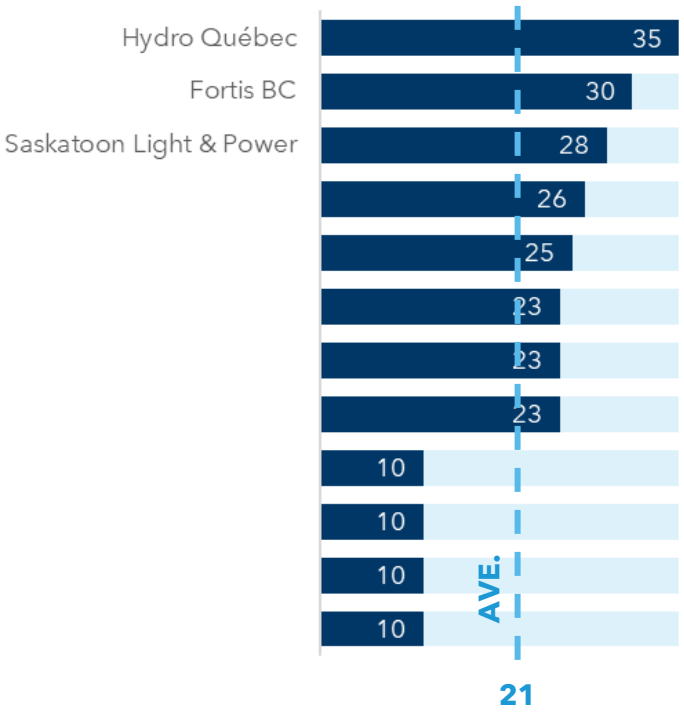
1.4 Corporate Leadership. Leadership, transparency, and accountability needed to facilitate the transition.



1 Clean Energy Supply

1.1 PLANNING & DESIGNING TO DECARBONIZE THE GRID

POINTS AVAILABLE **35**



Utilities and their partners (e.g., system operators, provincial government) have a key role in developing robust and actionable visions for a decarbonized grid. To achieve our net zero goals we need provinces, territories and regulators to set clear direction and for utilities to align their plans with net-zero pathways.

- **Clean grid goals are more often set provincially than at the utility level**. Three out of four provinces with carbon emitting generation resources have established decarbonization goals. Ontario is the exception: despite having a relatively clean grid, it is the only province that has not committed to maintaining existing and/or further decreasing its grid carbon intensity in the coming years. Ontario is now soliciting bids for new gas-fired power plants when several nuclear stations will be refurbished. If it proceeds, this will be Ontario's biggest increase in gas-fired generation in over a decade.[1]

- **Declared clean grid goals vary substantially.** Alberta aims for 30% by 2030, Saskatchewan 40% by 2030, and New Brunswick 100% by 2035. The federal Clean Electricity Regulation requiring 100% non-emitting generation by 2035 thus represents a considerable acceleration for some provinces. BC's and Québec's grids are already 99% clean, with plans to decarbonize remaining remote generation. While remote microgrids make up a small amount of production, they can be challenging to decarbonize.

- **As of 2021, several participating utilities had undertaken preliminary assessments of net-zero pathways, but most had yet to put together comprehensive plans (budgeted and timed) to achieve their targets.** In at least one case, a plan was in development (expected 2023), and in other cases plans existed for initial steps without covering the whole transition. Two of the three provinces with clean grid goals were on or above track towards meeting them (Alberta and New Brunswick). Only Saskatchewan was slightly short of its target, due to construction delays resulting from the covid-19 pandemic.

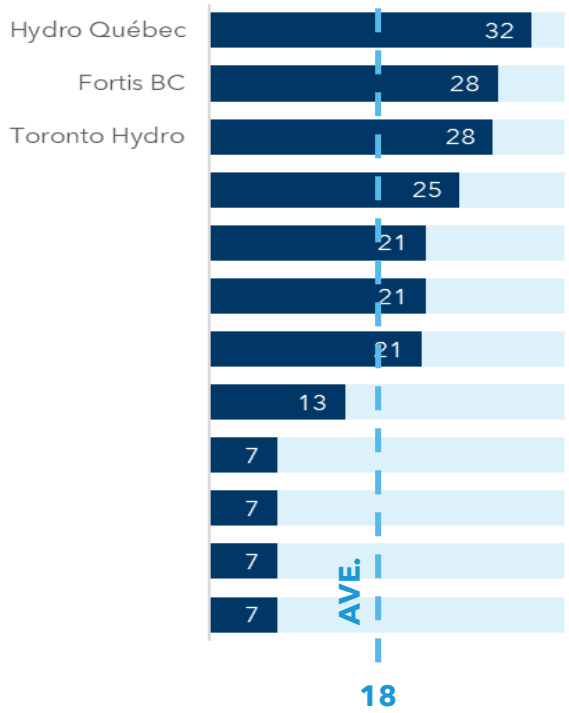
1. Source: IESO accessed at https://www.ieso.ca/en/Sector-Participants/Resource-Acquisition-and-Contracts/Long-Term-RFP-and-Expedited-Process In 2017, gas- and oil-fired generation was 4% of Ontario's electricity supply. By 2022, that figure reached 10.4%. Nuclear declined from 63% to 53.7% while Hydro Wind and Solar only increased from 33% to 36.3%. Source: IESO accessed at https://www.ieso.ca/en/Power-Data/Supply-Overview/Transmission-Connected-Generation..

SASKATOON LIGHT & POWER: Despite having limited control over provincial generation, the City of Saskatoon, which owns Saskatoon Light & Power, has developed a comprehensive implementation plan, *Alternative Currents*, for a low-emission energy transition, with specific actions and timelines to promote local baseload and distributed generation, storage, energy efficiency, and other measures.

1 Clean Energy Supply

1.2 CLEAN ENERGY PROCUREMENT & DEPLOYMENT

POINTS AVAILABLE **35**



A clean energy future requires the transformation of a utility's total retail energy supply, changes to energy procurements and actions to reduce barriers to clean energy technology deployment.

- **Most sampled utilities do not directly control generation and are thus dependent on the state of the provincial grid.** Large, vertically integrated crown corporations like Hydro-Québec, New Brunswick Power and SaskPower constitute the exception.
- **The share of non-emitting generation varied widely across Canada**, from 99% in BC and Québec, to 80-90% in New Brunswick and Ontario, and 15-25% in Saskatchewan and Alberta. The associated grid emission intensities accordingly also varied greatly. Utilities with significant share of non-emitting resources from legacy hydro and nuclear power had a natural advantage.
- **Procurement strategies for renewable energy generation varied from targeted to agnostic.** Half the reviewed jurisdictions (BC, NB and QC) exclusively procured renewable generation capacity, while two others (ON, SK) had released some dedicated renewable procurements. Only AB had not posted dedicated renewable procurements, though several projects were nonetheless under way.
- **As of 2021, a small majority of utilities were proactively undertaking actions that reduce or remove barriers to the deployment of clean technologies.** This includes seven of 12 utilities of various types, sizes, and regions. Actions include forms of information-sharing (e.g., feeder lists, developer manuals, hosting capacity maps, customer costing frameworks), integrated approaches to interconnections (such as a 'Power Generation Partners Program' to accompany clients through the journey), and transmission investments to increase the interconnection potential. The remaining five utilities reported no facilitating actions, beyond minimal regulatory requirements.

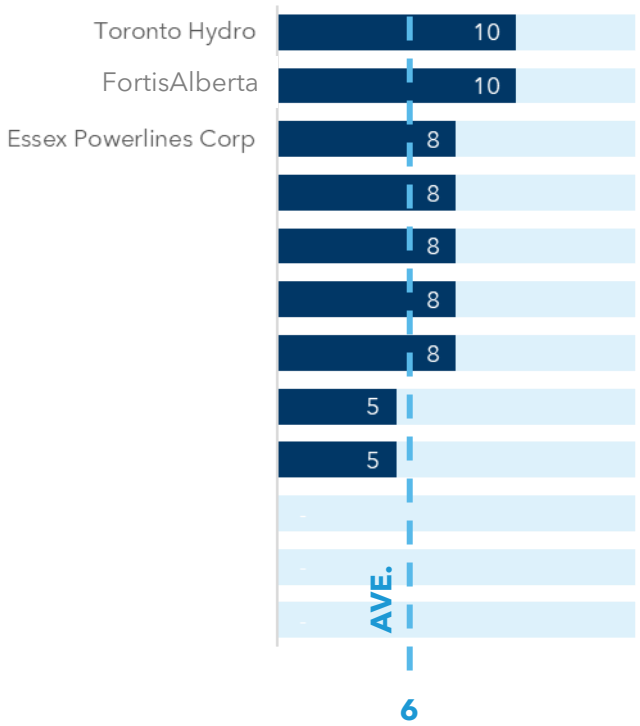
HYDRO-QUÉBEC: Hydro-Québec's own generation projects and procurement opportunities are exclusively for renewable energy – some exclusively for wind power, other for any type of renewable generation. Moreover, it has laid out a plan to decarbonize 80% of remote, diesel-powered microgrids by 2030, through a combination of transmission lines and distributed generation and storage.[1]

[1] See http://news.hydroquebec.com/en/press-releases/1815/hydro-quebec-reaches-a-major-milestone-in-the-decarbonization-of-its-off-grid-systems/.

1 Clean Energy Supply

1.3 INTEGRATION OF CLEAN ENERGY SUPPLY

POINTS AVAILABLE 15



As the penetration of intermittent renewables increase, procurement mechanisms and ancillary services market designs and rules may need to be modified. Additionally, streamlining and improving interconnection procedures will increase efficiencies and allow utilities to process more large-scale renewable interconnection requests, and accommodate newer and more complex systems.

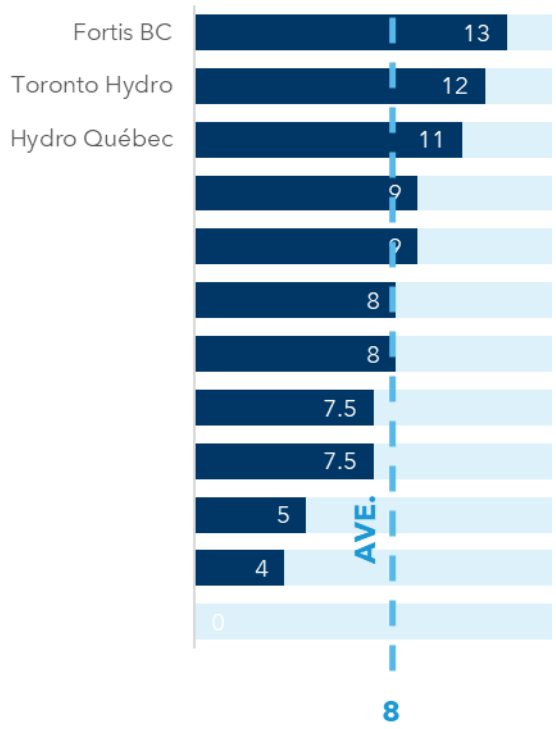
- **Canada is still "behind" in general with only one utility obtaining more than 50% of the points** in this metric.
- **Access to ancillary services payments for distributed energy resources (DERs) is limited**. As of 2021, no utility reported full access to ancillary services payments for clean and distributed energy resources. Such access was under consideration in the deregulated electricity markets (Alberta, Ontario), but its future remained unclear in other jurisdictions, which mostly do not operate through market mechanisms and include ancillary services on an ad hoc basis, if at all.
- **The typical time to *approve* interconnection requests for large-scale renewable projects (>5 MW) was half a year or less**, once correct documentation is submitted, and payment received. This period covers the part of the process within utilities' control (e.g., conducting a connection impact assessment) and usually varies depending on project size and regional requirements. Time to *commission* a project may be substantially longer, influenced by parties other than the utility. Of note, half of the reviewed utilities had not yet experienced any or enough large-scale renewable project requests to determine a 'typical time'.
- **As of 2021, only a third of utilities were undertaking or planning steps to improve/streamline large-scale interconnection processes**. Steps include undertaking customer journey mapping exercises, sharing documentation (e.g., hosting capacity maps, interconnection requirements), and engaging with developers. The remaining utilities were not undertaking or facilitating steps, mostly because they were not expecting large-scale interconnections in their service territory.

ONTARIO: Clean distributed energy resources (e.g., storage, distributed generation, demand response) have partial access to some IESO markets for ancillary services, such as operating reserves. The IESO is working with stakeholders to further enable DER participation in its' markets.

1 Clean Energy Supply

1.4 CORPORATE LEADERSHIP

POINTS AVAILABLE **15**



In addition to decarbonizing the grid and supporting customers, utilities will need to make the clean energy transition a core mandate within their organization and culture. This includes leading by example to decarbonize corporate buildings and operations, linking executive compensation to carbon-reduction goals, and being accountable through transparent tracking and reporting.

- **Corporate emission reduction targets and plans have become an industry standard. As of 2021, all but one utility had a corporate sustainability plan and/or initiatives**, **but the nature of the plans vary widely**. Several plans – mostly of smaller utilities - focused on isolated initiatives, such as employee days, safety training, local outreach, headquarter efficiency measures, etc. Some larger utilities had comprehensive environmental, governance and social (ESG) objectives related to their environmental impact, human resources practices, etc. Of note, some medium-sized utilities had comprehensive plans due to their links to a larger parent entity (e.g., municipality or large corporation).

- **As of 2021, two thirds of utilities had targets in place related to the decarbonization of their own operations (e.g., buildings, fleet), but the target years and depths vary**. The most ambitious utility aimed to be net zero by 2030, while another targeted 2040, three targeted 2050, and another three had interim decarbonization targets without any net zero commitment. Finally, four utilities (mostly small) had not declared their decarbonization ambitions, though some have pursued isolated initiatives to reduce their carbon footprint.

- **Three quarters of utilities had a public sustainability report to track their progress and accountability**. However, as with plans, the quality of reporting varied widely, ranging from general brochures about sustainability initiatives to consistent and comprehensive tracking and reporting on the indicators laid out in the corporate sustainability plan. Few utilities resorted to independent verification and reporting of their progress.

- **Only two utilities have tied executive performance and compensation to the achievement of corporate decarbonization objectives**, and none to grid decarbonization. See leader spotlight for an example.

FORTIS BC: At FortisBC, sustainability performance measures for annual incentive purposes focus on climate, people, and reliability. In 2022, the weighting of climate will increase to 40% from 30%, and long-term incentive plans will include a measure associated with reducing corporate carbon emissions for all executives.

Clean Energy Supply: Additional Spotlights

FORTIS BC: Fortis BC's 2021 Long Term Electric Resource Plan (LTERP) aligns with BC's environmental goals and ensures consistency with provincial energy policies and objectives.

1 Clean Energy Supply

- 1.1 Planning & Designing to Decarbonize the Grid
- 1.2 Clean Energy Procurement & Deployment
- 1.3 Integration of Clean Energy Supply
- 1.4 Corporate Leadership

TORONTO HYDRO: Toronto Hydro executives are eligible for performance-based compensation tied to corporate objectives. Two of these objectives aim at managing climate related risks and opportunities: Building Emissions Reduction and Fleet Electrification.

Modern Grid: Overview

2 Modern Grid

2.1 Enhanced Grid Planning & Management	2.2 DER Enablement & Integration	2.3 Visibility & Control Capabilities	2.4 Innovation & Emerging Technologies	2.5 Climate Resiliency

A modern, smart, and dynamic grid is crucial to enable utilities to decarbonize the grid, enable greater electrification, prepare for climate impacts, and respond to shifting customer needs and preferences. This will require advanced grid capabilities, planning and operations, greater visibility and control, and a willingness to innovate.

Under Modern Grid, we assess utilities on the following:

2.1 Enhanced Grid Planning & Management. Efforts to modernize or enhance load forecasting tools and planning processes.

2.2 DER Enablement & Integration. The portion of peak demand/system capacity represented by Demand Response (DR), share of energy savings from energy efficiency, how utilities are valuing Non-Wires Alternatives (NWAs), and whether utilities have a formalized DER strategy and/or roadmap.

2.3 Visibility & Control Capabilities. Current AMI coverage and capabilities, deployment of DERMS, SCADA, and ADMS.

2.4 Innovation & Emerging Technologies. Funding and/or spending on innovation, research and innovative pilots.

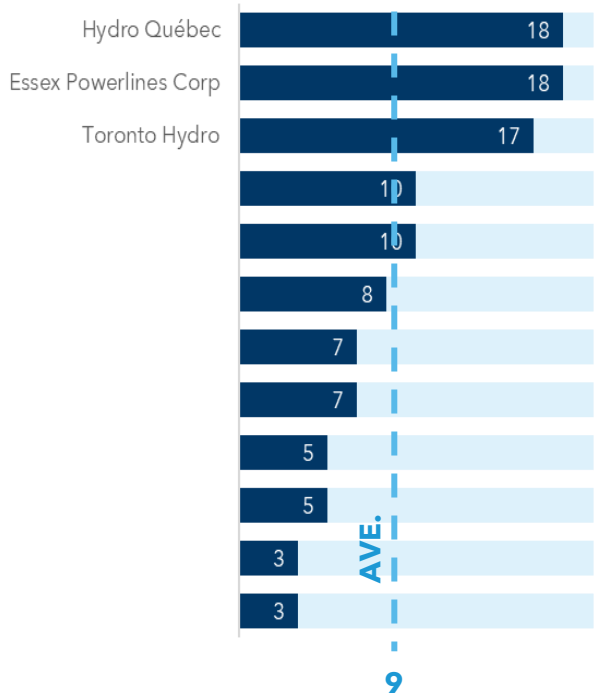
2.5 Climate Resiliency. Actions taken to fortify the grid to protect critical infrastructure and/or services during extreme climate events.



1 Modern Grid

2.1 ENHANCED GRID PLANNING & MANAGEMENT

POINTS AVAILABLE **20**



Grid planning must evolve to manage a complex mix of diverse, distributed and intermittent resources, and address increasingly localized grid challenges. This includes updating load forecasting practices to enhance their granularity and ultimately may require reframing utilities' roles, from one-directional to bidirectional operators.

- **As of 2021, all but one utility were modernizing or enhancing their load forecasting tools and processes to account for renewable growth, climate change, and/or vehicle electrification.** Several utilities were working with consultants and specialized service providers. Some utilities reported facing challenges calibrating existing studies and tools to their local contexts and customers.
- **Three quarters of utilities had DER forecasting capabilities**. Of these, two thirds relied on basic, top-down forecasts, with only three utilities – including at least one small utility – using bottom-up or advanced modelling to forecast DER adoption.
- **Most load forecasts were at the system level and on an annual or seasonal basis**, but two utilities – including at least one small utility – generated load forecasts that are both localized (at the bus level) and on a year-round, hourly basis ("8760", for the number of hours in a year) to capture the increased pressure on their distribution systems.
- **Half of assessed utilities were actively updating their operational model in the context of the energy transition**, for instance by developing a "Grid Transformation Roadmap". The other half had not laid out a comprehensive plan as of 2021.[1] Moreover, only two utilities were explicitly planning changes to their business model, such as transitioning to a Distribution System Operator (DSO) model – see leader spotlight for an example.

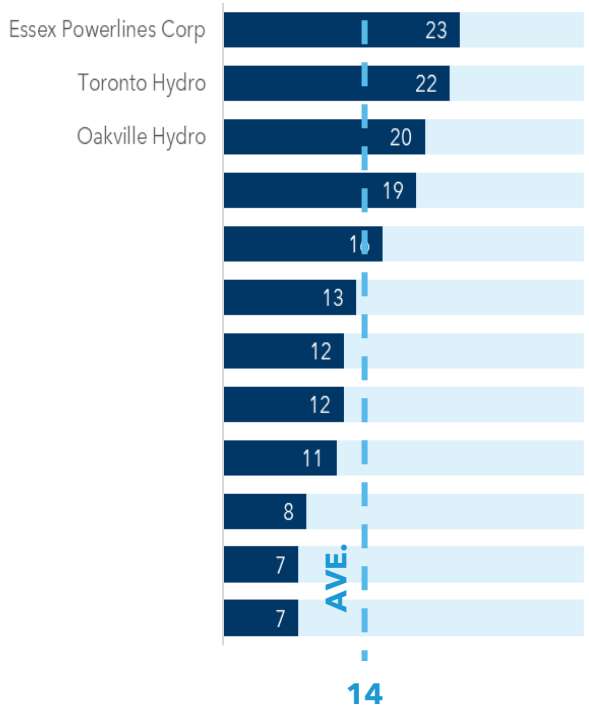
ESSEX POWERLINES CORP.: Essex implemented advanced temporal and spatial forecasting capabilities providing year-round hourly load forecasts. Moreover, their *SmartMAP* application, connected to their main dashboard, detects EV's and DER enhancing visibility of localized network impacts. Essex's 2021 application to the IESO Grid Innovation Fund outlines a roadmap to transform into a DSO.

[1] Some Ontario utilities pointed to the IESO's 2019 report about "Structural Options for Ontario's Electricity System in a High-DER Future", see https://ieso.ca/Sector-Participants/IESO-News/2019/06/ETNO-releases-report-on-system-options-in-a-high-DER-future.

2 Modern Grid

2.2 DER ENABLEMENT & INTEGRATION

POINTS AVAILABLE **35**



To support the transition, utilities will need to integrate more DERs, consider non-wires alternatives (NWAs), address peak demand and system capacity, incorporate energy efficiency (EE) and demand response (DR) initiatives, streamline and improve DER interconnection processes, and manage the distribution system.

- **Few utilities – principally vertically integrated crown corporations – had a mandate for delivering EE and DR programs and savings**. In several provinces, public agencies or system operators administer programs, if any. Scores here are thus based on provincial savings as a percentage of domestic electricity sales (GWh) or annual peak demand (MW). Savings were highest in ON (0.75% of sales, 7.5% of peak) and QC (0.75% of sales, 4.5% of peak), followed by SK for peak savings (2%) and by AB, NB and BC for energy savings (0.5-0.6% of sales). By contrast, leading American states achieve over 2% of sales in savings.[1]
- **As of 2021, no utility had developed a comprehensive process for valuing DERs as NWAs**. Half had conducted preliminary research, for instance developed an "NWA staff toolkit" or "DER Value Registry", or reviewed approaches in other jurisdictions. The other half had not yet undertaken any steps.
- **No utility used DERs for ancillary services**. Two utilities in deregulated markets (AB, ON) were awaiting regulatory enablement to do so, while one large utility was running pilots (black start, frequency regulation).
- **Two thirds of utilities had a DER strategy or roadmap**, **though the level of detail varied** from basic documents to comprehensive, costed plans. Some DER strategies were integrated into a wider transformation vision (e.g., a grid modernization roadmap). The remaining third of utilities – of various sizes – had no formal plan or strategy related to DERs.
- **Interconnection processes and timings for small-to-medium renewable projects varied across and within jurisdictions, with no harmonized steps.** Timelines range from 14 days to 3 years (avg of 150 days) for medium-scale projects of 10 kW to 5 MW, and from 1 day (automatic approval) to 365 days (avg 61 days) for small projects below 10 kW. Two thirds of utilities were actively working to reduce these times. Measures include distributed generation maps, customer journey maps, restricted feeder lists, developer manuals and outreach.

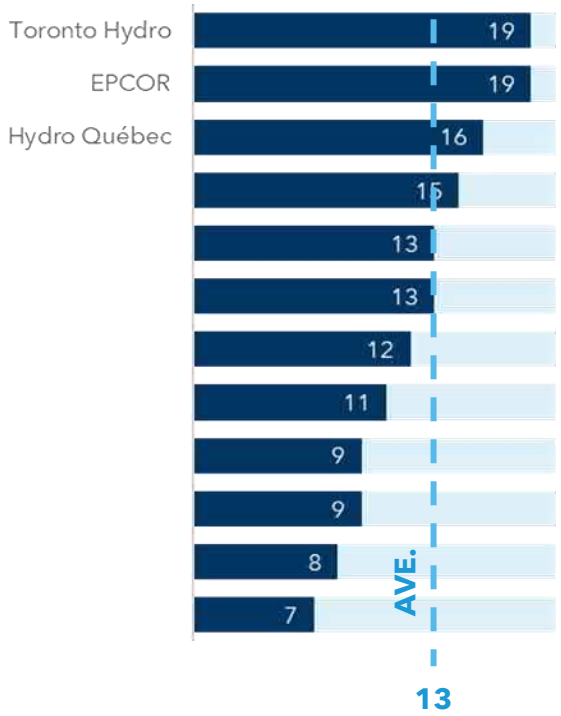
OAKVILLE HYDRO: Oakville Hydro's distribution plan was reviewed by third party consultants to assess DER/NWA opportunities as alternatives to planned grid investments. Additionally, all 12 micro-embedded generation facilities added to the local grid in 2021 were connected within planned timelines.

[1] Data for Canada from Efficiency Canada's 2022 Canadian Energy Efficiency Scorecard (data for 2021), and for the United States from the ACEEE State Energy Efficiency Scorecard: 2021 Progress Report, p.17 (data for 2020).

2 Modern Grid

2.3 VISIBILITY & CONTROL CAPABILITIES

POINTS AVAILABLE **20**



To effectively and safely operate increasingly diversified grids, utilities need an advanced understanding of assets' locations and capabilities. This requires enhanced visibility and control capabilities, using software solutions (e.g., AMI, ADMS, SCADA), and distribution automation.

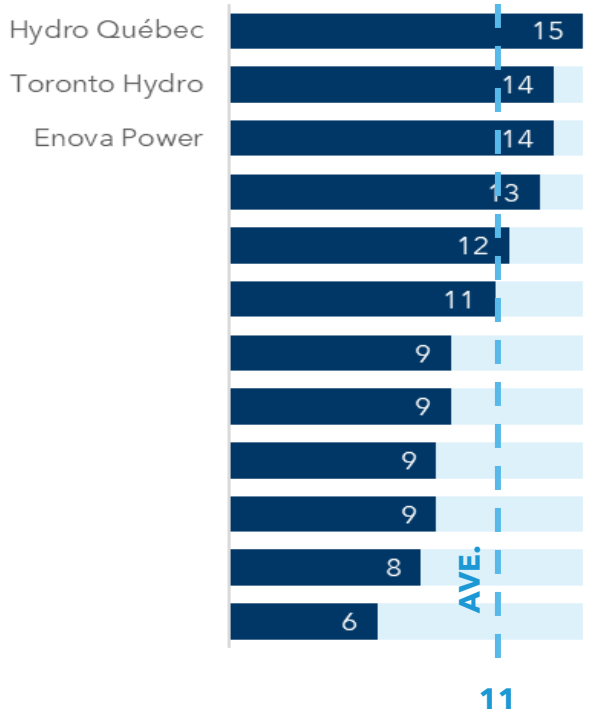
- **AMI deployment is very advanced across Canada**. As of 2021, all but two utilities had deployed AMIs to 90+% of customers. Both remaining utilities were planning mass deployment, although a global microchips shortage slowed plans in one case.
- **Just over half of utilities leverage AMI capabilities beyond basic metering**, such as two-way control (e.g., remote disconnection), outage detection, power quality analysis, energy theft detection, etc. The remainder of utilities had either metering-only capabilities or did not have AMIs.
- **Only two utilities had deployed DER Management Systems (DERMS)**, with two other utilities in advanced planning stages. Utilities using or considering DERMS were more likely to be large. Utilities were primarily drawing on DERMS from external service providers, with some using funding from Natural Resources Canada (NRCan) to support DERMS deployment.
- **All except one (small) utility had deployed a Supervisory Control and Data Acquisition (SCADA) system as of 2021 or were about to do so**. Some utilities had deployed SCADA for their transmission system only and were only about to deploy it at the distribution level.
- **Three quarters of utilities had deployed an Advanced Distribution Management System (ADMS)** as of 2021 or were about to do so. Only three utilities had no ADMS or short-term plans to deploy one, ranging across different provinces and size categories. Moreover, several utilities of various sizes have recently deployed Fault Location Isolation and Service Restoration (FLISR) technology.

EPCOR: Over 99.9% of customers have AMI, and EPCOR has deployed ADMS, SCADA, and DERMS. The DERMS was supported by NRCan funding in 2018 and was being tested with the integration of E.L. Smith solar farm and a Battery Energy Storage System (BESS).

2 Modern Grid

2.4 INNOVATION & EMERGING TECHNOLOGIES

POINTS AVAILABLE **15**



Innovation, deployment of new technologies, strategic investments and collaboration with external partners will be needed to overcome today's challenges and achieve net zero by 2050.

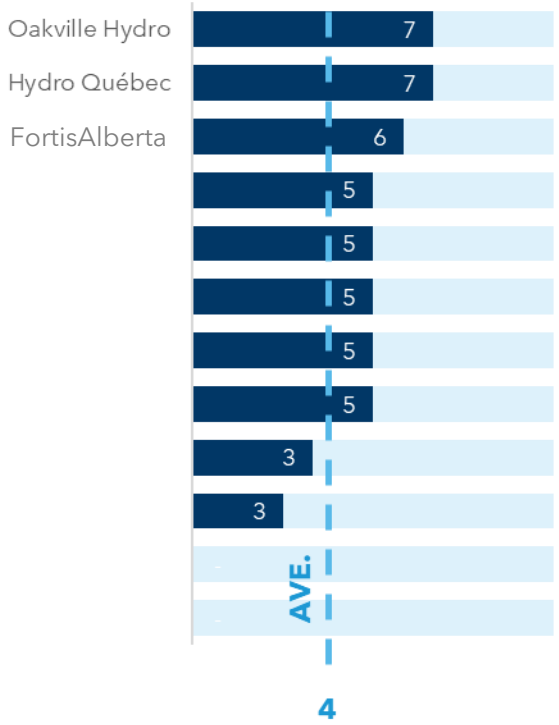
- **Two thirds of utilities had dedicated envelopes for innovation and research in 2021**, with a third spending more than 1% of revenue, another third less than 1%, and the final third unable to provide a figure as costs were distributed across multiple budget lines and not earmarked for "innovation" specifically.
- **Large utilities are more likely to afford dedicated research and innovation budgets** (e.g., Hydro Québec's research division), but one medium and one small utility also had large innovation budgets. Several are leveraging innovation funding, such as the IESO's Smart Innovation Fund, or NRCan's smart grid funding.
- **All but two utilities had a dedicated innovation resource team or staff member**. Innovation is sometimes, but not always, explicitly part of the role description, with one utility for instance describing its Grid Transformation Team as its innovation lead. The two remaining utilities noted they pursue innovation in a cross-cutting way, without a designated resource.
- **All but two utilities demonstrated practical applications of their investments into visibility and control capabilities**, such as improved geographic information systems (GIS), data and enterprise analytics, system interoperability (GIS, ADMS, SCADA, AMI), DER mapping, or outage management (see leader spotlights). However, the value of these applications could rarely be quantified.
- **All but one utility were running innovative pilots/projects as of 2021**, with innovation defined relative to their context. Initiatives include process innovations (robotic process automation, data visualization tools), program innovations (EV demand response pilot, smart water heater pilots), organizational innovations (transitioning towards an integrated distribution system operator role), and asset-based innovations (mobile battery energy storage system, use of optical ground wire as both transmission neutral wire and internet cable).

ENOVA POWER: Enova established an Innovation and Business Transformation department and created a Manager of Innovation position. A formal innovation strategy is under development and an additional resource is planned to assist advance innovation and new technologies. Already, the implementation of a Fault Location Isolation and Service Restoration (FLISR) technology led to a 33 percent decrease in Customer Minutes of Interruption in 2021 for residents in Waterloo, Woolwich and Wellesley.

2 Modern Grid

2.5 CLIMATE RESILIENCY

POINTS AVAILABLE **10**



As our climate changes, utilities will need to anticipate, plan for and mitigate impacts to critical infrastructure that can affect their ability to deliver safe and reliable service. Utilities' must also consider their exposure to climate risk, which could impact their financial risk rating.

- **As of 2021, three quarters of utilities were pursuing several actions to protect critical infrastructure and services during extreme climate events**. Actions include developing a climate adaptation and management plan, setting up a storm operations center, reducing vegetation risk, modifying pole design to withstand more extreme or frequent weather events (ice storm, fires, floods), modifying materials (composite poles, stainless steel transformers), oversizing equipment, funding battery storage in remote areas, etc. One (large) utility cited its ISO 14001:2015 certification in this regard, as well as using the Public Infrastructure Engineering Vulnerability Committee Protocol developed by Engineers Canada.
- **However, initiatives are rarely part of an integrated plan**. Only a few utilities have developed a comprehensive plan, such as the "Climate Adaptation and Management Plan" or the "Climate Change Adaptation Roadmap" developed by one medium and one large utility, respectively.
- **Moreover, only a third of utilities explicitly consider climate change scenarios in their planning processes**. While several utilities report on climate change risks and some consider climate change in weather forecasts (wind, rain), only four utilities (one small, one medium, two large) have incorporated scenario analysis into their planning. The most elaborate analyses were undertaken by utilities which have made an organizational commitment to analyse and report risks against global standards, for instance Fortis BC and FortisAlberta (see leader spotlight).

FORTISALBERTA: A Task-Force on Climate-Related Financial Disclosures (TCFD) report was completed in 2021. The TCFD analyzed four climate scenarios and their possible impacts (transition, physical climate risks). FortisAlberta has since developed asset management programs to build grid resiliency (e.g., Wildfire Risk Mitigation Plan with specific actions).

Modern Grid: Additional Spotlights

EQUS REA: Since 2018, EQUS REA has deployed a next generation Ultra-Rural Radio Frequency mesh network of advanced metering infrastructure to automate meter readings, and support the increased penetration of renewable energy sources, EV charging stations, and storage systems. The project aims to address challenges associated with serving rural customers while improving response times and repairs to outages. Separately, EQUS inaugurated a new near net-zero facility in Innisfail in 2020, which incorporates a solar array and a 15-kilowatt battery.

2 Modern Grid

2.1 Enhanced Grid Planning & Management	2.2 DER Enablement & Integration	2.3 Visibility & Control Capabilities	2.4 Innovation & Emerging Technologies	2.5 Climate Resiliency

NB POWER: NB Power is taking several climate resiliency actions to protect critical infrastructure and/or services. For example, both transmission and distribution have right of way line widening programs to reduce vegetation risks, transmission line designs consider expected weather events, and distribution line standards ensure structure designs do not exceed 75% of structure strength (to provide buffer for ice loading, etc.). Salt contamination zones due to potential flooding are defined, and special design considerations and materials are used in these areas.

Composite poles are being implemented through pilots in 2023.

Customers & Society: Overview

3 Customers & Society

3.1 Changing Customer Preferences	3.2 Enabling Transport, Building & Industry Electrification	3.3 Being Intentional About Diversity, Equity & Inclusion	3.4 Aligning Actions & Engagement

Electrification presents a significant economic opportunity for Canada's electric utilities. New technologies and platforms are increasing customers ability to participate in the energy transition and utilities can play an important role to educate, engage and enable customers to electrify their buildings, transportation and industry. Comprehensive and meaningful stakeholder engagement must be part of the process to inform all decisions, empower customers, obtain support and buy-in and ensure a just and equitable transition.

Under Customers & Society, we assess utilities on the following:

3.1 Changing Customer Preferences. Digital platforms, rate-based solutions, and awareness, education and energy services.

3.2 Enabling Transportation, Building & Industrial Electrification. Comprehensive electrification strategies and initiatives to catalyze transportation, buildings and industrial electrification.

3.3 Being Intentional About Diversity, Equity & Inclusion. Diversity, equity and inclusion goals and actions to ensure a diverse and inclusive workforce and mitigate impacts to vulnerable populations.

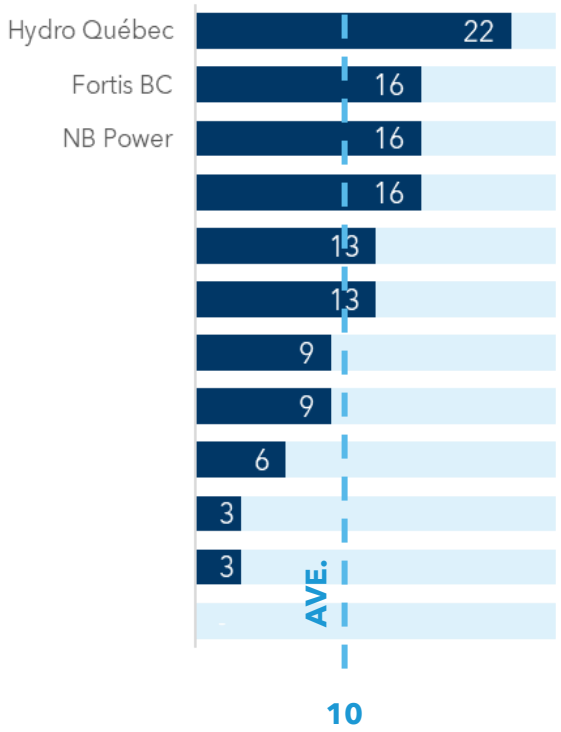
3.4 Aligning Actions & Engagement. Alignment, strategic partnerships and collaboration to facilitate the transformation



3 Customers & Society

3.1 CHANGING CUSTOMER PREFERENCES

POINTS AVAILABLE **25**



Utilities have an important role to play in raising awareness and empowering their customers to participate in the clean energy transition. This includes offering tailored products and services that enhance customer experience.

- **As of 2021, most utilities offered portals that allowed customers to view their consumption, but less than half offered additional support to help customers to act on the data**. Only four utilities offered digital engagement tools to support energy efficiency and building energy benchmarking, such as Home Energy Reports, Energy Star Portfolio Manager, Green Button,[1] or an online rebate marketplace.
- **Canada was split in terms of dynamic pricing, with half the reviewed jurisdictions/utilities offering it**. All Ontario utilities as well as two other utilities offered dynamic pricing. The other six utilities had yet to introduce rate-based solutions or investigate cost-drivers that could influence consumer behavior.
- **All utilities worked to build awareness and educate customers on the clean energy transition**. All offered basic education to engage customers, such as dedicated webpages for EVs, DERs and/or energy saving tips, media campaigns, bill inserts and tools/resources (e.g., developer manuals). One leading utility offered information in multiple languages and established an Indigenous customer care center. In one jurisdiction, utilities flagged that they had filed regulatory requests to support education initiatives but were denied.
- **Half the utilities were delivering services and solutions to remove barriers to increased electrification and efficiency**. Solutions included incentive programs for EVs and building efficiency, investments in charging infrastructure, renewable subscription services for commercial and industrial customers to buy renewable energy certificates to support their own carbon reduction targets, heat pump and smart thermostat programs. Some utilities were working with clean tech companies and seeking external funding to explore, pilot and/or design new initiatives (e.g., renewable generators, energy storage systems).

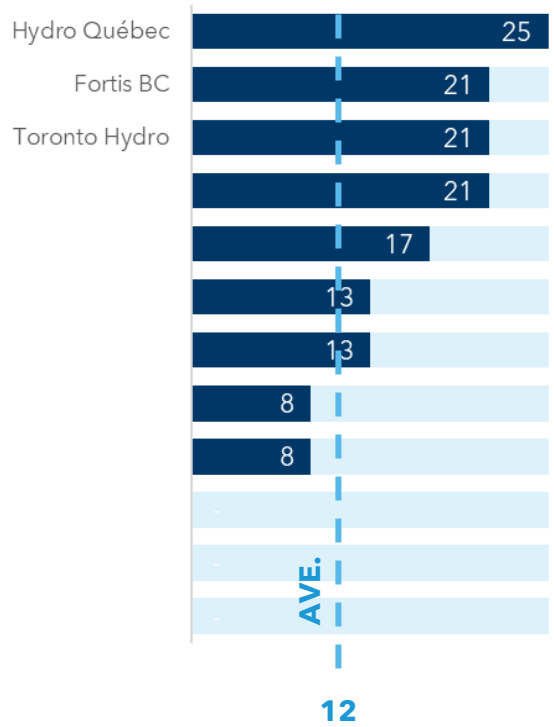
NB POWER: NB Power offers personalized energy management and peer-to-peer comparisons (e.g., Home Energy Reports and Energy Start Portfolio Manager). NB Power also launched new initiatives (e.g., Beat the Peak campaign and EV charging rebates) and is developing others, including a clean energy rate.

[1] The Green Button initiative is an industry-led effort that aims to provide utility customers with easy and secure access to their energy usage information in a consumer-friendly format for electricity, natural gas, and water usage.

3 Customers & Society

3.2 ENABLING TRANSPORT, BUILDING AND INDUSTRY ELECTRIFICATION

POINTS AVAILABLE **15**



As the grid decarbonizes, utilities should help to enable transportation, buildings and industrial electrification. To do so effectively requires careful planning and thoughtful discussion to identify and maximize opportunities.

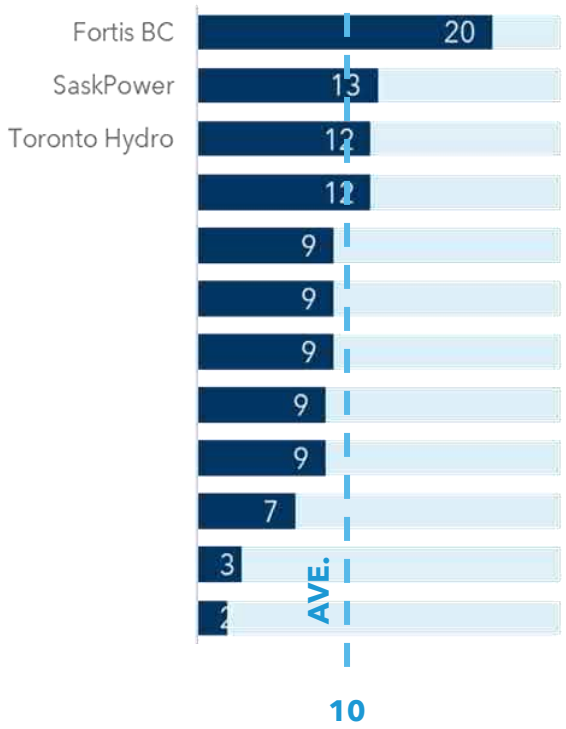
- **Only half the utilities had developed electrification strategies, and only two had done so in a comprehensive multi-sector way.** One utility had centered its strategic plan on enabling the electrification of the local economy, while another had developed a climate action plan that considers the role of the utility in supporting actions, like electrification, that combat climate change and spur equitable economic growth. Four other utilities had draft electrification strategies and the remaining six utilities had no plan as of 2021.
- **Most utilities were undertaking actions to enable electrification, but often in a siloed or *ad hoc* manner.** Nine utilities offered programs or services to catalyze electrification, for instance dedicated account managers supporting large customers with building or transport electrification, or pilot projects related to EV smart charging or tariffs. Of the nine utilities with services, four focused on electrification in only one sector (e.g., transportation or buildings), rather than across multiple.
- **Electrification in certain sectors is challenging, and several utilities are pursuing hybrid approaches**. One utility is partnering with a gas utility to encourage a dual-fuel approach for peak demand management along with a dual-energy rate. Another is investigating hybrid systems while focusing on decarbonizing the gas supply for thermal applications.

HYDRO-QUÉBEC: A key pillar in Hydro Québec's 2020-2024 Strategic Plan is to Electrify Quebec. Hydro Quebec subsidiaries (EVLO, Hilo, Cléo) offer energy storage, smart energy management and transportation electrification solutions that help reduce GHG emissions, while generating economic spin-offs and collective wealth across the company and society.

3 Customers & Society

3.3 BEING INTENTIONAL ABOUT DIVERSITY, EQUITY & INCLUSION

POINTS AVAILABLE **25**



The energy transition could disproportionately impact vulnerable communities unless utilities actively assess and consider the community impacts and prioritize and entrench equity in all decisions. Currently, Canada's electricity workforce has lower representation of women, BIPOC (black, indigenous and people of color), persons with disabilities, 2SLGBTQI+, and newcomers than what is reflected in the general population.[1] Establishing diversity, equity and inclusion (DEI) goals and actions, setting targets and tracking progress are necessary to create a diverse and inclusive workforce and to ensure a fair, just and equitable transition for all.

- **As of 2021, all but one utility had some kind of workplace DEI policy or strategy – but only five were comprehensive**, with baselines, representation targets, training, and dedicated DEI communications. Four utilities were signatories to the Leadership Accord on Diversity, Equity and Inclusion developed by Electricity Human Resources Canada, making a public commitment to advance, integrate and prioritize DEI. Others have achieved or are pursuing the Canadian Council of Aboriginal Business (CCAB) Progressive Aboriginal Relations (PAR) certification. The remaining half of utilities had only draft/basic plans, or no plan at all.
- **Community-wide DEI strategies, goals and targets were less common or clear, and there were few mechanisms to track progress and impacts.** Only one utility had a comprehensive strategy. Eight utilities offered underserved community programs (e.g., low-income, First Nations, multifamily, small business), with programs ranging from self-install energy saving kits to comprehensive turnkey solutions at zero upfront costs. Several utilities did not offer programs, but not always for lack of desire: one utility's regulatory application for a "Low Income Energy Efficiency Initiative" was rejected.
- **None of the benchmarked utilities or provinces spent 20+% of their Demand-Side Management (DSM) portfolio budgets on programs for vulnerable sectors in 2021.** Leading utilities in other jurisdictions have committed or been mandated to allocate 20% of DSM portfolio spend towards low-income programs.[3] This recognizes that different levels of investment and types of services and supports are needed to achieve the same outcomes for those most vulnerable.

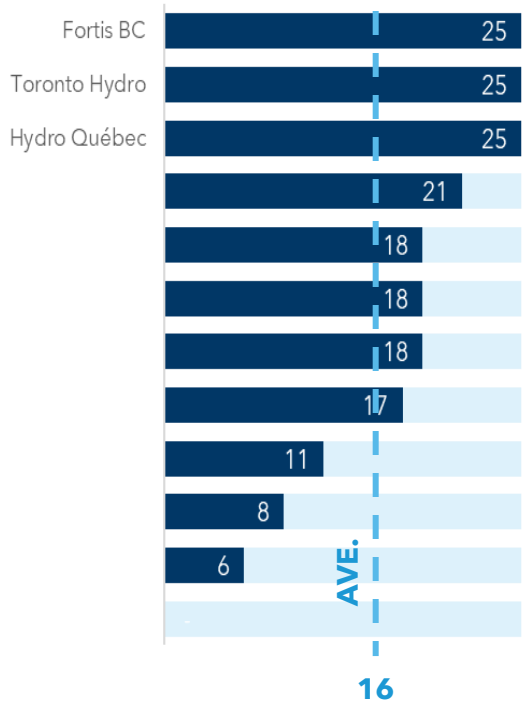
1 See https://electricityhr.ca/
2 The state of New York requires that 20% of any energy efficiency investments through the utilities be directed to the LMI market segment. For the 2017–21 District of Columbia program cycle, low-income spending requirement was 20% of expenditures. See Subramanian, S., W. Berg, E. Cooper, M. Waite, B. Jennings, A. Hoffmeister, and B. Fadie. 2022 State Energy Efficiency Scorecard. Washington, DC: ACEEE. www.aceee.org/research-report/u2206.

SASKPOWER: SaskPower has a robust Diversity & Inclusion Strategy, which outlines numerous initiatives, such as Advancing Women in Leadership and Trades, Indigenous Employees Network, Pride Employee Resource Group, Employees with Disabilities Network, Cultural Diversity Group, Women's Resource Group; and PowerGen (leadership development network) It also outlines a communications and tracking plan.

3 Customers & Society

3.4 ALIGNING ACTIONS AND ENGAGEMENT

POINTS AVAILABLE **25**



Aligning goals and conducting comprehensive engagement with a wide range of stakeholder groups is needed to ensure success. Engagement must be proactive, iterative and inclusive around key topics (e.g., clean energy, modern grid, electrification). This will help utilities to understand stakeholder needs and motivations; identify challenges, innovative solutions, and potential partnership opportunities; support decisions, and obtain buy-in for new investments and approaches required to meet net zero goals.

- **Only three utilities completely aligned with government climate ambition, while seven were partially or indirectly aligned.** There is large alignment by nature at utilities owned by provincial and municipal governments in Canada. In most cases, a municipality is the sole shareholder, and three utilities are crown corporations. Utilities that received lower scores in this metric are in jurisdictions that have noticeably lower GHG emissions objectives and no regulator and utility mandates. Utilities need clear direction from governments, regulators and system operators to focus planning and investments on net-zero pathways and expand their efforts beyond maintaining and decarbonizing the grid to increasing clean-electricity economy-wide energy use.
- **Utilities are increasingly proactive in collaborating with other stakeholders**, such as local and provincial governments, energy efficiency organizations, electricity systems operators and regulators to advocate for and advance clean energy, grid modernization and electrification. While all utilities had integrated resource planning engagement processes, only four had comprehensive engagement plans specific to the energy transition. Leading utilities had robust public relations/engagement and policy teams to proactively and deliberately engage on climate, regional planning and electrification. Five utilities only had a draft or basic engagement plan, while two had no plan.

TORONTO HYDRO: Toronto Hydro is working with the IESO on pilots and participates in numerous stakeholder sessions about the energy transition, DERs, NWAs, and regional planning process with other utilities. Toronto Hydro also works closely with the City of Toronto; Toronto Hydro's Climate Action Plan that details how they can support the City's Net Zero Strategy.

Customers & Society: Additional Spotlights

ONTARIO: All Ontario utilities offered time-of-use and tiered pricing. Price signals charge higher rates during peak periods and lower rates at off-peak hours to encourage customers to reduce their consumption and lower electricity costs by shifting their usage to lower price periods. Tiered pricing charges customers higher prices when consuming more.

A new ultra-low overnight rate was introduced in Ontario in 2023 for customers that use more electricity at night, including shift workers, those that heat their home or charge their electric vehicles at night to save money when peak demand is lower.

3 Customers & Society

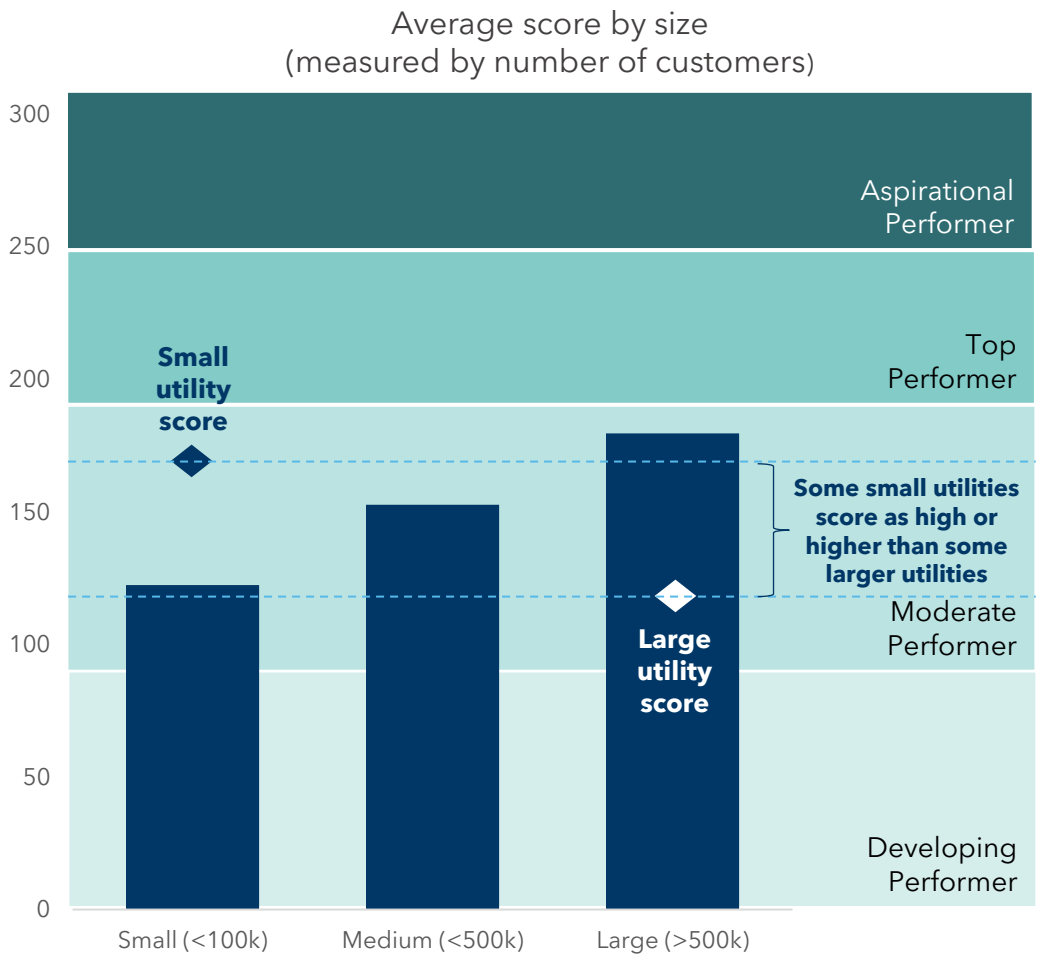
- **1.1 Changing Customer Preferences**
- **1.2 Enabling Transport, Building & Industry Electrification**
- **1.3 Being Intentional About Diversity, Equity & Inclusion**
- **1.4 Aligning Actions & Engagement**

EPCOR: EPCOR's 2021 comprehensive Environmental, Sustainability and Governance (ESG) Plan has established workplace DEI commitments and reports on the organization's progress. EPCOR has set targets at all levels across the organization and achieved or came close to achieving them in 2021. For example, the plan sets a Board Gender Diversity Target (at least 40% board are women), as well as an Employee Ethics Training Target (100% of eligible employees trained every second year).

Although no targets were set in 2021, EPCOR also reports on Diverse and Representative Workforce metrics (e.g., percentage of women, visible minorities, and women in senior leadership).

Utilities' average scores can be influenced by size, how clean the grid is, and ownership structure; however, these variables are not always indicators of success. Each utility is demonstrating leadership in various metrics and across the three main categories

- **SIZE:** Larger utilities tend to score more points, as they likely have more financial and non-financial resources to plan, execute, innovate and adopt best practices. However, some small utilities do well due to a combination of local innovation, jurisdictional opportunities and leveraging external funding sources. For example, one of the four small utilities achieves the fourth-best overall score.
- **GRID:** Utilities in jurisdictions with cleaner grids score higher on average. Those with already clean grids have a natural advantage in the clean energy supply category; however, this trend also applied to the two other dimensions (modern grid and customers & society). This may be because utilities with already-clean grids are able to devote attention elsewhere.
- **OWNERSHIP:** Crown corporations score highest on average, partly driven by their size, followed by municipally owned utilities, some of which are small. These utilities are organically aligned with government and community objectives.



Note: given the limited number of participating utilities, no statistically significant conclusions can be drawn about correlations or causations between performance and any utility characteristics.



4. Key Takeaways & Considerations

Ten Key Insights from the Results

INSIGHT 1	**Canadian utilities have embarked on the energy transition journey**. They recognize the climate emergency and have established plans to reduce emissions. While utilities are at various stages in the transition, every benchmarked utility demonstrated leadership in certain areas.
INSIGHT 2	**More effort is needed.** The pace and scale required to meet our net zero goals by 2050 and avoid the worst climate change impacts, requires greater leadership and ambition, comprehensive decarbonization and electrification strategies, detailed inclusive roadmaps, and the tools and resources to act. The clock is ticking; without accelerated action, several actors will be challenged to achieve their targets.
INSIGHT 3	**Utilities are a diverse group, which must be considered when comparing scorecard results, opportunities and solutions.** Utilities vary in terms of size, structure, services, context, and control over their environment. We must recognize this diversity when interpreting the results and crafting policy and/or regulations that will affect utilities. Where possible, utilities and others can leverage diversity of thought and approaches to adapt innovative solutions to their unique context. Jurisdictions with less clean grids will require substantial and coordinated support to quickly live up to their own goals, and in some cases, even more ambitious federal targets.
INSIGHT 4	**Utilities are facing a massive transformation**. An already complex electricity system is under greater pressure to continue to deliver safe, affordable and reliable electricity along with being clean, resilient and equitable. If not managed carefully, this transformation could leave some groups – including some utilities and their communities – behind.
INSIGHT 5	**Utilities can't do it alone and current government commitments and regulatory structures have constrained some utilities**. Government and regulators must give utilities concrete climate targets, direction and support to guide their net-zero pathways. Utilities need latitude to implement needed action and support to make significant investments to balance DER integration, facilitate greater electrification and resiliency, and enable customers to contribute to, and benefit from, the transition. In many cases, legislation and regulation needs to evolve to enable utilities and financial support is needed to complement utility investment.

Ten Key Insights from the Results

INSIGHT 6	**Utilities need a comprehensive strategy that covers all three dimensions of this transition**. All the scanned utilities are making progress and demonstrating leadership in certain areas, but more work is needed to effectively address and coordinate actions across all elements of the clean energy transition.
INSIGHT 7	**Distribution-oriented utilities have historically not been the main drivers of grid innovation but will become increasingly important as gateways for the integration of DERs into the grid**. As such, utilities will require considerable support (policy, regulatory, financial, technological) to increase deployment of, and leverage, DERs, including valuing DERs in ancillary services. Canada lags American and European jurisdictions in enabling and leveraging distributed grid flexibility.
INSIGHT 8	**Utilities are anchored in their communities and are thus valuable partners to relay information both ways**. It will be important for utilities to communicate messaging related to the energy transition to partners and customers and provide diverse services and solutions to help customers participate in, and contribute to, the transformation. Vice-versa, utilities can communicate customer needs, expectations and reactions to policy-makers to inform future policy.
INSIGHT 9	**More attention needs to be paid to equity implications of the transition**. Utilities are actively considering equity in the workplace to ensure that it is diverse and inclusive, but internal action has not yet translated to community-wide equity impacts and strategies (e.g., several utilities have set internal diversity targets and implemented actions, but most have yet to study community needs and establish comprehensive strategies to measure and mitigate the transition's impact on those most vulnerable).
INSIGHT 10	**Ultimately, the clean energy transition presents a significant opportunity for electric utilities and society**. Utilities' core service – deliver clean, safe, reliable and affordable electricity – is at the heart of the energy transition and set for significant growth. By becoming more sustainable, resilient, and efficient, electric utilities can contribute to communities' as well as to their own prosperity.

1 Clean Energy Supply

53/100

AVERAGE SCORE | High (80%+) | Mid (50-80%) | Low (>50%)

Reviewed utilities are at different stages of their decarbonization journeys, levels of commitment, degree of control over their supply and experience integrating variable clean resources at scale. While some benefit from existing non-emitting resources, others have only just begun the transition. Without bold leadership and accountability, utilities may be challenged to meet their corporate and community goals.

1.1 Planning & Designing to Decarbonize the Grid — 21/35

- Most jurisdictions had varying clean grid goals and timelines to achieve. These are often set provincially versus by utilities.
- Without commitment and accelerated action, several utilities will be challenged to meet federal clean energy regulations by 2035. Ontario demonstrates that procurements of fossil-based resources will continue in the absence of clean grid targets.
- As of 2021, almost all participating utilities have undertaken preliminary net-zero pathway assessments; however, few with clean grid goals had outlined a comprehensive plan to achieve these.

1.2 Clean Energy Procurement & Deployment — 18/35

- The share of provincial non-emitting generation varies widely, ranging from 15% to 99%. Jurisdictions with existing hydro and nuclear power have a natural advantage.
- Renewable energy procurement varies. While half of provinces studied procured renewable generation exclusively, 2 had some dedicated renewable procurements, and 1 (AB) did not earmark any.
- Distribution utilities rely on the state of the provincial grid with little control over the pace or scale of grid decarbonization, which affects scores (positively or negatively). However, they are expected to play an increasingly important role as a DER gateway into the grid.
- Several utilities were pursuing initiatives to reduce clean technology deployment barriers like information-sharing, integrated interconnection approaches, and transmission investments.

1.3 Integration of Clean Energy Supply — 6/15

- Canada appears “behind” in this metric, with a low average score.
- Most benchmarked utilities had limited to no experience with large-scale renewable projects (> 5MW). For those that did, approval times varied; thus, no ‘typical time’ could be established. Utilities explored opportunities to improve/streamline processes, for instance through customer journey mapping exercises.
- DER access to ancillary services payments remained limited across all utilities in 2021. While some were exploring how to integrate DERs into ancillary services markets, regulatory or market barriers remain.

1.4 Corporate Leadership — 8/15

- Corporate emission reduction targets and plans have become the standard, but the nature of plans vary. Smaller utilities tended to focus on isolated initiatives, while larger utilities had more comprehensive environmental, social and governance (ESG) plans and objectives. However, the level of accountability and quality of reporting varied widely.
- Most utilities had corporate decarbonization targets for their own buildings and fleet, but the target depths and timeframe differs (e.g., net zero by 2030, 2040 or 2050). Three have interim decarbonization targets without a net zero commitment and four (mostly small) have none.
- Tying executive performance and compensation to clean grid goals is limited across most utilities.

2 Modern Grid

51/100

AVERAGE SCORE | High (80%+) | Mid (50-80%) | Low (>50%)

Canadian utilities are in the process of upgrading their grids and grid capabilities. Most are following incremental pathways, with only a few pursuing transformational visions. Overall, there remains a gap between the roadmaps, innovative pilots, and control system investments, and the limited amount of actual DER enabled and integrated.

2.1 Enhanced Grid Planning & Management — 9/20

- Modernizing load forecasting to account for DERs, climate change, and electrification was common. External service providers, tools and studies are useful, but must be calibrated to local contexts.
- Most utilities took a basic, top-down approach to DER forecasting, while leading utilities used bottom-up or advanced modelling to forecast adoption.
- Most load forecasts were at the system level and seasonal; leading load forecasts were localized (at the bus level) and on a year-round, hourly basis to better capture distribution system impacts.
- Many utilities focused on changing operational models in the context of the energy transition; however fewer are explicitly planning changes to their business models.

2.2 DER Enablement & Integration — 14/35

- Demand side management (DSM) responsibilities vary. Vertically integrated Crown Corporations are typically responsible for DSM. Conversely, DSM was non-existent in some provinces.
- No utility had a comprehensive process for valuing DERs as NWAs.
- DER access to ancillary services markets was limited. A few utilities were awaiting regulatory approvals or in an exploratory pilot phase.
- Interconnection processes and approval times for small-to-medium renewable projects varied widely across jurisdictions. There are opportunities to improve and/or streamline.

2.3 Visibility & Control Capabilities — 13/20

- Visibility and control capabilities were advancing and expected to continue to grow.
- All but two utilities had deployed AMIs to 90+% of customers. Most utilities had access to AMI capabilities beyond basic metering, such as power quality analysis.
- Similarly, most utilities had deployed an Advanced Distribution Management System (ADMS) and Supervisory Control and Data Acquisition (SCADA) as of 2021.
- Other systems like DER Management Systems (DERMS) and Fault Location Isolation and Service Restoration (FLISR) technology were less common but growing.

2.4 Innovation & Emerging Technologies — 11/15

- Most utilities had dedicated research and innovation envelopes in 2021, and a dedicated innovation team or staff. A third were unable to provide a figure as innovation resources are distributed across multiple budget lines.
- Large utilities are more likely to afford dedicated research and innovation budgets, with some allocating over 1% of overall revenue to research and development.
- Running innovative pilots/ projects related to process, automation, programs, organization, and/or technology was common in 2021, with innovation defined relative to their context (i.e., what is innovative to one utility may not be innovative to another).

2.5 Climate Resiliency — 4/10

- Most utilities were pursuing actions to protect critical infrastructure and services during extreme climate events (e.g., Storm Operations Center, funding battery storage in remote areas, adding remote sensing and control devices).
- However, initiatives were in many cases siloed. Only some utilities had comprehensive Climate Adaptation and Management Plans.
- While several utilities report on climate change risks and/or consider climate change in weather forecasts, few considered explicit climate change scenarios in their planning processes, potentially exposing them to greater climate, operational and financial risk

3 Customers & Society

48/100

AVERAGE SCORE | **High (80%+)** | **Mid (50-80%)** | **Low (>50%)**

Utilities are increasingly engaging with key stakeholders to transform the electricity system. While few had developed comprehensive electrification strategies, many had focused on electrification in specific sectors. Many utilities considered equity within their organizations to varying degrees; vulnerable community groups will need to be prioritized to ensure an equitable transition.

3.1 Changing Customer Preferences

10/25

- While basic digital platforms with consumption and billing data are commonplace, tailored customer reports that support action, such as Home/Business Energy Reports, are offered by only a few utilities.
- There is partial penetration of dynamic pricing (e.g., time of use, tiered pricing) to encourage customers to reduce their consumption and lower electricity costs.
- All utilities delivered basic education and awareness campaigns through traditional channels, while leading utilities worked to communicate more equitably (e.g., information in multiple languages, Indigenous customer care centers, hands-on customer support).
- Half of utilities delivered solutions to remove barriers, enable electrification and enhance efficiency (e.g., incentives, charging infrastructure investments, emerging technology pilots). Several utilities' efforts to offer programs were stymied by regulators.

3.2 Enabling Transportation, Building and Industrial Electrification

12/25

- Comprehensive multi-sector electrification strategies are rare. Only one utility has developed and implemented a comprehensive electrification strategy, and another had a climate action plan.
- Most utilities are helping to enable electrification in various ways, but often taking a siloed approach. Only one had a coordinated, wholistic approach that considers all sectors.
- While greater electrification is needed to meet our climate goals, there are certain economic sectors where electrification will be challenging (at least in the near-term), requiring a diverse portfolio of solutions. A few utilities are implementing and/or exploring dual fuel approaches, dual-energy rates, and hybrid systems in parallel with decarbonizing the gas supply.

3.3 Being Intentional About Diversity, Equity and Inclusion

10/25

- Canada's electricity workforce has lower representation of women, BIPOC (black, indigenous and people of colour), persons with disabilities, 2SLGBTQI+, and newcomers. While some utilities had comprehensive workplace DEI strategies and initiatives, more work is needed to breakdown systemic barriers and create a diverse, inclusive workforce.
- Community-wide DEI strategies, goals and targets were less common or unclear. Accountability mechanisms to track progress and impacts were limited or non-existent.
- Spending on programs for vulnerable and underrepresented communities varied and was below other leading North American jurisdictions that mandate minimum budget allocations for lower-income communities.

3.4 Aligning Actions and Engagement

16/25

- There is large alignment by nature with utilities owned by provincial and municipal governments.
- Utilities that received lower scores in this metric are in jurisdictions that have noticeably lower GHG emissions objectives and no regulator or utility mandates.
- Utilities are increasingly proactive in collaborating with key stakeholders to advocate for, and/or advance the clean energy transition; however, many do not have comprehensive engagement plans to guide the process.
- Leading utilities had robust public relations/engagement and policy teams to proactively and deliberately engage on clean energy and electrification.

Considerations

The clean energy transformation requires collaboration and cooperation across stakeholders. Each has a unique role to play in promoting the adoption of cleaner energy sources and transitioning towards a sustainable energy future. We outline key considerations for utilities, SGIN, and government, regulators and system operators.

Utilities	• Participating utilities can use their scorecard results to **inform internal discussion**, diagnosis, planning and prioritization, as well as to **engage external partners** whose support is needed for progress, including regulators, governments, and others. They can also draw on the **community of practice** created by this initiative to share insights, good practices and lessons learned. • Other utilities in Canada can **review this scorecard to situate themselves,** obtain guidance for their own transition and consider participating in future scorecards.
SGIN	• SGIN should **publicize the scorecard to promote its takeaways as well as awareness of the smart utility concept**. • Phase B of this initiative – the Maturity Model – will **support select participating utilities** to build on their scorecard results and improve their specific capabilities. • Phase C of this initiative – the Knowledge Hub – will make smart energy benchmarking trends, and good practices **available to a broader audience**, such as other utilities across Canada as well as policy makers, regulators, system operators, and service providers. • SGIN intends to **repeat the scorecard** to monitor progress from existing utilities and include additional utilities. Future scorecards should include indigenous and northern utilities, and may consider other relevant metrics (e.g., cybersecurity).
Government, Regulators, and System Operators	• **Governments** can use this scorecard to help inform energy- and climate-policies, regulations and goals. They must guide, support, and as needed aid utilities in undertaking necessary actions, as well as support research and public engagement. • **Regulators** ensure that utilities comply with government policies and regulations. They can use the scorecard to set regulatory frameworks and observe the impact on utilities' abilities to accelerate the energy transition. Regulatory innovations are needed to enable required investments, accelerate the adoption of new technologies, processes, tariffs and programs, and ensure that no one is left behind. • **System operators** can use this scorecard to pinpoint barriers to the integration of DERs and intermittent generation assets into the grid and wholesale markets. They play key roles in outlining clear standards and pathways for decarbonization, and in some cases, in implementing demand response and demand side management programs.



5. Appendix –
Individual Utility Scorecard Results

Category 1: Clean Energy Supply

ID	Sub Metric	Total Points[1]
Metric 1.1: Planning and Designing to Decarbonize the Grid		
1.1.1	Does the utility or their partners have clean grid goals (e.g., the Clean Energy Standard or similar clean energy penetration targets)?	5.0
1.1.2	What is the depth of the clean energy supply target (as % of MWh energy delivered)?	5.0
1.1.3	What is the timeframe to reach their clean energy supply target?	5.0
1.1.4	Does the utility have a clear roadmap to achieve its targets?	10.0
1.1.5	Has the utility followed through with their clean energy supply plan and commitments?	10.0
Metric 1.2: Clean Energy Procurement & Deployment		
1.2.1	What is the current share of clean energy (in % of MWh energy delivered) on the grid?	7.5
1.2.2	What is the current grid emission intensity (for MWh energy delivered)?	7.5
1.2.3	Has the utility or their partners released procurement opportunities and/or developed projects (if the utility builds its own generation) exclusively for non-emitting resources?	10.0
1.2.4	Has the utility demonstrated actions that reduce or remove barriers to the deployment of clean technologies (e.g., energy storage or distributed energy resources)?	10.0

1. Total points may not add up due to rounding.

Category 1: Clean Energy Supply

ID	Sub Metric	Total Points[1]
Metric 1.3: Integration of Clean Energy Supply		
1.3.1	Do clean resources have access to ancillary services payment to promote their use across all grid services such as through the utility, parent company, market, etc.?	5.0
1.3.2	What is the typical time for interconnection approval of large-scale renewable projects (5>MW)?	5.0
1.3.3	Is the utility taking steps to improve/streamline its interconnection process of large-scale renewable projects (5>MW)?	5.0
Metric 1.4: Corporate Leadership		
1.4.1	Does the utility have a corporate sustainability plan and/or initiatives (e.g., ESG plan)?	3.8
1.4.2	Does the utility have a corporate commitment to become carbon neutral in its own operations?	3.8
1.4.3	Are executives' compensation tied to a reduction in carbon emissions of clean energy supply and/or corporate operations?	3.8
1.4.4	Does the utility have a public corporate sustainability report to track progress and accountability?	3.8

1. Total points may not add up due to rounding.

Category 2: Modern Grid

ID	Sub Metric	Total Points[1]
Metric 2.1: Enhance Grid Planning & Management		
2.1.1	Is the utility modernizing or enhancing load forecasting tools and planning processes (e.g., IRPs, IDPs)?	5.0
2.1.2	Does the utility have DER forecasting capabilities?	5.0
2.1.3	At what level of granularity does the utility load forecast/planning consider the impacts of electrification/ decarbonization on load growth?	5.0
2.1.4	Does the utility have a plan, feasibility study, or assessment to consider whether changes to its business and operation model is warranted (e.g., DSO)?	5.0
Metric 2.2: DER Enablement & Integration		
2.2.1	What portion of peak demand/system capacity is represented by DR?	7.0
2.2.2	What was the average share of annual energy savings provided by energy efficiency initiatives in the utility's service area?	7.0
2.2.3	Has the utility determined the value or a process for valuing DERs as NWAs?	6.0
2.2.4	Is the utility considering DERs for ancillary services?	2.0
2.2.5	Does the utility have a formalized DER strategy and/or roadmap?	4.0
2.2.6	What is the typical time for interconnection approval for medium-scale renewable projects (10kW to 5MW)?	3.0
2.2.7	What is the typical time for interconnection approval for small-scale renewable projects (<10kW)?	3.0
2.2.8	Is the utility taking steps to improve/streamline its interconnection process for small-scale (<10kW) and/or medium-scale (10kW to 5MW) renewable projects?	3.0

1. Total points may not add up due to rounding.

Category 2: Modern Grid

ID	Sub Metric	Total Points[1]
Metric 2.3: Visibility and Control Capabilities		
2.3.1	What is the current coverage of AMIs (% of total costumer coverage)?	4.0
2.3.2	What capability does the utility have access using AMIs? (ex:, remote reading, connect/disconnect, outage detection, system voltage monitoring, IoT, etc.)	4.0
2.3.3	Has the utility deployed DERMS?	4.0
2.3.4	Has the utility deployed SCADA?	4.0
2.3.5	Has the utility deployed ADMS?	4.0
Metric 2.4: Innovation and Emerging Technologies		
2.4.1	How much is the utility funding and/or spending on innovation and research (as % of overall revenue)? (innovation is defined as outside of BAU)	3.8
2.4.2	Has the utility demonstrated applications of their investment under Visibility and Control Capabilities (AMIs, DERMs, ADMs, etc.)?	3.8
2.4.3	Is the utility running innovative pilots/projects?	3.8
2.4.4	Does the utility have an innovation resource (team or person)?	3.8
Metric 2.5: Climate Resiliency		
2.5.1	What actions are being taken to harden the grid to protect critical infrastructure and/or services during extreme climate events?	5.0
2.5.2	Is climate change included in the forecasts for the utility's planning process?	5.0

1. Total points may not add up due to rounding.

Category 3: Customers and Society

ID	Sub Metric	Total Points[1]
Metric 3.1: Changing Customer Preferences		
3.1.1	Is the utility leveraging digital platforms to engage customers?	6.3
3.1.2	Is the utility offering rate-based solutions to encourage and influence electrification and/or behaviour?	6.3
3.1.3	Is the utility providing energy services and solutions to customers?	6.3
3.1.4	Is the utility building awareness and educating its customers on clean energy issues/energy transition?	6.3
Metric 3.2: Enabling Transportation, Building, & Industrial Electrification		
3.2.1	Has the utility or their partners developed and implemented comprehensive electrification strategies that sends a clear signal to investors on the increasing need for decarbonization?	12.5
3.2.2	Is the utility or their partners catalyzing building (C&I and/or residential), transportation, and/or industrial process electrification?	12.5

1. Total points may not add up due to rounding.

Category 3: Customers and Society

ID	Sub Metric	Total Points[1]
Metric 3.3: Diversity, Equity & Inclusion Goals & Actions		
3.3.1	Does the utility have a diversity, equity & inclusion (DEI) plan or is DEI considered during the planning/decision-making process?	6.3
3.3.2	Is the utility actively engaging indigenous, low-income, or other under-served communities to ensure their voices are considered in the decision-making process for a clean energy transition?	6.3
3.3.3	How much (as a share of total revenue) is the utility investing in electrification and/or distributed energy resources (DER) programs targeting indigenous, low-income, or other under-served communities?	6.3
3.3.4	Does the utility promote diversity and inclusion in the workplace (reducing barriers and challenges for women, minorities groups, etc.)?	6.3
Metric 3.4: Aligned Actions and Engagement		
3.4.1	Does the utility have a stakeholder engagement plan that addresses related topics (i.e., clean energy, grid modernization, IRP and IDP, electrification, regulatory requirements, etc.)?	8.3
3.4.2	Is the utility undertaking proactive efforts and/or supporting initiatives within or across jurisdictions to realize the clean energy transition?	8.3
3.4.3	Has the utility aligned its planning and investment decisions with governmental (provincial/municipal) climate ambitions?	8.3

1. Total points may not add up due to rounding.



“NO DISCLAIMERS” POLICY

This report was prepared by Dunsky Energy + Climate Advisors, an independent firm focused on the clean energy transition and committed to quality, integrity and unbiased analysis and counsel. Our findings and recommendations are based on the best information available at the time the work was conducted as well as our experts' professional judgment. **Dunsky is proud to stand by our work.**

Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
1B-SEC-5
Appendix E
UPDATED: October 9, 2024
(18 Pages)



Toronto Hydro Sustainability Review: Data Report

Discussion Purposes Only - Confidential and Proprietary

PwC Canada ESG Sustainability and Climate Change Team

Updated: October 28, 2021

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1 Background and Context





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Introduction and context

Toronto Hydro has an opportunity to elevate its ESG disclosure practices, taking into consideration leading peer and stakeholder practices trends.

To inform its approach, a review has been conducted to help Toronto Hydro better understand its overall ESG disclosure maturity, which included a current state assessment and comparative analysis of disclosed leading practices, including Toronto Hydro's. Based on the assessment, a report has been prepared to outline the results.

The objective of the assessment report is to:

- Summarize the assessment approach and ESG disclosure positioning within Toronto Hydro; and,
- Understand Toronto Hydro's overall disclosure maturity compared against peers.



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How is Toronto Hydro currently positioned on ESG?

Purpose: We're committed to delivering excellent customer service, providing a safe and reliable supply of electricity, and delivering long-term value to the City of Toronto.

Talent management and diversity	• Diversity and inclusion • Talent development and training	• Attraction, retention and engagement • Health and safety
Accountable and transparent leadership	• Data and systems driven • Personalized, transparent interactions with members and employees	• Board composition for good governance • Ethics and integrity
Customer satisfaction	• Customer engagement • Continuous improvements	• Product/service offerings innovation • Affordability programs
Community impact	• Fundraising • Community partnerships	• Employee volunteering • Education and sponsorships
Innovation and digital transformation	• Robust, secure products and services • Innovation in energy systems	• Risk management and data security • New technology investments

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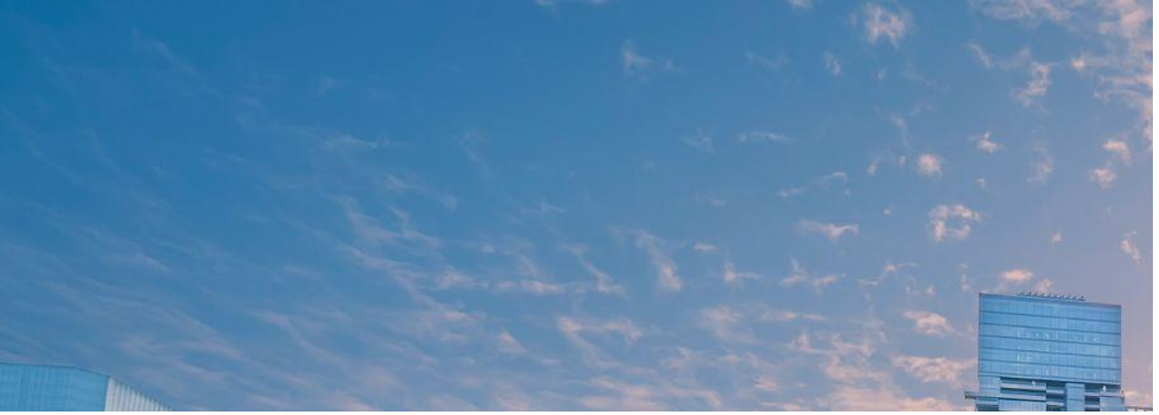

2 Report Approach





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Data report approach

To conduct the analysis, a four-step process was undertaken as described in the table below:

Step 1

Identified current state of Toronto Hydro along with peer benchmarking

Toronto Hydro was assessed through document review and interviews with its the sustainability group as well as key staff within Facilities and fleet, Customer services, Conservation programs, Organizational effectiveness, Talent development, Including:

- Joe Bile, Manager, Business Development
- Dave Clark, Director, Organizational Effectiveness
- Bryan Desouza, Manager, Supply Chain Services
- Phil Genoway, Director, E, H & S
- Jen Grado, Manager, Large Customer and Key Accounts
- Kees Homsma, Director, Facilities & Fleet
- Jen Stulberg, Director, Talent Management

Additionally, 11 sector peers and core stakeholders (see page 14) were assessed through a desktop comparative review to understand leading practices and priority areas of focus.

Step 2

Assessed ESG disclosure program maturity and priority topics areas of Toronto Hydro and peers

ESG disclosure program maturity areas included:

1. Corporate culture and policies
2. Accountability
3. Strategy
4. Programs
5. Performance and review
6. Reporting

ESG topics of focus included:

1. Equity, diversity and inclusion
2. Health and wellbeing
3. Community and partnerships
4. Talent and training
5. Indiginous relations
6. GHG emissions (including energy)
7. Climate change
8. Resource management (including land and biodiversity)
9. Waste
10. Environmental compliance
11. Affordability and accessibility
12. Service reliability
13. Customer service
14. Risk management
15. Ethics and integrity
16. Profitability

Step 3

Assessed Toronto Hydro's disclosure program maturity against peers and core stakeholders

Assessed Toronto Hydro and peers' and stakeholders' disclosed data against the following scoring criteria:

Score	Maturity	Initiatives
0-1	Informal	[redacted]
1.1-2	Emerging	
2.1-3	Structured	
3.1-4	Leading	
4.1-5	Strategic	

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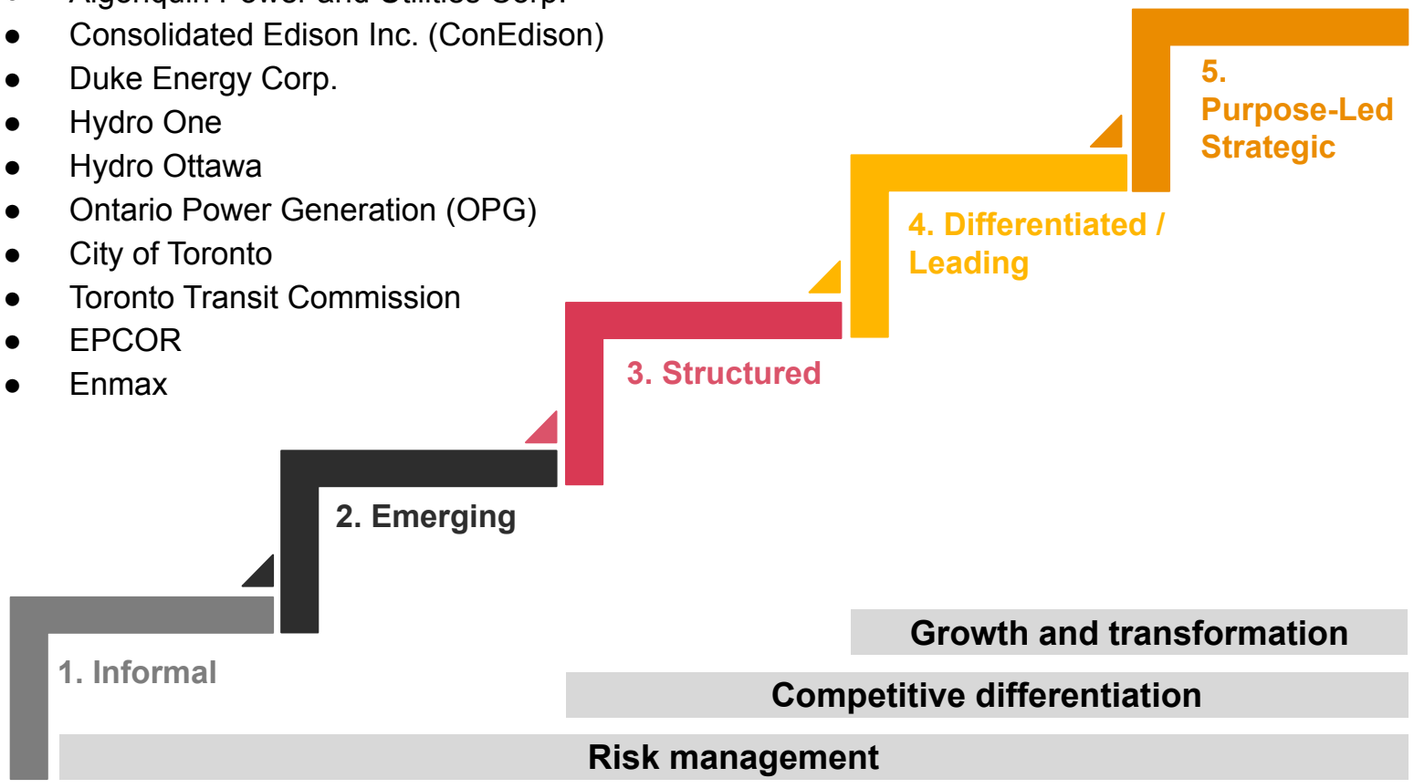
Disclosure maturity analysis

We defined the key elements of the ESG maturity journey on a scale from 1 to 5 and assessed Toronto Hydro's performance against its competitive landscape to provide a reference point for performance.

- Alectra Inc.
- Algonquin Power and Utilities Corp.
- Consolidated Edison Inc. (ConEdison)
- Duke Energy Corp.
- Hydro One
- Hydro Ottawa
- Ontario Power Generation (OPG)
- City of Toronto
- Toronto Transit Commission
- EPCOR
- Enmax



Overall disclosure maturity framework on ESG management

A. **Corporate culture and policies:** [redacted]

B. **Accountability:** T[redacted]

C. **Strategy:** [redacted]

D. **Programs:** [redacted]

E. **Performance monitoring and review:** [redacted]

F. **Reporting:** [redacted]

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3 Maturity Results





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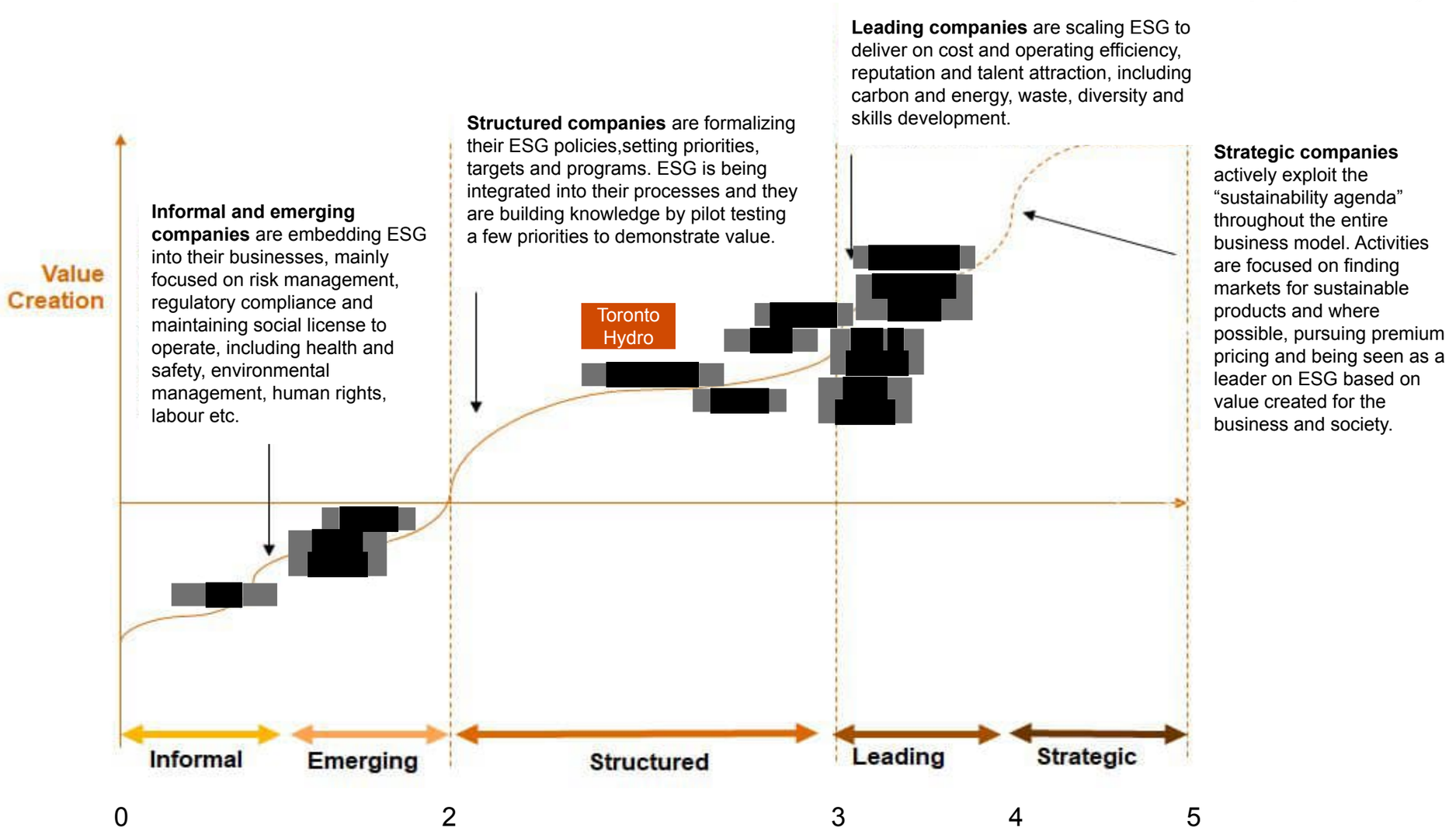
Overall ESG maturity

For illustrative purposes only

Toronto Hydro's overall disclosure ESG maturity demonstrates it is at a "structured" level of maturity. Many of its direct peers, on average, are in similar states of maturity.

[redacted] are on the leading edge of ESG program maturity and offer lessons learned for Toronto Hydro as it advances to a leading program.



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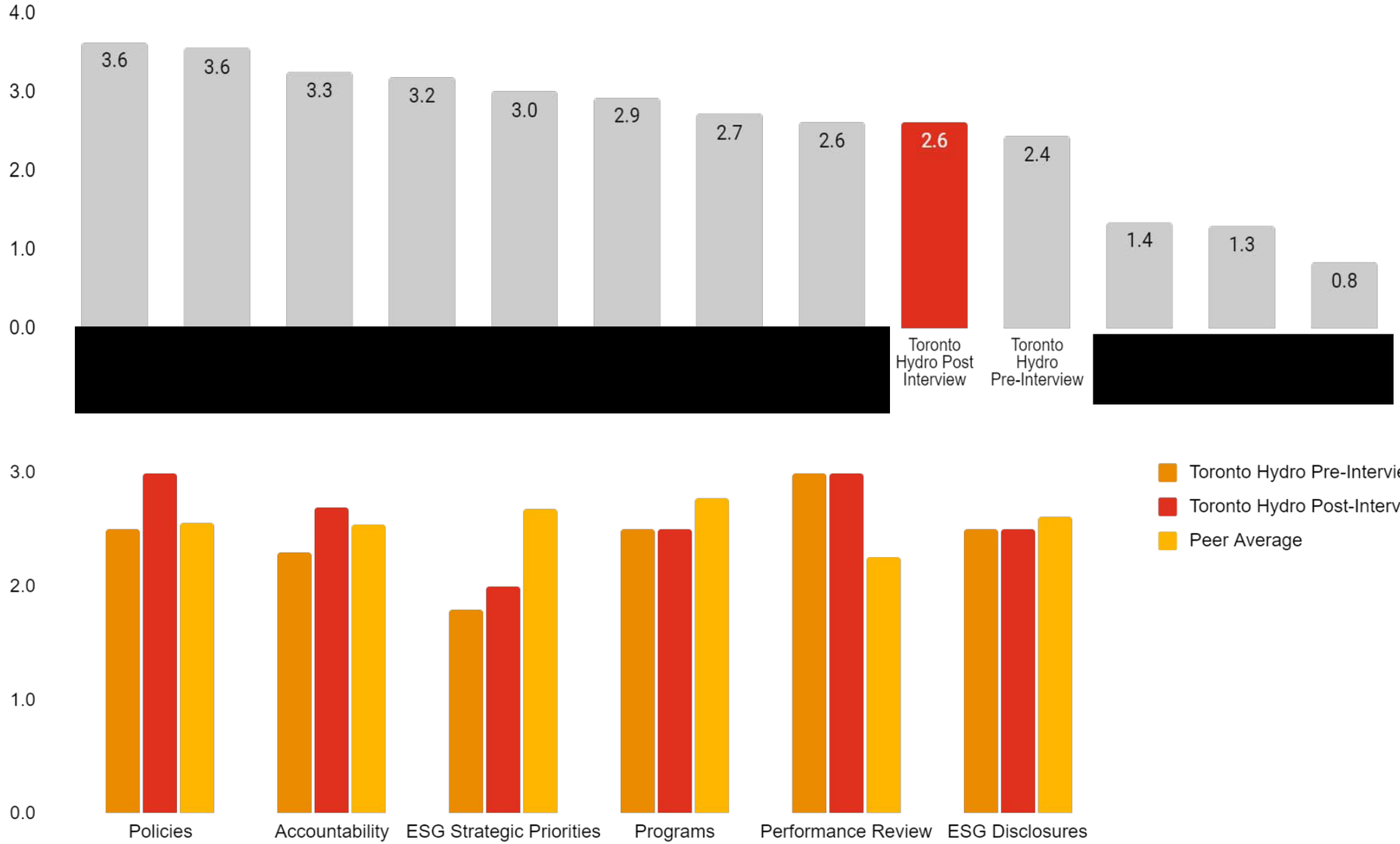
Overall ESG maturity

The graph shows a breakdown of the maturity score of Toronto Hydro's overall disclosure ESG program as compared to its peers.

Note that Toronto Hydro performed above the average on policies, accountability and performance review.

However, it fell behind the peer group on ESG strategy and programs.

With disclosing more information , the program maturity would increase.



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ESG disclosure program maturity: Peer best practices

ConEdison's sustainability strategy has oversight from the board and there is an ESG committee at the executive level. Executive compensation is tied to key ESG KPIs (i.e., D&I)

Operational Excellence

Accountability

Our company made Newsweek's list of America's most responsible companies. Newsweek honors companies that are "good citizens and give back to the communities they operate in."

EPCOR has established and disclosed an ESG scorecard with key performance measures, data and targets aligned to its most material ESG factors and incentive-based pay.

SOCIAL		2017	2018	2019	2020	TARGETS AND COMMENTARY
Health and Safety						
S1	TOTAL RECORDABLE INJURY FREQUENCY Continuous reduction in total incidents (TRIF) *SASB Code: IF-EU-320a.1(1)* *GRI 403-9(a)(iii)*[E]	1.12	2.35	1.44	1.03	A safety-first culture, driving to zero incidents.
S2	LOST-TIME INJURY FREQUENCY Continuous reduction in lost-time incidents (LTIF)	0.16	0.35	0.13	0.06	A safety-first culture, driving to zero incidents.

Algonquin Power discloses its approach to stakeholder engagement, including how they engage, frequency, key concerns raised, and how concerns are addressed.

Stakeholder engagement

GRI: 102-21, 102-40, 102-42, 102-43

Stakeholder dialogue not only guides our reporting process and informs our report content selection, but is an essential element of our core business practices. Our key stakeholder groups include our customers, employees, investors, communities, and government and regulatory bodies. An overview of these stakeholder groups, our engagement methods, and priority concerns can be found below.

Stakeholder group	How we engage	Frequency of engagement	Key concerns raised	How we address those concerns
Customers	• Annual J.D. Power Customer Satisfaction Survey • Call centers • Community education programs • Conservation and outreach programs • Regular email communications • Focus groups • Local customer walk-in centers • Local media outlets • Participation in and sponsorship of local events, teams, and charitable foundations • Social media	Annual and ongoing	• Customer service improvements • Rates and pricing • Digital billing and payments • Communications (i.e., outage alerts) • Increased community involvement • Low-income household needs	• Customer First program • eCustomer project: new MyAccount customer experience improvement • Updated Outage Management system • Continuous communications through email, social media, and bill inserts on local community engagement • Customer Savings Program (expected savings of approximately $300 million over 30 years)

Duke Energy discloses an annual ESG report aligned to international standards, reports to various ESG raters, and identifies links between disclosures and corporate strategy.

Global Reporting Initiative (GRI) Index

Duke Energy uses the GRI Sustainability Reporting Standards to help guide our reporting. This index is based on the most recent versions of the Standards available as of May 2020 and includes the Electric Utility Sector Supplement. For most indicators, we refer users to information on our website or other public documents. For some indicators, we provide brief narrative responses. Most data in this index address calendar year 2020, in coordination with our most recent Sustainability Report.

General Disclosures

Number	Topic	Response
Organizational Profile		
102-1	Report the name of the organization	Duke Energy Corporation
102-2	Activities, brands, products and services	The Businesses We're In Duke Energy at a Glance

Hydro One has established comprehensive ESG pillars and priority areas, including accompanying goals.

People

Priorities

- Set broader diversity and inclusion hiring goals
- Identify, eliminate and prevent systemic barriers in the workplace

Goals

- Hydro One signed the BlackNorth Initiative Pledge and is commited to achieving 3.5% Black executives and board directors, and 5% Black student hires by 2025.
- As a signatory to the Catalyst Accord, Hydro One is commited to achieving at least 30% female executives and board members

Planet

Priorities

- Achieve established targets for GHG reductions
- Continue to include climate change considerations into decisions and plans to ensure grid resiliency

Goals

- Hydro One is committed to achieving net-zero GHG emissions by 2050
- We have established a target to achieve a 30% reduction of GHG emissions by 2030

Community

Priorities

- Continue to support the Ontario economy through partnerships
- Build safe communities by supporting youth initiatives that promote safety training and safe play

Goals

- Hydro One is committed to increasing our Indigenous procurement spend to 5% of the company's purchases of materials and services by 2026
- As part of our community investment program, we are committed to ensuring that 20% of our corporate donations and sponsorships support Indigenous communities

The City of Toronto has established goals, targets and programs to achieve its priority areas, outlined in its strategy documents.

- Net Zero Strategy +
- Toronto's Greenhouse Gas Emissions +
- Toronto's 2017 Greenhouse Gas Emissions Inventory +
- TransformTO Targets +
- TransformTO Goals +
- Reports & Updates +
- Community Engagement +
- Technical Scenario Modelling +
- CityInSight Visualization Tool +

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Peer ESG priority topics being disclosed

	Importance to Sector (% of peers)	Toronto Hydro Approach
1 Human Capital (People)	**69%**	
Equity, Diversity and Inclusion	78%	Diversity and Inclusion Plan, Recruitment and Selection policy
Health and Wellbeing	100%	Occupational Health and Safety Policy
Community and Partnerships	56%	Code of Conduct
Talent and Training	78%	The Sustainability and Training Annual Plan
Indigenous Relations	33%	none
2 Environmental Stewardship (Planet)	**55%**	
GHG emissions (including Energy Management/Innovation)	78%	Environmental Policy
Climate Change (Resilience/Adaptation)	78%	Environmental Policy
Resource Management (Land and Biodiversity)	33%	Environmental Policy, Vegetation Management Program
Waste	44%	Code of Conduct, EHS Annual Plan
Environmental Compliance	44%	Strong environmental compliance program, ie. ERP, ISO
3 Responsible Business (Prosperity)	**78%**	
Affordability and Accessibility	89%	Accessibility Policy
Service Reliability	89%	Disaster Preparedness Management Program Policy; Rate Application
Customer Service	78%	Customer Engagement Summary
Risk Management	78%	Enterprise Risk Management Policy
Ethics and Integrity	56%	Code of Conduct
Profitability	78%	Code of Conduct

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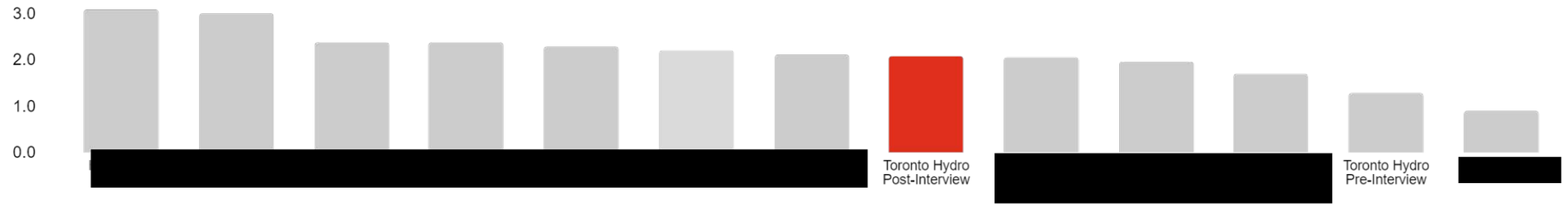
ESG pillars performance

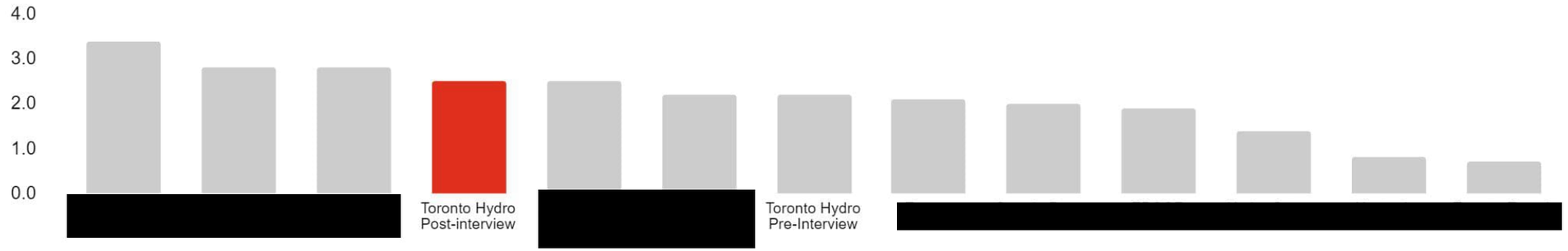
Toronto Hydro achieved a structured level of overall disclosure maturity in each ESG pillar, which is at average-levels amongst its peers.

In review of ESG the pillar areas as a whole, [redacted] and [redacted] scored at a leading or differentiated level (see page 13 and 14 for definitions and detail) amongst the peer and stakeholder group.

Human Capital



Environmental Stewardship



Responsible Business



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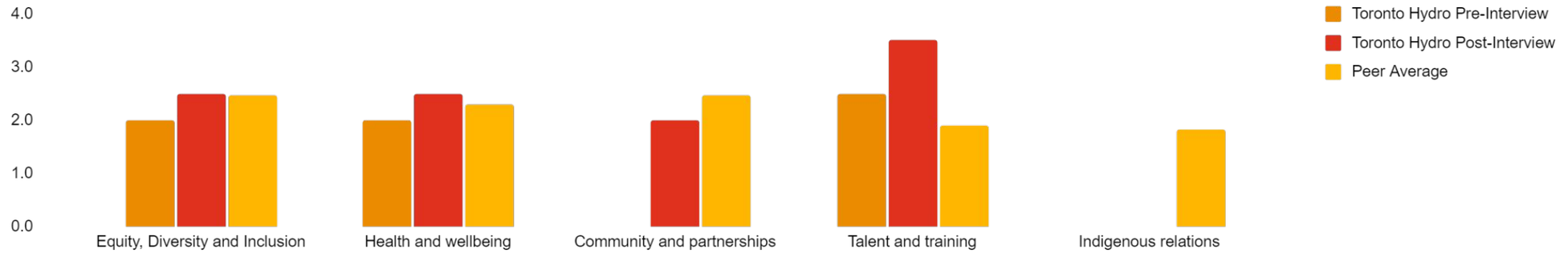
ESG focus area performance

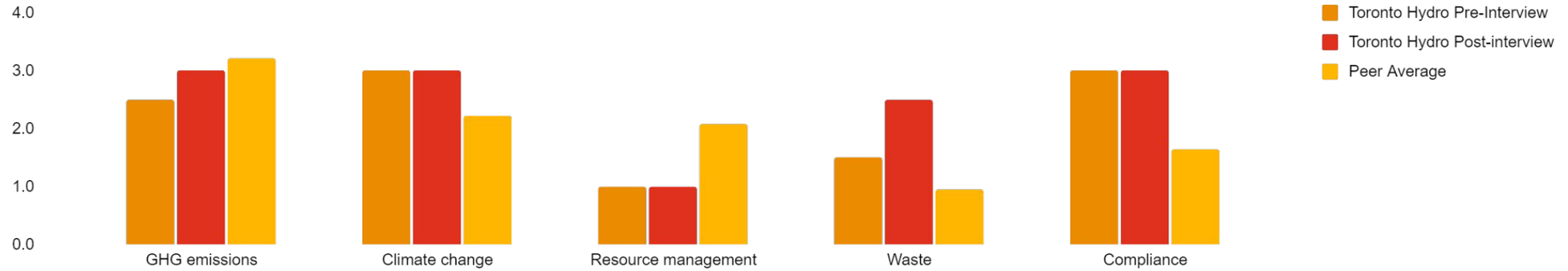
Toronto Hydro's strongest areas, in terms of information disclosure, are in talent and training and equity, environmental compliance, service reliability, customer service and risk management.

Opportunities relate to community and partnerships, Indigenous relations, and affordability and accessibility, where a higher level of effort and peer focus exists.

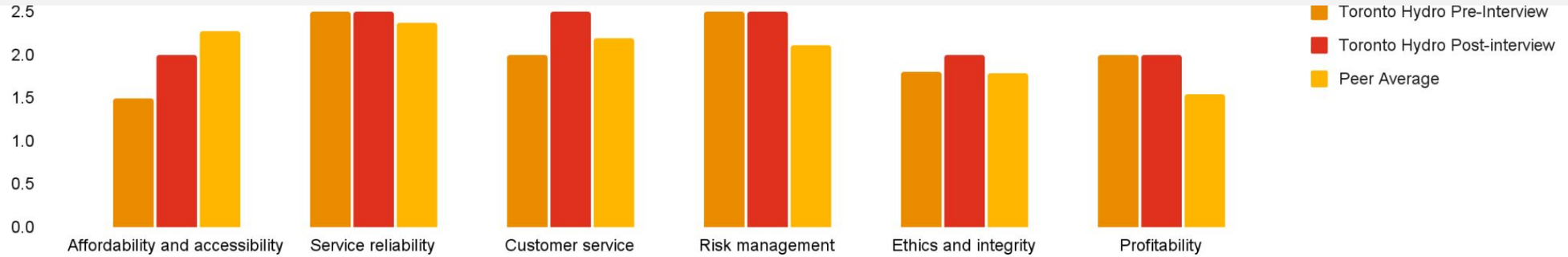
Human Capital



Environmental Stewardship



Responsible Business



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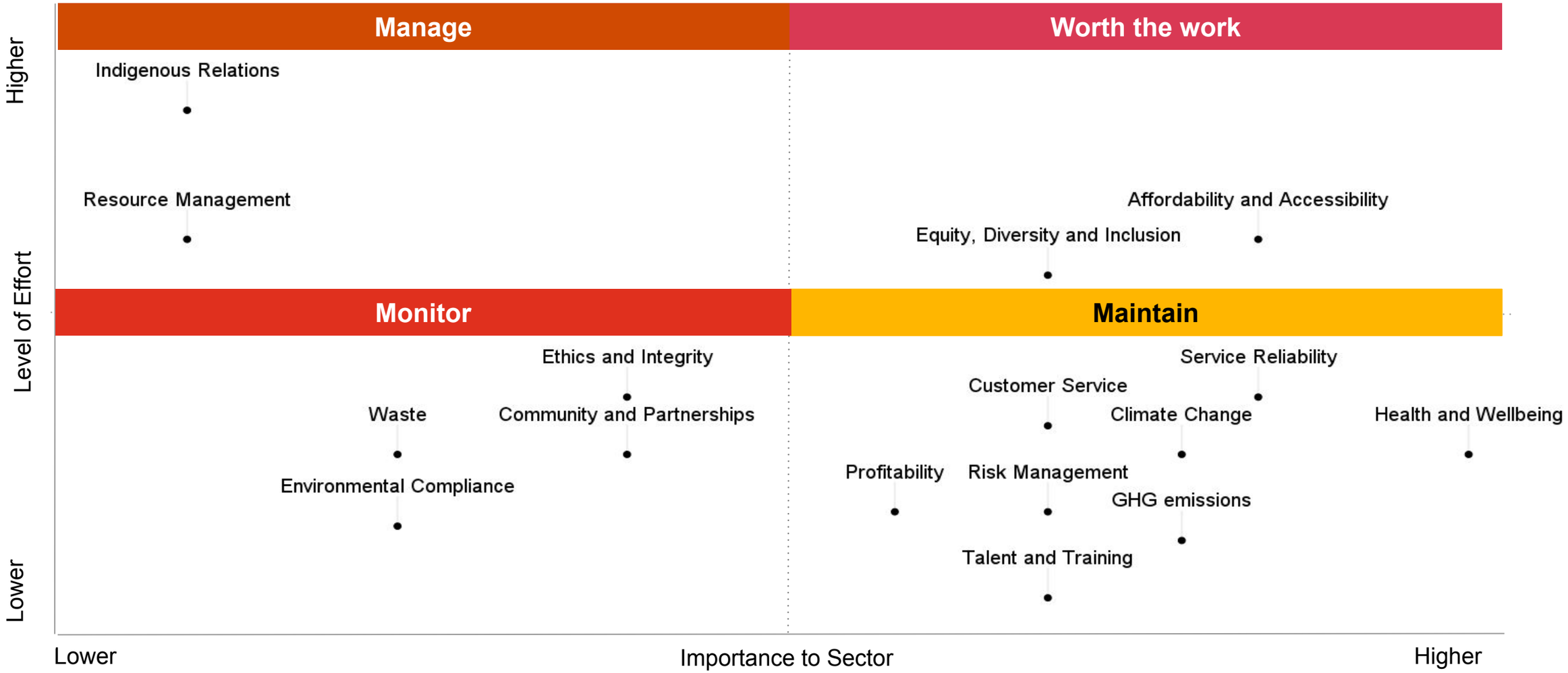
Results

ESG topics are ranked based on importance to sector and level of effort for Toronto Hydro, informed from peer's prioritization of topics and Toronto Hydro's rating in each of these areas.



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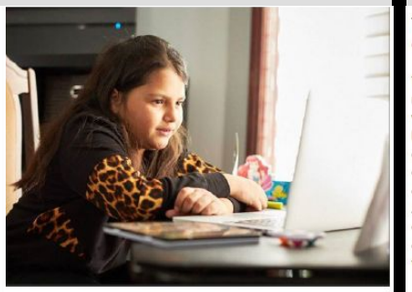
ESG focus areas: Peer best reporting practices

HydroOne tracks spend on Indigenous businesses and set targets for 20% of community investment to support Indigenous communities and 3% to promote investment in Black communities.

We are committed to increasing our Indigenous procurement spend to 5% of the company's purchases of materials and services by 2026.

While several Indigenous communities closed their borders to visitors in order to limit exposure to COVID-19, Hydro One respectfully adapted to these realities and hosted numerous public community engagement sessions and meetings online. Post-COVID-19, we will review opportunities to enhance our online engagement which has, in some cases, made communication more efficient. However, we still plan to continue to focus on reconnecting with Indigenous communities through in-person meetings.



We fast-tracked $32.9M in payments to 124 Indigenous and small business suppliers in Ontario.

Algonquin Power provides education grants to eligible employees and offers work flexibility programs.

Talent attraction and retention

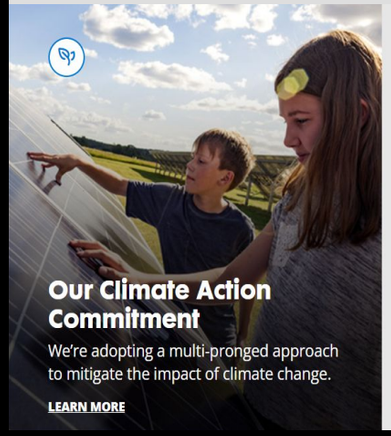
Talent attraction and retention are the pillars upon which we build our employee lifecycle. We know that the competition for talent is real, and an organization is only as good as their workforce. At Algonquin and Liberty, our workforce is our family, and we pride ourselves in the way we grow our family.

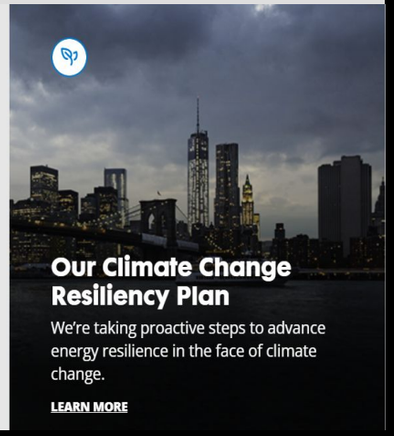


Duke Energy has disclosed a net zero by 2050 ambition and an interim target of reducing CO_2 emissions from electricity generation by 50% by 2030 through its 2020 Climate Report.



ConEdison discloses against the TCFD recommendations and has published its climate change and climate resilience and adaptation implementation plans.





Enmax is conducting pilot projects to test programs to remove barriers to energy access and affordability, delivering energy saving kits to select households.

Our approach

Our energy affordability efforts will be geared towards supporting customers at each stage of the affordability lifecycle (noted below), incorporating efforts from across business units in Alberta and Maine, informing community investment strategies and laying the groundwork for advocacy with policymakers and regulators in an effort to advance broader strategies in the years ahead.

SUPPORTING CUSTOMERS IN THESE STAGES

1. Affordability
   Provide sustainable energy solutions, including tools, education and awareness
2. Prevention
   Invest in programming to reduce barriers to affordable-energy access across all our operating communities
3. Crisis Management
   Provide relief to customers in energy-need crisis through agency partnerships

City of Toronto incorporates ESG and climate change into its new ERM framework and has implemented a climate change risk management policy.

The City's risk factors identified through the ERM process



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Appendix A: Reviewed Disclosures



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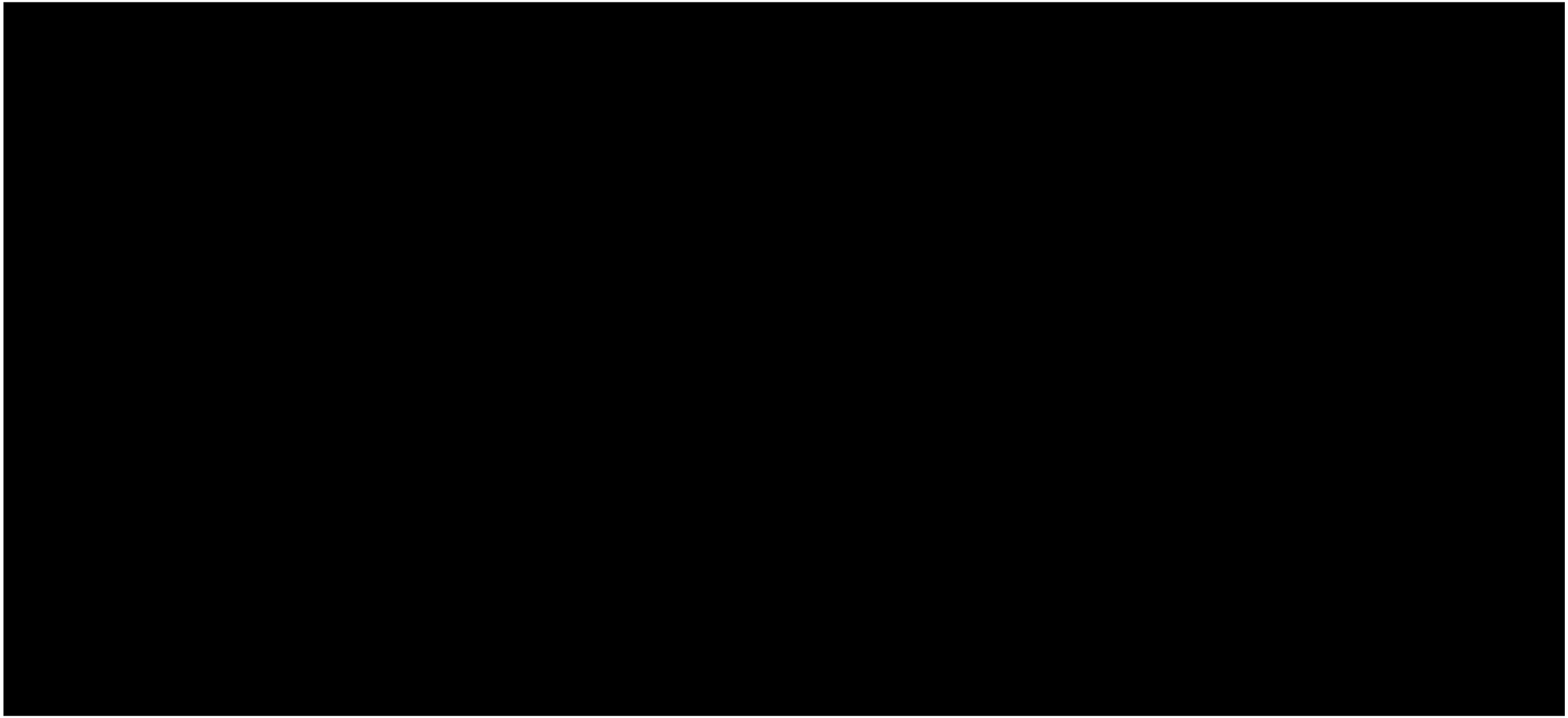
Reviewed peer disclosures



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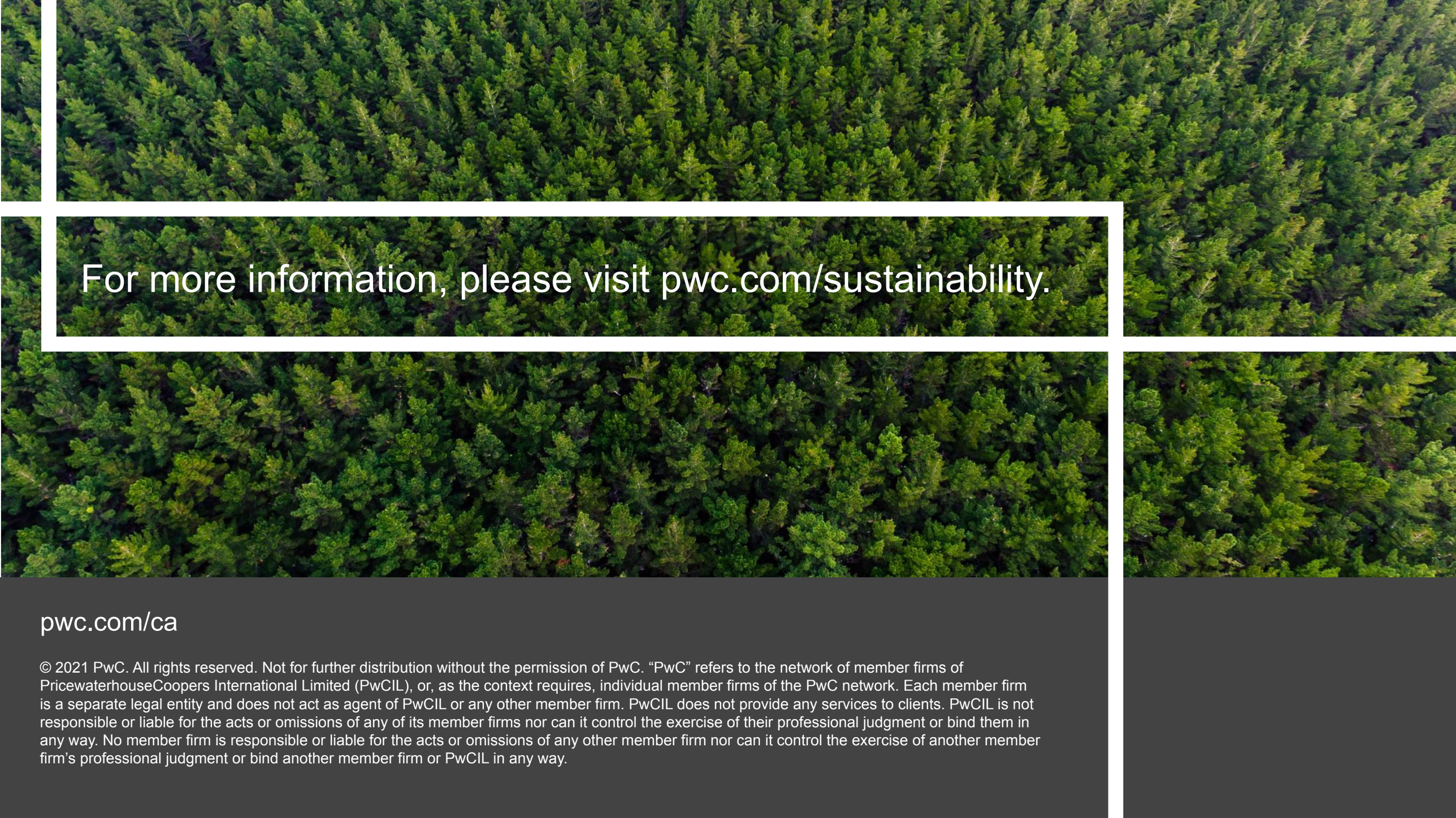

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Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
1B-SEC-5
Appendix G
UPDATED: March 21, 2024
(18 Pages)

Auto-FLISR Assessment Executive Report

18 August 2023

Col Smart, Hongyu Wu, Bill Conn
TRC Companies

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AGENDA

1. Executive Summary
2. Project Overview
3. Project Methodology
4. Utility Interviews
5. Oracle Interview
6. Risk Assessment
7. FLISR Operation Readiness Strategy
8. Potential Timeline
9. Items for Consideration



Project
Executive Summary



THESL is currently progressing the use of Fault Location, Isolation, and Service Restoration (**FLISR**) and seeks to move the deployment of automated FLISR, aka Auto-FLISR.

A six-week assessment was conducted to identify key aspects, risks and mitigations for the journey to Auto-FLISR. The assessment also considered aspects of a high-level timeline for Auto-FLISR.

Key Conclusions

1. The deployment of Auto-FLISR will be a multi-year, multi-stakeholder undertaking and will require participation by system operations, engineering and IT.
2. The planned manual FLISR evaluation pilot will serve to provide valuable insight and deployment risk mitigation for Auto-FLISR.
3. Successful Auto-FLISR implementation will ensure continued safety of operation.
4. Auto-FLISR has delivered operational benefit to utilities using the technology.
5. Auto-FLISR performance objective of resolution in under one minute (the momentary criterion), is a stretch goal impacted by various factors including circuit topology, communication latency, number of switching plans to be run, and solution duration.

Project Overview



TRC Companies (TRC) started a *six-week project* on 22 May 2023, and completed 30 June 2023.

The intent of the assessment was to conduct a series of activities which would result in the development of *a report as an information and decision support tool*.

The assessment was designed to allow for the following **key areas of consideration**:

- Potential timeline for the deployment of Auto-FLISR
- Risks relevant to the deployment of Auto-FLISR
- How risks may be mitigated
- Insights as to high-level cost impacts

The assessment process involved activities to provide insight to THESL's internal approach, consideration of the key enabling technology (Oracle NMS), and lessons learned from other utilities who have progressed with Auto-FLISR deployments.

TRC added to this its own expertise with Auto-FLISR and other utility solution deployments.

Project Methodology



TRC undertook the following activities:

- THESL data review
- THESL discovery meetings
- Utility benchmarking interviews
- Oracle interview

TRC identified various *items which may impact the deployment of Auto-FLISR* at THESL and grouped these into **10 categories** which were then tracked to impact in the areas of **Safety, Performance, Schedule, and Cost**.

TRC produced a detailed report of their findings and this project briefing deck.

Utility Interviews



The following utilities were either interviewed or investigated as part of the utility benchmarking, with the following main themes:

- **The deployment of Auto-FLISR will be a multi-year, multi-stakeholder undertaking and will require participation by system operations, engineering and IT.**
- **Data quality remains one of the most important dependencies to enable Auto-FLISR operation.**
- **Change management was highlighted as key to Auto-FLISR acceptance.**

[redacted]

- OSI ADMS Platform
- Data quality, particularly for SCADA keys, was considered critical
- Consistency of procedure approach was key.
- Established a test laboratory (8 devices) before deploying further.
- Testing needs to cover failure modes and be very deliberate around how Auto-FLISR fails.

[redacted]

- OSI ADMS Platform
- [redacted]s Auto-FLISR objective is to improve SAIFI / SAIDI but safety is another a priority
- Focus on configurable functionality not customization.
- SCADA data preparation is a key factor.
- Established a specific Change Manager role for ADMS and then Auto-FLISR acceptance.

[redacted]

- [redacted] has Oracle NMS but is not using it for any FLISR operations at this time
- [redacted] engineering staff participated in an initial qualifying conversation

[redacted]

- Schneider Electric ADMS Platform
- Auto-FLISR was taken offline in March 2023 due to an operational fault.
- A five stage validation criteria on model fine tuning (Analysis Ready – AR) was set for critical review of a feeder for Auto-FLISR enablement.

[redacted]

- Survalent ADMS Platform
- Alectra has had FLISR experience but has not transitioned to Auto-FLISR
- No interview scheduled at this time

[redacted]

- Oracle has advised that [redacted] has manual FLISR in production on 200+ feeders but does not have Auto-FLISR
- No interview scheduled at this time

Utility Interviews



[redacted]

- Currently on Oracle NMS 2.5
- Auto-FLISR ran for one year during which there were 30 Auto-FLISR events which generally successfully operated.
- The original benefits [redacted] hoped to gain from Auto-FLISR was Auto-FLISR was disabled for several reasons:
    - SCADA issues giving either false positives on device outages or RTU communications issues.
    - Oracle upgrade from NMS 2.3 to 2.5 caused issues. Oracle NMS 2.5 has many different elements to Oracle NMS 2.3 including a different power flow engine, with algorithm changes, and different processes for ingesting data such as weather.
    - SCADA system change from ACS to OSI
    - Network areas re-defined to more identified as high fire risk and so Auto-FLISR is not able to be used in these areas

[redacted]

- Currently on Oracle NMS 2.5
- [redacted] has been guided by the principle that Auto-FLISR should be quicker while adhering to the controllers' established practices.
- On average, there were 1-2 SCADA controlled devices, excluding the tie switch for early auto-FLISR adoption, and currently 2-3 SCADA controlled devices per feeder.
- The introduction of Auto-FLISR has notably improved reliability, reducing fault response time from 10-30 minutes (manual) to less than 1 minute. Though [redacted] has adjusted their momentary criteria to 3 minutes recently, their aim remains a 1-minute operational time. On average, the entire process took around 45 seconds, with approximately 15-20 seconds allocated for fault detection, demand scanning from NMS, and resolution time, along with an additional 20-40 seconds for command issuance.
- Efforts have been dedicated to enhancing communications, including upgrading device firmware and standardizing configuration settings.
- [redacted] opted for a comprehensive deployment of auto-FLISR, enabling its activation circuit-wide once the confidence period had been successfully navigated.
- Scenarios warranting the disabling of auto-FLISR encompass live Line work, bush fire days, and sensitive earth faults.
- The average turn around time for updating GIS model is 2 days.
- Auto-FLISR has been turned on even during “grey-sky” conditions due to the outweighing benefits over associated risks.

Oracle Interview



Oracle provided for interview a team of subject matter expertise with knowledge of the THESL NMS deployment.
Below are the key points:

- NMS 2.3 is nearing end of life and will move to **limited support mode** as of December 2024.
- THESL's upgrade to NMS 2.6 is seen as more complex than the norm due to the **high amount of customization** of the platform. Oracle has assessed that the level of effort necessary for the NMS 2.3 upgrade resembles that of a comprehensive re-implementation. As a result, both Oracle and TRC have collaboratively reached a consensus on the projected upgrade timeframe, which now spans from **24 to 36 months**.
- In NMS versions 2.3 and 2.5, the system experiences slowdowns or diverts additional resources to carry out computations within a single thread. The assumption is that NMS 2.6, designed with **multi-threading capabilities**, is more efficient and capable of simultaneous multitasking with less impact. It is important to emphasize that there exists a definite computational capacity, and the system must be tailored to meet specific performance benchmarks.
- The objective of **1-minute Auto-FLISR solutioning is a stretch objective** and can be impacted by various factors:
  - Circuit topology (# of feeders and devices),
  - Device status validation time,
  - Adjacency to and leveraging of other circuits as part of the solution,
  - Post switching plan protection validation,
  - Number of switching plans to be run,
  - Forward forecasting time for which the switching plan is to solve
- Oracle recommends expanded testing of use cases during the planned FLISR pilot to be able to learn and solve for various potential issues.

Auto-FLISR
Risk Items



TRC identified various *items which may impact the deployment of Auto-FLISR* at THESL and grouped these into **10 categories** which were then tracked to impact in the areas of **Safety, Performance, Schedule, and Cost**.

These items are all expected to be encountered to some extent during the Auto-FLISR journey.

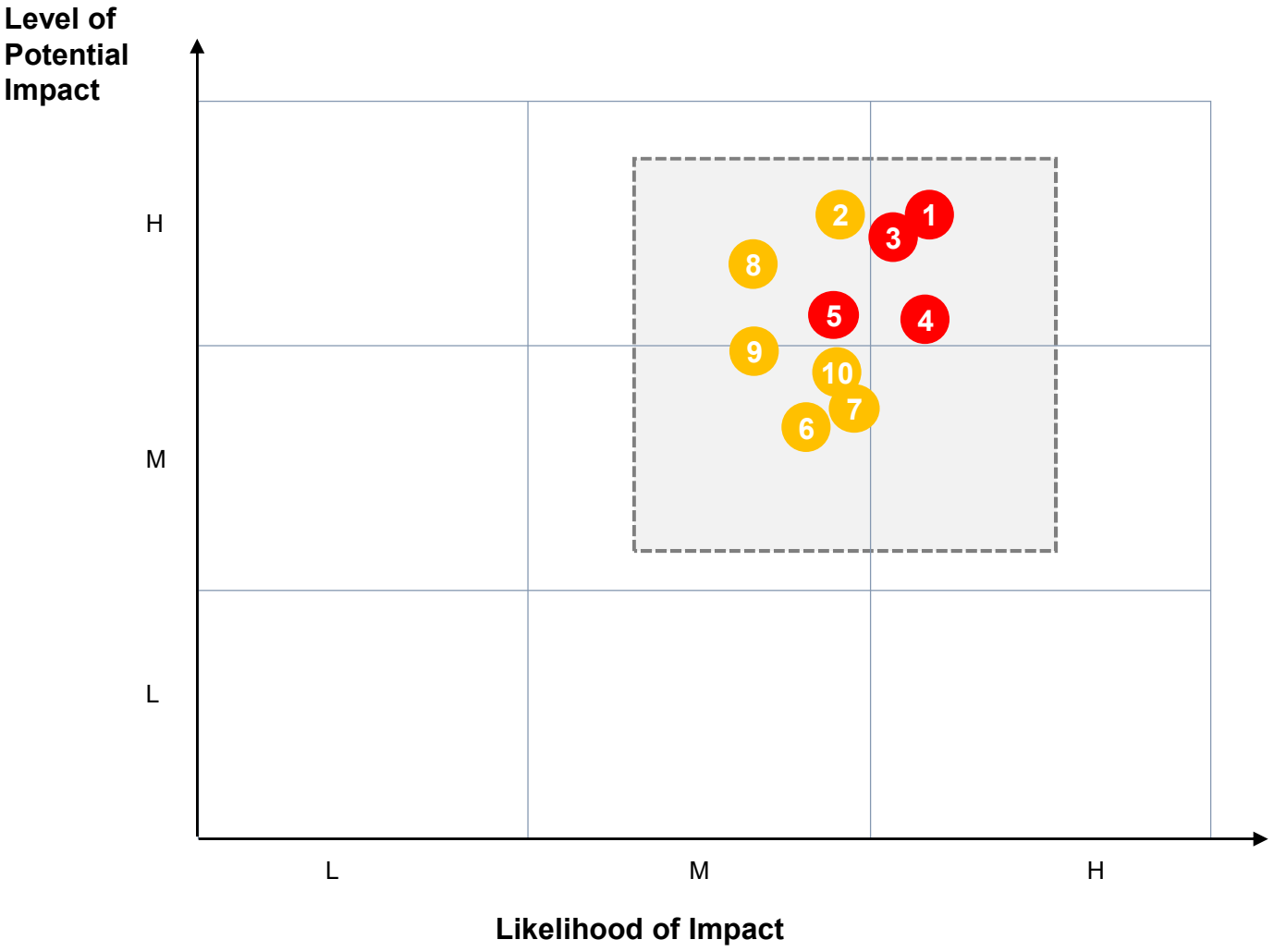
The 10 items of risk are as follows:

1. **Auto-FLISR Performance** – Solution expectations and how different factors impact the performance of Auto-FLISR
2. **Dependency on NMS Upgrade** – How NMS upgrade impacts the deployment of the Auto-FLISR (Operations and IT)
3. **Data Quality** – How data quality impacts Auto-FLISR performance and the ability to maintain the required data standard
4. **NMS Product Gap** – How well the core software does what THESL needs and extent to which additional unique coding is needed
5. **Auto-FLISR Testing** – Validating the FLISR switching models for each circuit and equipment operation
6. **Standard Approaches to Work** – How work process are aligned and simplified to allow for improved automation
7. **Change Management / Acceptance** – How will staff be impacted by Auto-FLISR and communication of benefits of automation
8. **Operational Safety** – How system operators and field crews safely work with automated controls
9. **Cyber Security** – Security of the technologies executing the automated control
10. **Auto-FLISR Deployment Strategy** – How will Auto-FLISR be rolled out to various circuits at different times and how will this be coordinated

The following slide provides a high-level view of their impact.

Auto-FLISR
Risk Assessment





#	Risk Item	Difficulty of Mitigation	Impact			
			Performance	Schedule	Cost	Safety
1	Auto-FLISR Performance	High				
2	Dependency on NMS Upgrade	Medium				
3	Data Quality	High				
4	NMS Product Gap	High				
5	Auto-FLISR Testing	High				
6	Standard Approaches to Work	Medium				
7	Change Management & Acceptance	Medium				
8	Operational Safety	Medium				
9	Cyber Security	Medium				
10	Auto-FLISR Deployment Strategy	Medium				

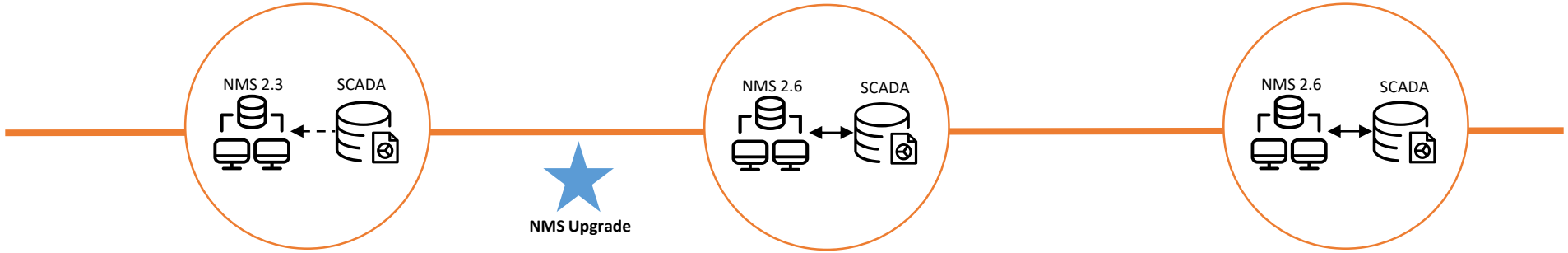
FLISR
Operation Readiness Strategy



STAGE 1:
MANUAL FLISR 2.3 - EVALUATION

STAGE 2:
MANUAL FLISR 2.6 - EVALUATION

STAGE 3:
AUTO-FLISR



- NMS 2.3 FLISR module
- THESL team validates FLISR switching plan periodically, but does not use it during system operation
- Confidence period

- NMS 2.6 FLISR module
- THESL team validates FLISR switching plan periodically, but does not use it during system operation
- Confidence period

- NMS 2.6 FLISR module in automatic mode
- NMS FLISR executes the switching steps automatically with manual intervention only when required

IMPORTANT NOTES

- These stages are those used by various utilities. Not all stages need to be taken and are provided as reference only
- An entry/exit criteria should be set to move between FLISR stages
- System circuits may be in different FLISR stages
- Procedures should be established for operating in various FLISR stages

Auto-FLISR
Timeline



The following three slides provide a view of various timeline aspects:

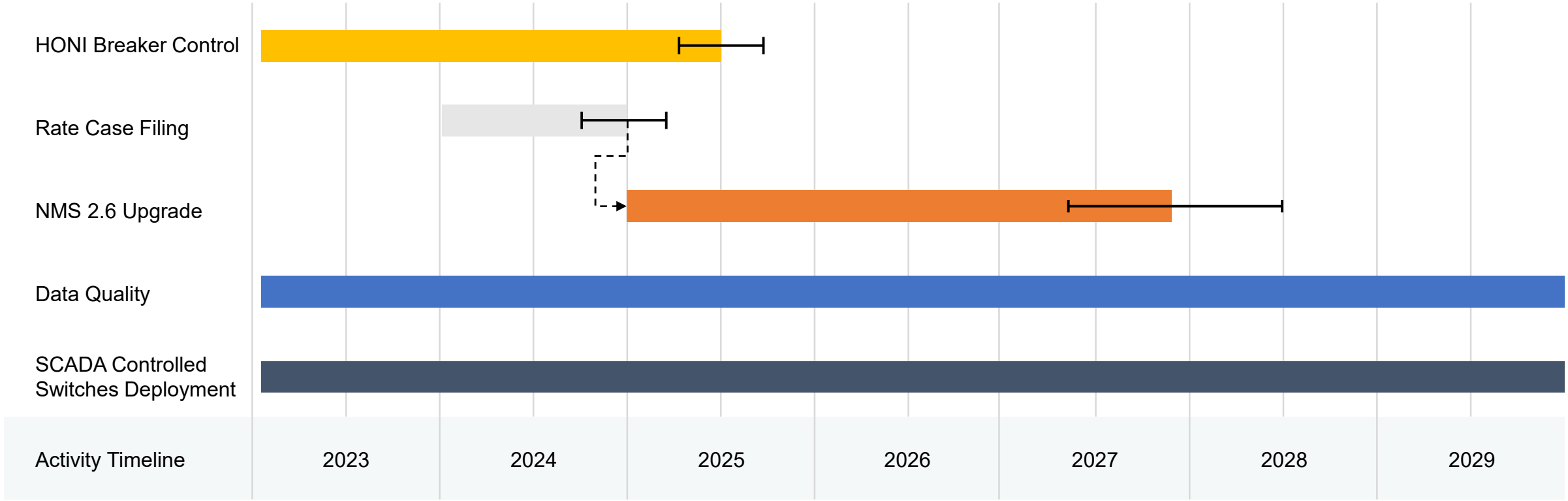
Related Timeline
- This slide serves to provide a high-level context of when aspects relevant to Auto-FLISR enablement may be expected to occur and therefore establish context for scheduling.

High-Level Timeline
- This slide provides a view of the high-level Auto-FLISR specific activities, their relationship and representative timing for these activities.

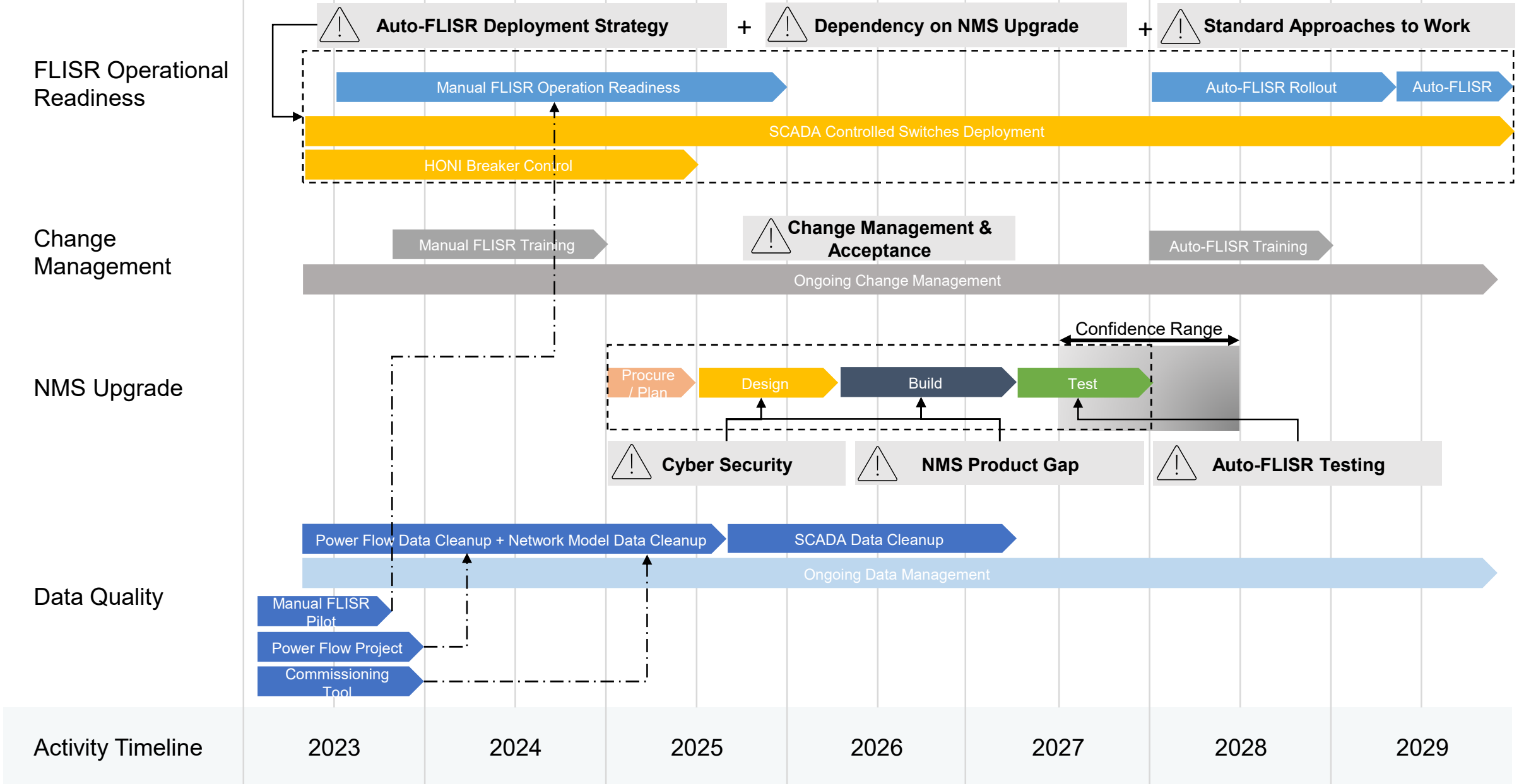
Indicative Activities
- This slide provides a view of activities that may be expected to be conducted within the specific focus of the technology deployment, their sequencing and potential timing.

Auto-FLISR
Related Timeline





Auto-FLISR High-Level Timeline



NMS Upgrade

Indicative Activities



Timeline	2025 Q1	2025 Q2	2025 Q3	2025 Q4	2026 Q1	2026 Q2	2026 Q3	2026 Q4	2027 Q1	2027 Q2	2027 Q3	2027 Q4
Planning & Initiation	Procurement	Implementation Plan										
Discovery & Blueprinting			Process Design	Requirement Documentation	Functional & Technical Design							
Build						Infrastructure / Environment Build	NMS 2.6 Build	R1 System Configuration	R2 System Configuration			
QA								R1 Unit / Functional / SIT	R2 Unit / Functional / SIT			
								R1 Point to Point Testing				
								R1 Non-functional / Regression / Performance Testing		R2 Non-functional / Regression / Performance Testing		
										NMS 2.6 R1 UAT		NMS 2.6 R2 UAT
Training & Change Management									R1 Training		R2 Training	
		Change Management								NMS 2.6 R1 Go-Live		NMS 2.6 R2 Go-Live

Auto-FLISR
Items for Consideration



The following items will potentially impact the Auto-FLISR deployment and warrant further review. These items have not formed part of the assessment.

Hydro One – Switch Ownership and Control
- A large population of circuit breakers on the THESL system are owned and controlled by Hydro One.
- This is potentially a significant complexity for the deployment of Auto-FLISR at THESL.
- Note – An interview is scheduled with Hydro One for June 30, 2023, to gain more insight.

Procedure Governance
- THESL's current operational performance has not been reviewed to establish a performance baseline for the Auto-FLISR assessment.

Staffing and Skills
- The aptitude and training of the existing THESL staff in the context of a transition from a manual to an automated operating environment have not been assessed.



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Toronto Hydro-Electric System Limited (THESL) Auto-FLISR Assessment

Presented on:

August 18, 2023
Final Draft

TRC Consulting North America, Inc.

7917 St-Denis
Montréal, Québec
Canada, H2R 2G2.
T 514-819-6600
F 514-819-8800
www.TRCCompanies.com

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1 Executive Summary

Toronto Hydro-Electric System Limited (THESL) owns and operates an electricity distribution system for the city of Toronto. Its priority is delivering safe and reliable electrical power to about 787,000 customers in the largest city in Canada. THESL's distribution represents approximately 18 percent of the electricity consumed in the province of Ontario servicing residential, commercial, and industrial customers.

THESL is currently progressing the use of Fault Location, Isolation, and Service Restoration (FLISR) and seeks to move the deployment of automated FLISR, aka Auto-FLISR.

THESL hired TRC Company (TRC) to conduct a six-week high level assessment of THESL's journey to Auto-FLISR with a focus on learnings from other utilities, expected benefits, potential timeline, and the significant risks and potential mitigation of the risks.

During the course of the six weeks TRC conducted discovery interviews with THESL staff, benchmarked Auto-FLISR experience with other utilities and interviewed THESL's key Auto-FLISR technology platform provider, Oracle.

TRCs key findings fall into categories of impact: Safety, Performance, Schedule, and Cost.

Safety

Safety is key for utility operations. The key potential aspect of safety was identified as being the ability to ensure that field crews and operators follow clear procedures to ensure that automated control is turned off to switches associated with faults to which field crews are deployed. Utilities using Auto-FLISR see this as controllable in the normal course of business practice, augmented by clear control status on the Auto-FLISR system.

Performance

An important aspiration for THESL, and other Canadian utilities, is for Auto-FLISR to operate in under one minute to meet the standard for an outage to be considered a momentary outage. Oracle noted this as a challenging goal, with various factors that may impact this performance goal. Most of the Auto-FLISR deployments benchmarked for performance are in US utilities where the standard for a momentary outage is less than five minutes.

TRC has been unable to interview any utilities currently operating to the Auto-FLISR momentary objective of one minute. Oracle has identified [redacted] in [redacted] meeting this objective. Initial information and interview suggest that [redacted] have achieved this goal in a limited fashion.

The performance of Auto-FLISR is influenced by various factors, some of which a utility has control while others have more potential for variability. Factors such as the number of communicating controllable devices on the electric network and the quality of data provided to the automated system are within the utility's control. The number and extent of outage events occurring due to, for example, extreme weather events at any one time are out of the control of the utility. It is likely that achieving this timing goal will require a simple switching plan which may result in fewer customers being returned to service overall and THESL will likely have to make trade offs in performance preferences.

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Schedule

The deployment of Auto-FLISR at THESL will be a complex undertaking with many aspects contributing to the final outcome. Foundational to the operation of Auto-FLISR will be the upgrade of the Oracle NMS platform and moving this platform into the higher security operating environment. The platform will also be upgraded to a high availability architecture to supply 5 x 9 reliability (system to be available 99.999% of the time). Complicating this work is that THESL's NMS is highly customized, meaning specific code has been added for THESL rather than native system configuration being leveraged. If extensive customization is to be applied to the upgrade, the already complex project can expect to be delayed beyond what may be considered typical. Given what is mentioned above, the NMS upgrade should be acknowledged as a multifaceted project with an estimated minimum duration of two years, with many dependencies on both business operations and IT staff.

Integrating Auto-FLISR function testing and enablement as a separate work stream contributes to the complexity of the NMS upgrade schedule. Notably, changes in power flow algorithms in NMS 2.6 might necessitate further efforts in model tuning and data gathering. Additionally, achieving the desired 1-minute target for Auto-FLISR function in NMS 2.6 will involve an iterative process of configuration work. Establishing practical yet effective test exit criteria for Auto-FLISR function in the NMS 2.6 upgrade will be crucial in managing these aspects.

The outcomes of the manual FLISR pilot project conducted in 2023 have the potential to inform the overall schedule. The insights gained from the pilot, such as assessing data readiness, configuring FLISR settings in NMS, and building operational confidence, will inform the design of the NMS 2.6 upgrade and the test strategy for the Auto-FLISR module. These learnings will play a crucial role in shaping the subsequent stages of development and deployment of the FLISR system, potentially leading to adjustments in the overall timeline and implementation approach. Once the NMS platform upgrade is complete the transition to Auto-FLISR for various substations can commence as soon as operator and field training, supported by appropriate operating procedures are in place. It is common to deploy Auto-FLISR to select circuits to develop operational confidence before wider deployment. Deployment will also be enhanced by further deployment of communicating controllable field devices in support of switching optionality. THESL is currently in the process of implementing an average of 2.5 SCADA controllable sectionalizing devices per feeder, which will enable an initial level of FLISR performance. To mitigate impact to the rollout schedule of Auto-FLISR these aspects should be planned well in advance of Auto-FLISR software platform go-live.

Cost

Feedback from other utilities has confirmed that the cost of the field equipment and communications is by far the costliest aspect of an Auto-FLISR deployment, especially if a key objective is to have increased switching optionality for effective fault mitigation. THESL's deployment of the NMS platform to the high security and high availability environment can be expected to considerably increase cost to a typical software upgrade.

Impactful Items

In this report we have also noted other potentially impactful items that could impact the Auto-FLISR deployment, and which warrant further review. These are:

- Operation of Hydro One owned breakers.
- Procedure Control.
- Staffing and skills.

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Impactful Opportunity

While there is no specific industry roadmap for an Auto-FLISR deployment, TRC believes that THESL's planned initial step of piloting a manual use of FLISR output from the existing NMS platform is an important opportunity and should be conducted at depth including a wide set of potential use cases in the pilot. This pilot, if conducted comprehensively with broad stakeholder engagement, has the potential to provide insight which will either serve to mitigate or manage expectations for the overall Auto-FLISR deployment.

TRC recommends that the FLISR pilot be recognized as the most important initial step for the THESL Auto-FLISR journey and that it is approached with suitable rigor, support, and transparency.

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2 Project Description

2.1 Scope Overview

The services of TRC were retained to conduct a six-week assessment of THESL's journey to the deployment of Auto-FLISR. The intent of this assessment was to conduct a series of activities which would result in the development of this report as an information and decision support tool for THESL leadership when considering Auto-FLISR.

The assessment was designed to allow for the following key areas of consideration: the potential timeline for the deployment of Auto-FLISR, risk relevant to the deployment of Auto-FLISR, and how risks may be mitigated. TRC has also provided insights as to high-level cost impacts from the deployment of Auto-FLISR, which are provided in the appendix of this document.

The assessment process involved activities to provide insight to THESL's internal approach, consideration of the key enabling technology (Oracle NMS), and lessons learned from other utilities who have progressed with Auto-FLISR deployments. TRC added to this its own expertise with Auto-FLISR and other utility solution deployments.

2.2 Auto-FLISR Principles

As a level set and to provide context for the rest of the conversation in this document it is important to provide a definition of Auto-FLISR and what may be considered reasonable expectations from the tool.

The central purpose of FLISR operations is to reduce the magnitude and time of any system outages experienced by customers. This is done by identifying the location of a specific system fault, determining how devices such as breakers, reclosers and tie-lines may be leveraged (switched) to isolate the impacted fault area to the minimum number of customers, and to then execute a switching plan to return all other customers to service as quickly as possible.

FLISR can be a broad term that encompasses various approaches and technologies used for fault management and power restoration in distribution networks. Generally decentralized and centralized FLISR.

- Decentralized FLISR: FLISR systems leveraging intelligent electronic devices which have pre-defined trigger rules to allow them to operate autonomously, and quickly. These devices are relatively simple to configure and can be quickly to deploy. These systems typically operate in seconds and re-route power and shed non-essential load under multi-contingency situations. These are not centrally coordinated for optimized outcomes.
- Centralized FLISR: Centralized FLISR systems use SCADA-enabled switches and sensors located at key points in the distribution system to detect an outage, locate the faulted area, isolate the fault, and restore service to unfaulted areas. Some switching operations can be performed automatically depending on the capabilities of the IEDs and sectionalizing devices, and the speed of SCADA system communication.

While the decentralized FLISR can be said to be automated, the discussion of manual or automated operations tends to focus on the centralized FLISR. In this context the manual and automated FLISR, aka Auto-FLISR, are as follows:

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- Manual FLISR: This approach involves manual intervention by utility operators to execute switching instructions determined by FLISR system to detect faults, locate their exact positions, isolate affected sections, and restore power to customers. It involves the use of either SCADA controlled devices.
- Automatic FLISR: This approach involves a FLISR software system connected to the SCADA control automatically locating the fault, solutioning to isolate the fault, executing switching actions to isolate the faulted part of the feeder, and restoring power to healthy elements of the feeder without operator intervention. This Auto-FLISR solution is generally able to execute with greater speed than the manual FLISR approach.

It is assumed that THESL will seek to deploy a centralized automated FLISR solution.

Generally, the objectives of FLISR relate to electric utility service performance metrics such as System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI). Additionally, effective FLISR, automatic or manual, operations improve the efficiency of field trips in that crews are directed to a narrowed potential location of the fault to be resolved and the opportunity to dispatch crews with the correct equipment is increased.

There is also generally a particular focus on momentary versus sustained interruptions of supply. A momentary interruption is the brief loss of power delivery caused by the opening and closing operation of an interrupting device. In many jurisdictions a momentary interruption is defined as being less than five minutes in duration. A sustained interruption is any interruption lasting longer than a momentary interruption.

It should be noted that THESL and other Ontario utilities use the more rigorous one minute (60 seconds) as the defined time period for a momentary interruption.

A momentary interruption is quite often able to be resolved with the operation of a recloser which is a switch that automatically opens when a specific voltage change is detected and then tests the electrical line to determine whether the trouble has been removed. If the problem was only temporary, say a brief tree contact, then the recloser automatically resets itself (closes) and restores electrical power.

In the case of the recloser operation it is normally the case that the recloser is operating in isolation of other components on the powerline (feeder) or circuit as a whole. The device may try multiple attempts, generally two to three times, to reclose without any external control and only when it fails to be able to close does it move to an open condition, or lock out, and send notification to the Supervisory Control and Data Acquisition (SCADA) system of a sustained outage. Depending on the number of recloser attempts, the time to the lock out stage can be up to 10 to 15 seconds based on peer utility interview results. Currently THESL is utilizing one reclose attempt scheme with lock out stage under 1 sec but will be soon evaluating a multi-reclose scheme (2 recloses instead of 1), with a projected lock out stage to be 4-5 seconds.

Once the lock out condition is received by the SCADA system it will need to be parsed to the Auto-FLISR system, Oracle NMS in the case of THESL, and a FLISR solution determined. The speed at which the solution can be impacted by many factors:

- The number of devices on the feeder which can potentially be operated.
- Whether device(s) are communicating as expected
    - Communication can be impacted by various issues. Potential contributors include network or connectivity latency, faulty hardware or equipment, power supply issues, incorrect configuration or settings, software or firmware issues, and environmental factors.

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- The forward-looking duration of the switching solution (for example is the switching solving for 4 hours, or 8 hours, or 12 hours).
- The quality of the data available to feed the solution calculation.
    - Data quality includes the accuracy, completeness, and consistency of the data, across diverse data sources. Data may include engineering data such as equipment capacity and ratings, relay trip settings, customer energy use data; and operational data such as fault target, breaker lockout status, and bus voltage.
- The compute capacity of the FLISR system and whether that compute capacity is under constraint at the time
    - Compute capacity constraints can be generated from such as a high demand for FLISR/SCADA transactions due to multiple events occurring in parallel.
- The latency between any device communication and system pass-throughs such as security gateways.
    - Compared to SCADA, the system response in NMS will be slower as it does not talk directly to RTUs.
    - [redacted] breaker control may require signals to transit via more gateways which could result in latency.

There are specific instances where Auto-FLISR will be restricted from running. Generally, these are instances where field crews are preparing to work on the feeder and breaker protection is in place for the safety of the field workers. There may also be different protocols applied during significant storm days.

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3 Methodology And Observations

3.1 Data Discovery

TRC provided THESL with an initial data discovery request which was designed to provide material from which TRC could gain a foundational insight into THESL Auto-FLISR plans and current situation. THESL was able to provide various data in the context of this data request from which TRC was able to gain a view of THESL operations and technology approach to Auto-FLISR.

The initial data set, while high level, provided a view of how the control room is currently organized, how switching is currently conducted, and the potential future switching approach. Also provided were swim lane diagrams with representation of various technology projects relevant to the journey to Auto-FLISR, including power flow related data cleansing, a manual FLISR pilot, alignment with Hydro One for breaker control, and the Oracle NMS upgrade and testing.

This data set was augmented by the discovery meetings discussed in the next step.

3.2 THESL Discovery Meetings

In the initial project plan, it was intended that project workshops would be conducted with a broad population of THESL staff, representing both operational and technology responsibilities. Potential participants were identified during the kick-off phase of the project and a formal project kick-off briefing was conducted for these participants.

In discussion with the project team, it was determined that the initial workshop would be conducted as a discovery meeting with a key business operations lead, Ali Syed (Senior Manager – System Operations), and a key technology lead, Frank Ning (NMS Solution Architect). Both were able to provide knowledge of the current operational and technology aspects for switching operations and insight into the planned approach for moving to Auto-FLISR at THESL.

In total three discovery calls were conducted with Ali and Frank, supported by members of the project team, over a two-week period. Ali and Frank were able to provide clarity and context for the data discovery material and insight as to the FLISR operations, objectives, and technology dependencies.

During the discovery calls the swim lane diagrams were advised to be initial, dates to be developed/confirmed, and no formal project plans or regulatory filing documents in support of the approach has been developed. It did become clear from the material and discussions that there are three anticipated foundational aspects for THESL Auto-FLISR journey, the upgrade of the Oracle NMS 2.3 platform, the initial target service area for Auto-FLISR is the area known as “the horseshoe,” and the field deployment target is for an average of 2.5 Auto-FLISR capable switches per feeder.

3.2.1 Oracle NMS

The Oracle NMS 2.3 platform is currently staged in the corporate IT environment but accessible from corporate environment. NMS 2.3 has control capability that THESL does not utilize due to security concern. The intended upgraded is to Oracle NMS 2.6 combined with a re-build of the NMS platform in the secure corporate environment to allow for SCADA control, and to deploy on a high availability architecture.

The objective of the high availability deployment is for the upgraded NMS platform to perform with three nines reliability. According to THESL's latest design, this reliability criterion means that the system in

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question will be available 99.96 percent of the time, which allows for less than 3 hours of downtime a year. This is a substantial improvement compared to the previous downtime of approximately 56 hours per year. The complexity of this system design requires the elimination of any single points of failure, the establishment of reliable crossover to redundant systems, and the implementation of rigorous failure detection measures. These approaches are typical for critical systems. It was identified that this performance criterion is to be established for the NMS platform and not to other non-operational input systems.

The target date is to have the upgrade to NMS 2.6 complete by late 2026.

The drivers for the NMS 2.6 upgrade include improving system's operational standard (including high availability, one operator GUI and better NMS patching experience, etc.), enabling the SCADA control in support of Auto-FLISR operations, and gaining synergies from undertaking these activities as an aligned and coordinated project.

3.2.2 Auto-FLISR Service Area

The targeted service area for the Auto-FLISR deployment, the service area known as the horseshoe, is a 27.6 kV supply in the northeast and northwest of the THESL service territory. The intention is to have deployed the minimum average of 2.5 switches to all feeders on the horseshoe service territory by 2029. Currently there are approximately 196 feeders that meet this criteria, 99 feeders with less than 2 sectionalizers and 36 feeders with no SCADA ties.

Two substations have been identified as the initial pilot locations.

A manual FLISR pilot is to commence at the two targeted substations as of August 2023. In this pilot the existing instance of NMS will be used to run FLISR switch sheets in real-time and these switch sheets will be compared bi-weekly with the actual switching approach that was conducted. This will create the opportunity to educate operators as to the FLISR output and to identify opportunities to improve the NMS output. NMS FLISR timestamps will be recorded and tracked to identify performance criteria for key elements of the NMS FLISR output. These two substations have also been used for a recent power flow study.

[redacted]

During the course of discovery conversations, it was identified that there is a significant amount of system control coordination with [redacted] Approximately thirty percent of circuit breakers are owned and operated by [redacted]. Parallel discussions are underway between THESL and [redacted] leadership as to how future control of [redacted] breakers by THESL may be enabled in the future. THESL provided in their technical project swim lanes representation of the potential to resolve the issues of [redacted] breaker control, including implementation and testing of a technical solution, prior to the commencement of the Oracle NMS upgrade project.

This is an aspect which may provide potential complexity to the deployment of Auto-FLISR at THESL. Due to the nature of the project being a high-level review of issues there has not been an opportunity for insight as to the potential scope and resolution of this aspect of THESL operations. However, it does warrant further review.

THESL is aware that HONI has also made some progress with Auto-FLISR and asked that TRC interview [redacted] in this context. The summary of TRC's interview findings can be found in section 3.3.3. Below is a summary of THESL's latest engagement status:

- THESL started discussion with [redacted] in 2022. A working level agreement with was reached with a Memorandum of Understanding (MOU) circulated (still needs to be signed) to form a technical and

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operational working group between the two utilities to define the operational parameter and a scope of work.

- Working group sessions were initiated in April 2023. The two teams meet bi-weekly and are aiming to have requirements drafted by Sept 2023 and a Scope of Work (SOW) developed in October/November.
- THESL has historically had supervisory control of [redacted] assets. This was a legacy setup, that [redacted] continuous to retire.
- The working level agreement between the two companies, revolves around the following:
    - [redacted] will provide operating control for the FLISR application only. TH will continue to contact HONI for controller driven switching and planned work.
    - The breaker controls will be done for outage restoration only, and not a return to normal i.e., THESL will not be making any parallels between feeders without [redacted] consent.
    - The utilities will rely on ICCP for controls, similar to the existing setup with Hold-off requests.
- In parallel with the technical and operating discussion, legal/regulatory teams on both organizations are working on the regulatory arrangement and legal agreements.
- THESL expects a Scope of Work to be signed off by the end of 2023, with implementation in 2024.

3.2.4 Distributed Energy Resources (DERs) Integration

DERs are a new complexity likely to expand in presence and impact on the operations of electric systems. In the context of grid switching operations the potential for DERs such as solar, wind, storage, and electric vehicles (EV) to create power flow changes and to impact switching decisions, and protection schemes, is significant. DERs are an emerging area of consideration for Auto-FLISR operation and are an area which THESL is investigating.

The potential impact of DERs have not been investigated as a specific control aspect have not been considered in this high-level assessment. In general, utilities are considering both the risks and opportunities that will arise from expanded DER deployment in the context of grid operations, and the use of FLISR:

- Increased Complexity: High DER penetration potentially introduces bi-directional power flows. This increased complexity can pose challenges for FLISR implementation as the system needs to accurately identify fault locations, isolate affected areas, and restore power while considering the presence and behavior of DER related power flows.
- Communication and Coordination: With DERs integrated into the distribution grid, effective communication and coordination between FLISR systems and DER control systems becomes crucial. FLISR must be able to receive real-time information on DER operation and adjust its responses accordingly to ensure safe and efficient fault management.
- Enhanced Situational Awareness: DERs can provide additional data points and enhance situational awareness for FLISR systems. With the ability to monitor DER generation, voltages, and power flows at different points on the distribution grid, FLISR can make more informed decisions during fault detection, isolation, and service restoration processes.
- Improved Resilience: When properly integrated, DERs can enhance grid resilience by providing localized generation and storage capabilities. FLISR can leverage these DER assets to support quicker service

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restoration by utilizing their power sources to re-energize isolated sections of the grid during fault events.

3.3 Utility Benchmarking

TRC identified utilities that would likely serve to provide useful insight and lessons learned for THESL's Auto-FLISR journey. The initial utilities targeted were [redacted]. During the course of conversations with THESL staff [redacted] and [redacted] were added to this group. TRC was also asked to provide insight to the Auto-FLISR operations at [redacted].

Key themes from the peer utilities benchmarking call included:

- Auto-FLISR Maturity: Auto-FLISR implementation has been perceived as an ongoing journey rather than a one-time endeavor for each utility. Note that there are no specific performance results over an extended period of time, however, all of the utilities remain committed to the journey. The maturity level of Auto-FLISR varied across different utilities and regions. The implementation and adoption of Auto-FLISR technology have been progressing steadily, but the maturity level can differ based on several factors such as Utility Size and Resources and Technological Advancements. The prevailing consensus is that Auto-FLISR will realize its intended benefits once it reaches a state of full maturity in its implementation.
- Data Accuracy and Quality: Auto-FLISR heavily relies on accurate and high-quality data from monitoring devices for fault detection and decision-making. Ensuring the accuracy and reliability of the data is essential to avoid false alarms or incorrect actions during fault events.
- Operational Training and Operation Confidence: Auto-FLISR implementation requires proper training for utility personnel to effectively operate and manage the system. Skilled operators must understand the high-level automation logic, data analysis, and coordination processes to ensure smooth operations. Apart from providing operational training, operation confidence can be built by involving operators during User Acceptance Testing (UAT), drawing insights from well-planned pilot projects, and addressing and resolving unique scenarios encountered during day-to-day FLISR operations.

3.3.1 [redacted]

[redacted] have advanced experience with the deployment of Auto-FLISR and while [redacted] uses the OSI platform rather than Oracle NMS, the insights from [redacted] are transferable across operations and technologies. OGE was generous with their time in making a key project lead available for interview and in providing briefing material to provide broad insight. This cooperation from OGE was augmented by TRC subject matter experts (SMEs) who have worked with [redacted] on various stages of their Auto-FLISR journey, both in the context of operational technology (OT) strategy and for key operational aspects.

Key take aways from the [redacted] benchmarking call included:

- Data quality, particularly for SCADA keys, very important.
  - OGE conducted a $30 million system data validation project.
- Consistency of procedure approach was key.
- Established a test laboratory (8 devices) before deploying further.

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- Testing needs to cover failure modes and be very deliberate around how Auto-FLISR fails.
- Auto-FLISR creates new challenges to old rules, for example operators have automation steps in their processes and confirmation of automation override/shut off steps when appropriate.
- Change management is an important point of focus for solution acceptance.
- Training of operators, field and IT staff needs to be planned and budgeted (O&M).
- ADMS and other system upgrades results in continual cost generation, both capital and O&M, to maintain a system which is heavily integrated and dependent on other systems for source data.
- Auto-FLISR software module cost was not large compared to recloser costs.
- FLISR overall "dramatically" improved performance.

3.3.2 [redacted]

PGE, who also use the OSI platform, was responsive to the request for a benchmarking interview and made several SMEs available who were able to provide a broad range of insight. Similar to [redacted] was able to discuss technology and operational aspects which are pertinent to any Auto-FLISR progression, including important lessons learned which have impacted the deployment of Auto-FLISR at [redacted].

Key take aways from the [redacted] benchmarking call included:

- [redacted] objective to improve SAIFI / SAIDI but safety a priority.
- System integrations are challenging.
- Focus on configurable functionality not customization.
- SCADA data preparation is a key factor.
- Split ADMS and OMS teams, and TSO and DSO teams.
- Transitioning from radios for device communication to Verizon VPN to omni-cellular (multiple carrier solution).
- Established a specific Change Manager role for ADMS and then Auto-FLISR acceptance.
- Conducted Just-in-Time training then experienced an unplanned deployment delay.
- Clear language key for communication between operators and field crew.
- Confidence in Auto-FLISR being disabled during field work is key – supported by operator training and system indicators.
- Load forecast is an 8-hour look ahead, objective to get to 24-hours but this slows solution execution.
    - The forecast look ahead is the duration for which the FLISR solution must solve, considering the expected load fluctuations over the period in question. A longer the duration to be solved the more complex the analysis and the longer it is expected to take the FLISR system to respond.
- Allow for additional recloser deployment and substation relay work, beyond simple upgrades.
- PGE established a FLISR laboratory test site and conducted field testing to gain confidence.
- Issues around functionality delayed the project.

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3.3.3 [redacted]

As noted in the prior section, [redacted] was identified during the THESL discovery discussions as a key relationship for THESL in the context of the Auto-FLISR journey. It was identified that there is considerable device switching coordination required between THESL and [redacted] with as many as 30 percent of substation breakers owned and operated by Hydro One.

HONI was contacted and responded to an interview request by making several subject matter experts available for an interview. As requested by THESL the issue of THESL operating [redacted] devices was not covered in the interview.

- HONI currently has Auto-FLISR scheme developed on eight 27.6 kV sub-transmission feeders out of two different substations. The eight feeders are modeled in SCADA and were migrated to DMS with FLISR profiles.
- HONI moved through two stages with the initial stage being the FLISR solution being provided to the operator to execute and stage two being Auto-FLISR.
- Intended to initiate Auto-FLISR from August 2022 but delayed due to operator concerns and need to conduct additional operator training. Additional operator training over a three-month period resolved issues in January 2023 and Auto-FLISR ran until March 2023.
- A five stage validation criteria on model fine tuning (Analysis Ready – AR) was set for critical review of a feeder for Auto-FLISR enablement.
- Auto-FLISR was taken offline in March 2023 due to an operational fault. FLISR correctly executed but it was determined that field devices were not correctly tagged in SCADA (devices set as switches not reclosers).
- The scheme is working as intended but [redacted] is having issues fine tuning data. The main issue is that the operators identified that the state estimation convergence criteria, which is required to perform within a 10 percent range, is not performing within range.
    - State estimation is the basis for building the real-time system model and is a static mathematical representation of the current conditions in an interconnected power network.
- The operators have a high sense of ownership for switching and are risk adverse, improving communication has been important to gain operator engagement.
- [redacted] does not have a significant history of automation and so change management / communication has been important to overcome resistance.
- [redacted] has not received resistance from field crews as yet, but communication needs to grow so field crews have a good understanding.
- Maintenance of automated devices has been an issue with twenty percent of automated devices not available at any one time due to maintenance issues, which puts the automated grid at risk.
- Field crews need to be trained to conduct different types of maintenance and to be scheduled in support of automated system operations.
- [redacted] is focused on improving SAIFI and SAIDI but also see Auto-FLISR as important to demonstrate capability to the regulator for [redacted] to be the Distribution System Operator (DSO). [redacted] is also focused on supporting DER growth.

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- [redacted] currently attempts to auto-reclose three times but may add an additional reclose attempt to reduce the number of sustained outages.
- Auto-FLISR is seen as component of overall grid modernization effort and is what drives the value from foundational investments such as the DMS and SCADA enabled devices.
- [redacted] has moved from grid modernization discovery of a range of technologies to deployment of individual technologies with their own cost / benefit justification.
- [redacted] uses the Schneider Electric FLISR application as part of the Schneider v3.7 DMS platform.
- Significant costs have been SCADA enablement of devices and the DMS deployment. Other notable costs have included system upgrades, licensing, system studies and establishing FLISR profiles.

3.3.4 [redacted]

[redacted], which was also identified by Oracle as a good customer example of use of the Oracle NMS platform for Auto-FLISR, advised their openness to participate in an information session for Auto-FLISR. [redacted] has advised that they went to Auto-FLISR but then returned to manual FLISR mode due to data related issues. This has the potential to be valuable insight for THESL. Key take aways from the [redacted] benchmarking call included:

- Auto-FLISR ran for one year during which there were 30 Auto-FLISR events which generally successfully operated. The original benefits SDGE hoped to gain from Auto-FLISR was to improve SAIDI scores and to allow operators to focus on other matters while Auto-FLISR took care of more easily automated switching.
- Prior leadership was aggressive in deploying Auto-FLISR to networks on which it was not originally intended to operate.
- Auto-FLISR has been turned off for 5 years. [redacted] currently runs FLISR in manual mode, in that FLISR generates a result which the operator checks and then either executes their own switching solution or they can execute the FLISR recommended switching, both via NMS. Now operators are manually checking NMS FLISR outputs it is, in some cases, taking longer than it would without FLISR.
- Auto-FLISR was disabled for several reasons:
  - SCADA issues giving either false positives on device outages or RTU communications issues.
  - Oracle upgrade from NMS 2.3 to 2.5 caused issues. Oracle NMS 2.5 has many different elements to Oracle NMS 2.3 including a different power flow engine, with algorithm changes, and different processes for ingesting data such as weather.
  - SCADA system change from ACS to OSI
  - Network areas re-defined to more identified as high fire risk and so Auto-FLISR is not able to be used in these areas
- A heartbeat of RTU check process was put in place to better recognize RTU communication issues.
- The upgrade to Oracle NMS 2.5 has been a challenge and Auto-FLISR has been put on the backburner while this is resolved.
- Operators are not confident (“suspicious”) in the FLISR outcomes as a consequence of all of the issues.

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- The NMS 2.3 power flow engine is based on the original OpenDSS system which was designed for offline study and not for real-time outcomes. This results in long-solution time as many iterations are run. While these are run other NMS services tend to slow down.
- NMS 2.5 is based on the single threaded architecture. [redacted] has heard Oracle 2.6 is multi-thread (TRC team were able to confirm this is what Oracle has told).
- [redacted] uses the NMS Fault Location Analysis (FLA) as a separate function from FLISR. FLA focuses on the most accurate location for the fault so crews patrol time can be reduced, very important to SDG&E for fire areas.
- [redacted] note that FLISR only identifies location in the context of the nearest switching device to operate, not to the specificity of FLA.
- Prior to originally deploying Auto-FLISR, [redacted] ran 1,700 test cases to test switching recommendations. They did not create a test laboratory environment. They assumed devices would work as expected.
- [redacted] is aware that utilities like Louisville and [redacted] (Australia) run during storms but noted that both have fewer SCADA devices and not as many set points.
- Cost – [redacted] highlighted that investment in communication infrastructure/bandwidth is an area of focus they recommend as SCADA device communication has been an issue.
- Costs – [redacted] highlighted the need to budget for staff to create, test and check models is important.
- Costs – [redacted] highlighted the need to prepare for system upgrade costs.

3.3.5 [redacted]

[redacted] Australia was identified by THESL as a utility of interest. Oracle was able to provide an amount of insight. UEC is currently running in Auto-FLISR mode. As a representative example they managed six events over three weeks via Auto-FLISR. One event was executed successfully in automatic mode, one event correctly terminated due to adverse conditions on the network, and for four events no solution was possible due to faults being at the end of the feeder.

For the one event that ran successfully in Auto-FLISR mode customers were restored 40 seconds after outage. Oracle advised the following transaction timings:

- 10 seconds wait for demand scan to complete.
- 1 second for FLISR to find the solution.
- 2 seconds to create and start executing the switch plan.
- 27 seconds to execute the steps in the plan that led up to the re-energization of customers.

[redacted] was contacted and responded to an interview request by making several subject matter experts available for an interview. The interview was also joined by THESL's system operations manager for Q&A. Below are the key takeaways:

- [redacted] has been guided by the principle that Auto-FLISR should be quicker while adhering to the controllers' established practices.

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- Prior to the implementation of Auto-FLISR, [redacted] had a large number of distribution automation devices in operation. On average, there were 1-2 SCADA controlled devices, excluding the tie switch, for early auto-FLISR adoption, and currently 2-3 SCADA controlled devices per feeder.
- The introduction of Auto-FLISR has notably improved reliability, reducing fault response time from 10-30 minutes (manual) to less than 1 minute. Though [redacted] has adjusted their momentary criteria to 3 minutes recently, their aim remains a 1-minute operational time. On average, the entire process took around 45 seconds, with approximately 15-20 seconds allocated for fault detection, demand scanning from NMS, and resolution time, along with an additional 20-40 seconds for command issuance.
- Efforts have been dedicated to enhancing communications, including upgrading device firmware and standardizing configuration settings.
- Currently operating on NMS 2.5, FLISR is employed on [redacted] high-voltage (HV) network model rather than the low-voltage (LV) network.
- While the initial release of Auto-FLISR functioned on legacy kVA mode, which was deemed highly successful, [redacted] has shifted to kVA mode and is transitioning to full power flow mode. This transition results in approximately 40 seconds of the solution time.
- The adoption of power flow mode is driven by UE's intention to utilize more PF-based applications such as Fault Location Analysis (FLA).
- Significant cost components include field work (estimated at 2 - 2.5 million) and NMS upgrades.
- [redacted] opted for a comprehensive deployment of auto-FLISR, enabling its activation circuit-wide once the confidence period had been successfully navigated.
- Scenarios warranting the disabling of auto-FLISR encompass live Line work, bush fire days, and sensitive earth faults.
- The average turn around time for updating GIS model is 2 days.
- Auto-FLISR has been turned on even during “grey-sky” conditions due to the outweighing benefits over associated risks.
- A risk assessment workshop was conducted across different organizational sectors including control room, asset management, and protection.
- Key lessons learned emphasize the importance of meticulous attention to detail. Unique challenges may arise for each circuit, making precise configuration of protection and fault Indicator settings crucial for successful FLISR operations. UE conducted a comprehensive office review to address these aspects.

3.3.6 [redacted]

[redacted] is another Ontario based utility that was identified as a good interview target during the THESL discovery meetings. Alectra was contacted and agreed to a meeting, but as of writing a time for the interview has not been scheduled.

[redacted] advised that they have some experience with FLISR in their “east region,” but the solution is currently de-activated due to an issue in their SCADA system. [redacted] advised that they previously operated FLISR in semi-automatic mode and did not transition to fully automatic mode.

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3.3.7 Other Utilities

[redacted] was identified by THESL as a utility of interest Oracle was able to provide an amount of insight. FirstEnergy conducted a wide ranging ADMS deployment project to deploy the solution across five US states and ten operating companies. The project commenced in 2019 with Go Live millstones for ADMS and FLISR set for Q3, 2022. Manual FLISR is in production on 200+ feeders. In this manual mode suggested switching is provided but not automatically initiated. [redacted] are analyzing the events generated and they also run a Loss of Voltage functionality in production for both substations and feeders.

[redacted] was able to make an operational resource available and email exchange with their technology lead confirmed that while [redacted] uses Oracle NMS it is focused on outage management and is not leveraged for Auto-FLISR. [redacted] has isolated automatic switching on their radial system but not an Auto-FLISR model.

3.4 Oracle Interview

An interview was conducted with key Oracle team members in the context of THESL's intended upgrade for the Oracle Network Management System (NMS), which is intended to be the foundational technology platform for THESL's Auto-FLISR operations.

The Oracle team were able to provide insight as to the status of THESL's current deployment of NMS version 2.3 and the issues and opportunities associated with the upgrade to NMS 2.6 in the context of future Auto-FLISR operations. It was a key point of focus for the Oracle team that THESL should be encouraged to act on the upgrade of NMS 2.3 to NMS 2.6 as a matter of priority as NMS 2.3 will move to a limited support mode, called sustained support, as of December 2024.

The Oracle team also noted that the objective of solving and executing switching solutions in under one minute will be challenging. It was identified that based on studies to date this will require Oracle NMS to establish the switching solution in 15 seconds.

In the context of the upgrade in general the Oracle team noted that the THESL deployment of NMS 2.3 has what Oracle would consider to be a high level of customizations. It was noted that some of these customizations were deployed to delay the need for an upgrade from NMS 2.3 and Oracle identified that NMS 2.6 provides increased configuration options which THESL can leverage. Oracle stressed that should THESL decide to carry forward current NMS 2.3 customizations they would need to be rebuilt in NMS 2.6 which would complicate the upgrade. More detail is provided in this regard in section 5.6 of this document.

In addition to the points around support, Auto-FLISR transaction time, and customizations, the following are key elements from the Oracle interview:

- Establishing data for the manual FLISR pilot has been a key factor.
- Oracle has provided THESL with a "cheat sheet" of the key data needed for a successful FLISR output.
- Oracle has identified the prioritization of the data by its impact on the quality of the FLISR result, and how missing data will impact the FLISR outcome.
- NMS 2.6 will be simpler, less complex, and more powerful than NMS 2.3 with a dedicated power flow engine and various processes running in parallel and more efficiently resulting in quicker processing speed.
- 2.6 manages data in a better manner than 2.3 and does not share services for functions.

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- Performance in a higher security zone may be expected to be slower if transitioning security layers however the build of the new environment will create the opportunity for deployment of new servers with improved processing.
- Auto-FLISR can be run in NMS 2.3 but only if deployed in secure zone with SCADA control.
- Oracle recommends manual mode testing of FLISR in NMS 2.3 be expanded to more than only two substations so more edge cases can be identified and tested in manual mode.
- Oracle estimates a standard upgrade to NMS 2.6 to take one year to 18 months but note that the following factors add to the complexity and required time for the upgrade:
  - Building in a secure control environment.
  - Extent of data cleansing and ETL issues.
  - Amount of customization.
- Oracle advised that THESL have identified 15 to 20 NMS 2.6 enhancements (customizations), not Auto-FLISR related, which are not on the NMS roadmap.
- NMS 2.6 has an extensive set of business rules (called SRS) which allow for considerable configuration flexibility.
- Oracle recommends aligning to product configuration to mitigate upgrade timing, complexity, and cost risk.
- Oracle notes that acceptance of "out of the box" use of systems is a strategy emerging with many utilities and that THESL is potentially following this strategy with their Oracle Customer Care and Billing (CC&B) upgrade.
- Oracle does not believe any new cyber risks as being introduced by NMS 2.6.
- Oracle believes THESL may be a head of some of Oracle's other customers by having a project team with a depth of Auto-FLISR knowledge on the project team.
- Auto-FLISR is included in the overall NMS 2.6 licensing.
- NMS 2.6 can be run in FLISR manual mode where NMS produces the switching solution but waits for operator approval before executing the solution in NMS.
- Oracle identifies that testing can be improved with the inclusion of a real-time SCADA feed to the test environment so edge cases can be found and tested.
- Oracle identified San Diego Gas and Electric (SDGE) as an example of a good NMS Auto-FLISR deployment.

3.5 Observations on FLISR Benefits

Overall, Auto-FLISR offers potential benefits in terms of faster power restoration, improved reliability, enhanced grid resilience, operational efficiency, and increased customer satisfaction. By leveraging advanced automation and smart grid technologies, Auto-FLISR helps utilities respond more effectively to outages and maintain a more reliable power supply. Quantifying the specific benefits of Auto-FLISR can be

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challenging as they depend on various factors such as the specific implementation, network configuration, and operational context.

The utilities interviewed for this assessment have generally considered Auto-FLISR within the context of overall grid modernization type strategies and while there is consistency in the desire to improve SAIFI and SAIDI scores, and to increase field work efficiency via accurate fault location (note that Oracle FLISR and Fault Location Analysis are separate modules unlike OSI or SE ADMS products), definitive improvement goals for these elements have not been established specifically in the context of Auto-FLISR. There is also a theme of a foundational drive to improve situational awareness and automation where appropriate across their business.

In seeking to gain insight into benefit metrics, TRC sourced commentary of FLISR related benefit findings beyond those utilities interviewed. Following are the insights gained:

- Reduced Outages and Momentary Disturbances: Florida Power & Light (FPL) utilized automated feeder switching and FLISR operations to reduce customer interruptions and momentary disturbances: 9 operations serving almost 16,000 customers led to more than 9,000 fewer customer interruptions and approximately 2,500 fewer upstream momentary disturbances. FPL also achieved a significant increase in annual customer minutes of interruption avoided. This leads to benefits like convenience, cost savings, and avoidance of medical and safety problems for residential and commercial customers.[1]
- Reduced Outage Minutes and Increased Member Satisfaction: FLISR actions, such as automated feeder switching, contribute to reducing the number of customers affected by sustained outages and the duration of outages. Pacific Gas & Electric (PG&E) in its 2020 Smart Grid Annual Report[2], identified that Customer Reliability Benefit for FLISR since inception (2014) is $1,320 million, with 472 million customer minutes avoided, as well as approximately 35% Customer Minutes of Interruption (CMI) improvement on 5-year average outage minutes basis.

  In comparison, the Rural Electric Cooperative Smart Grid Benchmarking Report mentioned that FLISR implementation led to a significant reduction (average 10%) in outage minutes reported by members and that members expressed higher satisfaction (with 65% of participating utilities giving a 5-star rating) due to improved reliability.

  The following chart is a summary provided by the Rural Electric Cooperative of their results.

[1]Source: Distribution Automation – Results from the Smart Grid Investment Grant Program (https://www.energy.gov/sites/prod/files/2016/11/f34/Distribution%20Automation%20Summary%20Report_09-29-16.pdf)

[2]Source: Pacific Gas and Electric Smart Grid Annual Report – 2020 (https://www.pge.com/pge_global/common/pdfs/safety/how-the-system-works/electric-systems/smart-grid/AnnualReport2020.pdf)

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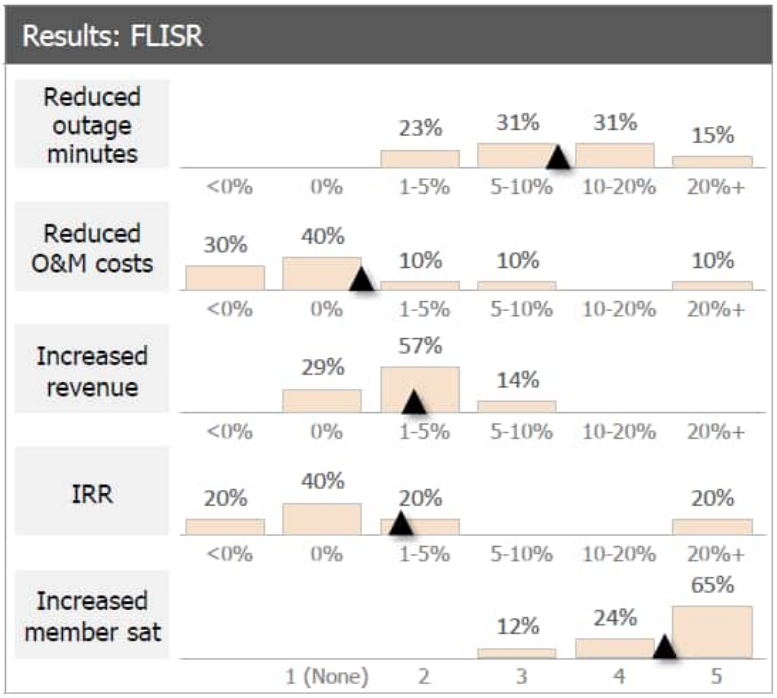

Source: Rural Electric Cooperative Smart Grid Benchmarking Report (https://www.nrtc.coop/wp-content/uploads/2022/08/REC_Smart_Grid_Benchmarking_Report.pdf)

[Triangle indicator for weighted average of the responses]

In the EPRI DA/FLISR State of Industry Survey, provided by THESL, which collects data from 48 respondents worldwide, it is identified that DMS With FLISR system contributes to approx. average reduction of SAIDI by 25%. Often, the benefits of FLISR and Distribution Automation (DA) can become intertwined, especially for utilities with existing DA devices in the field. This is evident in the EPRI report, where most participating utilities already possess Distribution Automation. Therefore, the adoption of Auto-FLISR is seen as an incremental improvement. However, this is not the case for THESL as the distribution automation deployment is still at its early stages, leading to possibly greater benefits (e.g., SAIDI reduction) from Auto-FLISR implementation than the industry average.

Overall, it is important to note that the specific quantification of FLISR benefits will vary depending on the utility's circumstances, the extent of FLISR implementation, and the available of data for comparison.

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4 Potential Timeline

4.1 High-level Potential Timeline

TRC has reviewed the material available on THESL's potential Auto-FLISR timeline and related projects. Insight was also gained from the experience of the benchmark utilities, Oracle and TRC's own project experiences.

The foundational project to the deployment of Auto-FLISR at THESL will be the upgrade of Oracle NMS and the deployment of the platform in the higher security control environment, supported by high availability architecture. Oracle identifies that a typical NMS upgrade takes 18 months but has noted that the THESL deployment is more complex than the norm due to the high amount of code customizations. TRC believes that the complexity of the move to the higher security environment with the high availability architecture argues for a more conservative timeline of 30 to 42 months. Under the worst-case scenario, the NMS 2.6 could be nearing the end of its support cycle once the Auto-FLISR implementation is finalized.

Mitigation to the NMS upgrade schedule impact will be early identification and prioritization of the design elements of the system, expected performance criteria and reduction of system customizations.

There are various activities that are part of any technology deployment, for example planning, design, build, and testing. Each aspect of these can have risk to their execution time and require a dedicated project team of both business owners and technology staff to be successfully executed.

The fact that the platform is to be built in the higher security environment will provide a higher level of cyber security than applied to a typical corporate IT environment. This can be expected to add complexity, and potentially time, to the platform design and build. However, the deployment of technology platforms in a secure operating environment is a known process (similar to what THESL currently has for SCADA) and can be mitigated with effective planning and the deployment of resources with experience building technology in these environments.

THESL has two projects which could potentially impact the Oracle NMS upgrade in the context of the Auto-FLISR functionality. These are the SCADA upgrade and the [redacted] Breaker Control agreement.

The SCADA upgrade is one significant undertaking. TRC has not reviewed the detailed plans for this upgrade, but our understanding is that the SCADA upgrade project is to be completed prior to the NMS upgrade project starting. We recommend that the SCADA upgrade team be advised of the objective of NMS control of SCADA devices so they may plan accordingly. Integration of these systems will be key to the success of the Auto-FLISR deployment and so close coordination between the projects will be important and potentially resources working on the SCADA upgrade can be deployed to support the NMS integration and can potentially be considered as an additional SCADA upgrade phase.

[redacted] Breaker Control agreement will impact the scale of Auto-FLISR rollout. The exact level of the potential impact of the [redacted] Breaker Control agreement is not known at this time but with a level of clarity expected to be gained by the end of 2023, insight as to potential impact, and the potential to plan for this, should be available well in advance of the NMS upgrade planning.

A common issue identified from the utilities who have deployed Auto-FLISR is the requirement for quality data. This is both in the context of existing data and for a process to ensure the quality of new data inputs, both of these are covered under the term data quality. In any integrated technology the Extract, Transform, Load (ETL) process is complex and not fully appreciated by those generating the original source data input, quite often in a system somewhat distant from an end goal such as Auto-FLISR.

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Fortunately, THESL has planned an initial FLISR pilot commencing in August 2023 where the switching outputs from the current NMS system will be compared to the switching plans executed by operators. It is likely this pilot will surface data quality issues and create real-life examples to inform data correction and education. THESL already has a data "cleansing" project planned as part of the manual FLISR pilot and is expected be effective as it will be informed by the outcomes of the FLISR pilot. Conducting these activities prior to commencement of the NMS upgrade will provide insight as to the design of the system for data acquisition and will reduce data related delays during the upgrade project.

If conducted in a broad, collaborative, and transparent fashion the FLISR pilot will also provide a starting point for the change management process. Commencing the change management process prior to the NMS upgrade is another aspect which will mitigate potential design and acceptance delays in the NMS upgrade. Not only will potential procedure changes be able to be discussed in advance of system design meetings but knowledge exchange, and relationship building, between project stakeholders will serve to mitigate communication issues which are the most common point of failure for any technology project. It should also be noted that Oracle identified a fundamental understanding of Auto-FLISR across the project team as an opportunity to improve the NMS upgrade project execution. As it stands, THESL has a dedicated and independent change management team engaged in the NMS upgrade project.

4.2 Deployment Sequencing

The sequencing of major activities is informed by dependencies, the ability of an activity's timing to impact the project success and opportunities for parallel activities to shorten an overall outcome time.

THESL is seeking regulatory approval in order to undertake the activities to enable Auto-FLISR. It is expected that this approval will be for both the field devices and the NMS technology platform upgrade. This regulatory process is expected to take place during the course of 2024 with a decision expected prior to commencement of a new rate period as of January 1, 2025.

Subsequent to regulatory approval THESL will be able to progress with the procurement elements of the Auto-FLISR project. While some of the procurement activities may be able to commence prior to the rate period THESL will not be able to issue any Request for Proposal (RFP) or contracting activities until after the regulatory approval.

As noted above the SCADA upgrade is due to complete prior to the NMS upgrade. It is also recommended that the [redacted] Breaker Control agreement be completed prior to the NMS upgrade project.

The FLISR pilot scheduled to commence in August 2023 is a sound approach by THESL, and not only will it inform the NMS upgrade, data quality, and change management but it can be expected to provide insight valuable to the regulatory filing and procurement activities.

While the data improvement process has already begun it should be expected to be an on-going process that will most like continue in parallel to all other activities and subsequent to the initial Auto-FLISR deployment, as operational experience is likely to create know inputs.

Another parallel activity which will be most important, and most likely the most expensive element, of Auto-FLISR capability will be the continued deployment of remotely controllable switches to allow for greater switching flexibility. THESL's objective is to get to an average of 2.5 controllable devices, with a minimum of 1.5 controllable devices, on each feeder in the horseshoe service area by 2029. Currently there are approximately 196 feeders that meet the 2.5 sectionalizers criteria, 99 feeders with less than 2 sectionalizers and 36 feeders with no SCADA ties.

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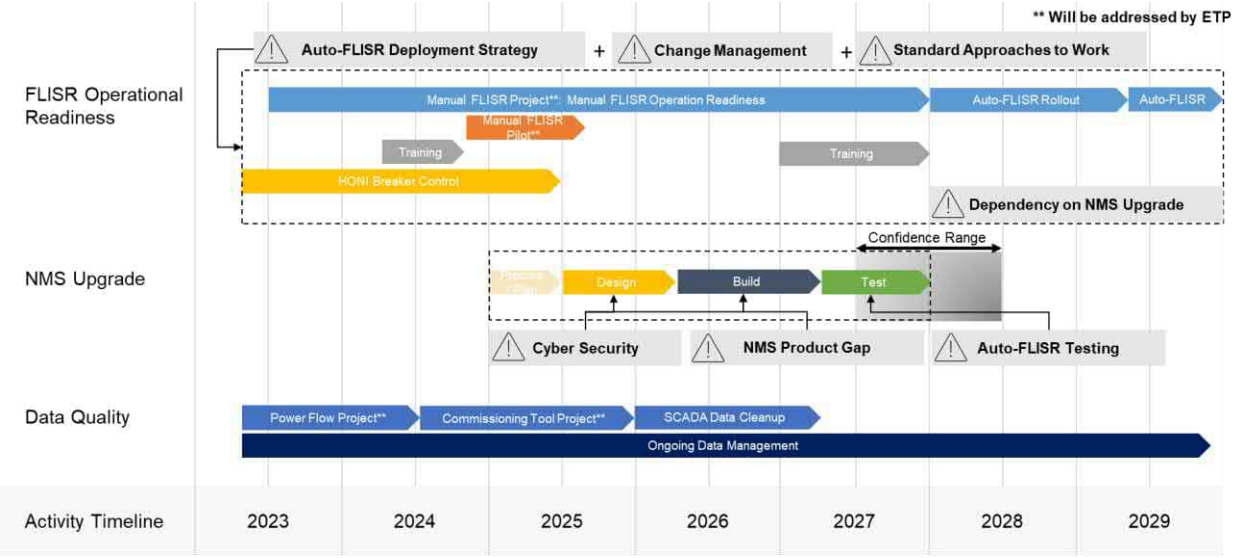
Based on the information above the following is a representative high-level time for the Auto-FLISR project at THESL.



[**NMS UPGRADE/AUTO-FLISR IMPLEMENTATION** – SCHEDULED BASED ON THE MID-POINT OF THE ESTIMATED DEPLOYMENT TIME RANGE. THE RANGE IS 30 TO 42 MONTHS AND THE MID-POINT IS 36 MONTHS.]

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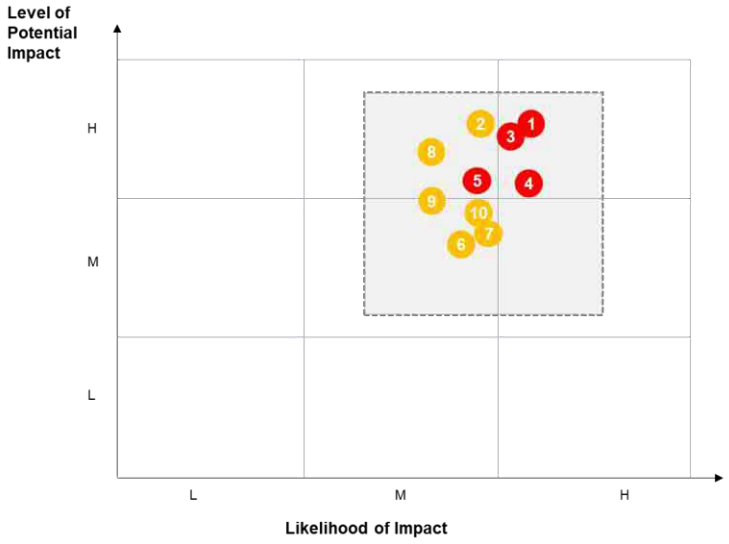
5 Risks and Mitigations

In the sections below items are identified which will to some extent result in an impact to THESL's journey to Auto-FLISR, and subsequent operation of the solution. The insight into these items have been derived from the activities identified earlier in this document. Due to the nature of the investigation these are provided as high-level insights and should be considered as directional rather than definitive.

While all warrant further detailed consideration they should provide a strong basis for consideration of more significant risks that may arise and how these risks may be mitigated. While certain risks are inherently inter-related (e.g., #2 and #4, #6 and #7), it remains crucial to classify them as distinct risks. This approach enables THESL to implement targeted measures more effectively and address each risk with greater attention.

For ease of reference the following table provides a summary of the risk items and the Auto-FLISR aspect which they may impact, to what potential level, and the mitigation difficulty.



#	Risk Item	Category	Difficulty of Mitigation
1	Auto-FLISR Performance	Performance	High
2	Dependency on NMS Upgrade	Schedule	Medium
3	Data Quality	Schedule, Cost, Performance	High
4	NMS Product Gap	Schedule, Cost, Performance	High
5	Auto-FLISR Testing	Schedule, Cost	High
6	Standard Approaches to Work	Schedule, Safety	Medium
7	Change Management & Acceptance	Schedule, Cost, Performance	Medium
8	Operational Safety	Performance, Safety	Medium
9	Cyber Security	Schedule, Cost, Performance	Medium
10	Auto-FLISR Deployment Strategy	Schedule, Performance	Medium

5.1 Auto-FLISR Performance

Likelihood	High
Impact	High – Performance
Difficulty of Mitigation	High

5.1.1 Description

As with any investment it is important to correctly appreciate the expectations for the outcomes or benefits that will result from the investment. This is no different for Auto-FLISR. The primary risk identified is the consistent achievement of the intended 60-second Auto-FLISR performance.

Auto-FLISR is a tool which is expected to complement the operations of the electric system to minimize the extent and time that customers are exposed to the loss of electric supply. Based on pre-set algorithms the Auto-FLISR solution is intended to quickly determine the location of the fault, isolate the location of the fault

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and return service to as many customers as possible. THESL has the goal of solving for these objectives within a period of sixty seconds or less, which results in the incident being considered a momentary outage rather than a sustained outage in the context of performance reporting.

There are many elements that will impact the ability to conduct the required steps in the prescribed time.

Working in cooperation with Oracle, THESL has identified a best-case timeline where a restoration via Auto-FLISR can potentially be expected to be around the 55 second mark. This will be made up of the following components:

- 5 seconds for lockout message.
- 15 seconds for demand scan (Note that Demand Scan in the Oracle Operating Manual is not currently supported in THESL's NMS product).
- 15 seconds for FLISR solution.
- 10 seconds to block reclosers, and isolate.
- 10 seconds to confirm isolation and send restore commands.

The Oracle team identified that the time allocated to NMS to complete the required transactions (solution time) is 15 seconds which is considered challenging. It should be noted that the utility use cases that Oracle references as the most robust Auto-FLISR deployments on their platform are in the United States (US) where a momentary outage is considered under five minutes. The solution time is measured from when the recloser first opens to the time that the Auto-FLISR platform identifies and performs the switching. Benchmarking with [redacted] and [redacted] and other informal enquiries, has identified that their Auto-FLISR solution timing ranges from 90 seconds to three minutes.

The complexity of the solution to be calculated considerably impacts the potential solution time. The complexity is a result of factors such as the following:

- Circuit topology (# of feeders and devices),
- Device status validation time,
- Adjacency to and leveraging of other circuits as part of the solution,
- Post switching plan protection validation,
- Number of switching plans to be run,
- Forward forecasting time for which the switching plan is to solve.

[redacted] noted that their most complex cases can take up to 10 times longer to solve than their less complex standard cases.

The overall solution time can then be further impacted by communication latency and demand on compute resources if a major event requires many simultaneous solutions and actions to be conducted. It should be noted that some utilities may turn off Auto-FLISR during major events due to the constant change of the network and as standard indices may not apply.

In addition to timing, the ability to segment the grid or tie in other supply pathways creates the flexibility to reduce the number of customers impacted. If there are limited controllable devices available on the circuit to isolate the fault the overall potential of Auto-FLISR will be mitigated. This results in a situation where a less impactful solution will run quicker than a solution with the potential to be more impactful.

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It should also be noted that the introduction of distributed energy resources (DERs) adds further complexity to the potential switching approaches and fault solutions. The industry is not yet well advanced in solving for the complexity of DERs via Auto-FLISR and typical solution timing for such are not known.

While Auto-FLISR is an important tool to demonstrate to stakeholders such as customers and regulators THESL's commitment to mitigate the impact of service outages, and certainly [redacted] confirmed that Auto-FLISR "dramatically" improved their performance, particularly in response to storm events, it will be important to not create expectations and/or goals which cannot be met.

5.1.2 Likelihood and Impact

The likelihood of the risk is considered as high for the following reasons:

- In peer utility interviews, it was observed that only 2 utilities ([redacted] and [redacted] during pilot phase) consistently achieved the 60-second target for Auto-FLISR performance.
- The THESL team has not fully explored the complexities of the solutions and communication latency.
- The Oracle team's experience in assisting THESL to achieve the 60-second performance target appears to be limited. In addition, the 55 second target is best-case, implying that there are more cases that are not less than 60 seconds.

The impact of the risk is considered as high in the performance category for the following reasons:

- The risk factors mentioned directly impact the system performance and the expectations that should be set for business units during the Auto-FLISR implementation journey.

5.1.3 Mitigation

Set clear expectations – Clear expectations should be set for what an Auto-FLISR will be able to improve and what may limit these benefits. An Auto-FLISR solution is not a panacea but rather a tool that if correctly deployed will support the expedited return of customers to service.

There may be circuits which have less complexity, essentially fewer options, than other circuits and so these circuits have a higher potential of resolution within the target time than other networks with more complexity. Being able to understand and explain the performance expectations based on the different circuit topology is important. THESL plans to target two pilot circuits with THESL breakers for Auto-FLISR, and the complexity of these circuits should be considered for performance expectations and the likely comparative Auto-FLISR performance as deployment of Auto-FLISR expands to other circuits with different complexity. It may be informative for THESL to deploy to a complex and a less complex circuit to provide some comparative insight.

Consider multiple attempts to reclose – As the initial step in fault response, we note that THESL currently conducts only one reclose attempt before the recloser locks out. Events such as tree contact are the most common reason for transient faults for above ground systems and as a consequence it is industry common practice to conduct two or three reclose attempts before lock-out. THESL is in the process of moving to two recloser attempts instead of one. Another common practice is to program the recloser for what is known as a single-phase trip / three phase lockout which can reduce events on unaffected phases. Reducing the number of transient faults that are treated as a real or sustained outage will reduce the demand on the Auto-FLISR system. Nevertheless, the recloser settings should be driven by THESL's business unit (i.e.: system

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operation and protection team) considering both the need of coordinating FLISR operation and the best practice for improving system reliability for THESL.

Verify communications – To maximize the performance of Auto-FLISR THESL should also ensure that there is a formal process to run daily validation of the communication status of devices and to proactively resolve any issues identified.

Consider sizing infrastructure for high impact – Shared resources, such as compute and communications, are normally sized to perform at the target transaction speed during predetermined conditions. In most cases these predetermined conditions are not high impact, low frequency events. Many utilities have experienced difficulty during unanticipated extreme events as a consequence. THESL should either size infrastructure and develop redundant pathways for high impact, low frequency events or manage the expectations of the ability of the Auto-FLISR solution to perform at the optimal level during such events. A goal of a percent of Auto-FLISR resolutions within one minute should be informed by such inputs.

Consider different solution plans – Simplifying the solution plan will reduce compute time but this may be at the cost of the number of customers that can immediately be returned to service. In this context a clear priority needs to be established so logic can be designed in an appropriate fashion. THESL may be able to investigate with Oracle whether the NMS 2.6 platform allows for a two-step switching solution where optimized solutioning is conducted to meet the response time criteria and then a secondary approach is deployed to return additional customers, even if the return of this additional customer set may be after the one-minute target time.

Considering all the aspects mentioned above, the difficulty of mitigations is regarded as high. This is due to the need for resolving engineering details to optimize performance and concurrently managing expectations for performance as THESL progresses on its Auto-FLISR journey.

5.1.4 Key Recommendations

- Set clear goals and expectations.
- Evaluate performance expectation and FLISR implementation complexity of each feeder. (e.g., is 60s achievable for any specific feeder? What is the expected performance for each feeder?)
- Identify key internal and external stakeholders and establish an education/communications plan.
- Review approach to transient faults and number of reclose attempts.
- Identify circuits by complexity, and by association target Auto-FLISR performance criteria.
    - Complexity may be represented by such as length of the circuit, number of devices to be operated, and diversity of customer operations.
- Communicate where Auto-FLISR is deployed or not deployed.
- Establish device communication status review process.
- Establish transparent performance reporting and goal setting.

5.2 Dependency on NMS Upgrade

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Likelihood	Medium
Impact	High – Schedule
Difficulty of Mitigation	Medium

5.2.1 Description

A foundational aspect of THESL's journey to Auto-FLISR will be the upgrade of the Oracle NMS platform from the current NMS version 2.3 to version 2.6. NMS will then be configured to enable control of SCADA devices, and as a consequence will be moved to the more secure control environment. This will be a complex undertaking. The complexity of this upgrade will increase your Auto-FLISR schedule risk. TRC's experience indicates that NMS upgrades and implementations are complex endeavors and clients typically accept schedule delays in lieu of compromises elsewhere in the project. Compromises such as scope and business process changes.

Enabling and testing SCADA control configuration from NMS is identified as one of the most important dependencies for THESL's Auto-FLISR implementation. It is THESL's intention to move to the configuration, testing and deployment of Auto-FLISR only after the NMS upgrade, environment relocation and SCADA control is successfully deployed in production for operation. The intent is that enablement of Auto-FLISR operations will be a distinct phase of the NMS upgrade project.

The planned NMS upgrade requires THESL to redesign its current system architect and build a new platform environment in a secure zone, and to design with high availability architecture. Integration to key systems will also be of great importance and system integration is an aspect of Auto-FLISR that [redacted] identified as having been challenging. This undertaking inevitably will introduce more complexity in planning and preparing the test cases across identified NMS use cases, especially as the THESL NMS team will be working with new environment conditions. The combination of a software upgrade, new functionality, and a significant infrastructure architecture change will increase the risk of the project getting delayed and delaying the Auto-FLISR go-live.

Oracle has also noted that the current NMS 2.3 deployment is highly customized which further complicates the planned upgrade. We discuss the issue of customizations further in section 5.6.

[redacted] noted that they have the Oracle NMS platform for OMS. [redacted] split their OMS and ADMS team with the ADMS (using the OSI product) in the secure CIP zone while OMS remains in the corporate environment managed by a specific OMS team. PGE was concerned with the challenge of training operators on NMS in addition to the other changes and so keeps this as a separate function. OGE mitigated this risk by moving to a single pane of glass and one system for DMS, OMS, and D-SCADA.

It is common among utilities to first gain confidence by putting NMS-initiated SCADA control into daily operations for some time before enabling Auto-FLISR. There are process changes to be managed once the SCADA control from NMS is enabled, such as the operation process, device commissioning process, and NMS IT-related process, such as increased security monitoring, alarm management, and fault resolution. In this context the transition to Auto-FLISR is a distinct phase after the completion of the NMS upgrade and once SCADA control has been established.

It is quite often the case when technology projects are late against deployment schedules or trending over budget that project elements are reduced or changed to meet amended targets. While THESL will have much to consider should such a situation arise, the impact to the timing and performance of Auto-FLISR should be considered.

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5.2.2 Likelihood and Impact

The likelihood of the risk is considered as medium for the following reasons:

- THESL is actively involved in the NMS upgrade planning, but the scope and exit criteria for NMS core and Auto-FLISR testing as separate release phases are yet to be specified.
- The manual FLISR project will provide THESL with more clearly defined requirements for the NMS 2.6 design phase.
- Constructing a new platform environment in a secure zone with a high-availability architecture is a novel undertaking for THESL.
- The likelihood of the risk is assessed based on the adjusted NMS upgrade schedule estimates, which fall within a range of 30 to 42 months.

The impact of the risk is considered as high in the schedule category for the following reasons:

- As discussed in section 4.1, the TRC team estimates that the NMS upgrade will take between 30 to 42 months to complete, and the enablement of Auto-FLISR depends on the NMS 2.6 go-live. Therefore, the risk is considered high due to the complexity of the NMS upgrade mentioned earlier.

5.2.3 Mitigation

Set NMS Upgrade project dependencies for Auto-FLISR – The scope and project detail of the NMS upgrade and enablement of SCADA control is foundational to the enablement of Auto-FLISR. The expectation should be set that the NMS upgrade and SCADA control is a schedule dependency for the deployment of Auto-FLISR.

The NMS upgrade and Auto-FLISR implementation project will have a comprehensive set of requirements, dependencies, and objectives. The deployment of the new system will also be complemented by new business and technology processes. The elements of the project and processes which track to Auto-FLISR enablement should be identified and tracked. If project decisions are anticipated which will impact these elements the Auto-FLISR leads should be engaged.

We discuss further below the benefits of process standardization and avoidance of customization and note that any technology deployment is helped by simplifying the processes that the technology will support.

Set Auto-FLISR as goal of NMS Upgrade – Due to the dependency of Auto-FLISR on the NMS upgrade with SCADA control enabled we recommend that Auto-FLISR is identified as a specific NMS go-live project goal so connection to the FLISR functionality remains clear and is a success criterion for the NMS upgrade and SCADA control project team. This will also allow for clear tracking of project schedules should there be delays to dependency tasks.

The difficulty of mitigation is considered as medium since the action items primarily revolve around project planning activities.

5.2.4 Key Recommendations

- Identify key project elements and processes which impact Auto-FLISR.
- Leverage learnings from the FLISR pilot in project planning.
- Establish Auto-FLISR functionality as a key project goal.

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5.3 Data Quality

Likelihood	High
Impact	High – Schedule, High – Cost, High – Performance
Difficulty of Mitigation	High

5.3.1 Description

Data quality has been identified as one of the key activities for successful Auto-FLISR implementation. The data quality should cover both data maintained by operational teams, including connectivity models, network model parameters, SCADA data, and other data collected via IT system integrations. Below is a high-level breakdown of Auto-FLISR data requirement based on our current-state analysis for THESL:

Data Category	Impact to Auto-FLISR	Level of Confidence	Level of Mitigation
Connectivity Model	High	High	High
Engineering Data (Impedance, Loading info…)	Medium	Medium	High
Operational Data (Fault Current, Lockout Status…)	High	Medium	Medium

- Connectivity Model: Data quality issue includes problems related to unknown or incorrect transformer connections, consumer-to-transformer connectivity, voltage level discrepancies, partial energization, inconsistent phases, non-existing loops, parallels, and breaks in the network.
- Engineering Data: This category of data quality issue directly impacts the power flow results. It involves inaccurate SCADA reading positions, unknown or incorrect element catalogs or parameters, inaccurate load information (e.g., transferring load from the adjacent feeder), inadequate load profiles, low average annual power values, incorrect status of generation units, inaccurate capacity ratings, and missing load data (load or consumer transformer data not imported).
- Operational Data: Data quality issue includes Inconsistencies in fault indicator SCADA readings, such as duplicate phases, number of signals, or signal existence, and inconsistencies in fault amplitude SCADA readings, including duplicate phases and number of signals.

Both OGE and PGE identified that data quality was a challenge in their Auto-FLISR deployments as gaps or inconsistencies in data impacted the effectiveness of the Auto-FLISR operation. The data comes from a range of sources with a spectrum of parties responsible for the data, which transits via various IT systems.

THESL is seeking to mitigate its data quality issues with data cleansing projects. The extent of this activity, the ability to maintain the quality and consistency of new data, and whether the standards for data quality are set at an enterprise level will be an important consideration. [redacted] advised that they undertook an extensive system-wide data validation project which cost in the range of $30 million . This project verified

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the connectivity and impedance model (wire sizing). The data from the field verification was critical for load flow to operate, which was the foundational component Auto-FLISR and Integrated Volt VAR Control.

Without a strong data quality approach there will likely be a higher percent of data gaps and inconsistencies that will reduce the effectiveness of Auto-FLISR, and which may result in detrimental switching outcomes. It should be noted that this would also be expected to be the case for current operations and so strong data quality has benefits beyond the deployment of Auto-FLISR.

5.3.2 Likelihood and Impact

The likelihood of the risk is considered as high for the following reasons:

- Data quality issues continue to be a prominent concern in peer utility Auto-FLISR implementations. While THESL has proactively undertaken several projects, such as manual FLISR, power flow, and commissioning tools, to create a robust data foundation for Auto-FLISR enablement, it is reasonable to anticipate that some data quality challenges may still emerge along the Auto-FLISR journey.
- According to the Auto-FLISR data requirement analysis in section 5.4.1, the THESL team possesses an overall medium level of confidence in their data quality to facilitate Auto-FLISR implementation.

The impact of the risk is considered as high in the performance, schedule, and cost category for the following reasons:

- As stated in the peer utility interview summary, data quality continues to be a significant factor contributing to Auto-FLISR deactivation. Poor data quality can directly affect Auto-FLISR's performance, leading to solution failures, incorrect switching plans, or solution time-outs.
- Addressing data quality issues is generally perceived as a costly and time-consuming process that necessitates coordination at the corporate level.

5.3.3 Mitigation

Long term view of data quality – Data quality should be planned and budgeted as a broad opportunity across a variety of grid modernization programs, and staff should be encouraged to take ownership of data quality. Some of the activities can be time-consuming and costly. For example, manually validating the network data models and their data mappings over all overhead lines is no small undertaking. Such endeavors need to be backed by a process of data validation and quality control at the initial point of entry. There are various ways this can be done, for example expected number control ranges can be established within electronic forms, barcode reading of components on installation, and verbal three-way communication of activities to confirm data being reported.

Plan for poor data quality – While data quality should be a key objective, it is also important to design for a tolerance to data quality issues during testing and to establish criteria for how Auto-FLISR is deployed where it is known that a specific circuit may have data issues beyond a specific baseline level. For example, how to interpret the circuit violation constraints given the confidence level of a network model.

The FLISR pilot, power flow project, commissioning tool project, upgrade of NMS and development of NMS SCADA control will establish an opportunity to improve foundational data quality and integration quality. The project team should work to determine how to configure the system in a way to better respond to different data quality issues while still reaching the intended system operation target.

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Budget for data quality -- Budgeting should be established for data quality baseline identification and improvement activities as an ongoing effort as part of normal operational activities.

Considering all the aforementioned activities, the difficulty of mitigating data quality issues should be regarded as high, aligning with the experiences of most peer utilities.

5.3.4 Key Recommendations

- Leverage the manual FLISR evaluation pilot to establish a data baseline, validate and correct data.
- Where data quality issues are identified, test the same data elements for use cases beyond the pilot location use cases and correct as required.
- Establish a broad data quality approach. This includes establishing working group to address data quality issue, leveraging data analytic to address data quality issues and establishing data quality framework, etc.
- Broadly communicate and educate staff about data quality objectives.

5.4 NMS Product Gap

Likelihood	High
Impact	High – Cost, High – Performance, High – Schedule
Difficulty of Mitigation	High

5.4.1 Description

It is generally considered best practice when deploying software to use the software as designed, leveraging the configurations that are native to the software. Functionality and configurations that are native to the software are expected to be maintained and upgraded as part of the quality assurance and performance standards included within the software licensing. Software is not an exact match for all of a company's operations and processes and that either the company needs to adapt to the software or that they need a specific change, a customization, to the software to meet their operational process. This section highlights the intricacies associated with the NMS 2.6 implementation, primarily stemming from extensive customizations and configurations. In comparison, the dependency on NMS upgrade risk centers around the activity schedule risk, while the Auto-FLISR performance risk pertains to the limitations of the NMS Auto-FLISR product. Acknowledging that there are overlaps among the three risks, it is important to designate them as separate entities. Doing so enables THESL to implement targeted measures more effectively and address each risk with precision.

During the interview with Oracle, they identify that they consider THESL's NMS 2.3 deployment to be at the high range of customizations that may be deployed to their NMS software. While Oracle noted that some of these customizations were developed to delay THESL's need to upgrade from NMS 2.3, Oracle identified that the extent of customizations will increase the complexity of the upgrade to NMS 2.6. Oracle identified that approximately 90 percent of the NMS customizations to NMS 2.3 are not native within NMS 2.6 and will provide a range of difficulty to reproduce in NMS 2.6.

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Some examples of customizations have been identified by THESL SMEs:

- UWPC (Utility Work Protection Code): Customization of Switching and Safety Document Modules (Custom cross record views, custom validations, custom emailing, printing, etc.).
- Customization of event management.
- OMA (NMS Operations Mobile Application).

Oracle has identified the NMS 2.6 has an expansive set of rule configurations, known as SRS rules, that create the opportunity for considerable configuration flexibility in the product. Oracle believes that these configurations will allow for most use cases. Oracle further noted that there is a common move within utilities to work to leverage software as designed, using native configuration, rather than for extensive customization.

Oracle advised that their experience is that a typical upgrade for NMS takes 12 to 18 months but believe that the THESL upgrade will take longer due to the complexity of the customizations. Also noted that THESL has already made 15 to 20 NMS 2.6 customization requests that are not on the NMS roadmap, meaning that such customizations would need to be supported at THESL's expense.

Oracle also took the opportunity to stress that they will discontinue the full support of NMS 2.3 after the end of 2024. After this time Oracle will offer only sustained support which does not support patches or bug fixes, only support critical issues. With the upgrade expected to take over 18 months THESL will need to plan internally to mitigate any potential operation and cyber security risks until the upgrade is in production.

5.4.2 Likelihood and Impact

The likelihood of the risk is considered as high for the following reasons:

- The current state analysis revealed that there are a number of customizations on the horizon planned for NMS 2.6 upgrade.
- It is unknown if the Oracle NMS team will enhance their current product to address THESL's specific use case in the near future.
- Given that the future state documentation on Auto-FLISR is still pending finalization, this may lead to additional customization or configuration work to bridge any product gaps.

The impact of the risk is considered as high in the cost, schedule and performance category for the following reasons:

- Extra time and budget are expected to be allocated to the Oracle team during the NMS 2.6 build phase due to the additional customizations required to address product gaps.
- As noted in the Auto-FLISR Performance section, configuring NMS Auto-FLISR settings is a critical factor in achieving the 60-second performance target and is inherently an interactive process.

5.4.3 Mitigation

Challenge status quo processes – THESL should seek to use the native functionality of the NMS product. In many cases this may involve product training and coaching managers/leaders to help drive organizational change, especially in the context of long held legacy process.

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[redacted] has had success in creating system super-users during the User Acceptance Testing (UAT) who are persons of influence within the organization to drive change acceptance. Such champions can be developed earlier in the use case review and product configuration stage to support use of the native system functionality and provide credible insight and support for resulting process change.

Establish rigorous customization approval process -- Where it is deemed that customizations are required a criterion should be established for their creation, and in the case of the upgrade from NMS 2.3 to NMS 2.6, their migration to the new version. The criterion should include the following:

- Degree of variance from existing configuration capability.
- Extent of use.
- Extent of operational impact.
- Level of effort to develop and maintain.

Apart from individual customizations, the overall extent should be understood as the sum of the parts may be greater than anticipated. There is a point where an extensive set of customizations has to generate consideration of whether the selected solution is a good fit and raises the question as to whether extent of customization was understood prior to solution selection. The difficulty of mitigation should be deemed high due to the extensive volume of activities that may be involved.

5.4.4 Key Recommendations

- Establish change management / training to leverage tool native functionality.
- Establish an approval criterion for customizations.
- Identify and establish agreement between THELS and Oracle to enhance Oracle NMS product to minimize the customization needs.

5.5 Auto-FLISR Testing

Likelihood	Medium
Impact	High – Schedule, High – Cost
Difficulty of Mitigation	Medium

5.5.1 Description

There are various Auto-FLISR testing approaches among peer utilities depending on the IT/OT system readiness and the FLISR implementation journey. The approach to testing impacts how the utility transitions through the stages of FLISR operation from manual FLISR evaluation through to full Auto-FLISR deployment. Based on our findings regarding THESL's current state, there is a potential risk that THESL may not be entirely prepared for the Auto-FLISR testing to achieve the desired outcome. The significant test areas are:

- Point check remotely controlled switches
- Adding remotely controlled switches into operator's processes

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- Verify switching plans developed by NMS
- Verify Auto-FLISR

Standard switching scenarios are normally tested with a level of rigor. Commonly known as edge cases or end cases, there are a handful of test cases surrounding system abnormal conditions (e.g. situation where there is large generation on the feeder). The process of planning for and gracefully addressing edge cases can be a significant task, and yet this task may be overlooked or underestimated. In particular, building testing cases around edge cases with real time system inputs should be given attention during the manual FLISR testing and are considered as a critical part of successful Auto-FLISR implementation both by Oracle and peer utilities. Different failure modes, protection miscoordination, N-1 operations or non-standard network configuration are not always considered as part of the test case inventory development.

Another aspect of testing is gaining confidence about network system behavior. For manual FLISR testing it is common to leverage a test simulator to test cases around switching plan validation. However, a robust Auto-FLISR testing strategy generally involves end-to-end testing as the last step before enabling the pilot circuits in production environment. Setting test environment around end-to-end testing can be a challenging process and if not planned, is likely to introduce additional schedule and cost impact.

As a major component of the Auto-FLISR journey, outbound SCADA control, is likely to be included in the NMS 2.6 upgrade test cases based on the interviews with THESL, failing to clearly specify the exit criteria for Auto-FLISR related testing during NMS upgrade period may lead to misalignment of expectations from business and IT stakeholders.

5.5.2 Likelihood and Impact

The likelihood of the risk is considered as medium for the following reasons:

- THESL is actively engaged in the NMS upgrade and Auto-FLISR planning, but the finalization of the master Auto-FLISR test strategy is pending. Additionally, the introduction of power flow algorithm changes and other FLISR-related functional modifications in NMS 2.6 could introduce uncertainties for Auto-FLISR testing.
- THESL has limited experience in distribution automation testing, which could be leveraged to inform the Auto-FLISR test strategy.
- In terms of Auto-FLISR testing, utilities often adopt diverse test approaches based on their system maturity and business case, leading to no universally applicable "golden standard" for testing. Consequently, THESL will need to invest time in identifying the most suitable test strategy for their specific requirements and operational confidence level.

The impact of the risk is considered as high in the schedule and cost category for the following reasons:

- If not planned properly, additional Auto-FLISR testing could lead to schedule slip for NMS Upgrade. Failing to include important edge cases into testing could also result in turning off Auto-FLISR after feeder becomes operational.
- The establishment of a dedicated test lab and the extensive point-to-point testing required could present significant costs for THESL.

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5.5.3 Mitigation

Test Case Completeness -- It is important to take a holistic approach to revisit the test case inventory to include both common cases and high-priority edge cases driven by THESL's system failure modes, as well as clearly align the Auto-FLISR test cases with the overall NMS upgrade test cases.

Use of Test Lab for Power Hardware -- As for good practices to prepare a rigorous yet efficient Auto-FLISR testing, key activities, and the timeline to set up a test environment for Auto-FLISR on the NMS 2.6 platform should be established. THESL should consider setting up a test laboratory with several control devices or using (power) hardware in the loop testing to further gain confidence for field device behavior in the context of Auto-FLISR operations. In the case of lab testing with field devices, THESL may consider testing different recloser settings during the test period. For example, configure some reclosers to have multiple operations before lock out. This shall help THESL determine if Auto-FLISR operation requires any protection setting change from the business side. For the purpose of gaining confidence of SCADA outbound control in production mode, advisory mode, where the operator approves the switching plan before permitting NMS control of SCADA devices, can be used for the transition of operations.

Inclusion of Business in Testing – The inclusion of the business in the development and execution of test cases can help with two items. First, including the business will help identify the edge cases as mentioned above. Second, business involvement will help with the change management needed to implement Auto-FLISR.

The difficulty of mitigation is regarded as medium since the main action items focus on establishing appropriate testing planning.

5.5.4 Key Recommendations

- Leverage learnings from FLISR pilot to inform Auto-FLISR testing.
- Establish end-to-end test plan which includes edge cases.
- Establish a test environment and test laboratory.
- Stage deployment based on confidence.

5.6 Standard Approaches to Work

Likelihood	Medium
Impact	Medium – Schedule, Medium – Safety
Difficulty of Mitigation	Medium

5.6.1 Description

[redacted] noted during their 20-year journey to Auto-FLISR that sophisticated protection schemes could not be easily adapted to permanent system changes. Complex relay logic was prone to settings errors and logic holes. Unique procedures for each system were identified as unsustainable and created system complexity, training difficulties and the potential for temporary switching changes to have unintentional impacts. [redacted]

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stressed the need to avoid individual procedures for each sub-station, and the need for consistency of approach with the deployment of Auto-FLISR.

[redacted] identified that a lack of ownership of recloser point architecture resulted in inconsistent point numbering / point mapping. When retrofitting these devices with additional points and/or modifying existing points some years later, a standardized template (currently in use) could not be used. Each point of each device had to be examined and modified by a DMS technician which is time consuming.

Humans have the capacity to deal with variance and to fill gaps where they may exist. While this does increase the risk of human performance errors it is relatively common that some level of variance is accepted. A technology solution is more cost effective when processes are simplified and standardized before their deployment. This reduces the cost of system deployment (reduced configuration work, consistent testing approaches and resolution) and improves the transaction success rate and execution speed.

Oracle noted the high number of customizations that THESL have on their NMS 2.3 platform. While the issue of configuration verse customization is discussed in detail in the next section, variation in processes can be a source of the need for customized solutions and generally do not support the case for the software vendor to develop and support a solution within their core codebase.

5.6.2 Likelihood and Impact

The likelihood of the risk is considered as medium for the following reasons:

- The current state analysis (manual FLISR pilot phase) has not revealed any significant process gaps, but specific process changes and documentations for Auto-FLISR are yet to be determined.
- While a dedicated change management team exists for the NMS upgrade project, there is currently no dedicated change management team specifically focused on Auto-FLISR implementation.

The impact of the risk is considered as medium in the schedule and safety category for the following reasons:

- Process changes generally requires additional work during design phase and additional training time before system goes live, which may result in overall schedule delays if not adequately planned.
- The standardization of Auto-FLISR processes related to protection coordination is expected to directly enhance operational safety.

5.6.3 Mitigation

Establish standard for interrelated activities – The process for standardization starts with standard devices, standard engineering guides, standard protection, and coordination settings (distribution and substation). The standardization has to be backed by ownership and accountability.

The manual FLISR pilot THESL is starting August 2023 will provide an excellent opportunity to identify inconsistencies in processes and their potential impact. The testing team should look to streamline and align processes as their first approach, before any technology solution is found to support inconsistent processes.

Quite often process variation in the field comes from legacy, regional and somewhat siloed operations. Finding those variations and working to consensus does not need to wait for a technology deployment. THESL can commence the identification of misalignment and the opportunity for consistency at their

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convenience. This can in fact serve as a foundational step for change management and for opening the dialogue for process improvement, including the role to be played by Auto-FLISR.

The difficulty of mitigation is considered as medium, as the main action items primarily involve business process improvement and management, which are within the project team's control.

5.6.4 Key Recommendations

- Establish process review and alignment as a goal of the manual FLISR pilot.
- Establish change management working group.
- Monitor compliance with process for training gaps.
- Apply accountability for compliance.

5.7 Change Management and Acceptance

Likelihood	Medium
Impact	Medium – Schedule, Medium – Performance, Medium – Cost
Difficulty of Mitigation	Medium

5.7.1 Description

During the utility benchmark interviews both [redacted] and [redacted] touched on the importance of change management during the journey to Auto-FLISR. Oracle indirectly raised the subject via the conversation around the high number of system customizations to adapt to the operators' legacy process, rather than having them adapt to the functionality of the selected system. This is a common concern voiced by software providers.

And it should be noted that the challenge of change management is not simply resistance to something new. [redacted] gives the example of field trouble-shooters replacing a fuse with what they had in their vehicle rather than the prescribed sized fuse. This is done with the good intent of speedily returning customers to service but without a change in process to report this to the operator or to update a system of record, the operator or automated system is not working with correct operational data knowledge. This was a key discover for [redacted] as when running FLISR, particularly Auto-FLISR, the model accuracy of protective devices like fuse size will be likely to have a larger impact on determining the expected system behavior during a switching event.

[redacted] highlighted that field crews wanted confidence that when Auto-FLISR was offline and that no automated operation would take place while they are working on equipment. Field crews had little prior exposure to automated switching and so engagement was important. Giving the field crews this confidence was a vital aspect of acceptance for Auto-FLISR at [redacted]

For Auto-FLISR implementation, there are several areas of change management identified based on conversations with Oracle and peer utilities:

- Operational procedure (control room, field, and communications with [redacted]).
- Field device commissioning and maintenance.

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- Protection coordination.
- Network model update.

These areas involve a diverse range of staff, many of whom may not have direct interaction with the Auto-FLISR solution and so may not fully appreciate the objectives served by the process changes.

The timeline of change management activities might be impacted by operation seasonality. THESL should consider any potential storm season or wildfire season when FLISR events are more frequent for rolling out the process changes.

While the importance of training was identified by both [redacted] and [redacted] [redacted] provided insight as to aspects of their training approach which have either impacted their Auto-FLISR deployment or been impacted by deployment issues.

As a critical component of change management activities, training was also highlighted for operators, field crews, engineering groups, and technology staff during the peer utilities interview.

[redacted] deployed a thorough change management process and engaged key personnel as varios stages of the Auto-FLISR project, they choose a just-in-time (JIT) training process. Under this model the operators are trained on the system shortly prior to the planned use of the system so that training can be fresh and reinforced by actual use of the system. As operator training has to be scheduled in line with the operator work schedules the planning and coordination for the training has an amount of complexity.

As a point of reference [redacted] advised that their operator training time was between eight and 16 hours of training per operator, but it took six weeks to cover all operators due to the operator shift schedule. [redacted] also noted the importance of training operators on a stable system.

[redacted] was able to successfully execute their JIT training plan based on the intended platform go-live date. Unfortunately, prior to go-live a system error was determine which resulted in a three-month delay to the go-live date. This resulted in [redacted] needing to establish a new JIT training approach around the new go-live date.

Compounding the issue of repeated training is the fact the user training is an operation and maintenance (O&M) cost and not a capital cost. [redacted] identified that consequently the delay of the go-live has been and impact on both capital and O&M costs.

[redacted] also noted that they had four minor operational incidents post go-live and that three of these involved an operator executing controls either in parallel with FLISR or restarting a process on an old event. These incidents resulted in additional training.

5.7.2 Likelihood and Impact

The likelihood of the risk is considered as medium for the following reasons:

- The specific process changes and design documentations for future state Auto-FLISR operation are yet to be determined.
- While a dedicated change management team exists for the NMS upgrade project, there is currently no dedicated change management team specifically focused on Auto-FLISR implementation.
- Given that THESL is a unionized organization, the suggested changes might pose greater challenges during implementation.

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The impact of the risk is considered as medium in the schedule, cost and performance category for the following reasons:

- Process changes generally requires additional work during design phase and additional training time before system goes live, which may result in overall schedule delays if not adequately planned.
- The efficiency and execution of the future process will directly impact the performance of Auto-FLISR, both of which are contingent on successful change management and acceptance.
- It is commonly the case that user training for a new technology is an O&M cost. Such costs should be planned for in the deployment costs and allowance should be made for pre-deployment/JIT type training and post-deployment training.

5.7.3 Mitigation

Place importance on change management – Both [redacted] and [redacted] placed importance on change management and had communication materials developed to share with different stakeholder groups. [redacted] established a Change Manager as a fully budgeted role in support of both ADMS and Auto-FLISR projects. This role led development of the migration strategy and communications plan, conducted extensive stakeholder engagement and message testing. She even identified whether the messaging was becoming too extensive and thereby losing the interest of its target audience.

A potentially good practice of change management also rewards participation. Such an example is [redacted] involving operators and their supervisors during Auto-FLISR UAT and then promoted them as super-users to be on the forefront of managing upcoming process and technology changes as result of Auto-FLISR implementation.

Change management activities should be designed to support the transition throughout the entire FLISR implementation phases, not only for the Auto-FLISR deployment. The implementation stages are discussed in more detail in section 5.11 below.

Focus on training the process and technology – Training is an important pre-requisite to going live with the new system. Assuming that user acceptance testing (UAT) is the final test before go-live, operator JIT training should be scheduled in close coordination with the scheduled UAT completion. An influential set of operators should be involved in platform pilots and design, trained early and involved in the performance of UAT. This allows these operators to become system super-users and system advocates post-deployment.

The difficulty of mitigation is regarded as medium since the main action items focus on business process improvement and management.

5.7.4 Key Recommendations

- Establish a change management lead.
- Create respected solution champions.
- Deploy consistent stakeholder engagement.
- Highlight safe operations as a foundation of trust.
- Leverage Manual FLISR pilot to engage controllers and to help influence change acceptance.
- Establish appropriate O&M funding for comprehensive training.

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- Develop training specific to various roles: operators, field crews, engineering, and technology support.
- Provide just-in-time training.
- Use training to establish influential super-users.
- Reduce complexity of operational process to support improved training success.
- Adopt a phased approach to roll out different change management activities.

5.8 Operational Safety

Likelihood	Medium
Impact	High – Safety, High – Performance
Difficulty of Mitigation	Medium

5.8.1 Description

A key consideration for the use of an automated system for operating switches on any electric grid is to have well understood parameters for such operation, the ability to determine when automated control is taking place and to be able to override that control should it be so required. It is of importance that there is confidence that field crews or others will not be placed in danger of an automated system operating a switch when it is not expected to do so.

It was a common theme from [redacted] and [redacted] that only one entity can be in control of a device at any one time, whether that be an operator or Auto-FLISR. Both utilities spoke to the need to ensure the system clearly showed the status of control and the operator procedures have a clear step to put Auto-FLISR in Off mode when field protection is required. These requirements had two direct impacts for [redacted] and [redacted] the need for system change from their vendor and very focused training of operators in this regard. Both have focused on ensuring that the system status is clearly identified in the user interface, and [redacted] is considering a coded control to block switching of any device with a tag applied.

As noted above, field crews wanted assurance that no automated operation would take place while they were working on equipment in the field. While some switches have a manual device to override remote operation the preference should be for formal process to disable Auto-FLISR control via the operator.

In the system context the potential for automatic actions misinformed by a model not yet updated and the potential for operators to lose situational awareness if Auto-FLISR changes the system without the operator's knowledge were key points of focus. The importance of accurate and updated GIS data was also raised in this context.

5.8.2 Likelihood and Impact

The likelihood of the risk is considered as medium for the following reasons:

- The current state analysis (manual FLISR pilot phase) has not revealed any significant gaps on operational safety, but safety-related process changes and documentations for Auto-FLISR are yet to be determined.

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- Compared with some other peer utilities interviewed, THESL lacks prior experience in working with distribution automation projects or decentralized FLISR. This lack of experience could limit THESL's understanding of operational safety practices in the context of grid automation.

The impact of the risk is considered as high in the safety and performance category for the following reasons:

- Operational safety holds paramount importance in the utility safety portfolio.
- Developing robust operating procedures to ensure operational safety will have a direct impact on the performance of Auto-FLISR, benefiting both operators and field crews.

5.8.3 Mitigation

Focus changes on safety – [redacted] made disabling (turning off) Auto-FLISR for conditions such as hotline hold offs and de-energized work permit key aspects of their Auto-FLISR pilot and updated work processes, but also took the opportunity to re-emphasize the performance of the usual steps for upstream protection. [redacted] stressed "If we are following all of our existing rules, FLISR cannot hurt us."

Consider all aspects of how work might change – As an additional item PGE identified that the use of the term "FLISR" during verbal communication to the field proved problematic as it was often heard as "phase." [redacted] have focused on the use of clear language and avoidance of acronyms in the context of communication between operators and field crews in the context of FLISR operation.

Considering the information from the peer utilities mentioned above, the difficulty of mitigations is estimated to be of medium level and within project team's control.

5.8.4 Key Recommendations

- Introduce a work step for field crews and operators to make sure Auto-FLISR is in Off mode.
- Focus on operational safety during the future state process design.
- Reinforce clear language and three-way communication practices between operators and field crews.
- Establish training scenarios where operator disables Auto-FLISR for field work protection.

5.9 Cyber Security

Likelihood	Medium
Impact	High – Cost, Medium – Performance, Medium – Schedule
Difficulty of Mitigation	Medium

5.9.1 Description

The Oracle team have confirmed that they do not see any change in the cyber profile for the NMS platform upgrade from version 2.3 to 2.6. In general terms it is normally the case that the expectation is that a newer version of a software should be more secure than a prior version, but Oracle did not explicitly confirm this.

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A key aspect of THESL's move to Auto-FLISR will be that the Oracle NMS platform, as part of its upgrade from NMS 2.3 to NMS 2.6, will be deployed in the higher security SCADA control zone, rather than being accessible from corporate environment as is currently the case. This is an important requirement and will result in the platform being at a higher level of system protection than may currently be the case. This is a positive outcome for security of the new platform.

The move to the more secure environment can be expected to result in deployment complexity, solution cost increases, and changes to system maintenance approaches which will require new procedures, and which may result in additional support costs.

All hardware and software being deployed in the higher secure environment can be expected to require specific screening for any introduction of rogue elements and once these hardware and software components are deployed, they are protected by increased levels of cyber and physical protection. Such protection can introduce software gateways, known as firewalls, which can add to system integration complexity and can, in certain cases, impact transaction latency.

Additionally, system support staff may either need additional training and approval to work with a system in a secure environment and/or need to be escorted to enable access to the system.

It is also noted that THESL intends to deploy the NMS 2.6 platform on a high-availability basis which if a new approach for THESL may provide more complexity to the platform build, but will, at the least, require that the alternate instance be also in a secure and presumably physically different location.

5.9.2 Likelihood and Impact

The likelihood of the risk is considered as medium for the following reason:

- Apart from establishing the existing SCADA System in the secure zone, THESL possesses relatively limited experience in constructing a higher security SCADA control zone. In comparison, some other peer utilities have gained more similar experience during their previous endeavors, such as building a transmission Energy Management System.

It is expected that the impacts of the deployment to the secure zone will be expected in the context of the project schedule (medium) and costs (high). To the same extent transaction latency should be understood and tested in the context of expected security transitions, which also impacts the performance of the NMS / Auto-FLISR (medium).

5.9.3 Mitigation

The upgrade of the NMS platform is foundational to the deployment of Auto-FLISR, and it is warranted that any platform controlling devices be in a secure zone. The move to the secure zone should not be avoided.

Prepare support personnel for new secure environment – THESL has an existing SCADA System in the secure zone and as such has established procedures and processes for the management of systems in the secure zone, and the associated training of staff. THESL should determine whether the existing staff should take responsibility for the management of aspects such as hardware installation and system patching or whether the existing NMS support staff are suitably trained to follow the discipline associated with the more secure environment.

Plan for the increased complexity of secure environment – The protocols of the more secure environment should be integrated into the planning for the deployment and management of the NMS platform in the context of control functions such as required by Auto-FLISR. As the protocols are known the deployment of

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equipment to the secure environment any additional implementation considerations and associated costs should be able to be identified and properly integrated to the NMS upgrade planning.

Considering all the factors mentioned above, the overall difficulty of mitigating this risk is considered as medium and falls within the control of the project team.

5.9.4 Key Recommendations

- Design system for secure transit as part of system performance architecture.
- Allow time and budget for a highly secure environment deployment.
- Leverage resources with expertise in working in a highly secure environment.

5.10 Auto-FLISR Deployment Strategy

Likelihood	Medium
Impact	Medium – Schedule, Medium – Performance
Difficulty of Mitigation	Medium

5.10.1 Description

Auto-FLISR is a multi-year journey for which each utility will need to develop a deployment and transition strategy based field technology (controllable switches) deployment and process readiness. For [redacted]E, they went live with Auto-FLISR at a sub-set of circuits in 2019 but it was not until 2022 that [redacted]E deployed Auto-FLISR on systemwide basis. [redacted] identified that this approach as allowing [redacted] to better understand their system behavior under their recently upgraded DMS. In comparison, [redacted] operated their FLISR scheme in auto mode for some time before later reverting to manual mode to validate and improve their distribution model. The consensus from utilities with Auto-FLISR experience is that the actual deployment has taken longer than was originally planned, particularly in the context of stabilizing system operations with automation. Not surprisingly, the efficiency of troubleshooting, finding edge cases, and tuning the system tends to improve over time as the operations and IT staff gain more experience about the product and the root causes of the issues.

During the deployment of Auto-FLISR operators, field crews and technology staff will have to adapt to circuits operating in different stages of Auto-FLISR deployment and transition. Stages can be expected to include manual stages where either NMS FLISR outputs are validated after the event or where the NMS output is used by operators to action switching, advisory or semi-automatic stage where NMS provides the switching solution but only executes after an operator approval, and then Auto-FLISR where the NMS system will execute independent of the operator. It should be noted that the manual stages can be used prior to NMS integration with SCADA control whereas the advisory/semi-automatic and full automatic mode require SCADA control. THESL anticipates that manual stages will be evaluated using first NMS 2.3 and then using NMS 2.6 and that the confidence gained from these manual stages will negate the need at THESL to go to the advisory/semi-automatic stage.

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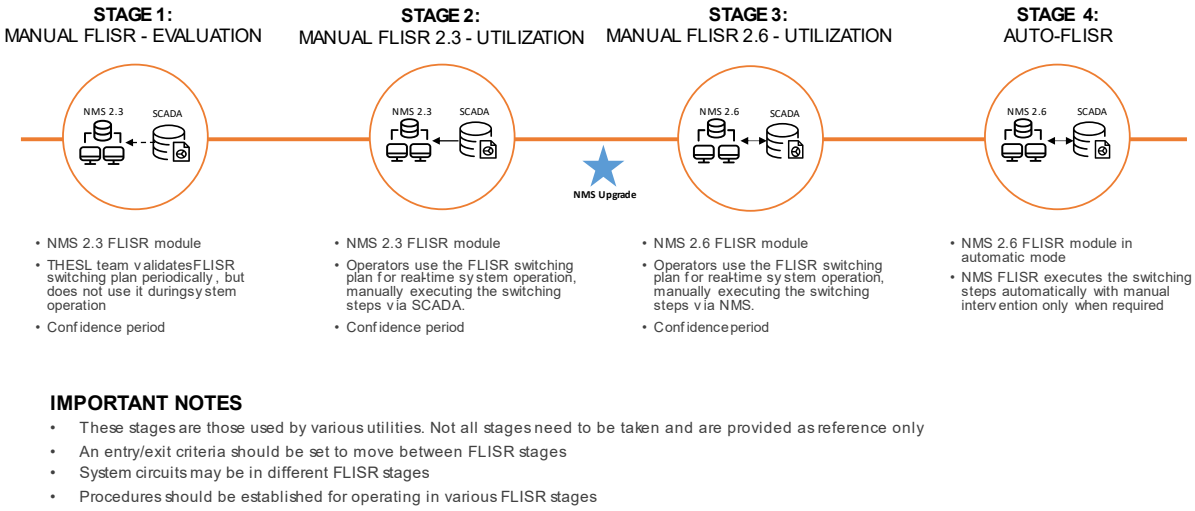
Currently THESL anticipates two pilots: a manual FLISR pilot (two substations) and an Auto-FLISR pilot (selected substations to be determined). It is worth noting that during each pilot phase, the system will need to operate in a hybrid mode in terms of global NMS FLISR settings.

These various modes of operation across the system until such time as Auto-FLISR is fully deployed as an operational norm will introduce additional complexity for control center operators, field crews, and technology staff. The complexity and need for clear process should not be under-estimated.

The Auto-FLISR transition stages expected at THESL are as follows. Note control of network devices from the NMS platform can only take place once SCADA control has been established.



5.10.2 Likelihood and Impact

The likelihood of the risk is considered as medium for the following reasons:

- The detailed Auto-FLISR rollout plan is yet to be finalized and is subject to change depending on THESL's operational confidence level.
- The process change during the transition phase (pilot phase) is not fully established.

The impact of the risk is considered as medium in the schedule and performance category for the following reason:

- Failing to implement a practical and effective rollout plan may lead to premature activation of Auto-FLISR, resulting in subpar system performance or even system failure, leading to the deactivation of Auto-FLISR.

5.10.3 Mitigation

Ensure situational awareness – Change management and training will play an important role to ensure all stakeholders are well informed as to the status of the FLISR deployment and to understand exactly what is in operation on which circuits, particularly in the context of those circuits that operate in a different FLISR mode compared to the majority, which is more extreme at the beginning and end of the Auto-FLISR deployment journey. Visual ques on displays can help operators identify pilot circuits.

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Move swiftly yet deliberately – These risks can be mitigated by more quickly moving through or, should confidence allow, avoiding intermediate steps such as advisory/semi-automatic phases. This will involve ensuring that lessons learned from early deployments and associated remediation of issues are deployed across the enterprise.

Taking into account all the factors mentioned above, the overall difficulty of mitigating this risk is considered as medium and falls within the control of the project team.

5.10.4 Key Recommendations

- Establish transition stage education as part of change management and training.
- Seek to minimize time in transition stages.

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6 Areas for Further Consideration

The following are areas which TRC believes warrant further consideration and investigation due to there potential impact on the success of the Auto-FLISR deployment and operation at THESL.

6.1 [redacted] Controls

As noted earlier in this document, [redacted] was identified during the THESL discovery discussions as a key relationship for THESL in the context of the Auto-FLISR journey. It was identified that there is considerable device switching coordination required between THESL and [redacted] with as many as 30 percent of substation breakers owned and operated by [redacted] in Toronto's horseshoe area.

[redacted] was contacted for an interview which they agreed to for June 30, 2023.

TRC was advised that senior level discussions are underway between THESL and [redacted] as to how THESL may operate the [redacted] breakers. In the roadmap documentation provided to TRC, identification is made of a technical working group process which will progress to technical implementation and testing. In the roadmap document the implementation of the [redacted] breaker control is completed in a timing to allow for input to the configuration of SCADA control from NMS.

The [redacted] breaker control introduces complexity that should be specifically scoped as part of the Auto-FLISR rollout planning process. [redacted] breaker control drives the number of stations THESL will first go live with. If THESL do not get operating control from [redacted] breaker (not a preferred option), other alternative solutions such as installing a recloser outside the station for every feeder will need to be put on the table.

6.2 Procedure Governance

As with any major operating or technology change it is expected that there will be various changes to procedures. It is also to be expected that the changes will result in overall benefits to the operations of the business.

In order to measure a benefit, it is normal to establish a benchmark from which to measure the subsequent improvement or benefit. In the context of a solution such as Auto-FLISR the focus for improvement measurement tends to start with customer impacting outcomes such as SAIFI and SAIDI. Efficiency measures such as time of crew arriving at the correct fault location are tracked as an operational benefit.

What can be more challenging is the recognition of benefits which may not be tracked to the same degree of specificity, or which may have subjective elements to them. These are also the areas which have the potential provide disagreement during the change management process. There will be debate during the discussion of change to procedures as to the effectiveness of the existing and the new procedures, and this becomes particularly complex when new service expectations are being set.

When entering into these conversations it is important to have a view of the effectiveness of the current procedures. The effectiveness of the procedures can be impacted by various aspects of which the following are examples:

- Clarity of purpose.
- Management of updates.
- Accessibility.

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- Training.
- Compliance monitoring.

Apart from providing valuable input for future procedure design and training, the rigor applied to procedure governance will set the foundation for the change management process during and subsequent to the transition to Auto-FLISR.

It is also worth noting that the expansion of activity at the grid edge, with various DERs potentially exporting energy, operational procedures and external compliance requirements are likely to increase in complexity during the period of the transition to Auto-FLISR.

6.3 Staffing and Skills

The progression to a technology such as Auto-FLISR is an example of a move from a previously manual process to a more automated process, where there is greater reliance on technology to conduct operations previously managed by employees.

The introduction of automated processed into the workplace can have many impacts on the operations of the business and key amongst these is the ability of staff to be able to understand the processes of the technology and to effectively manage it to the best outcomes of the business.

Staff roles will in many cases change from performing operations to monitoring a technology performing operations. This can be expected to require staff to learn new skills and potentially require the targeting of new hires with an aptitude for the management of the technology being deployed.

As the NMS platform transitions to a critical operational system, it can also be expected that the staff responsible for the performance of the platform, including system integrations and data governance will need to be re-trained in the context of managing mission critical systems and the disciplines associated with this.

Currently applied staff capability and development approaches for staff in these key areas may need to be reviewed and adjusted to align with future operational needs and expectations.

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Appendix A: Potential Costs

The journey to Auto-FLISR at THESL will involve various cost elements and feedback from [redacted] and [redacted] suggests that these be generally considered in the context of whether they are field/operational costs or technology related costs.

Also of consideration is capital costs as compared to O&M costs.

[redacted] particularly made the observation that while the technology costs were a significant investment, they were not of the scale of the costs involved to deploy newer and additional communicating switches and the overall communication solution. With an indicative cost of $100,000 per recloser the installed field costs can scale quite extensively. [redacted] and [redacted] spoke to the cost of substation relay upgrades that were required and that these projects quite often led to work more extensive than purely a relay replacement. It is noted that the field devices provide benefit beyond the Auto-FLISR capability.

In the context of a typical information technology project it can be expected that what may be considered typical for the upgrade of a system such as Oracle NMS will be increased by the need to build the upgraded solution in the higher security environment with a high availability architecture.

It is the case with such technology projects that it is not the costs of the particular software or hardware that drives the costs but rather the internal and external labour and services required to conduct the implementation effort over the period of several years.

These internal and external labour and services costs can be expected to be increased above an expected level based on Oracle's advice to the increased complexity of the NMS upgrade due to the high level of customization. Leveraging native configuration of the NMS 2.6 platform will be expected to mitigate such cost increases.

While the capital costs will inevitably be more significant than those of O&M, the planning for available O&M for user training is a vital component which should be planned. The better the users of a system are trained to use the system the more effective the use of that system will be. This is an important investment in support of the overall project investment.

[redacted] and [redacted] were not able to provide the specific costs identified as a discrete Auto-FLISR project as costs were allocated/shared to various operational objectives.

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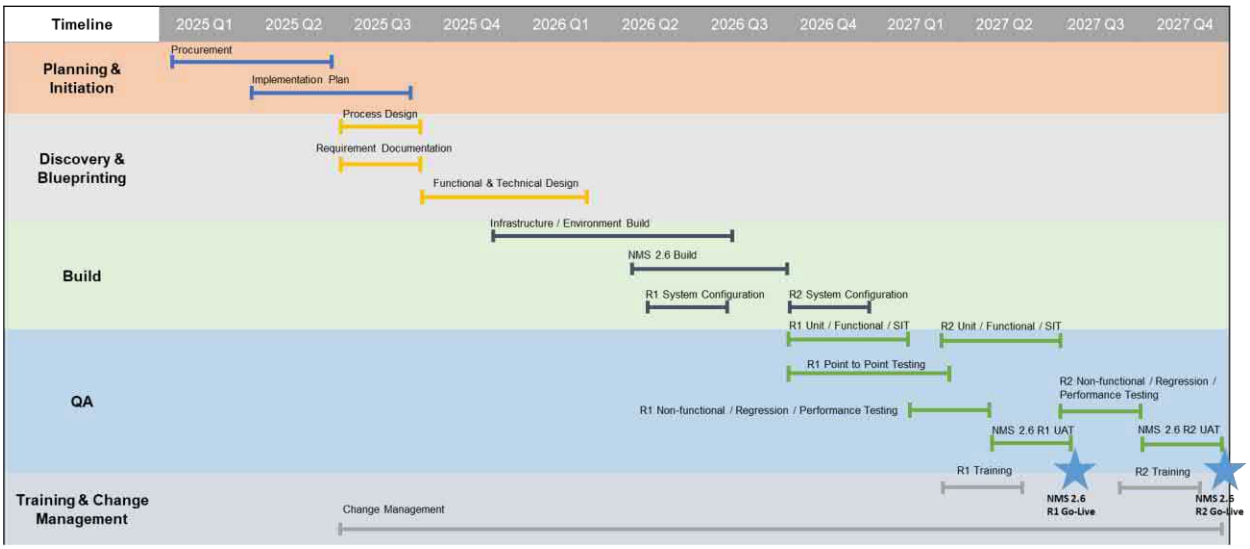
Appendix B: NMS Upgrade Indicative Activities

The following graph lists the main activities for NMS upgrade. The activity date and duration are indicative. Note that R1 activities focus on the NMS core functions including SCADA outbound control, while the R2 activities focus on Auto-FLISR related functions.



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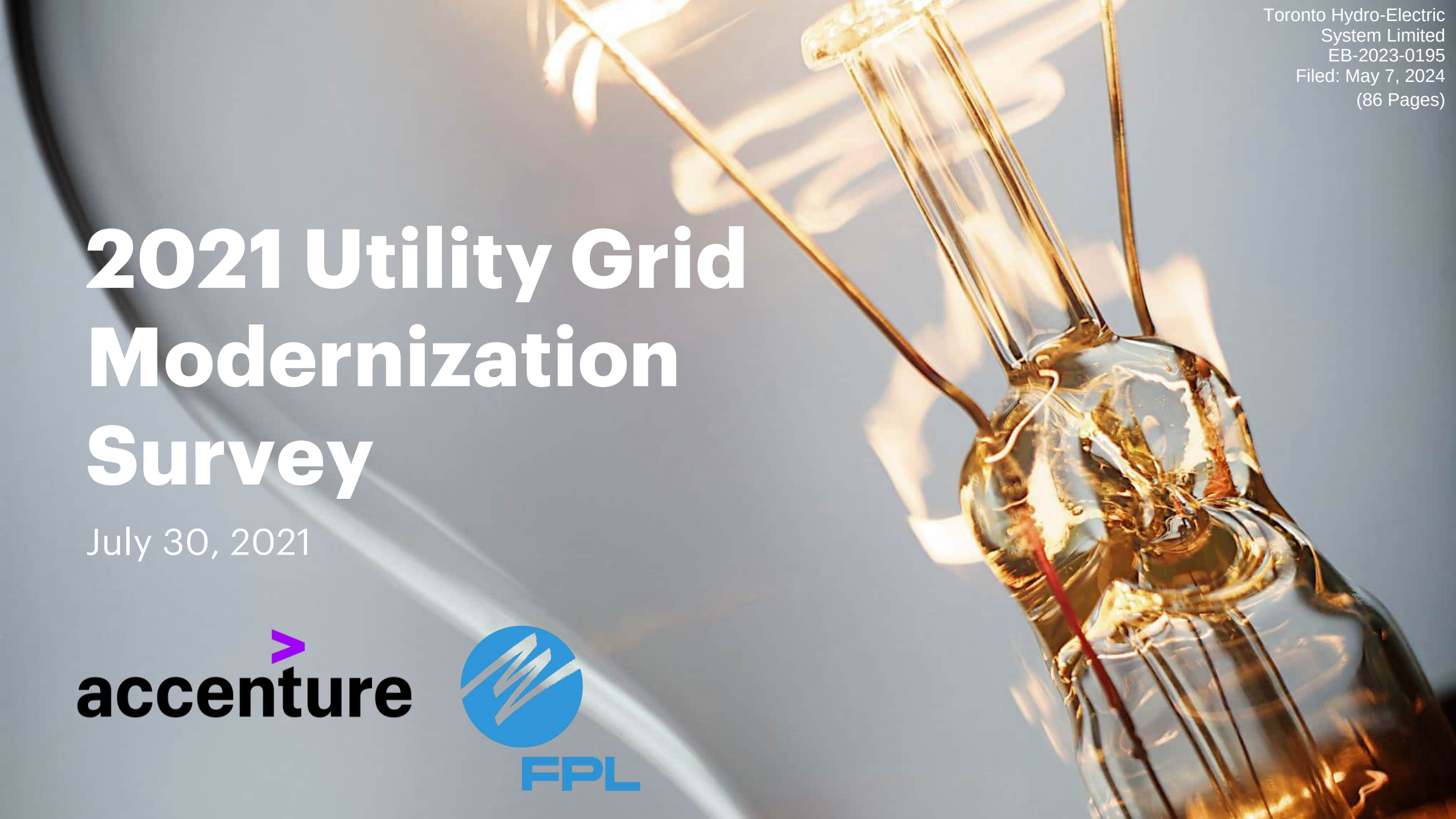
2021 Utility Grid Modernization Survey

July 30, 2021



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Executive Summary

The electric distribution grid is undergoing a massive transformation. This is being driven by innumerable factors including, but not limited to: aging infrastructure, extreme weather events, and shifting electricity supply and demand models. Given the extent of the challenge, there are many stakeholder groups involved in the grid transformation process including public agencies, industry, and consumers. However, utilities will be at the forefront of this change. They must lead the charge and guide the actions that need to be taken to reimagine and develop the electric distribution system of the future. Given the complexity of the undertaking and the various operating models and regulations facing utilities, there isn't one clearly defined course of action.

To help utilities understand the current grid modernization maturity landscape, FPL and Accenture developed this benchmark study. We asked our survey respondents to provide us insight into their capabilities surrounding numerous key grid modernization topics. We supplemented those findings with secondary research and further analyses. Through this process, we created a benchmark reference that respondent utilities can use to understand their respective grid modernization maturity and opportunities for growth.

There are four key considerations that utilities can take away from this study:

1. Utilities are recognizing the importance of grid modernization and have well developed grid modernization strategies which are impacting their future investment planning activities.
2. Many respondents' extreme weather response and control center procedures have not seen much growth in the wake of the modernizing grid. Given the successful integration of new operational technology (e.g., OMS, AMI), utilities can leverage analytics to make better use of the data received from these technologies.
3. While most respondents acknowledged the increased deployment and presence of DERs, many of them are still in early developing stages regarding strategizing and enabling capabilities.
4. New workforce technologies (e.g., drones, AI/ML, AR/VR) are rapidly becoming integrated into distribution operations.

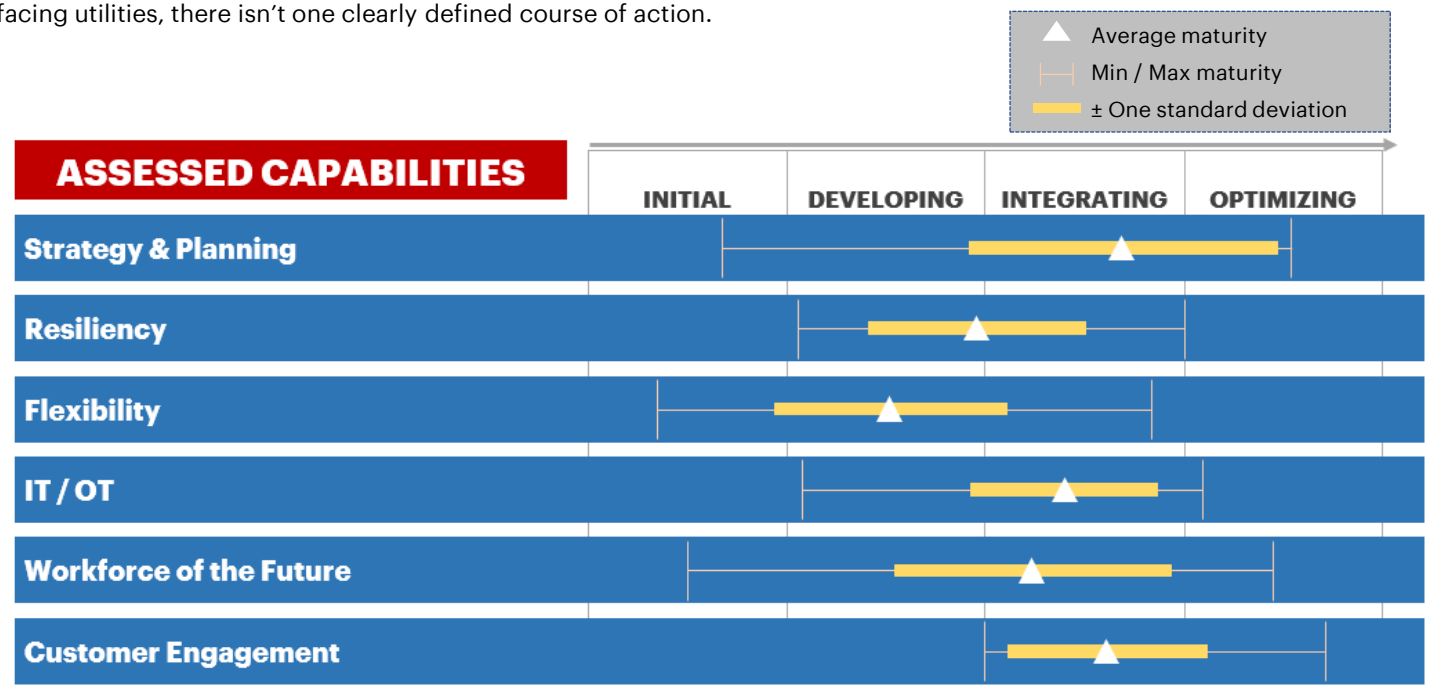

Figure 1. Average maturity per capability

Grid Modernization Overview

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Introduction

The 20th century developed North American grid is showing its age. A significant proportion of many distribution systems were built in the 1960s to 1980s and are nearing the end of their technical lives. One 2015 report from the U.S. Department of Energy concluded that 70% of power transformers are 25 years of age or older[1]. While this serves as a testament to the engineering ingenuity that developed the grid infrastructure, a massive overhaul is still required.

While the most apparent solution may be to just replace the old poles and wires, the reality is not as simple. One 2017 study estimated that the cost to replace the entire U.S. distribution infrastructure could be close to $1.8 trillion[2]. However, even putting aside the cost, the status quo is no longer sustainable.

Extreme weather events that contributed to the 2018 California wildfires and 2021 Texas Power Crisis not only highlighted the vulnerabilities in the existing grid infrastructure but demonstrated the urgency for more resilient systems. The combination of increasing supply of renewable energy resources and increased demand in the form of electrification and electric vehicle proliferation brings new flexibility requirements and a need for a more decentralized grid architecture.

While these challenges appear to be insurmountable obstacles, there are powerful new digital tools that can be leveraged to modernize and develop a “smart grid”. Cutting edge advances in technology, equipment, controls, and communication offer new grid operating capabilities and, more importantly, the ability to transform traditional decision-making mindsets.

$1.8T

Estimated cost to replace the U.S. distribution infrastructure

A modernized grid is long overdue and utilities can use the challenges of today to reimagine the future of the electric distribution system.

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Current day events are highlighting the need for grid modernization and projections on emerging trends point towards a need for prompt action.



Extreme weather events are increasing in number and only expected to become more destructive
Changes in climate patterns have had significant impacts across the grid. The most notable of these are the events that have caused damage to distribution infrastructure or been caused by failing infrastructure. A 2021 report found that there has been a 67% increase in weather-related power outages since 2000 in the United States[3]. Similarly, higher temperatures lead to both increased consumer demand and decreased generation plant efficiencies seen in the increasing number of rolling blackouts across many parts of the US.



Increased proliferation of variable renewable energy sources will create instability if left unaddressed
Global installations of renewable energy are projected to grow at a CAGR of 7.6% between 2021 to reach 3,812 GW by 2026 and DERs are estimated to compose ~10% of the renewable energy mix[4]. 31 US states currently have renewable portfolio standards, further requiring utility responses. While many utilities have been responding with utility scale storage and renewable generation, this shift also has impact on distribution systems. Renewables can create unforeseen impacts on voltage profiles, reverse power flows, and create difficulties in determining the source of network problems.



Exponential growth in electric vehicles adoption and electrification are increasing demand requirements
In North America, electric vehicles are expected to grow at a CAGR of 31% between 2021 – 2026[5]. This rapid increase has the potential to cause significant strain on the grid during peak load periods with one study projecting a 38% in US electricity demand solely due to EVs[6]. Increasing electrification trends in other industries is also contributing to an increase in demand requirements.



Recent cyberattacks on critical infrastructure are only part of a growing trend
The 2015 Ukraine power grid cyberattack is the first known successful cyberattack on the power grid. Not only did hackers compromise and damage information technology systems, but they also seized control of SCADA systems and were able to remotely shutoff substations. The 2021 Colonial Pipeline ransomware cyberattack prompted a pipeline shutoffs that created fuel shortage incidents. The utility industry is recognizing that these are not isolated incidents and that malign actors are increasing their focus on the power grid. A recent survey of global utility professionals found that 54% expect a cyberattack on critical infrastructure in the next 12 months[7].

67%

increase in weather-related power outages since 2000 in the United States

31%

projected growth in CAGR between 2021-2026 in the North American EV market

54%

of global utility professionals expect a cyberattack on critical infrastructure in the next 12 months

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Massive investments are needed to maintain a resilient and efficient grid that can deliver low-carbon electricity and meet customer demands. North American public agencies have recognized this imminent need and have taken actions at both federal and local jurisdiction levels.

Dec. 2020 – Energy Act

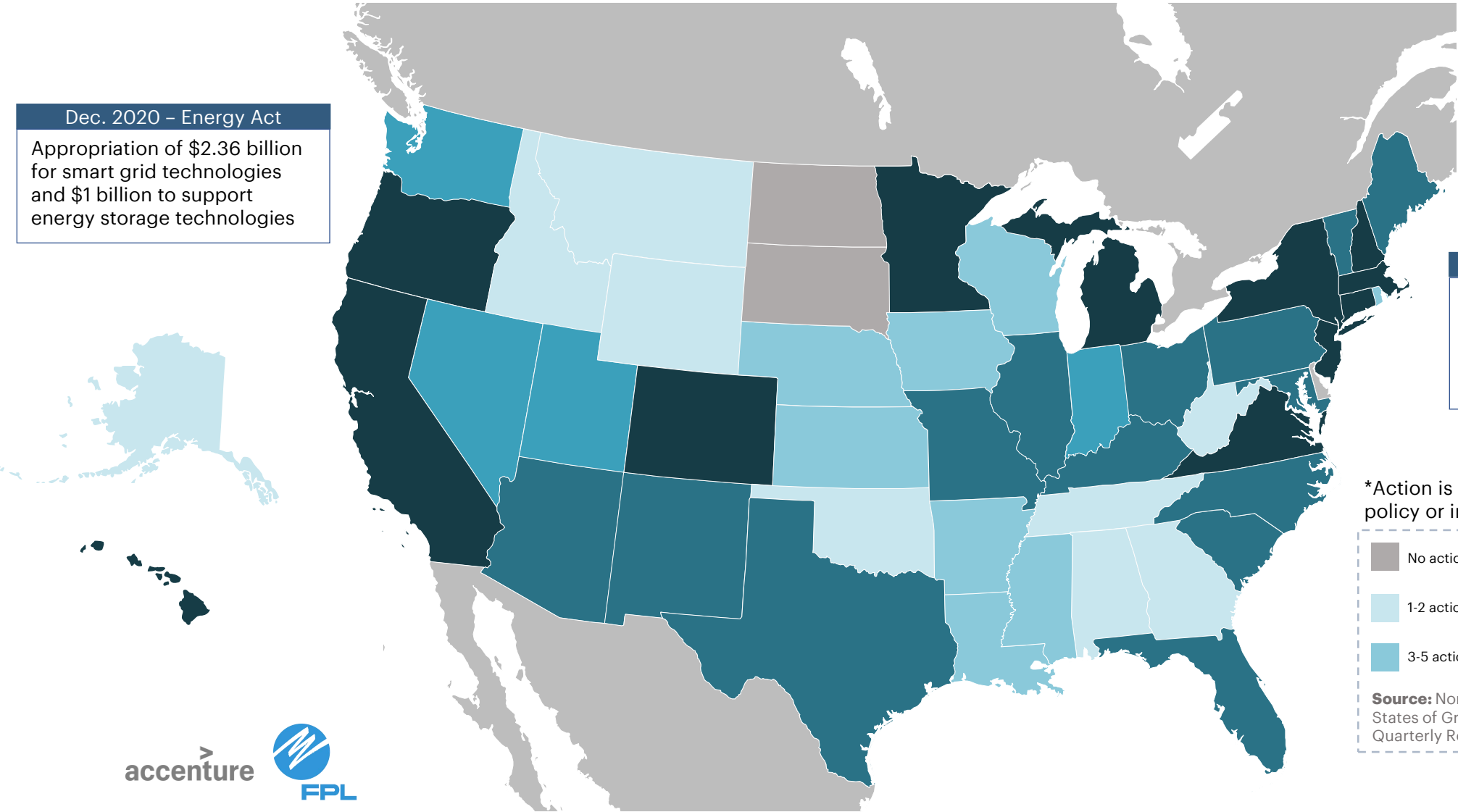
Appropriation of $2.36 billion for smart grid technologies and $1 billion to support energy storage technologies

Jun. 2021 - SREP Program

$964M program announced by Canadian government to support smart renewable energy and grid modernization

American Jobs Proposal

Biden administration's American Job proposal earmarks $100B to invest in America's power infrastructure



*Action is defined as any relevant jurisdictional level policy or investment decisions

- No action in 2020
- 1-2 actions in 2020
- 3-5 actions in 2020
- 6-9 actions in 2020
- 10-19 actions in 2020
- 20 or more actions in 2020

Source: North Carolina Clean Energy Technology Center, The 50 States of Grid Modernization: 2020 Review and Q4 2020 Quarterly Report, February 2021

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Survey Introduction

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Survey Introduction

Given the difficulties in even defining the term "grid modernization", it has proven even more challenging to assess the progress distribution utilities have been making in transforming the grid and incorporating new best practices. There is no standard, broadly accepted definition or scope of grid modernization. Different operating companies are subject to different regulations and operating situations, affecting their capabilities and priorities in grid innovations. However, in order for utilities to identify performance gaps and learn from each others' successes, there needs to be a mutual understanding of the key capabilities that will drive change in the industry.

The 2021 grid modernization benchmarking survey consists of 57 questions and assesses electric distribution utilities' maturities across a series of grid and utility modernization topics. Figure 2 denotes the six capabilities of grid modernization which directed the benchmark's survey. It is important to note that the survey is specifically targeted towards distribution utilities and does not ask any questions related to their transmission infrastructure or any generation capabilities. While these are very important areas of discussion, the distribution specific analysis was conducted for a more targeted discussion.

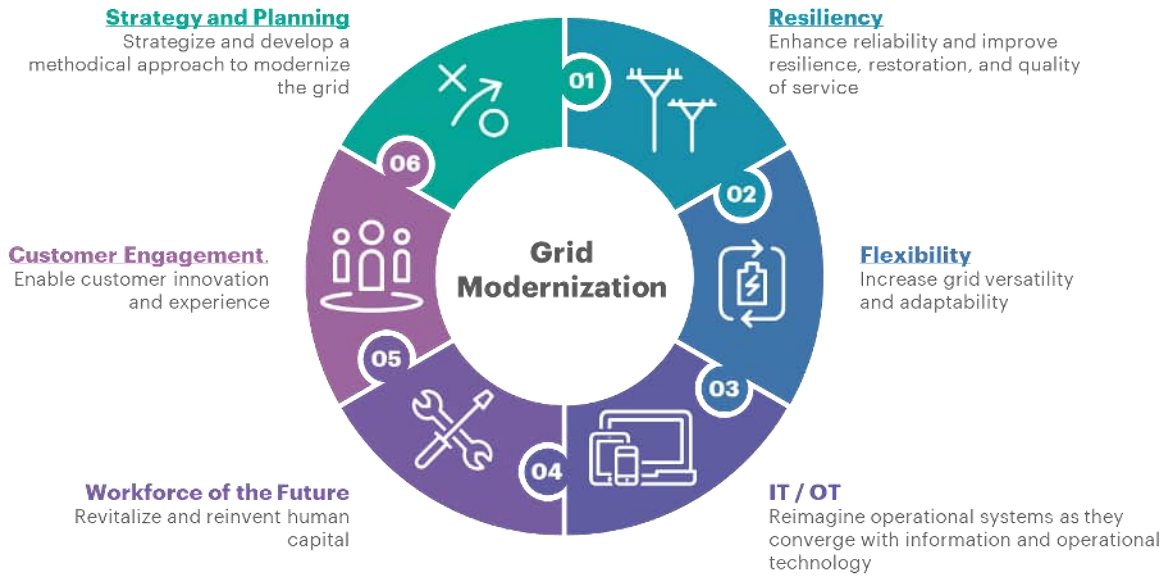
Key drivers behind the survey include:

1. How mature are utilities in key grid modernization capabilities?
2. Where have there already been significant recent transformations?
3. What are the key areas of growth and performance improvement?

For each question, survey respondents were asked to select from a multiple-choice list the descriptor which best described their maturity or abilities regarding a certain topic. Response options were compiled by industry experts and aimed at capturing the wide spectrum of grid capabilities. Respondents with multiple sub-entities were asked to either fill out separate responses per operating company or select the option that best described the average capabilities across the different entities. Similarly, entities with both North American and international operating companies were asked to describe the capabilities of their North American entities.

Each question was weighted equally towards the total results and were predicated solely on the direct responses from participants. The questions and response options were geared to be as agnostic as possible to regulatory jurisdictions; however, it should be noted that survey responses may be tied directly to jurisdictional restrictions or requirements outside of the utility's control.

Figure 2. Grid Mod Capabilities



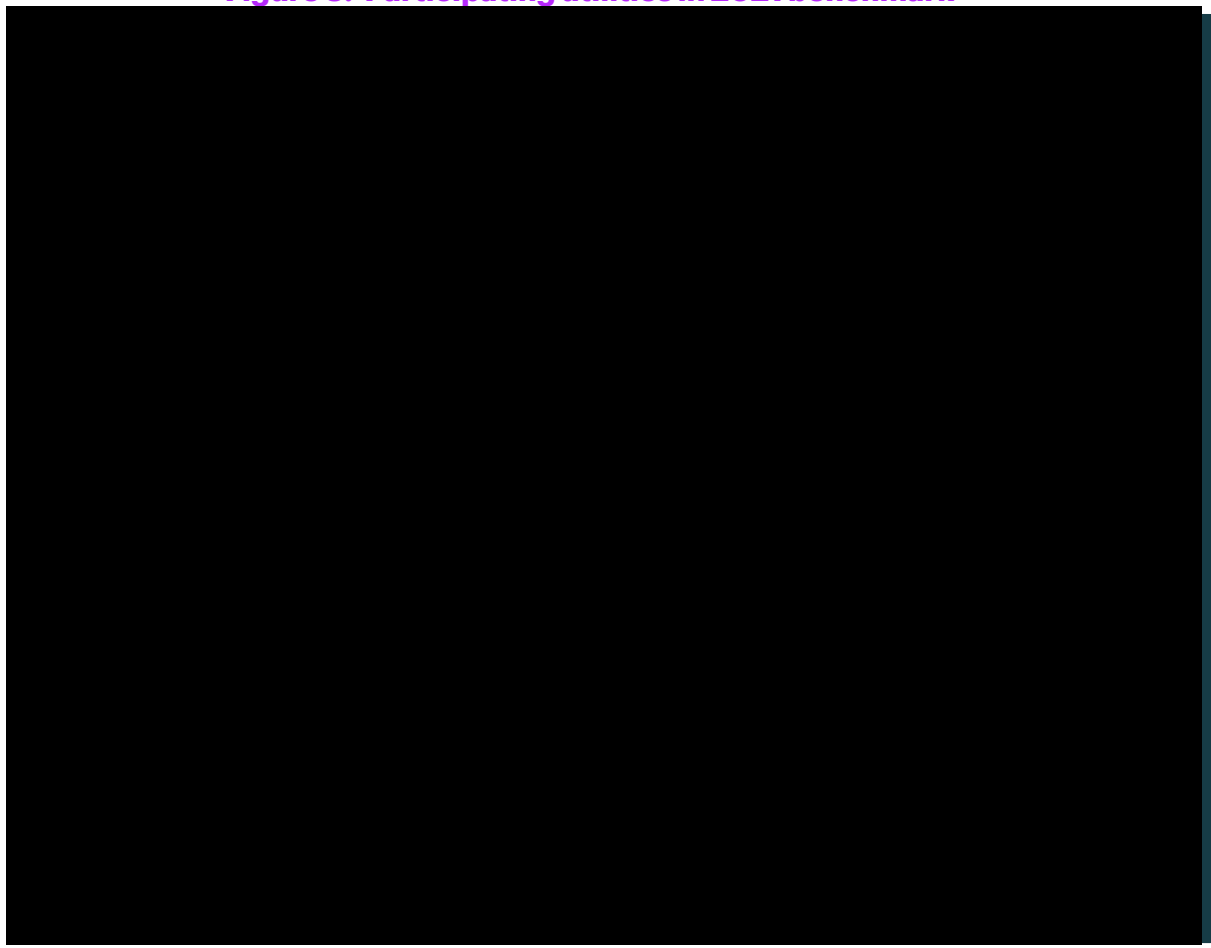
The six capability categories are the following:

- Strategy and Planning
- Resiliency
- Flexibility
- IT / OT
- Workforce of the Future
- Customer Engagement

Survey Participants

21 North American utilities participated in the 2021 survey spanning the United States and Canada. The respondents, largely consisting of large investor-owned utilities, covered 23 jurisdictions and represented over 50 million customers. Figure 3 contains the full list of surveyed utilities.

Figure 3. Participating utilities in 2021 benchmark



> 50M CUSTOMERS SERVED

23 JURISDICTIONS

> 1.4M ELECTRIC DISTRIBUTION MILES

>1.1M SQUARE MILES

Survey Results

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Strategy & Planning – Introduction

The concept of making improvements to the power grid is not a new one. Distribution utilities have always worked to continuously enhance their grid infrastructure. However, this has historically taken place in the form of disparate and disjointed initiatives. Grid modernization is elevating that concept to drastic new levels but with these increased challenges comes the importance of increased strategy and planning. The drivers behind grid modernization are too wide-spread, from increased variable generation to extreme weather, to be dealt with individually and require dedicated strategies and planning in order to arrive at success.

Arguably, the greatest strategic driver behind grid modernization is the increased penetration of distributed energy resources (DERs), largely in the form of renewables. Since 2008, local and state commitments have led to a near-doubling of renewable energy generation in the United States[8]. For utilities, these regulatory requirements translate to faster than usual investment timelines and accommodation of more distributed resources. However, in the face of these new requirements, regulators are still looking for utilities to demonstrate value from grid modernization investments, apart from societal benefits, to make sure that their ratepayers are being treated fairly.

Doing so will require the formation of new markets and models to properly obtain the value from these new assets—a massive shift from the transactional nature of the current distribution utility business model. Examples of such new models include using non-wires solutions (e.g. energy storage) as T&D investment deferral and grid service providers, DER aggregation for virtual power plants (VPPs), and renewables integration.

One of the most innovative models is the transformation from a purely asset driven business model to one that incorporates the increasing responsibilities of a distribution system operator (DSO). The expansion of the DSO role to include market-based procurement and operation of DERs creates a wide slew of opportunities for utilities, many of which are already playing key DSO roles. The incorporation of new functionalities as distribution grid operators, market operators, or DER operations represent a significant transformation for utilities would be an evolutionary leap.

The regulator will play a pivotal role in that journey and any type of DSO vision will require a strong supporting regulatory model that incentivizes the new investments. While the DSO model will not be appropriate for all types of distribution utilities, there are applicable aspects, irrespective of industry structure or regulatory model, that can be leveraged to optimize the value of DERs.



Strategy & Planning – Benchmark Results



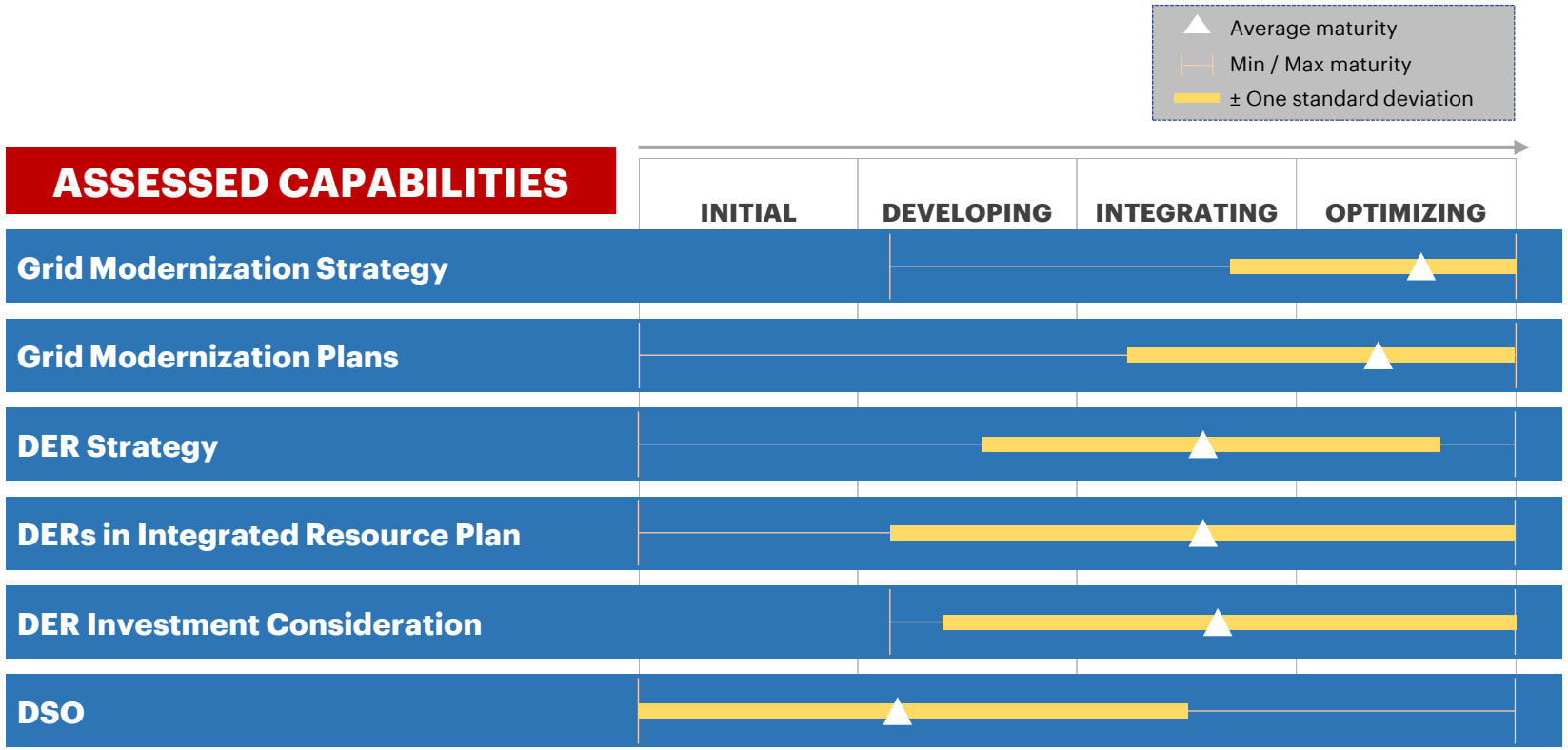

Figure 4. Strategy & Planning capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- Grid modernization strategies and plans have been largely defined and are being executed upon. These plans, projects, and associated investment figures are also being included in discussions with regulators.
    - **86% of surveyed utilities** have developed grid modernization strategies and begun implementation
- Utilities are developing strategies to tackle the increased penetration of DERs; however, there is a wide maturity spread in both strategy integration and execution capabilities
    - **33% of surveyed utilities are in early stages of DER strategy development** and do not have a formal strategy in place
- DER forecasts are becoming increasingly included into integrated resource plans either through jurisdictional requirements or utility initiatives
- Utilities are more regularly considering DERs as replacements or deferral opportunities for traditional grid investments. This presents an opportunities for new DER vendors who may be more incentivized to pursue grid facing services compared to current solely customer centric business models.
- There has been minimal interest and few conversations had with regulators on a potential DSO model thus very little actions have been taken. This observation warrants a further examination into the current gaps and obstacles that are impeding utilities' interests or abilities in assuming DSO responsibilities.

**Refer to Appendix for full breakdown of responses*

Resiliency – Introduction

Reliability, the ability to bounce back from individual system failure events, has been measured and managed throughout the decades. However, resilience and the ability to manage high-impact events, has yet to reach that level of maturity especially in the face of extreme weather events. A recent survey of North American utility executives showed that ~87% of respondents stated that extreme weather events severity and duration has increased in their locations over the past 10 years and 92% of respondents expected these type of events to increase or worsen over the next 10 years[9].

Currently, there is no standardized nor broadly accepted definition of resilience in the utility industry. Utilities don't have one; neither do regulators. Thus, the responsibilities will fall on utilities to take the lead and develop a roadmap to resilience that encompasses other key stakeholders (i.e., regulators, customers).

This overall shift from tactical to strategic will require a rebuilding of scenario planning and ensuring risk mitigation is a valued capability that is integrated across the enterprise. This occurs from assessing current risk capabilities, modeling possible scenarios, and then translating those scenarios into risk mitigation plans. The objective, of course, being an optimally hardened network that delivers the appropriate value to customers who will inevitably see increased costs from resilience initiatives.

These high–impact complex scenarios will also require an accelerated approach to digital solution adoption in order to deliver on resilience strategies. One of the key opportunities for digital solutions is damage assessment. Damage assessment drives the recovery process after any disaster and dictates the resources required, where you put them, and where to focus these efforts. Increased asset visibility and analytical tools such as Artificial Intelligence (AI) and Machine Learning (ML) can transform the foundation of how utilities view, manage, and maintain their system. Technology is not limited to pro-active decision making and can be used to inform restoration strategies using real-time geographic and weather data to inform priorities and improve communications with customers.

The shift towards digital comes with increased risk of cyber threats. The 2021 Colonial Pipeline cyberattack that halted all of the pipeline's operations demonstrated the extreme events facing the grid are not limited to natural forces. With a 160% year-on-year increase in ransomware events in 2020, there is an increased focus on mitigating potential cyber risks across both IT and OT environments[10]. These challenges facing utilities aren't going away anytime soon and a range of solutions and will be needed for a resilient future.

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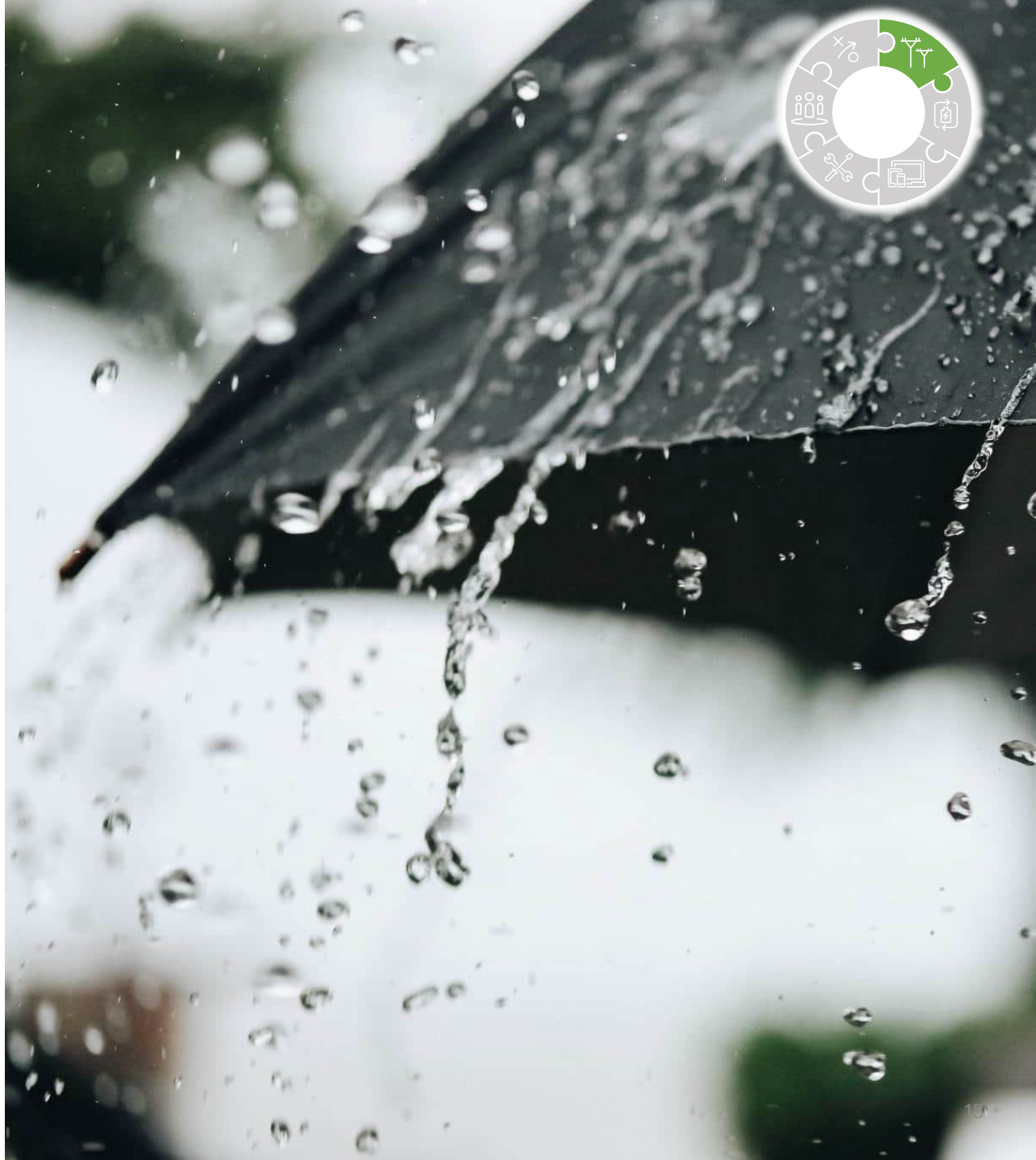


Resiliency – Benchmark Results

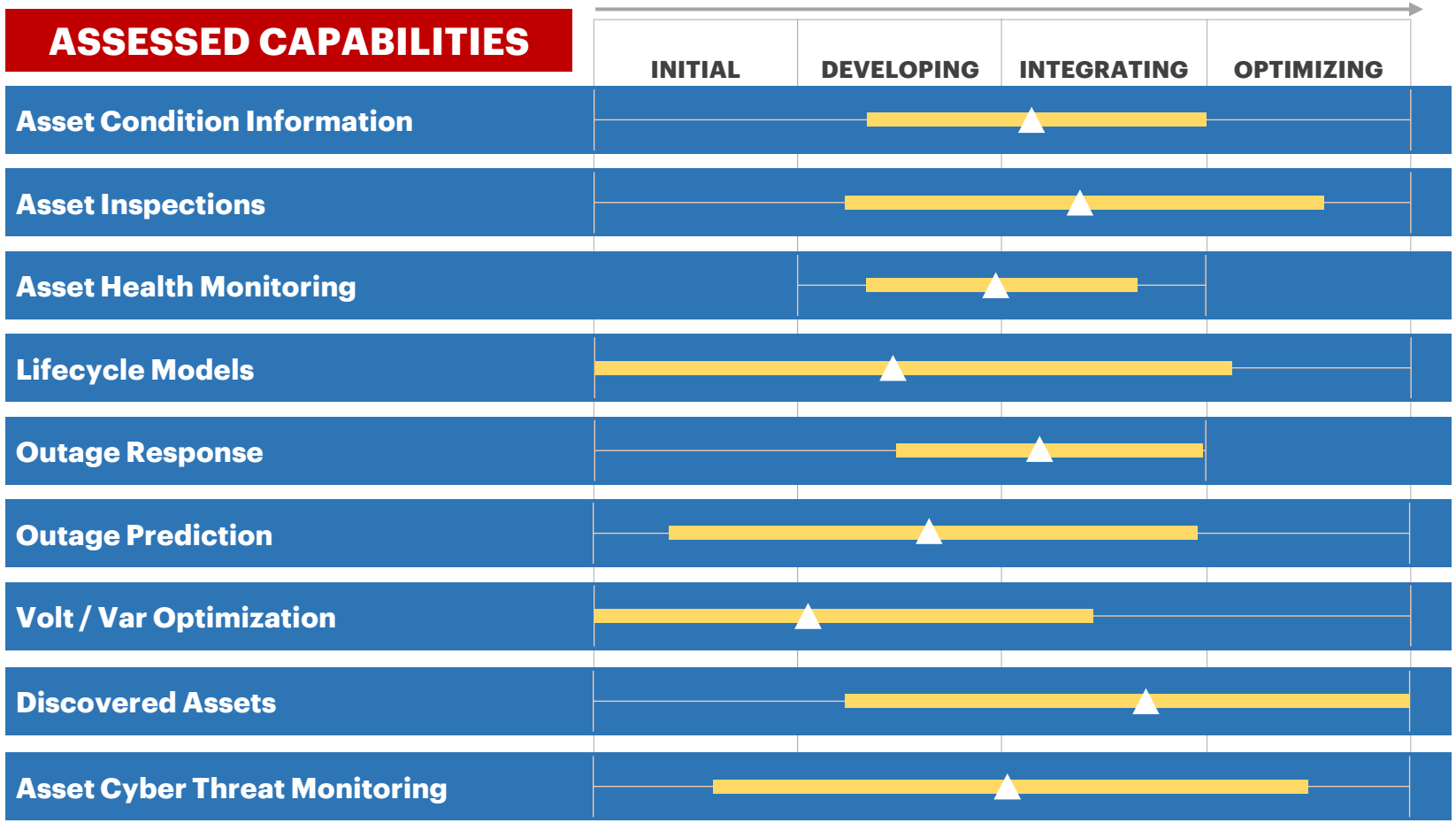


Figure 5. Resiliency capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- Asset health analytics, while still heavily subject-matter-expertise influenced, are trending towards increased use of company and industry data.
- While the majority of respondents stated that they used traditional run-to-failure or field inputs to make asset repairs or replacements, many utilities also employ data-driven lifecycle models.
  - **19% of utilities stated using predictive lifecycle models that use real-time data to proactively call for action**
- There was a **wide variance in maturity regarding outage prediction,** from respondents stating that they are not pursuing any outage prediction to those with systems in place, including predictive modeling, to detect disturbances correlated to outages.
- Volt / Var Optimization (VVO) deployment, while still in initial stages at many utilities, has gained noteworthy traction as 33% of respondents stated having the technology on over half of their distribution feeders.
- There was a **wide variance in maturity demonstrated regarding asset cyber threat monitoring** from respondents stating that they lacked any OT threat monitoring capabilities to those having real-time centralized monitoring via a security operations center (SOC).

**Refer to Appendix for full breakdown of responses*

Flexibility – Introduction

Flexibility is generally defined as the grid's ability to manage variability and volatility to balance electricity supply and demand. The increased penetration from renewable variable energy sources such as solar and wind have led to increasing grid instability and is aggravated further by distributed energy resources, especially rooftop solar PV. Developing greater system flexibility is not only required to manage these new supply and demand patterns but is also one of the most cost-effective approaches to build resilience.

There are several points along the electricity supply chain where distribution utilities can take action to inject flexibility. At the point of demand, tools such as behind-the-meter energy storage, demand response, and smart charging can be leveraged to smooth the variability from distributed generation and electric vehicle (EV) charging. At a larger distribution system level, self-islanding solutions can be used to reduce demand and grid dependency. Microgrid solutions are an example of tools utilities can use to develop both flexibility and resilience in the face of extreme events. A recent survey of utility executives found that 93% of respondents agreed that self-islanding solutions will be a major contributor to improved resilience. Lastly, at a large point of supply are utility-scale renewable generation, grid-scale storage, and vehicle-to-grid (V2G) solution options.

Energy storage, largely in the form of batteries, is one of the solution options that appears across multiple points of scale. While there is continued debate on the efficacy of grid-scale versus distributed energy system solutions, storage assets provide a unique level of versatility that allow them to pull from multiple value pools. Storage assets can be used to increase renewable penetration while also being deployed as T&D system assets to address grid inefficiencies or localized pockets of congestion that would otherwise require costly infrastructure investments.

Similarly, electric vehicles and related assets are having a transformative effect on the network of the future. Current projections expect a CAGR of 31% for the North American EV market during the forecast period of 2021 – 2026. A recent Accenture report estimates the total U.S. eMobility market to have a $700 billion worth by 2040, with $100 billion being attributed to the value of home and public charging stations[11]. Leading utilities will not only be able to develop commercial partnerships to address home and public charging investments but also leverage EVs to deliver grid flexibility. The Accenture report estimates that the value potential of this grid flexibility in the U.S to be $30 billion.



Flexibility – Benchmark Results

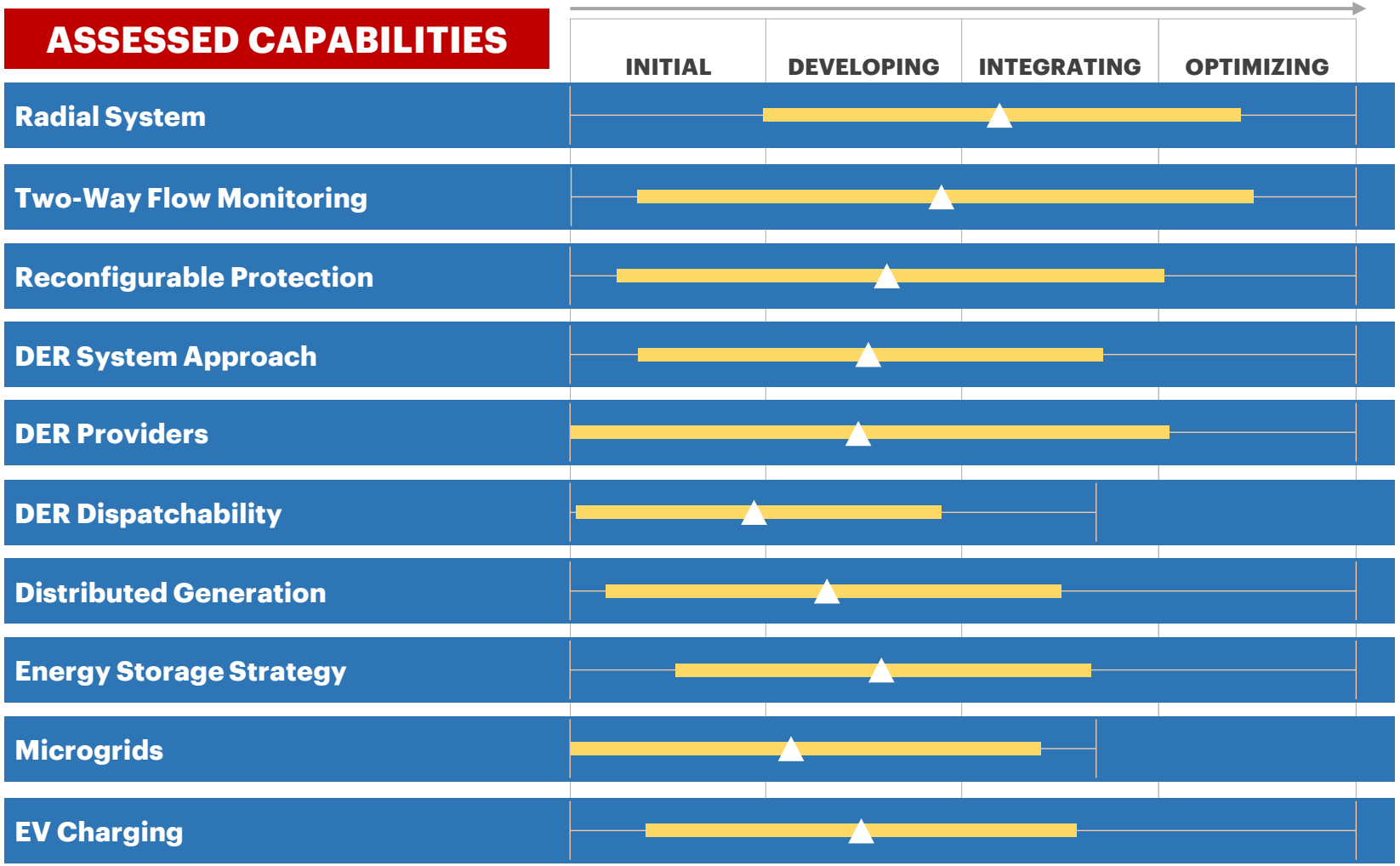


Figure 6. Flexibility capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- **Two-way flow monitoring**, a key component of monitoring distributed generation, has been enabled at 66% of surveyed utilities; however, only **33% of respondents have the ability to see real-time asset status.**
- Approximately 50% of respondents are in an early developing stage regarding system capacity/system protection strategies for increased DER penetrating, while 28% have operationalized their approach and implemented alternate protection schemes.
- Reconfigurable protection research has begun at many utilities but only **33% of respondents have implemented the capability either partially or throughout their service territory .**
- Distribution Management Systems (DMS) for DER dispatchability is in early consideration as **only 14% of respondents have begun any capability piloting.**
- While half of the respondents stated having no operationalized microgrids, 38% responded having microgrids that can be islanded and operated without centralized generation in pilot environments.
- The majority of respondents stated owning EV charging stations or having organizational provider partnerships; however, there was notable variance in the utilities' abilities to monitor or manage the charging station's usage.

**Refer to Appendix for full breakdown of responses*

IT / OT – Introduction

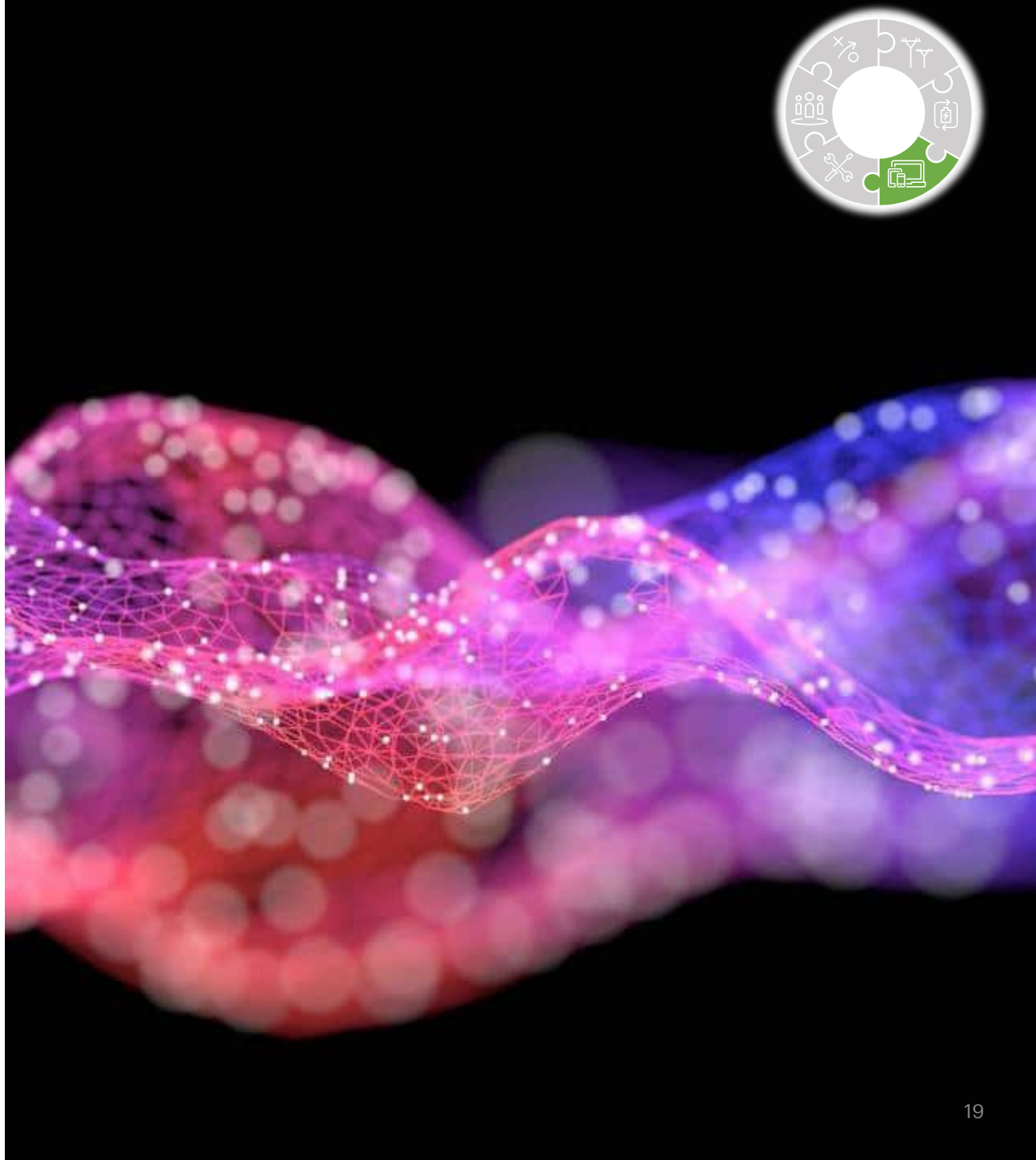
Arguably, the greatest driver of the modernized grid is the introduction and influx of digital grid solutions. Solutions include new cloud capabilities, 5G, edge computing, IOT, and automated sectionalizing devices to name a few. These solutions have applications across multiple utility ecosystems and will serve as enablers of other grid resilience and flexibility transformations.

Traditionally, most utilities have had their information technology (IT) and operational technology (OT) operate in completely different domains. IT capabilities were primarily focused on customer services (e.g. billing, desktop support) and internal functions (e.g. HR, communications). OT solutions were limited in scope to software systems that operated, managed, and reported grid technologies (e.g. SCADA, DMS, GIS).

However, with new technology solutions comes increased data and the increased needs for an integrated technology infrastructure that can scale with these new demands. Advanced Metering Infrastructure (AMI), the combination of smart meters, communication protocols and data management systems, is a prime example of a technology solution demanding this transformation. While smart meters were originally deployed for ease of billing capabilities, progressive utilities began are realizing that they could use the granular data from smart meters can be used with other data systems for advanced use cases such as outage isolation and voltage monitoring. This advanced use case of disparate databases and advanced analytics requires the integration of IT and OT capabilities to provide a solid and reliable foundation.

One of the key opportunities for advanced IT/OT is in the control room. Many utility control centers continue to be heavily dependent on human operators looking at multiple screens of data and reactively solving real-time problems with little to no context. However, the new challenges from extreme weather events, variable generation, and cyber attacks have introduced significant complexity and a magnitude of threat that may not be addressable by a reactive approach. Integrated data systems and automated task flows are examples of tools that both improve operators' abilities to address issues and decrease the risks from manual errors.

Evolving IT and OT systems enable the breakdown of generational siloes and the decision-making capabilities required to bring enhanced reliability and flexibility to the grid.



IT / OT – Benchmark Results (1/2)

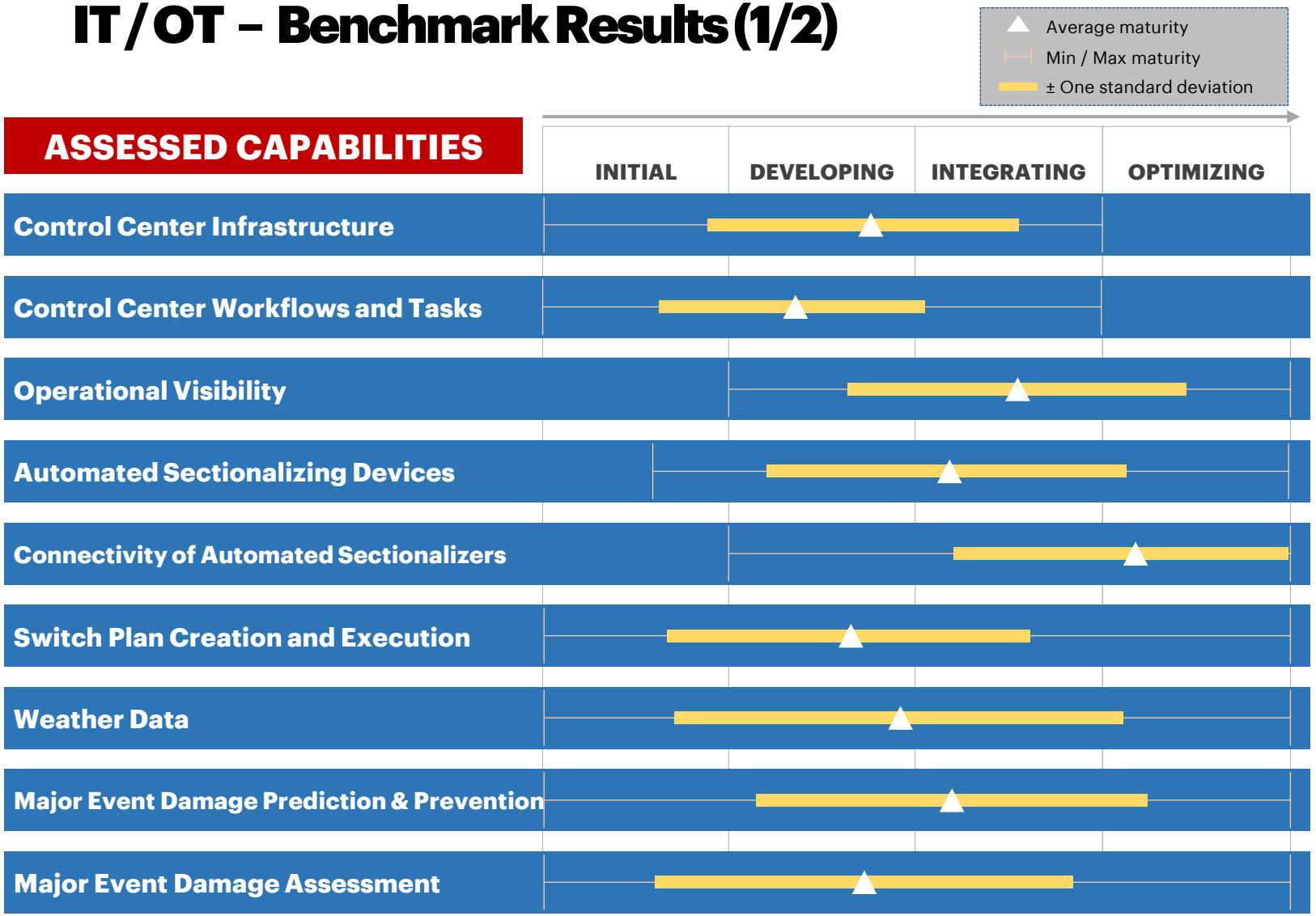


Figure 7. IT / OT capabilities benchmark results (1/2)

OVERALL ANALYSIS – KEY CONSIDERATIONS

- The majority of utility control centers have integrated data sources but workflows are still largely dictated by long-standing processes and are primarily focused on approval s and handoffs. Some utilities are beginning to look towards new technologies as **38% have started to experiment with using AI / ML in control center applications.**
- Automated sectionalizing devices have been well integrated in many utilities with a majority stating over 50% of their feeders had such operational technology.
- Many utilities, 52% of respondents, have recognized the potential of sectionalizers beyond reclosing activities and have devices provide telemetry and integrate data into operational models(e.g. ADMS)
- With the increased threats from extreme weather, many utilities are recognizing the importance of weather data. **43% of respondents stated using meteorology teams to perform sophisticated analyses (e.g. predictive modeling)** and a smaller portion stating that they had integrated real-time weather data into operations
- There are notable opportunities to integrate analytics into major event damage prediction and assessments with **71% of utilities responding that their damage prediction activities were limited to manual exercises.**
- Similarly, while the vast majority of utilities, 66%, stated that they used a combination of manual and digital tools post- major event to upload information into systems, the subsequent actions are driven by operator decision making. However a small portion, ~10%, stated using digital tools to feed systems that automatically recommend a course of action.

**Refer to Appendix for full breakdown of responses*

IT / OT – Benchmark Results (2/2)

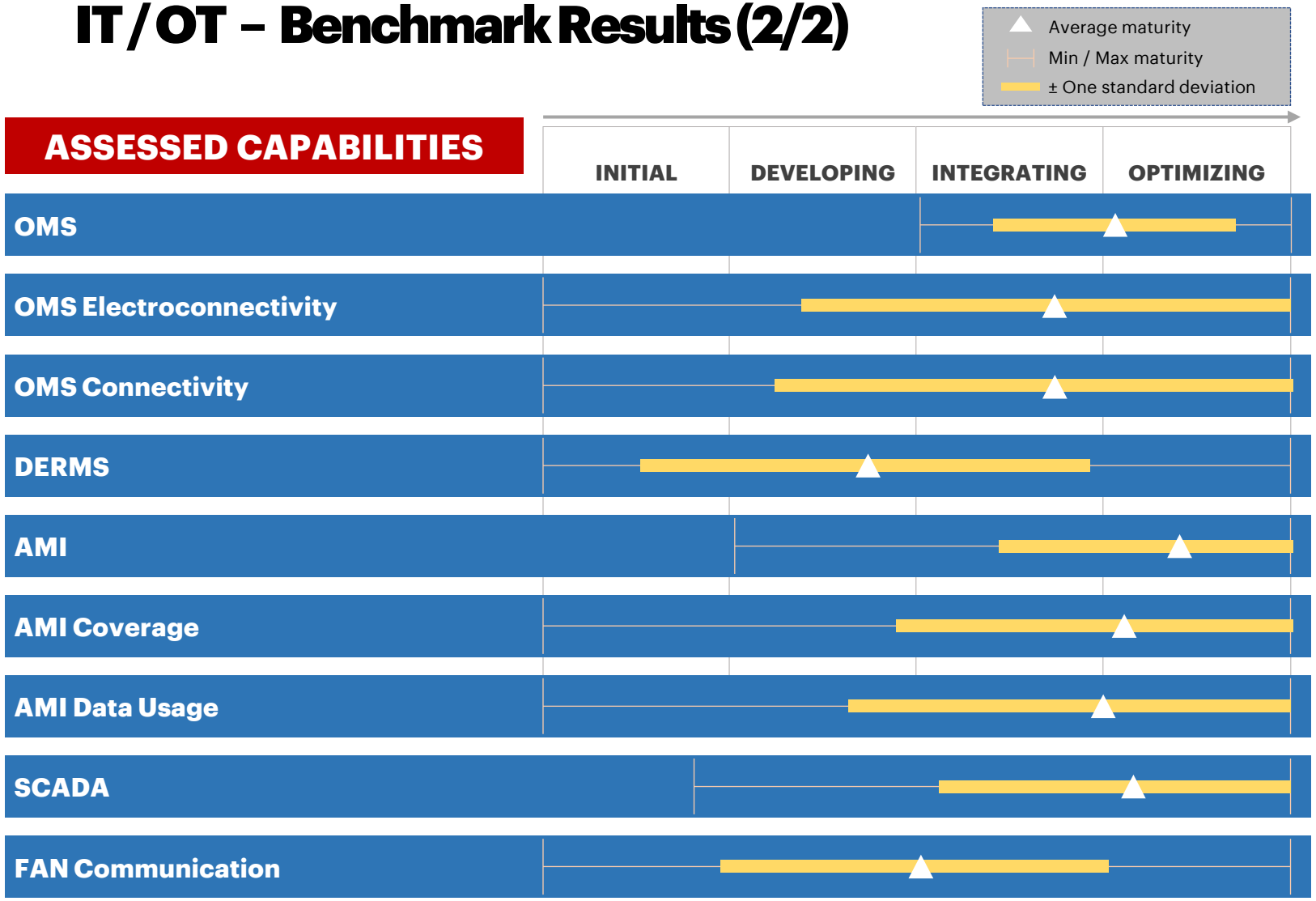


Figure 8. IT / OT capabilities benchmark results (2/2)

OVERALL ANALYSIS – KEY CONSIDERATIONS

- While all utilities stated having an outage management system (OMS), there is a wide variance within system maturity. The majority of utilities stated having elements of integration with other OT systems (e.g. GIS, ADMS), **only 24% could state that their systems were well integrated in that changes in integrated systems would be reflected real-time in OMS**. Similarly, the majority of respondent OMSs have electroconnectivity models but only **50% of models reflect dynamic, real-time status while the remaining are either static or had to be updated manually.**
- Utilities approaches and maturities regarding DERMS is quite varied. While **33% of utilities are only still having initial conversation on incorporating DERMS**, the remaining are evenly spread out the spectrum between having no DERMS initiative to fully operational systems.
- The vast majority of utilities have integrated AMI systems. While there is some variability in system maturity, **many utilities, 76% of respondents, are using AMI beyond standard customer operations** and leverage advanced intelligence capabilities such as outage management.
- While the majority of utilities continue to use the industry standard of 900 MHz Radio Mesh in their Field Area Network (FAN) communications, a small portion of utilities are leveraging more advanced communication networks such as high-speed wireless (14%) or fiber optic networks / LTE solutions (10%) that can better support new smart grid technologies.

*Refer to Appendix for full breakdown of responses

Workforce of the Future - Introduction

The COVID – 19 pandemic has highlighted the importance of utilities having a resilient workforce that can endure any type of event. However, utilities are currently facing an aging and retiring workforce with the US Department of Labor projecting that 50% of current energy utility workers will retire within the next ten years. Grid modernization has also introduced a need for a digital-savvy workforce that can develop and manage the technologies required for a future state smart grid.

One of the core approaches for creating a resilient workforce that can handle these challenges is the use of innovative technology to drive flexible plans and procedures. A digital organization can help capture the deep existing expertise of current employees and allow employees to focus on mission-critical tasks. A recent survey of utility employees found that only half of non-managerial employees believed that they were being utilized at their full potential.

Many activities within the industry require manual tasks and outdated tools that can now be automated with new technologies. Automated field work dispatch is an example of a technology that can allow dispatchers to automatically create and assign routine work thus allowing them to focus their efforts on the more challenging scenarios. More general technologies such as robotic process automation (RPA) can further reduce employees' busy work and allow them to concentrate on the challenges in evolving the grid rather than only do damage control on the status quo.

While operational efficiencies do allow employees to better use their time, new field technologies (e.g. drones, Augmented Reality (AR) / Virtual Reality (VR)) should be leveraged to better manage the grid. For example, drones can support overhead mileage inspections, maintenance jobs, and post major event damage assessments. Augmented reality solutions have been used to superimpose digital information on the real world, providing utility workers dynamic access to data and back-office systems. As grid infrastructure becomes more complicated with the introduction of smart devices, employees will need to instantly access more information in order to properly assess and maintain field assets.

Lastly, Artificial Intelligence (AI) and Machine Learning (ML), are some of the most disruptive new technologies that have seen proven success in many, if not all, grid modernization topics. However, successful use of AI and ML not only requires the right data science skills, but also the fostering of a digital savvy organization that can identify potential use cases and translate the results into appropriate actions.

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Workforce of the Future – Benchmark Results

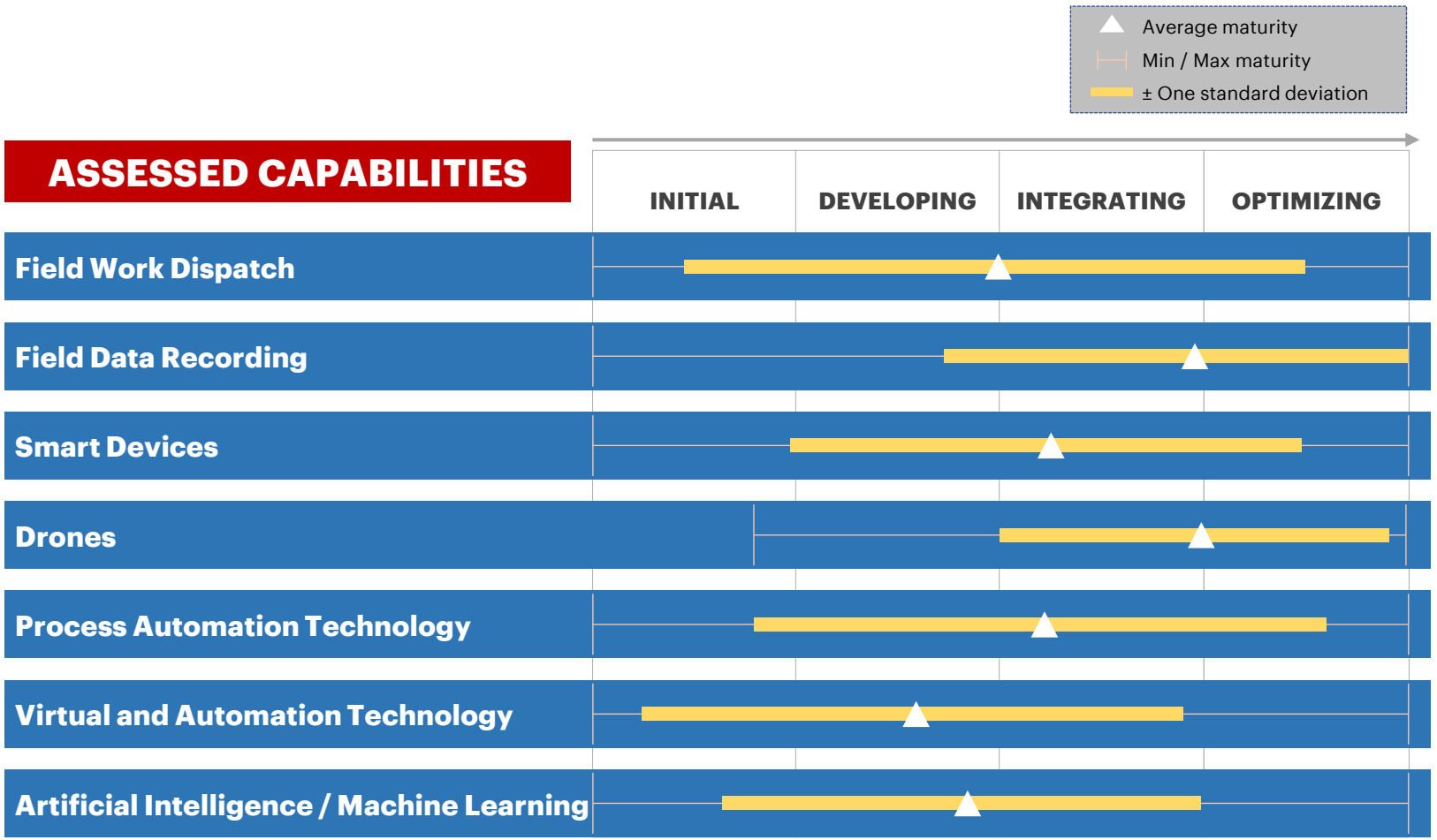

Figure 9. Workforce of the future capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- Despite the predominant usage of centralized digital systems of records for initial work dispatch, not all respondents are able to accommodate real-time emergent work and require at least some degree of manual intervention
- Field devices have been widely integrated into most utilities' field operations with **~50% respondents stating that their devices were connected to their system of records and can be updated in real time**
- While not common in most surveyed utilities, smart devices have either been lightly integrated or piloted into field operations across many utilities
- **Over 70% of respondents** have begun conducting **feasibility studies or pilots for drones' usage**
- While most respondents stated having only an initial or developing approach to integrating VR / AR, **nearly 30%** have begun or fully completed at least one form of operational implementation
- A majority of respondents have integrated AI/ML within distribution operations, with **33% stating that they have employed data scientist resources or capabilities to implement AI/ML in identified use cases**

**Refer to Appendix for full breakdown of responses*

Customer Engagement – Introduction

Customer engagement has traditionally not been associated with grid design or modernization as the relationship is primarily transactional. However, while customers are playing a significant role in the current challenges facing utilities, they may also prove to be a solution driver.

Many customers are becoming more scrutinous of their relationship with their electricity providers as major grid events disrupt their normal lives. The 2018 California wildfires are a prime example of a significant incident that caused customers to pay attention to their utilities' infrastructure capabilities and re-evaluate their utility relationship. Though most of North America is served by regulated utilities, the public can have major influences on regulators favorability to utility decisions.

Customers have been a driving force behind many of the flexibility challenges facing the grid. DER penetration, which has caused concern for grid instability, is continuing to grow at steady rates. The more significant driver through is the rapid increase in electric vehicles. Though slightly hindered by the COVID-19 pandemic, the North American EV market is estimated to grow at a CAGR of 31% between 2021 and 2026. The subsequent increase in load will lead to massive instability if left unchecked.

However, customer engagement may also prove to be a solution to many of the aforementioned issues. In 2020 and 2021, customer responses to utility and grid operators' requests to reduce peak load during supply shortages prevented severe blackout scenarios. Behind the meter systems including microgrids, solar-plus-storage systems- and dispatchable energy loads provided much needed capacity during these incidents. While DER resource deployment is largely customer driven, the utility can play significant roles in enabling and encouraging customers to install these assets. Similarly, while EVs can pose potential threats to stability if left unchecked, utilities can engage customers to manage load profiles and use EVs as flexibility assets.

Utilities can also take more direct roles through demand response and energy efficiency programs. In a recent survey, more than half of customers indicated that they are interested in time-of-use tariffs, flexible tariffs, and demand response options post-COVID 19 pandemic to increase cost savings.

Customers are now more willing than ever to accept innovation and utilities can leverage this to bring them along in the grid modernization journey.



Customer Engagement – Benchmark Results

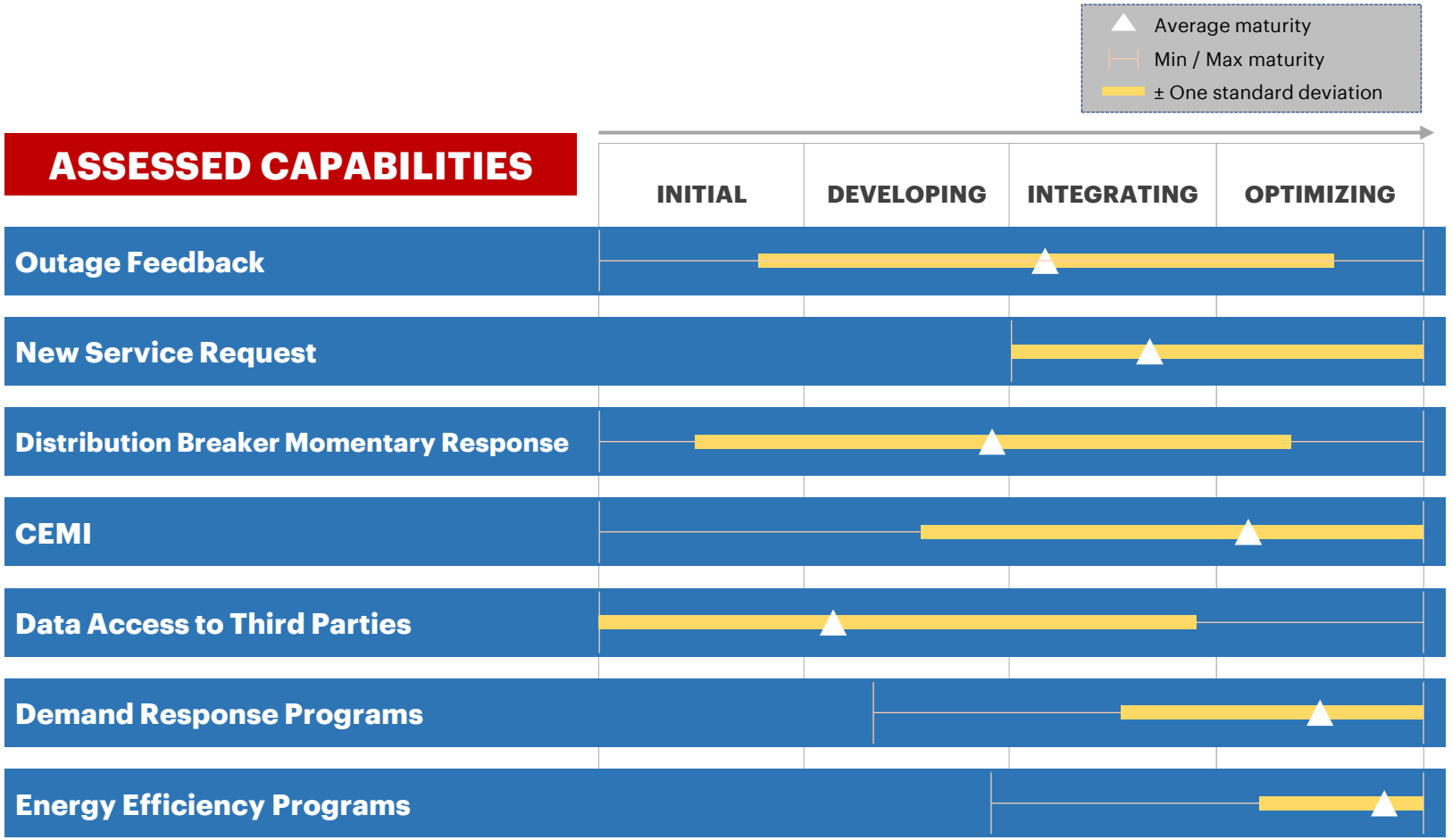

Figure 10. Customer engagement capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- 57% of utilities stated that they leverage information from systems such as OMS or AMI to provide customers with an estimated time of restoration (ETR) with 24% reporting that they were able to provide additional real-time information (e.g. outage cause)
- The majority of utilities, ~90%, currently measure CEMI (customers experiencing multiple interruptions), with 66% of respondents reporting that they have required action thresholds and plans in place. Similarly, 76% of utilities currently measure MAIFI, with 24% reporting that they have required action thresholds.
- The vast majority of utilities stated having both behavioral and controlled demand response programs as well as energy efficiency programs.

**Refer to Appendix for full breakdown of responses*

Conclusion

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Conclusion

Our benchmark has shown that there has been a wide degree of maturity throughout the industry, but more and more utilities are recognizing the need for a transforming grid and the key role their sector will play in facilitating this change.

86% of the surveyed utilities have both developed and begun implementation of grid modernization strategies. This strategic acceptance of grid modernization is the first step to enabling change; however, execution progress must not be overlooked. Many utilities have completed key programs such as AMI but effectively using the results and data gathered from these new systems will be the more notable differentiator.

One of the promising results from the benchmark has been the maturity displayed in customer engagement programs. While these activities may not directly lead to a modernized grid, consumers will ultimately shape the future requirements for the grid and the importance of maintaining a healthy relationship cannot be overlooked.

The greatest growth opportunities found were with regards to flexibility. While certain regions may not face the urgency of addressing DERs due to current low penetration rates, utilities must develop the grid for future energy supply and demand patterns and look towards the shifting landscape of EVs and increasing electrification.

There has been notable maturity shown throughout the benchmark, but the survey has also indicated that there is much that utilities can learn from each other. Many respondents displayed high maturities in comparison to their peers in certain categories but then in other topics, would be significant less mature against those same peers. The electric distribution grid is one of the most complex feats of engineering ever undertaken. Successful reimagining of the grid will require knowledge-sharing and cooperation to develop a holistic vision that can be tailored to each utility's needs and desires.

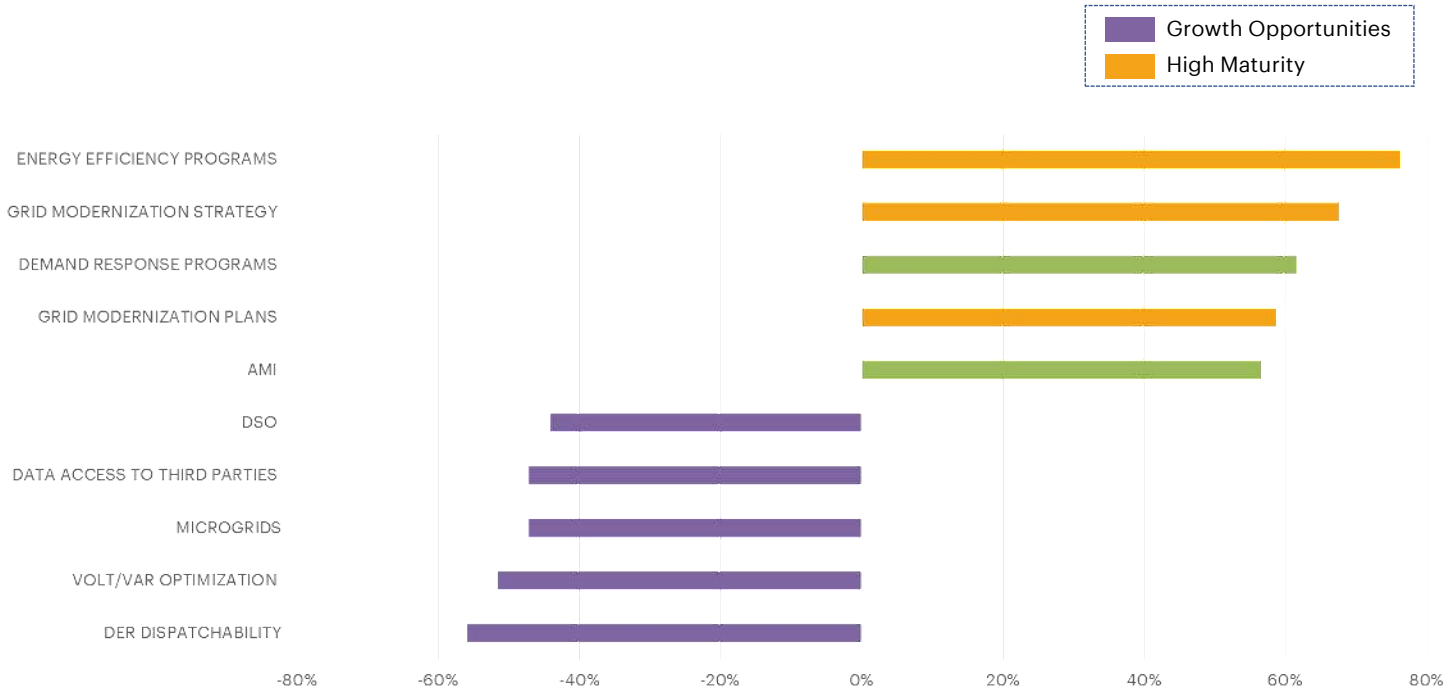

Figure 11. High maturity and growth opportunities compared to median results

Utilities are embracing the need for grid modernization but still have significant growth opportunities in critical execution

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Appendix

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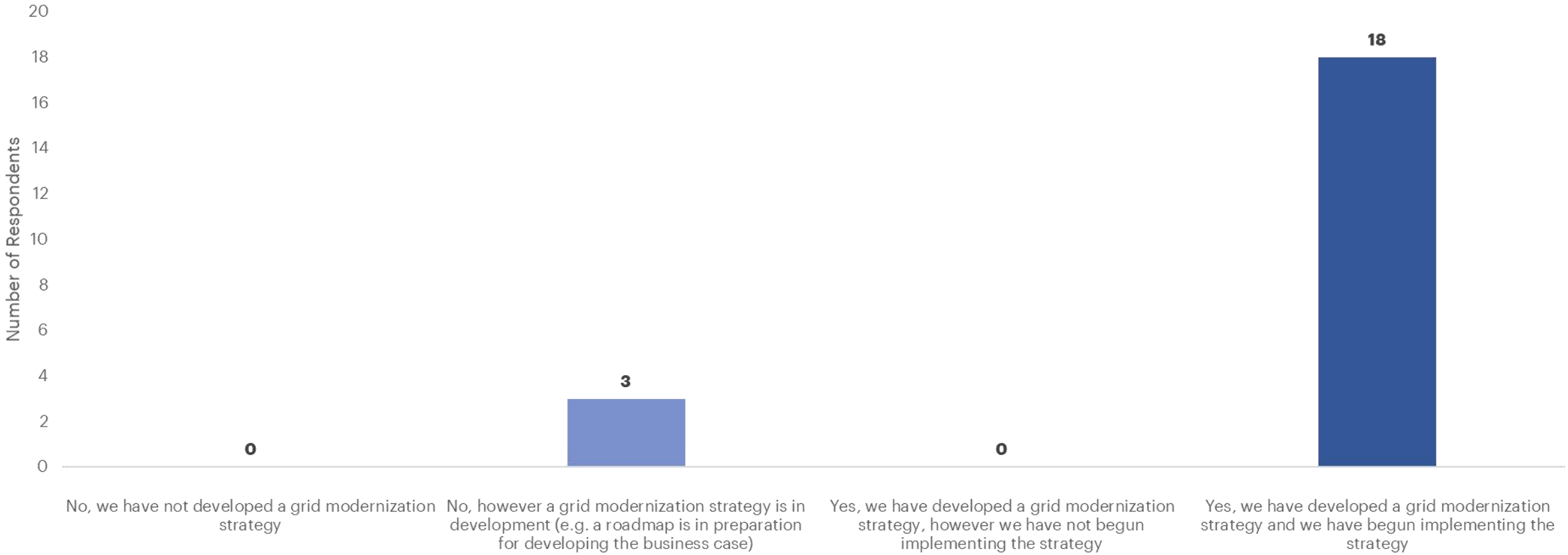
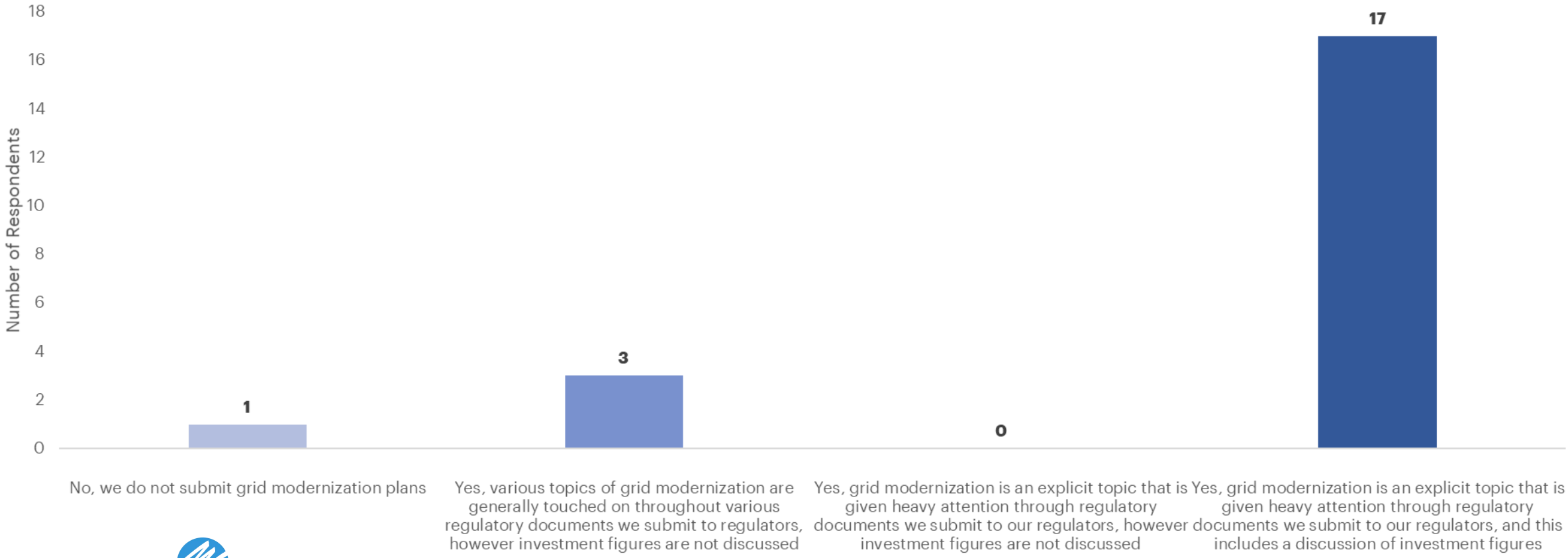
1.1) Grid Modernization Strategy

Question:	Have you developed a grid modernization strategy? NOTE: A grid modernization strategy would include items such as business objectives, a multi-year roadmap, budget, etc. dealing with a utility's plan to modernize its grid.



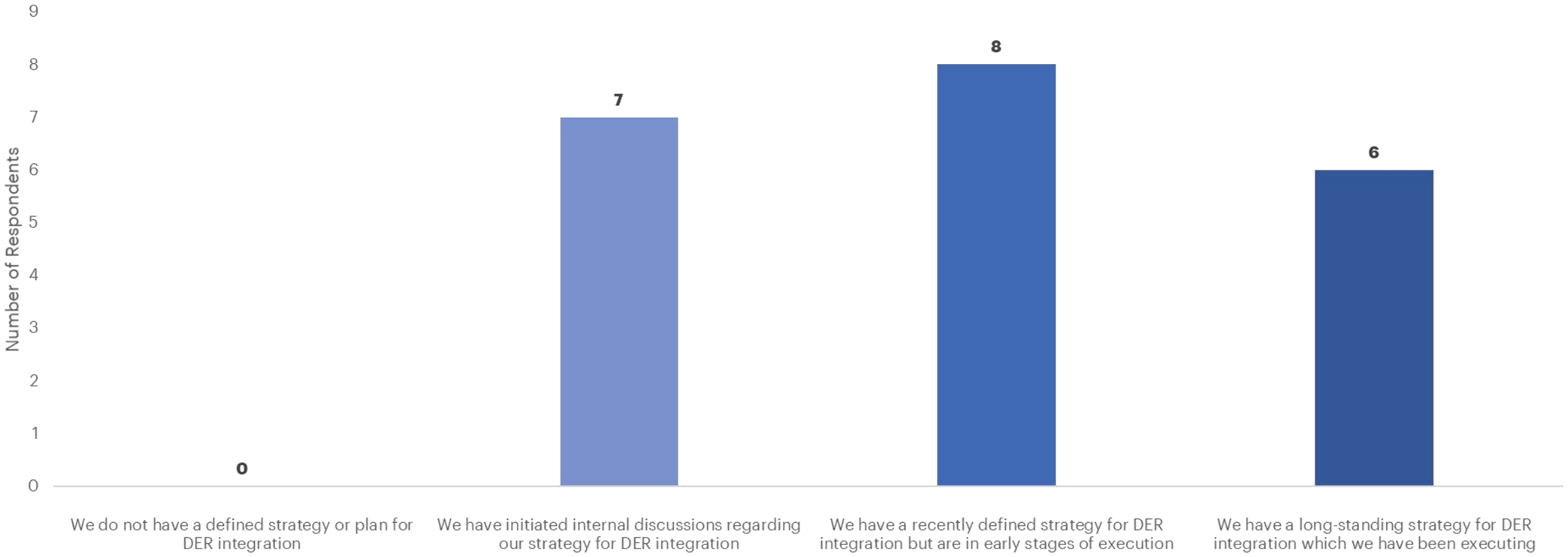
1.2) Grid Modernization Plans

Question:	Do you submit grid modernization plans to your state's public utilities regulator (despite whether such plans are required or not), and do those plans specify levels of investment for grid modernization programs? NOTE: Grid modernization plans can take the form of a resiliency plan, storm protection plan, or any such plan dedicated to outlining the advancement of the grid's modernization.



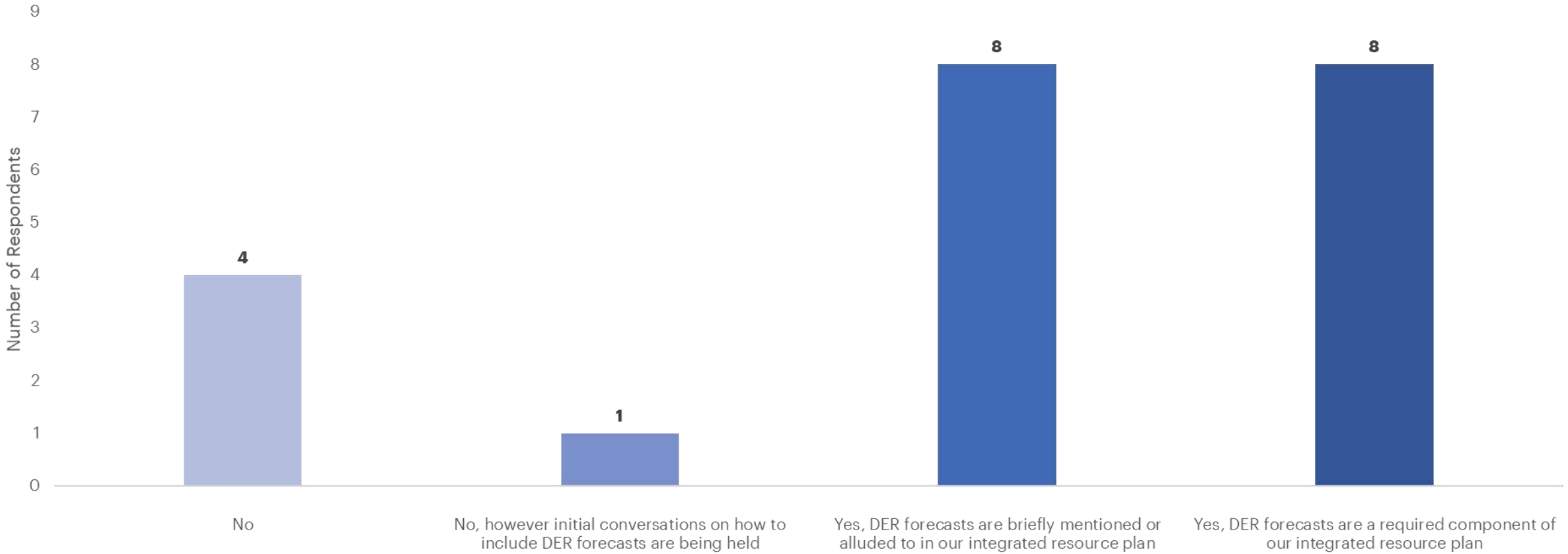
1.3) DER Strategy

Question:	Which of the following best describes the maturity of your strategy for integrating distributed energy resources (DERs)? NOTE: A DER is an electricity-producing/storing resource or controllable load device that is connected to the local distribution system, such as a solar panel or battery.



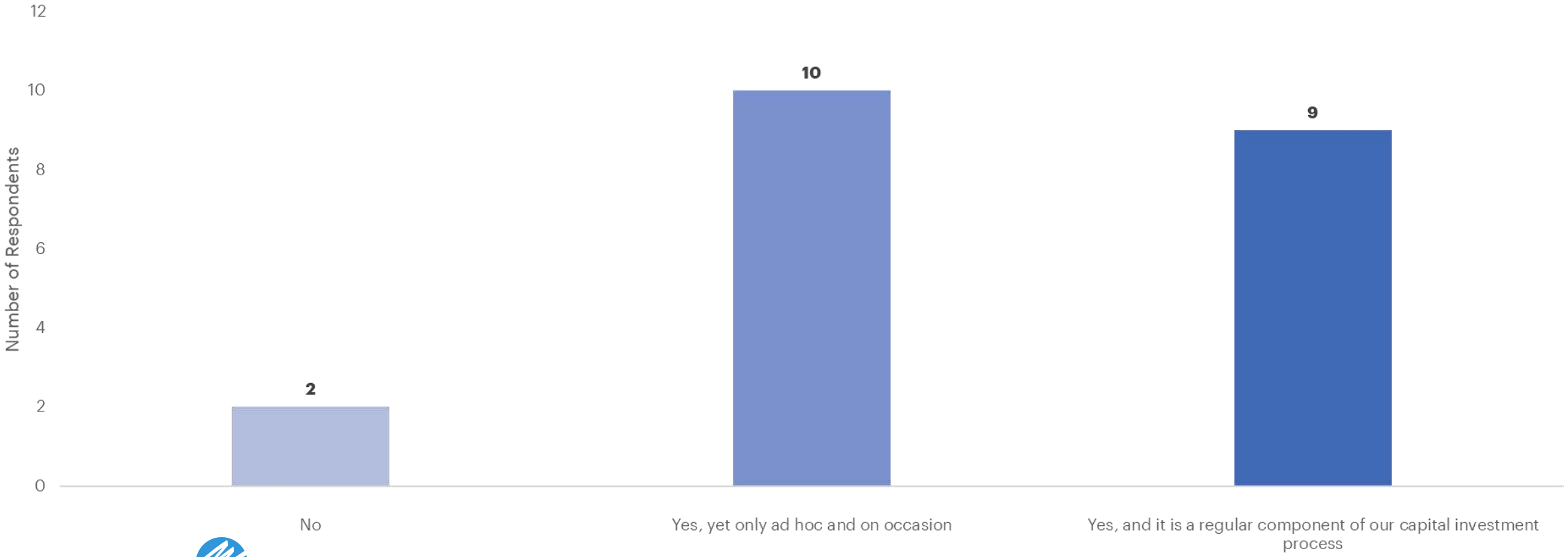
1.4) DERs In Integrated Resource Plan

Question:	Does your integrated resource plan include forecasts for anticipated DER penetration? NOTE: As a reminder, this question (along with the rest of the survey) is focused on distribution



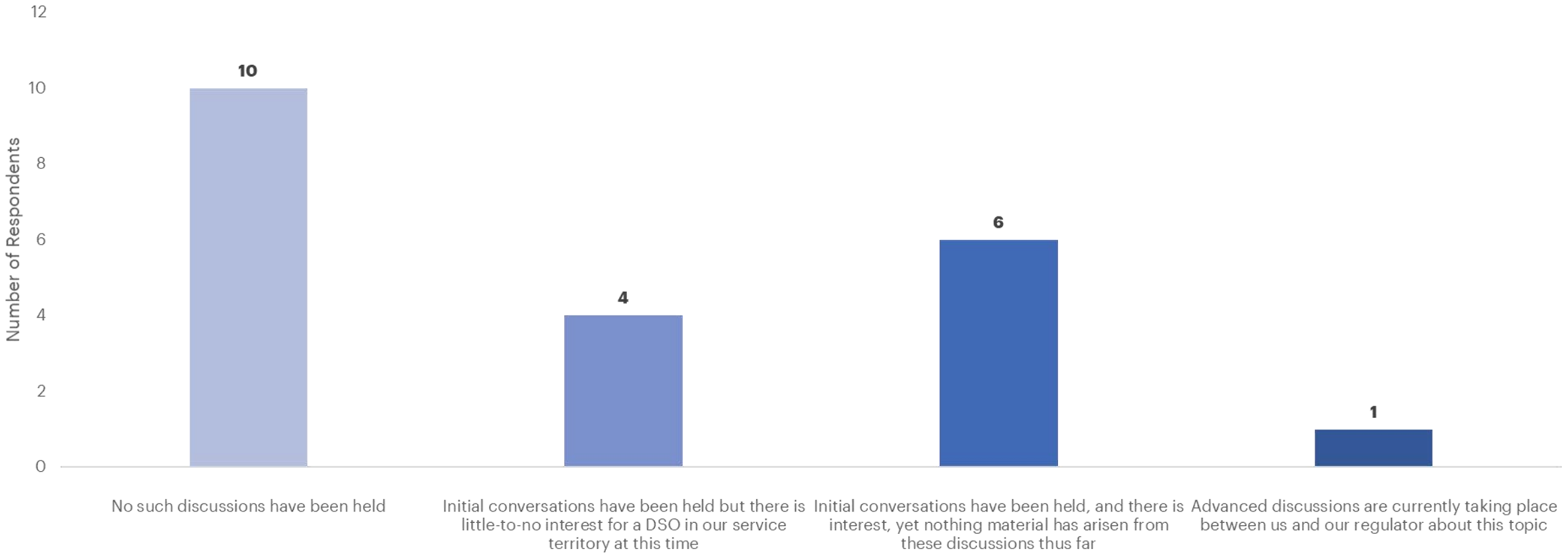
1.5) DER Investment Consideration

Question:	Does your capital investment process consider the deferral or replacement of traditional grid investments for the sake of distributed or other alternative investments? NOTE: An example of this would be assessing a location's load growth and considering DERs / energy storage / microgrids or other non-wires alternatives as an option alongside traditional distribution load growth projects



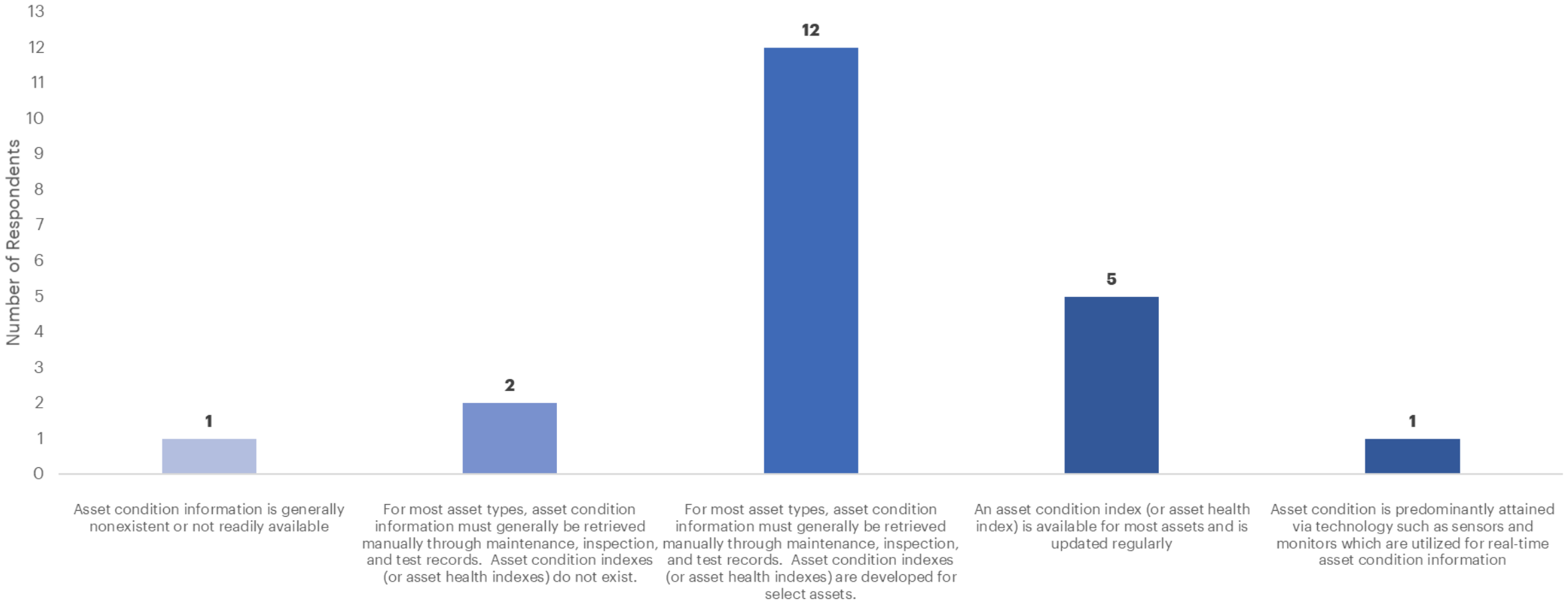
1.6) DSO

Question:	Have discussions been held between you and your regulator regarding the topic of transitioning your distribution line of business into the role of a Distribution System Operator (DSO) that facilitates the coordination of energy delivery similar to that of a Regional Transmission Operator (RTO)?



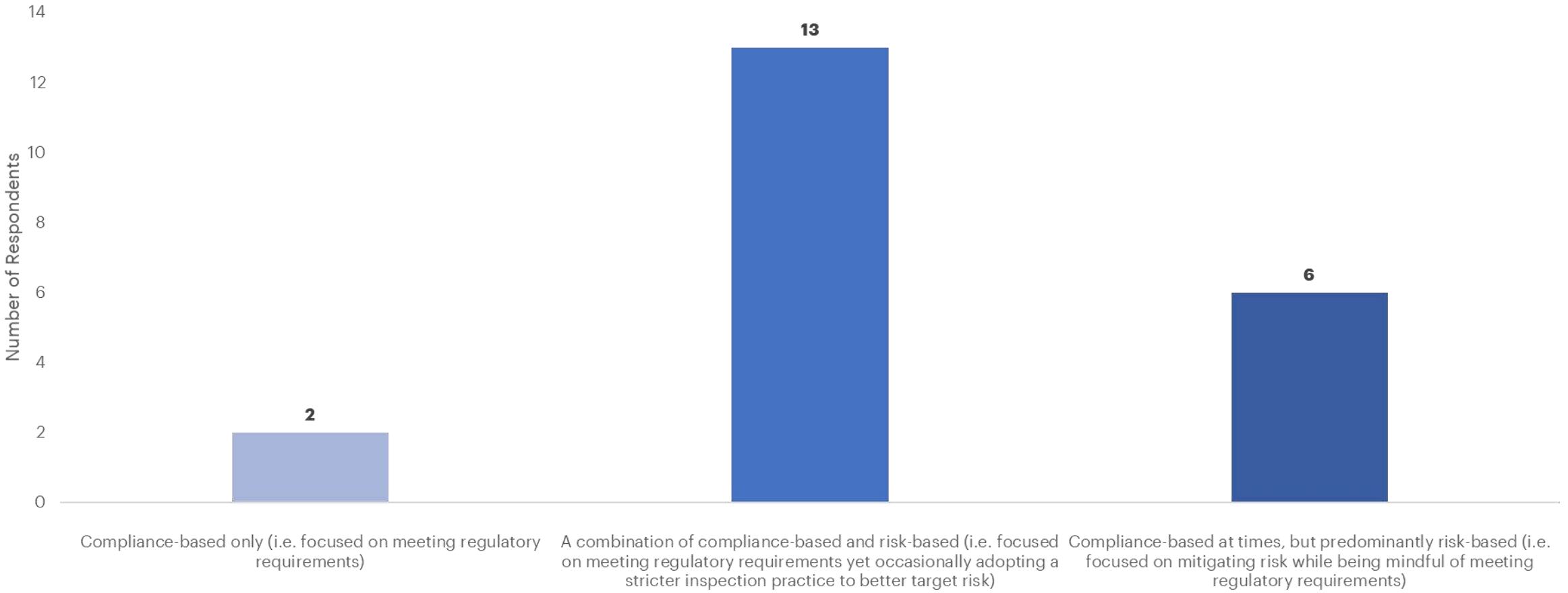
2.1) Asset Condition Information

Question:	Which of the following best describes your asset condition information? NOTE: This question is in reference to physical system assets.



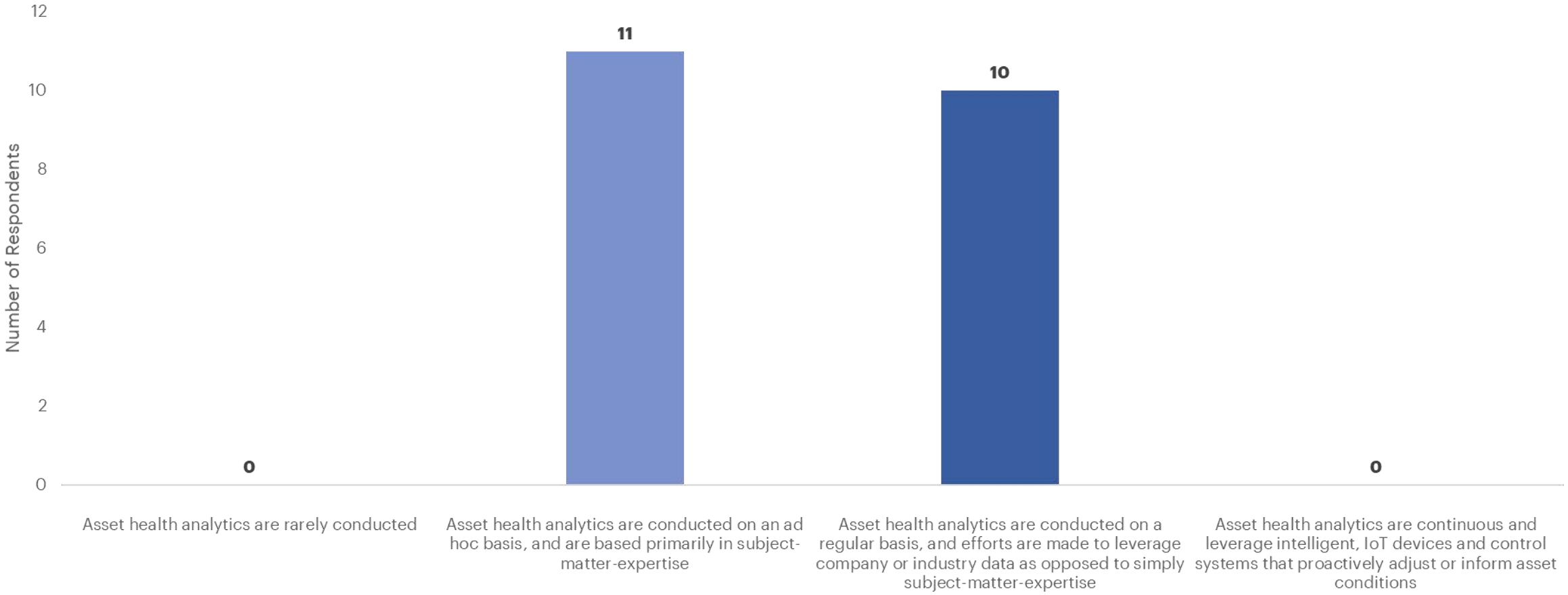
2.2) Asset Inspections

Question:	Which of the following best describes the inspection practices of your assets?



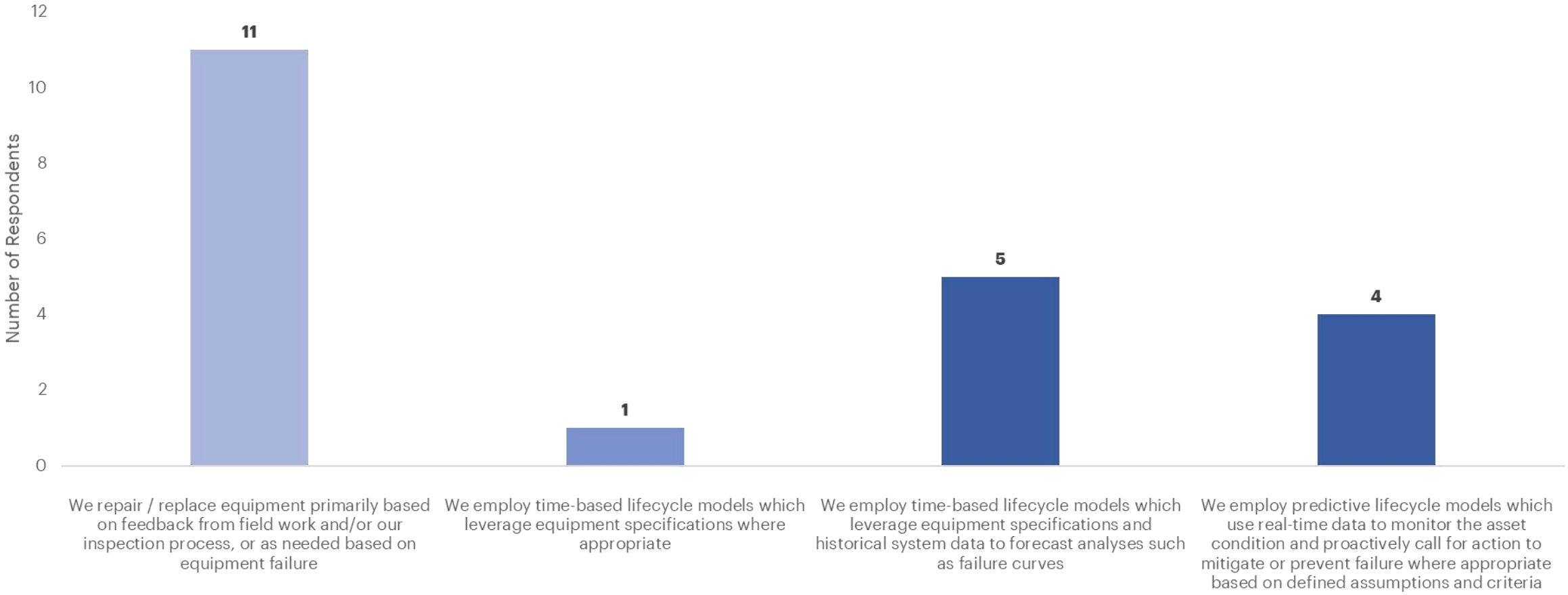
2.3) Asset Health Monitoring

Question:	Which of the following best describes your asset health monitoring?



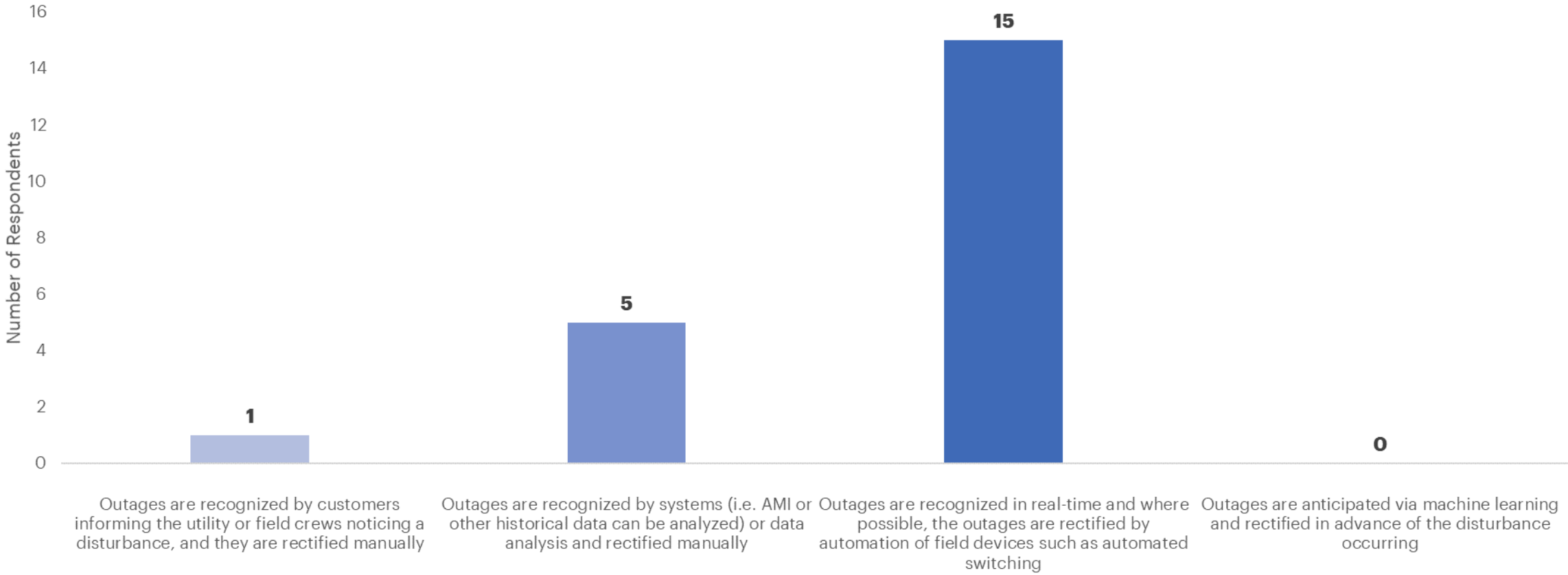
2.4) Lifecycle Models

Question:	Which of the following best describes how do you make repair / replace / run-to-failure decisions?



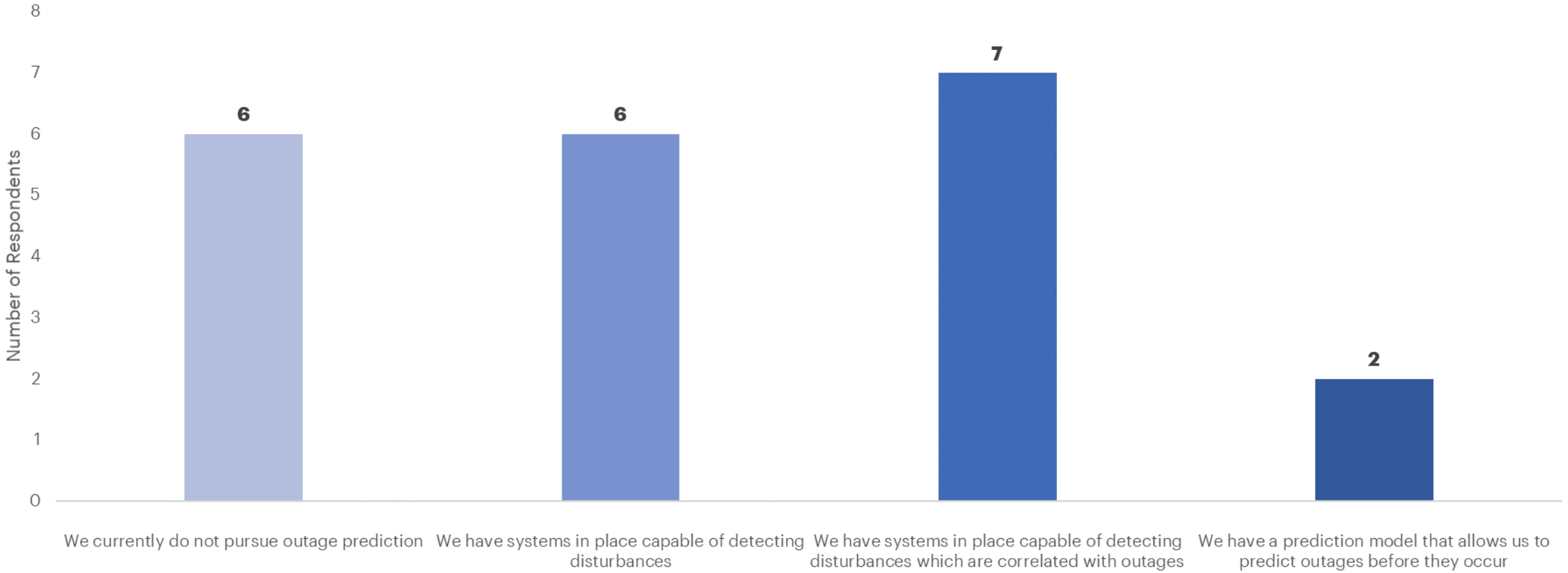
2.5) Outage Response

Question:	How is an outage recognized and rectified? Please select the option that best describes the highest level of practice at your utility. NOTE: Here, an "outage" is defined as a sustained system fault (not a momentary).



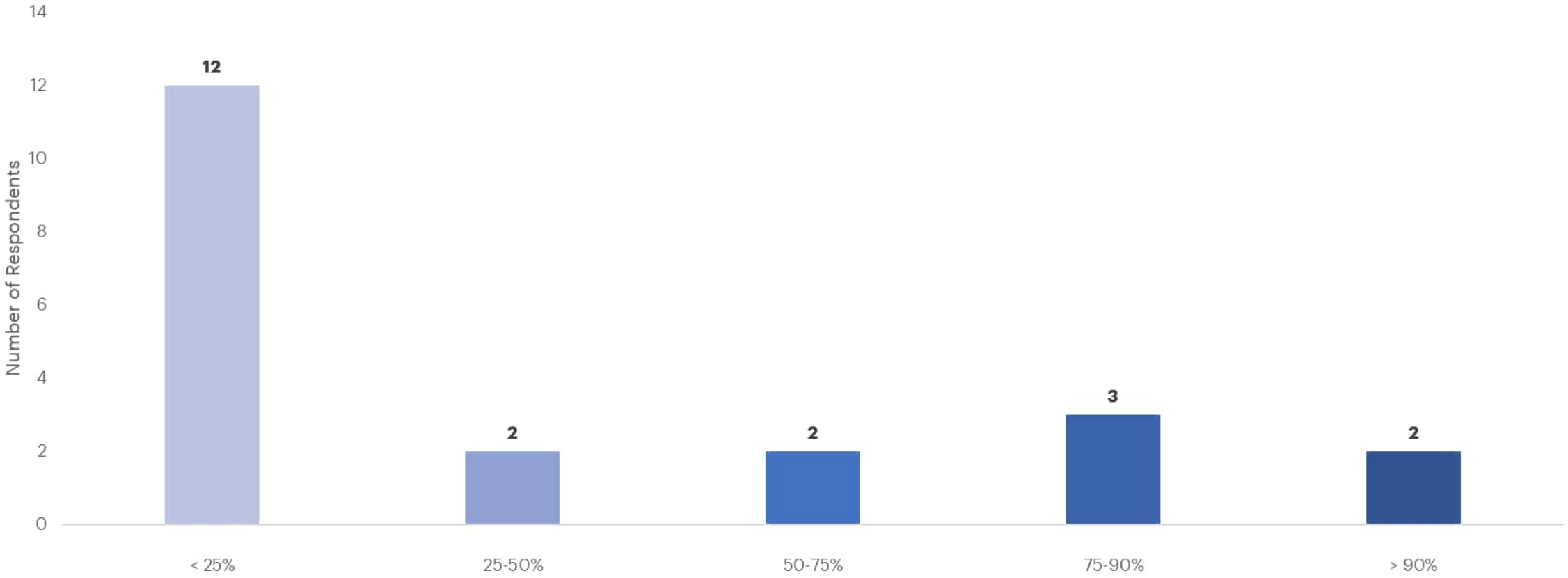
2.6) Outage Prediction

Question:	Which of the following best describes your capabilities regarding outage prediction? NOTE: Here, a “disturbance” is defined as an operational anomaly which does not trigger a protective device.



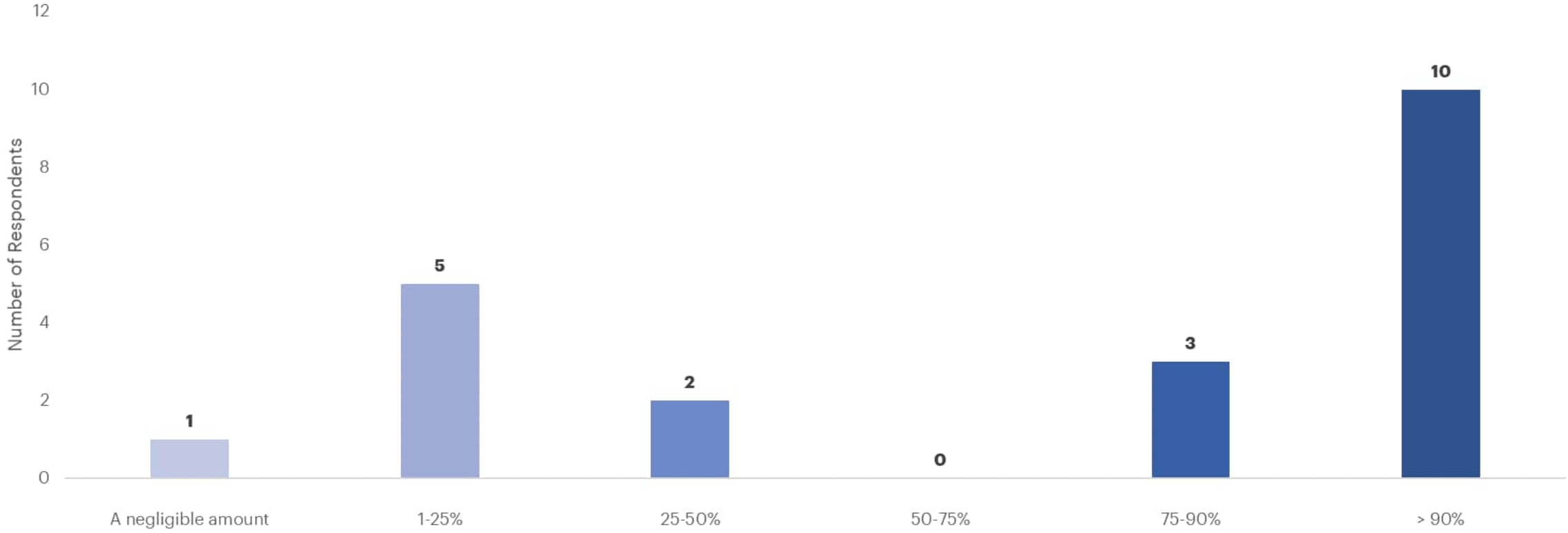
2.7) Volt / Var Optimization

Question:	What percentage of your feeders have integrated volt/var optimization (VVO) solutions? NOTE: Here, “integrated VVO” refers to a solution that optimizes both voltage and reactive power simultaneously using real time data.



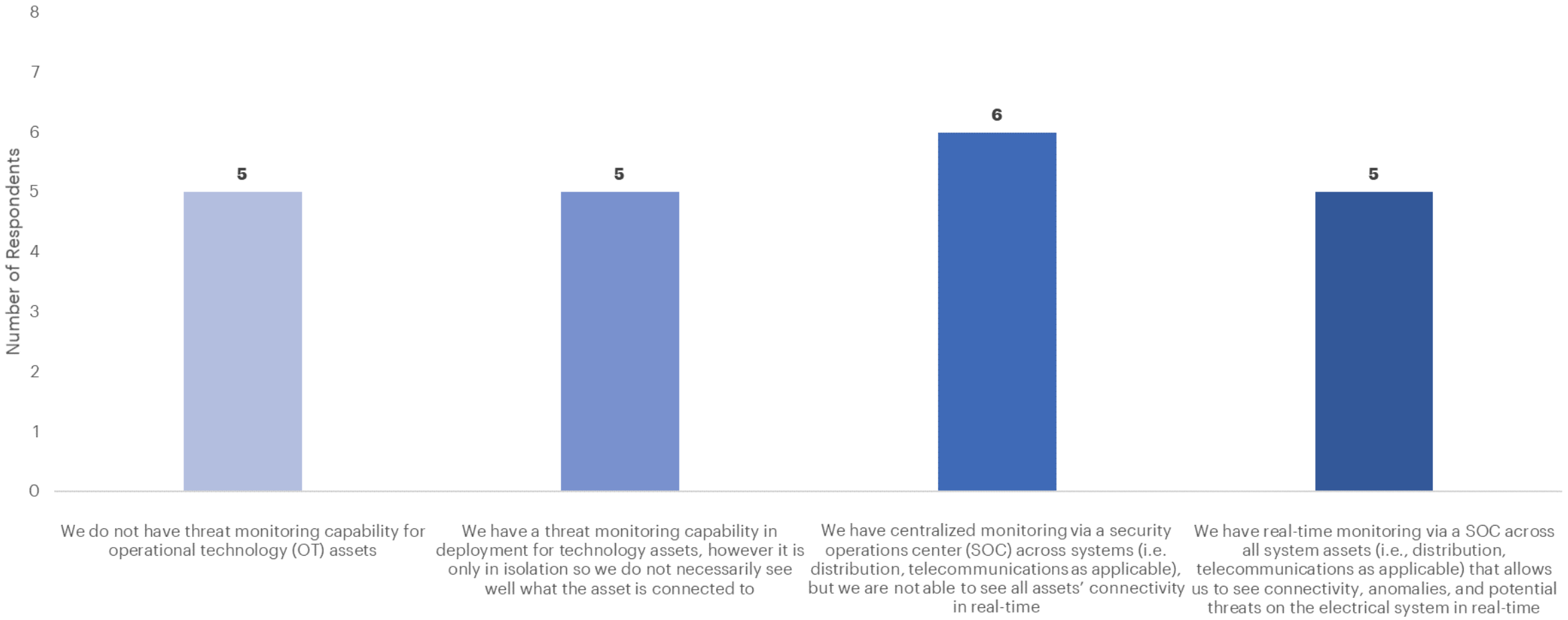
2.8) Discovered Assets

Question:	What percentage of your field technology assets are discovered? NOTE: Here, "discovered" implies that you have visibility into the asset from a threat intelligence perspective. As in, you have awareness of what the asset is and where it is.



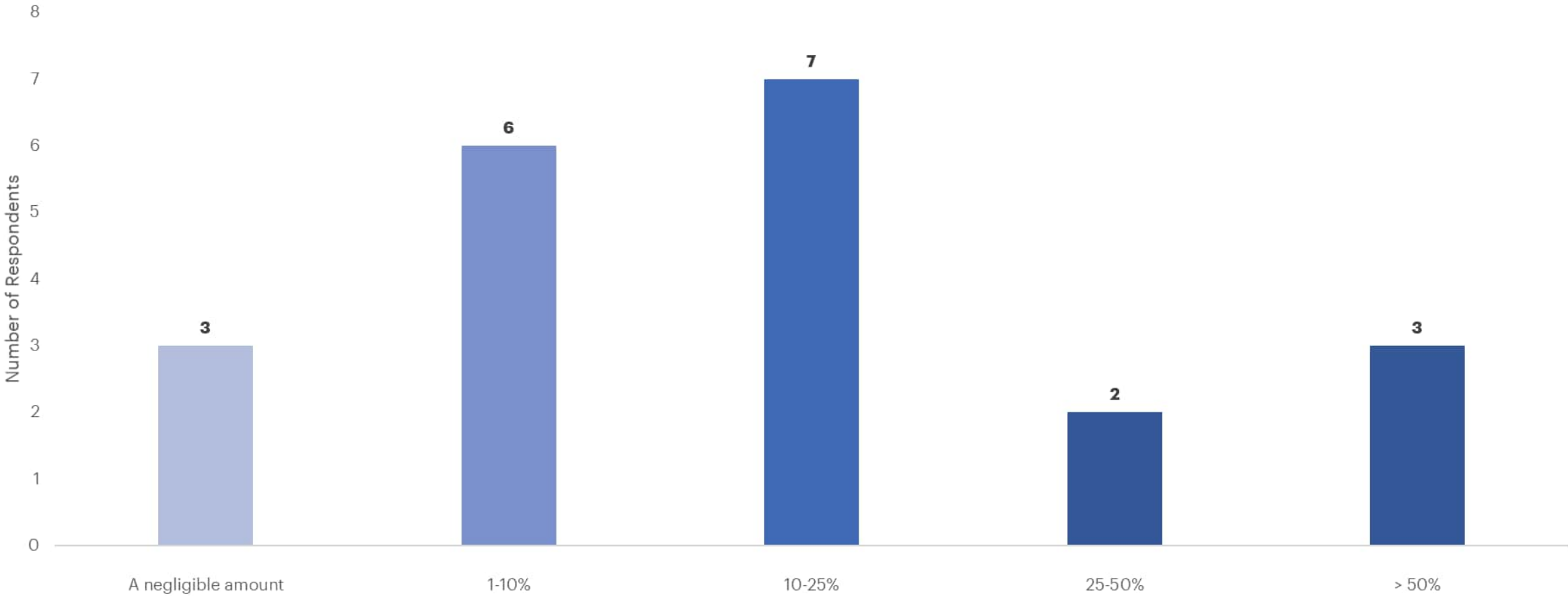
2.9) Asset Cyber Threat Monitoring

Question:	Which of the following best describes your capabilities regarding cyber threat monitoring of assets?



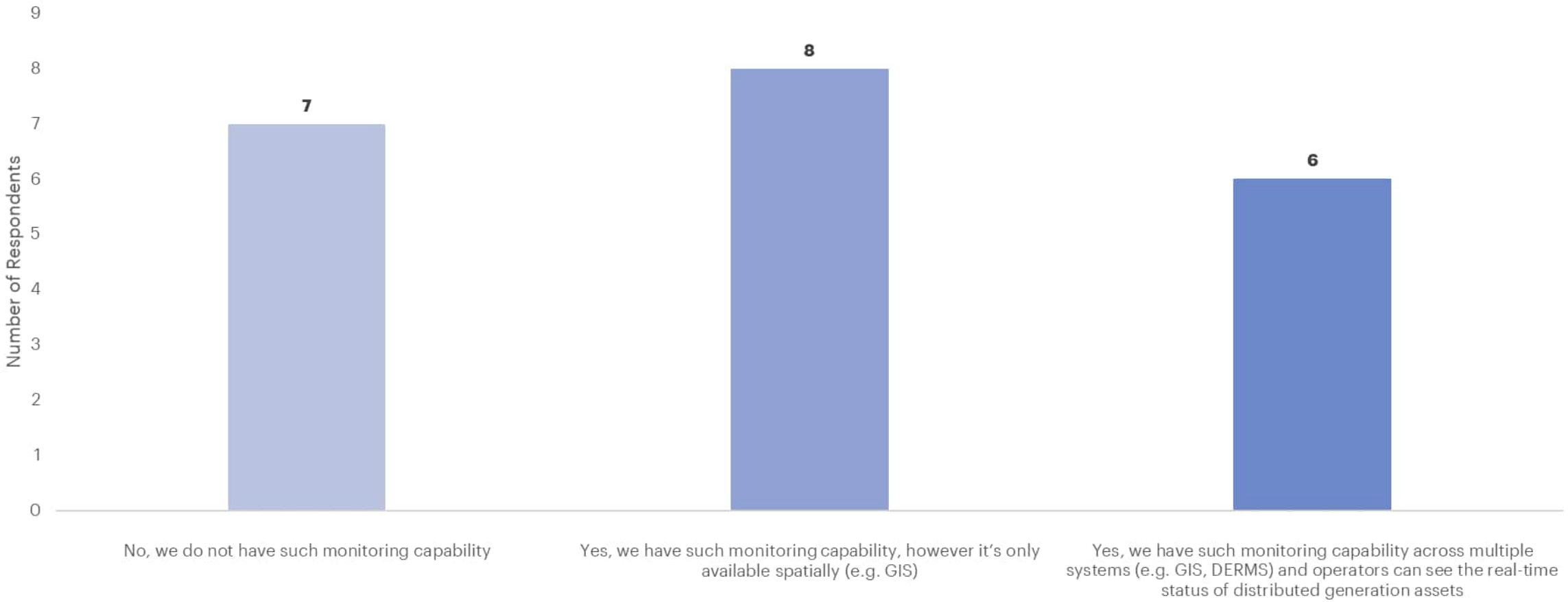
3.1) Radial System

Question:	What percentage of your customers are served by distribution backbone system that is radial (i.e., without capability of alternate feed)?



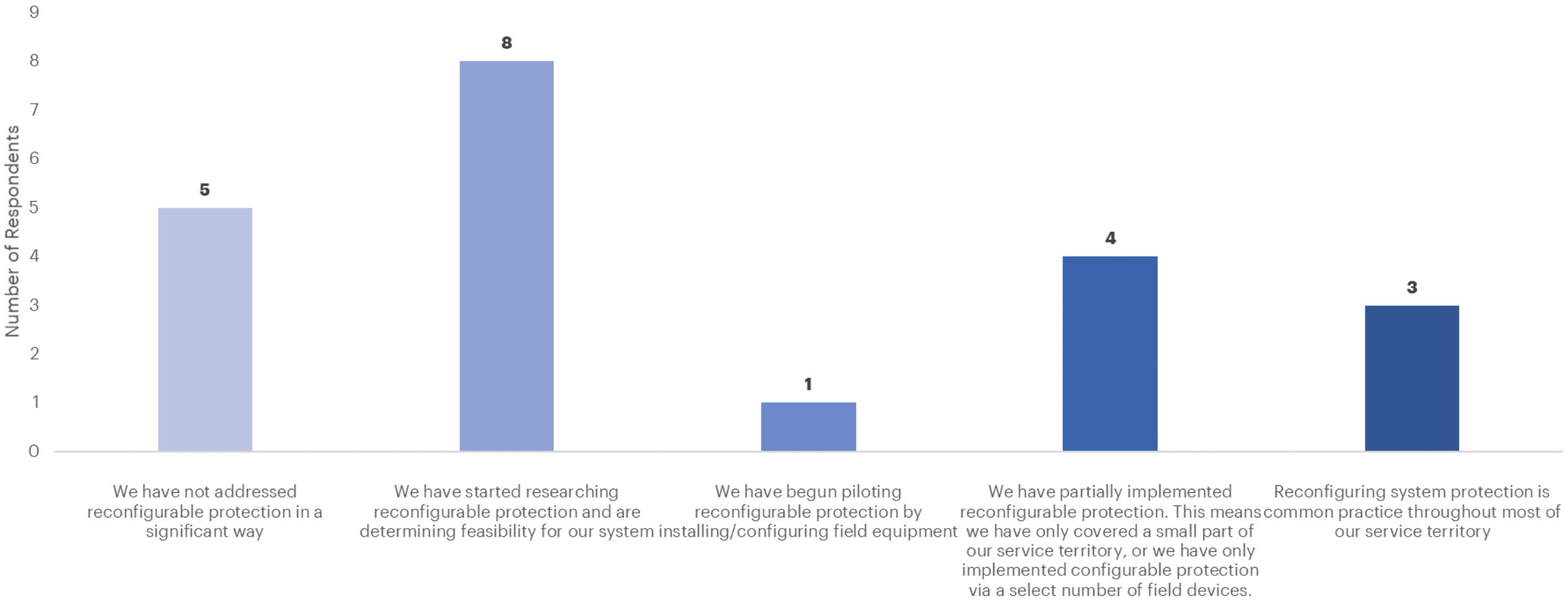
3.2) Two – Way Flow Monitoring

Question:	Do you have the monitoring capabilities that allow you to see distributed generation assets on your system?



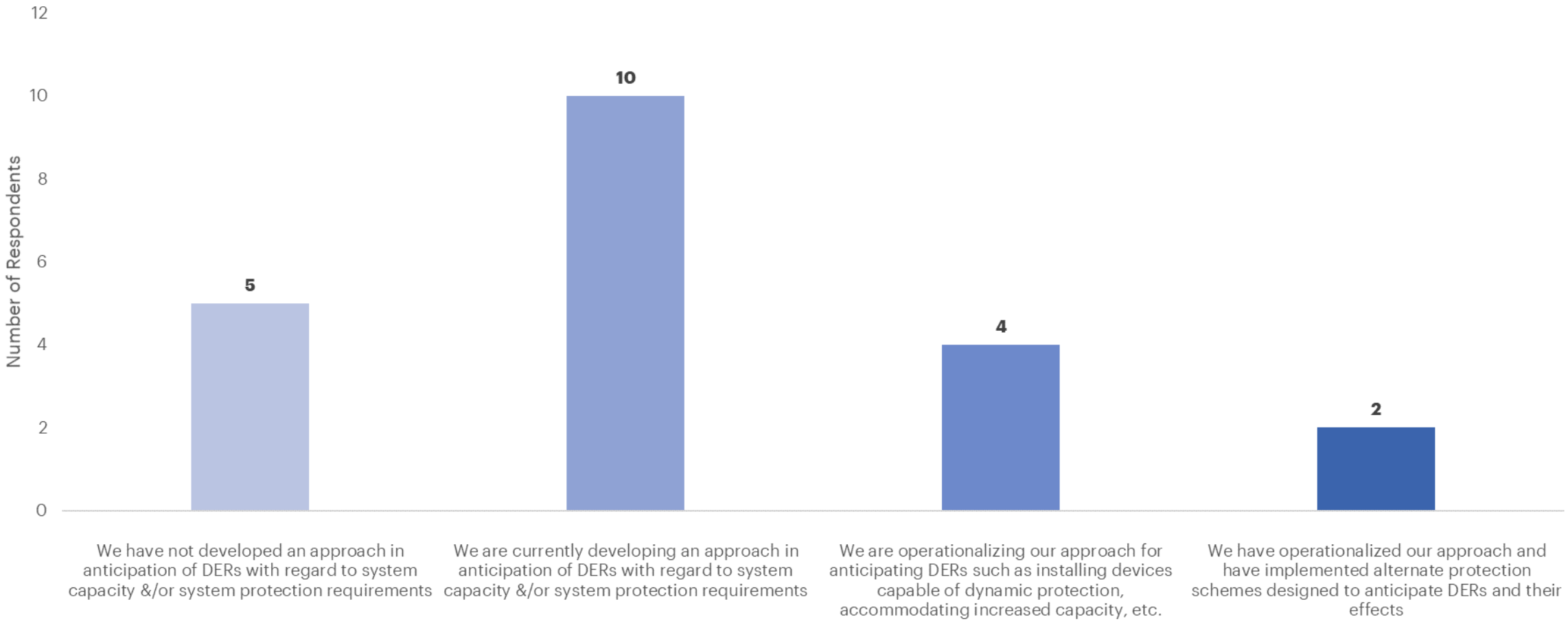
3.3) Reconfigurable Protection

Question:	Which of the following best describes your ability to reconfigure system protection as required given system dynamics?



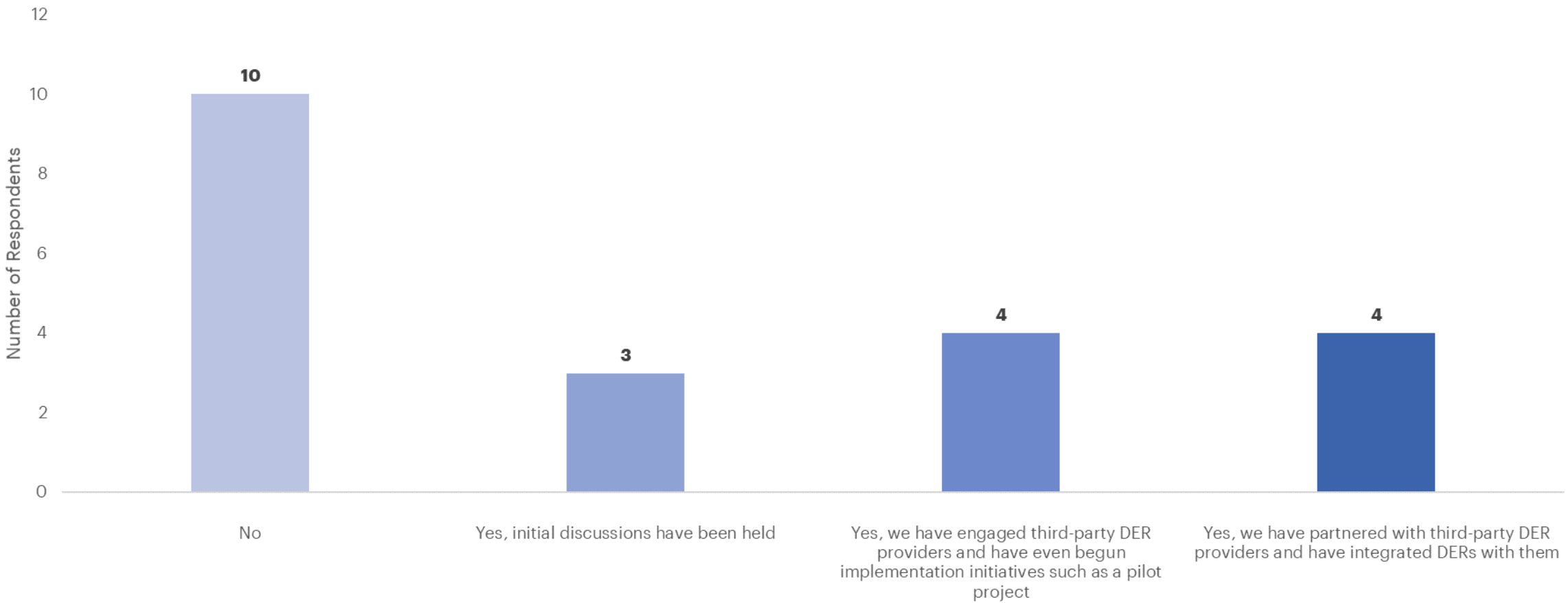
3.4) DER System Approach

Question:	Which of the following best describes your approach for anticipating changes to system capacity &/or system protection requirements due to increased DERs in your service territory?



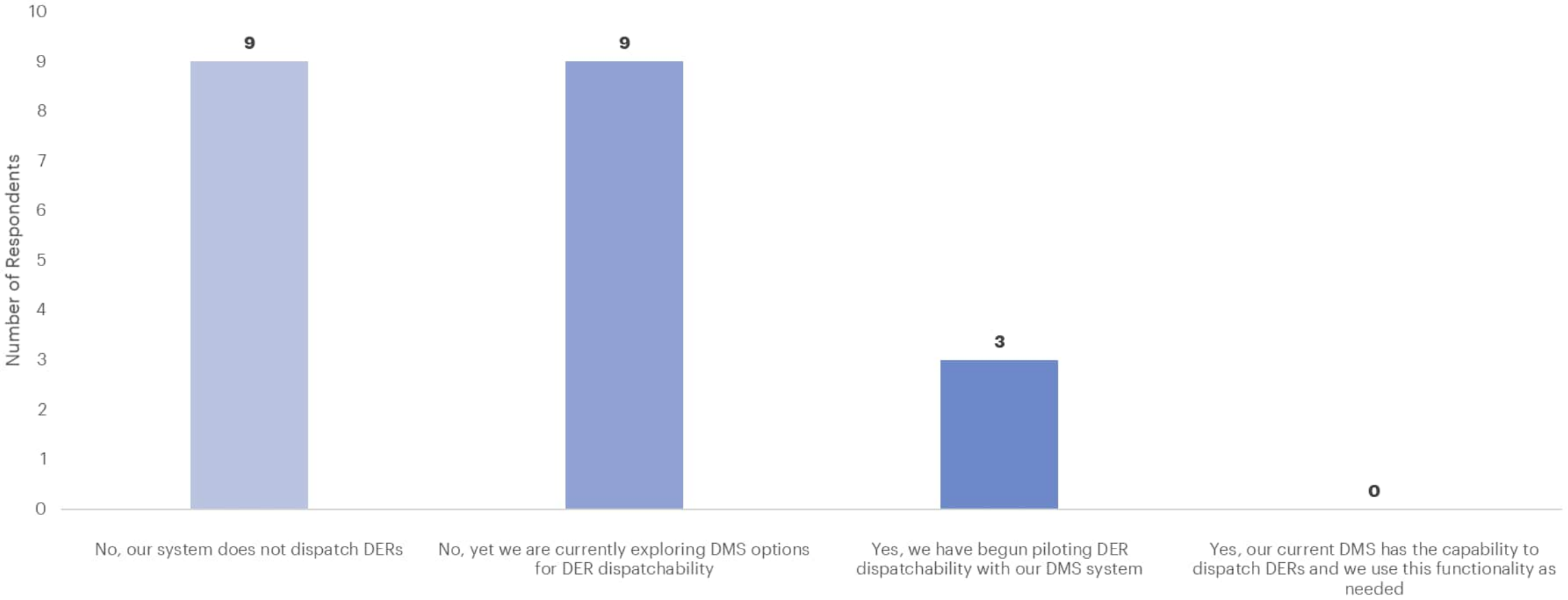
3.5) DER Providers

Question:	Are you partnering with third-party DER providers to integrate DERs in your distribution system?



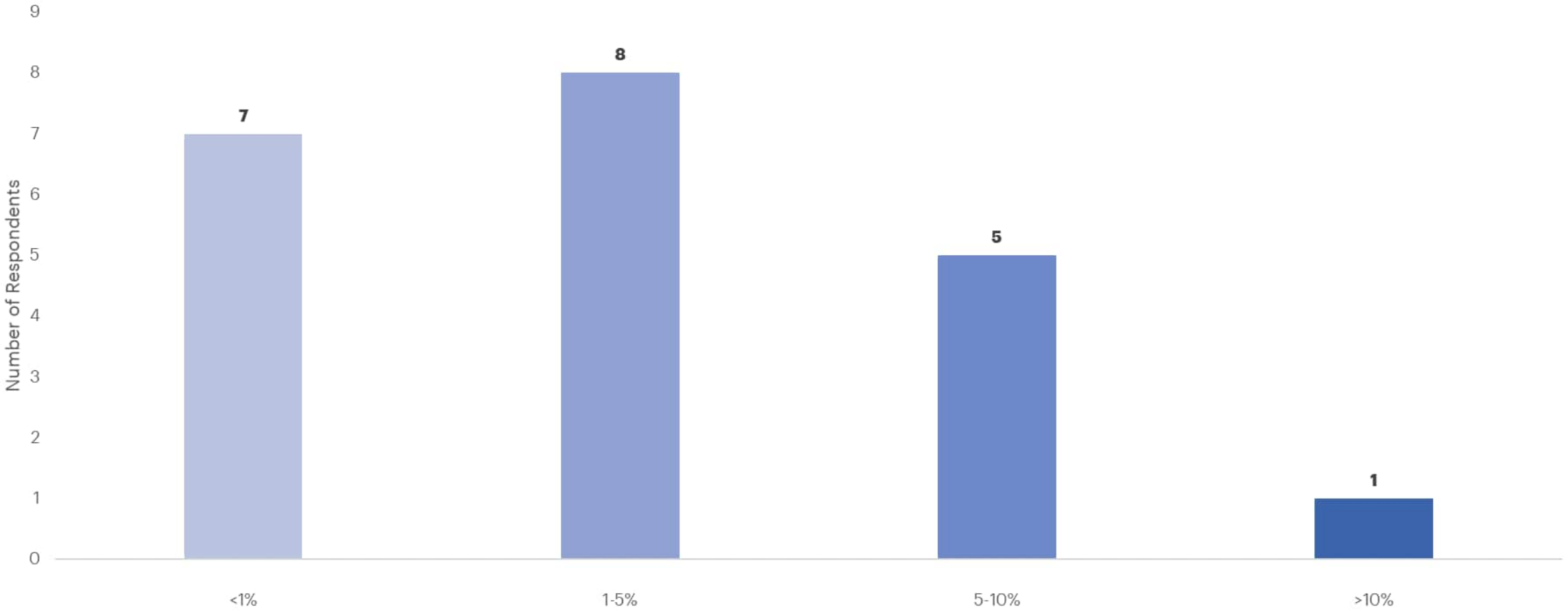
3.6) DER Dispatchability

Question:	Do you have a distribution management system (DMS) that allows for DER dispatchability?



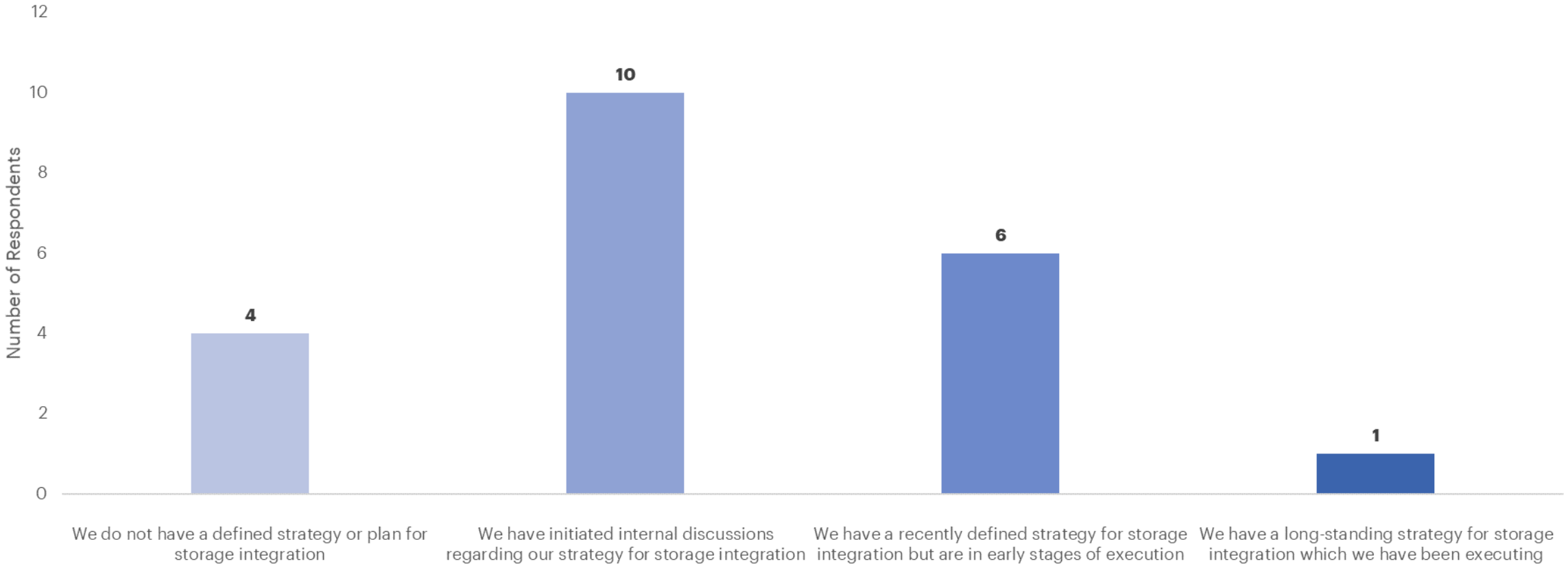
3.7) Distributed Generation

Question:	What % of your customers have customer-sited or directly connected distributed generation (e.g. solar, wind, fuel cells, etc.)?



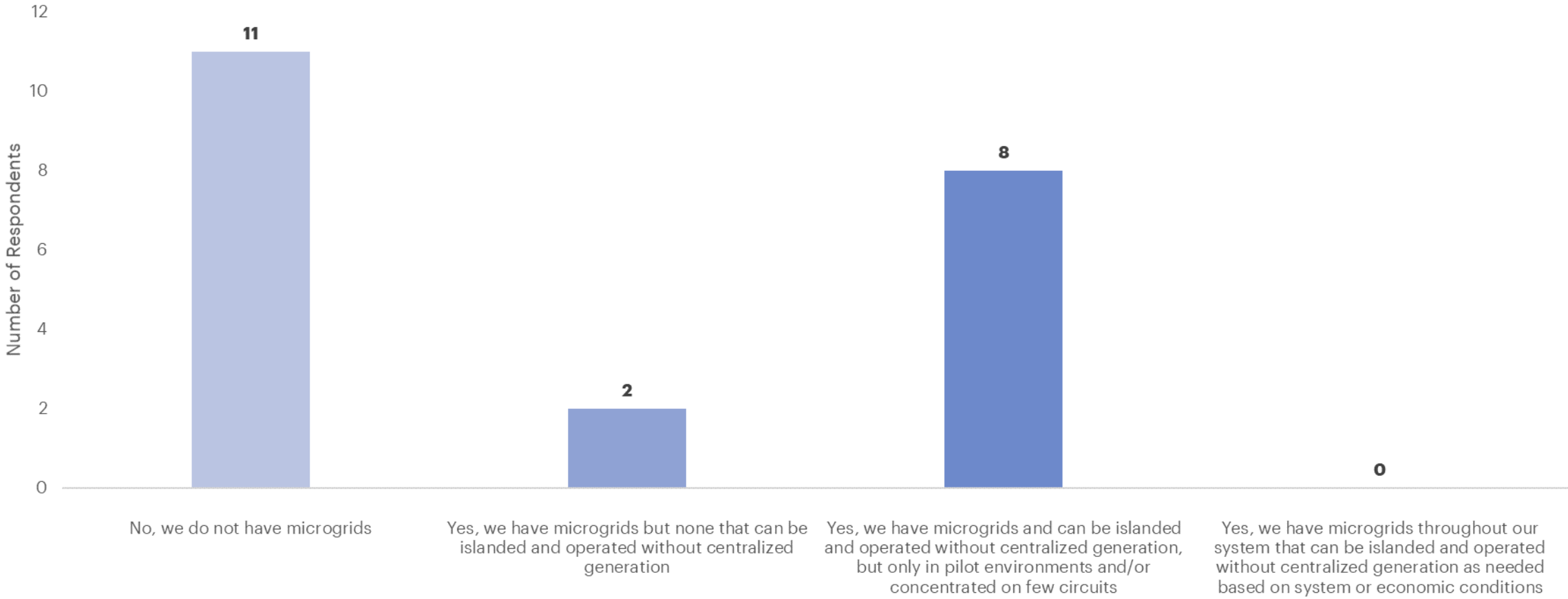
3.8) Energy Storage Strategy

Question:	Which of the following best describes the maturity of your utility's distribution level energy storage strategy? NOTE: This question refers to energy storage of your utility (not that of your customers). Examples of energy storage would include batteries (lithium ion or otherwise), fuel cells, etc.



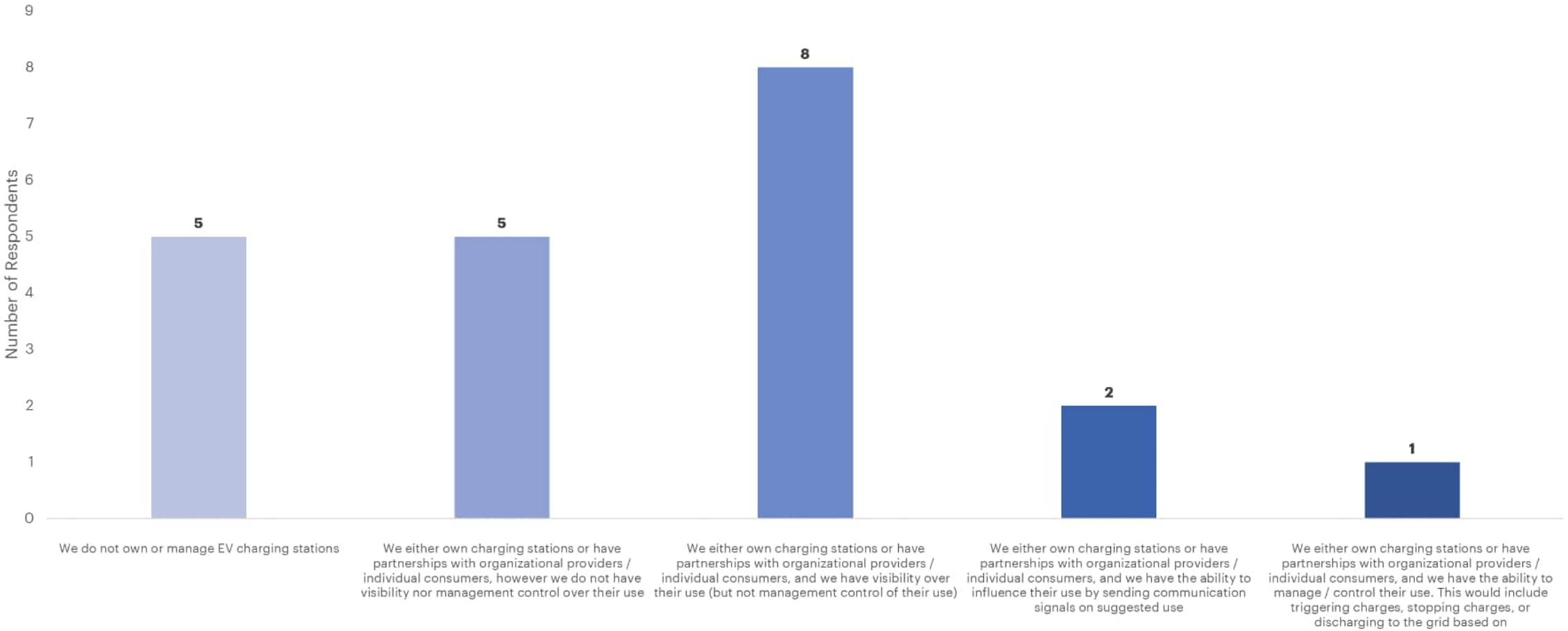
3.9) Microgrids

Question:	Do you have microgrids that can be islanded and operated without centralized generation? NOTE: This refers to microgrids which the utility controls, either by direct ownership or contract.



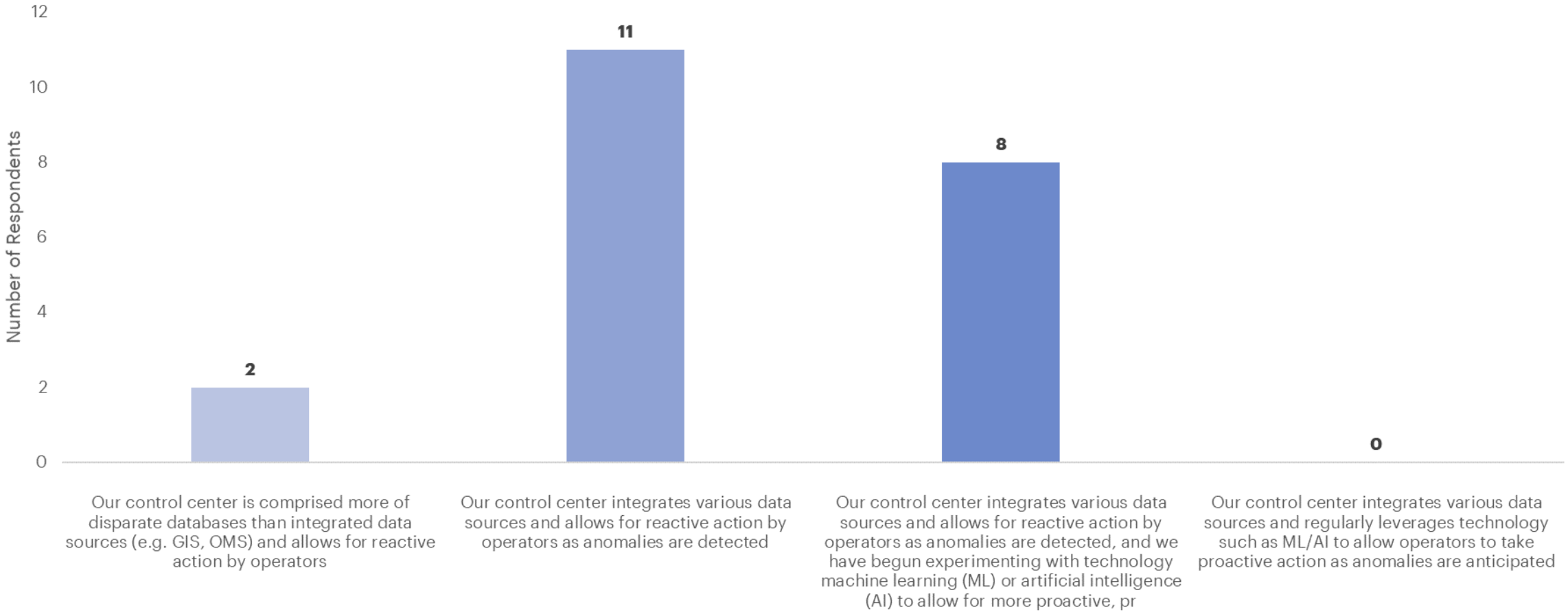
3.10) EV Charging

Question:	Which of the following best describes your electric vehicle (EV) charging capabilities?



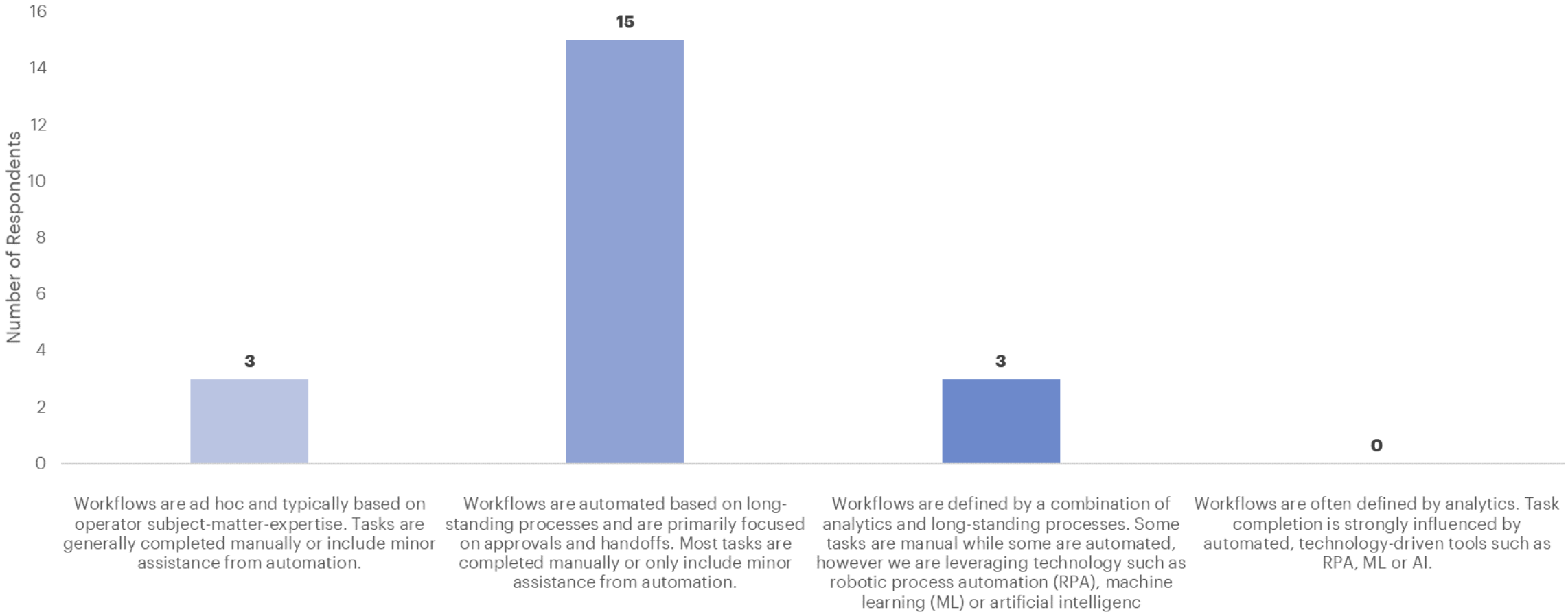
4.1) Control Center Infrastructure

Question:	Which of the following best describes the underlying infrastructure of your control center?



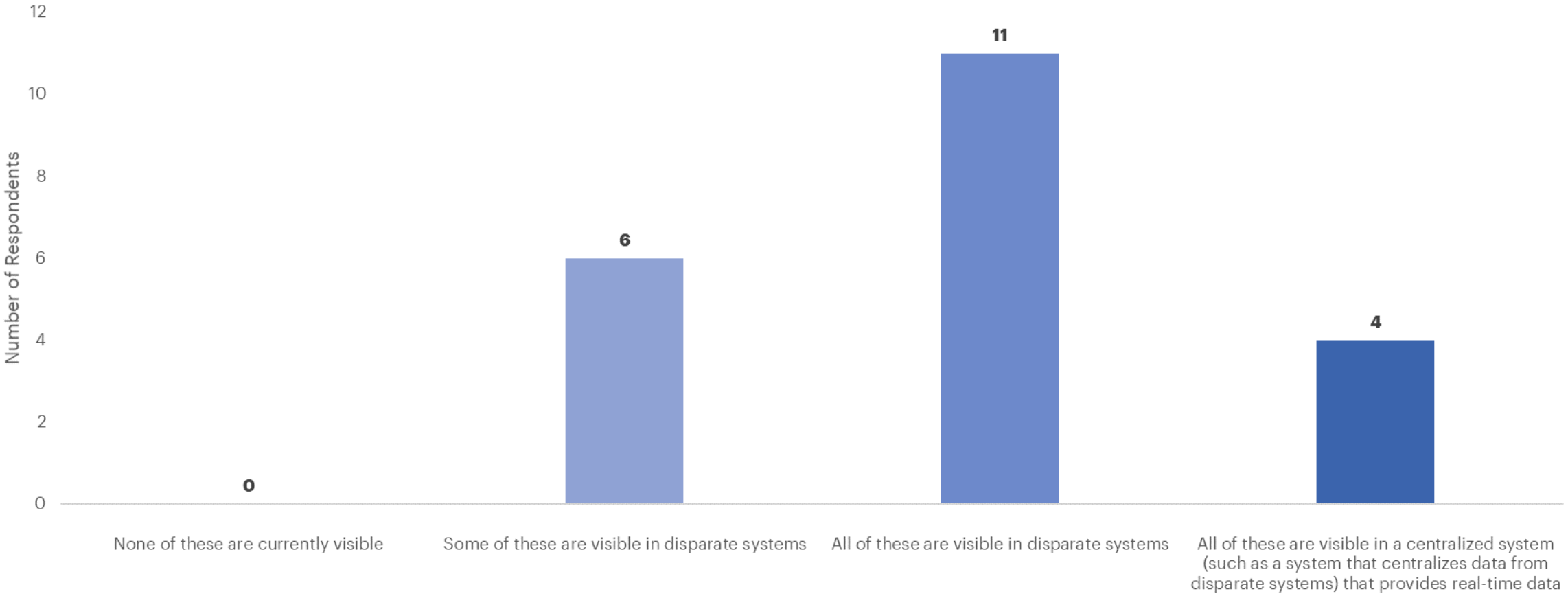
4.2) Control Center Workflows and Tasks

Question:	Which of the following best describes the workflows and tasks conducted in your control center?



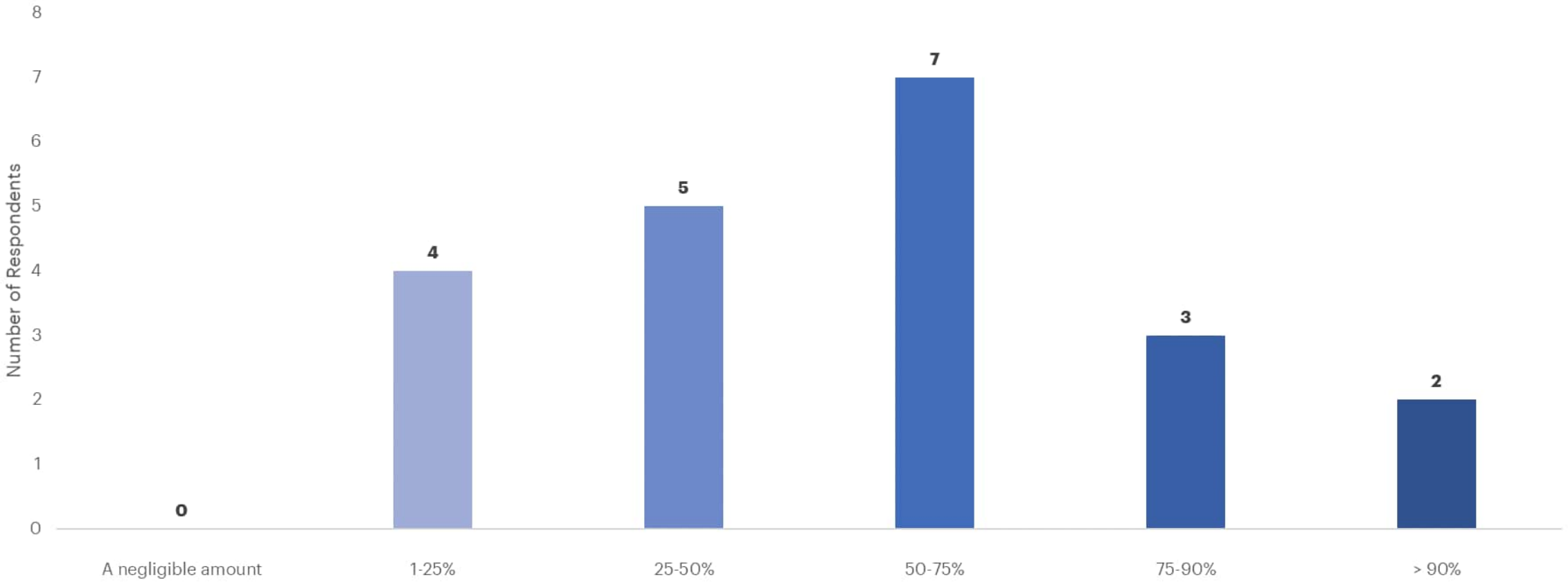
4.3) Operational Visibility

Question:	Which of the following best describes your visibility into operational activity such as customer energy usage, power flows, outages, and faults?



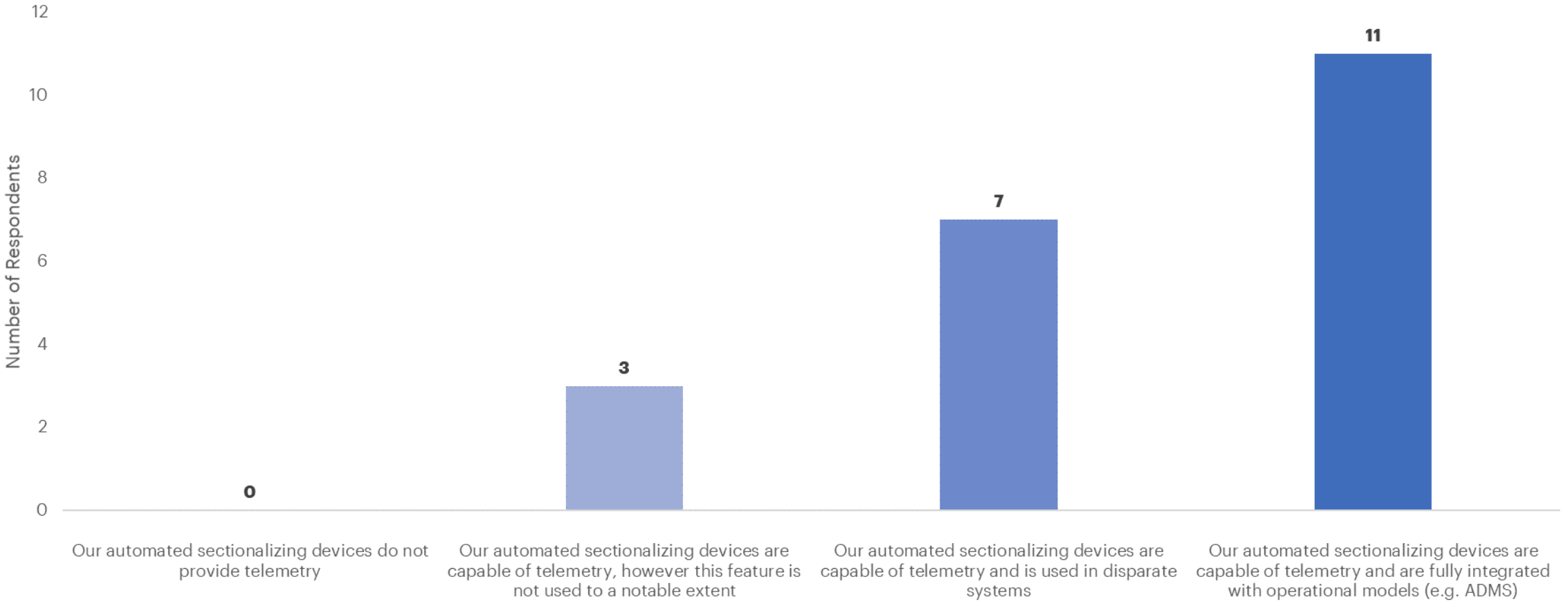
4.4) Automated Sectionalizing Devices

Question:	What percentage of your feeders have automated sectionalizing devices? NOTE: The entire feeder does not need to contain automated sectionalizing devices—partial coverage with automated sectionalizing devices suffices for this question.



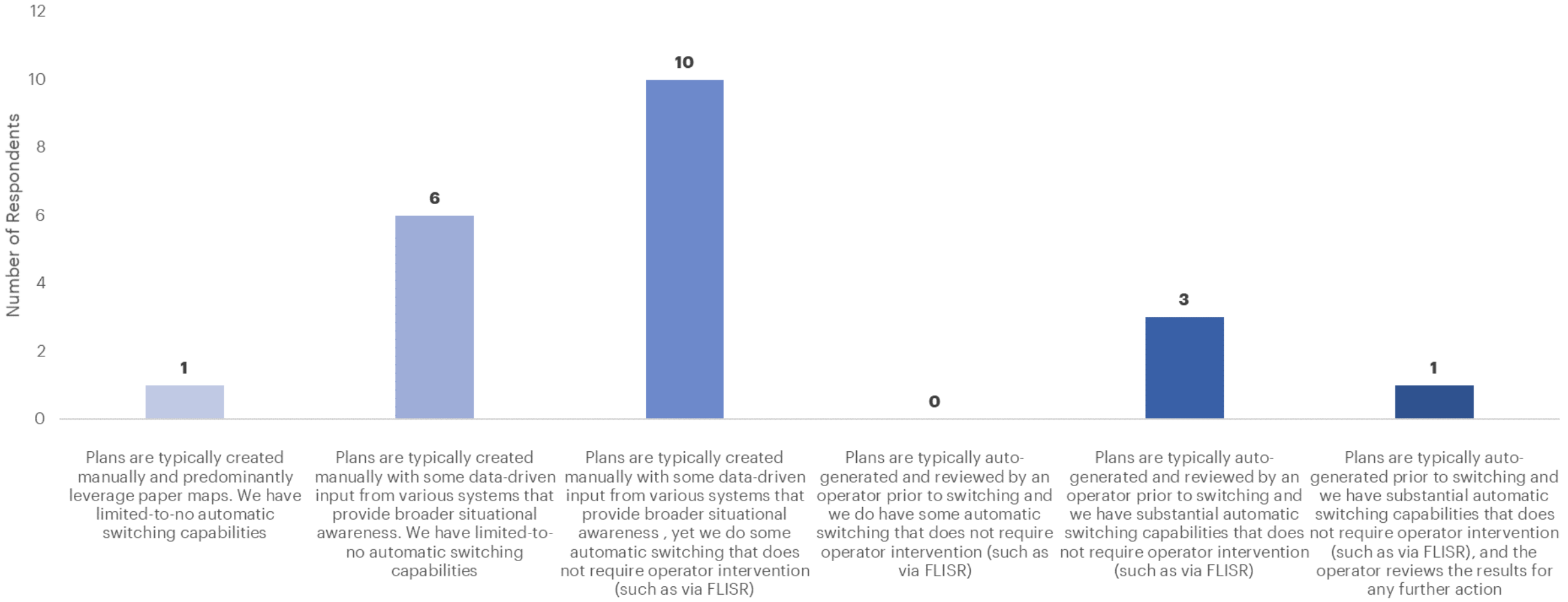
4.5) Connectivity of Automated Sectionalizing Devices

Question:	Which of the following best describes the connectivity and use of automated sectionalizing devices? NOTE: Below, “telemetry” refers to any measurement or status information gathered from the automated sectionalizing device.



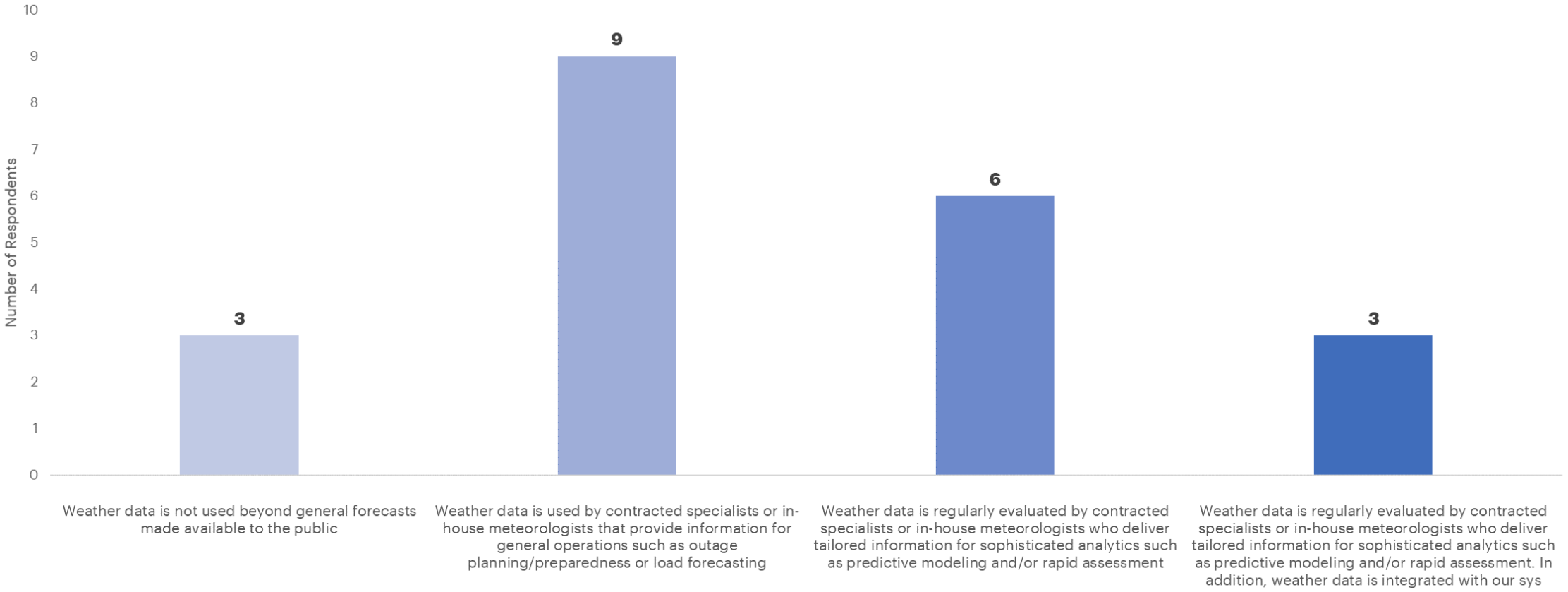
4.6) Switch Plan Creation & Execution

Question:	How are your switch plans created and executed for outage restoration?



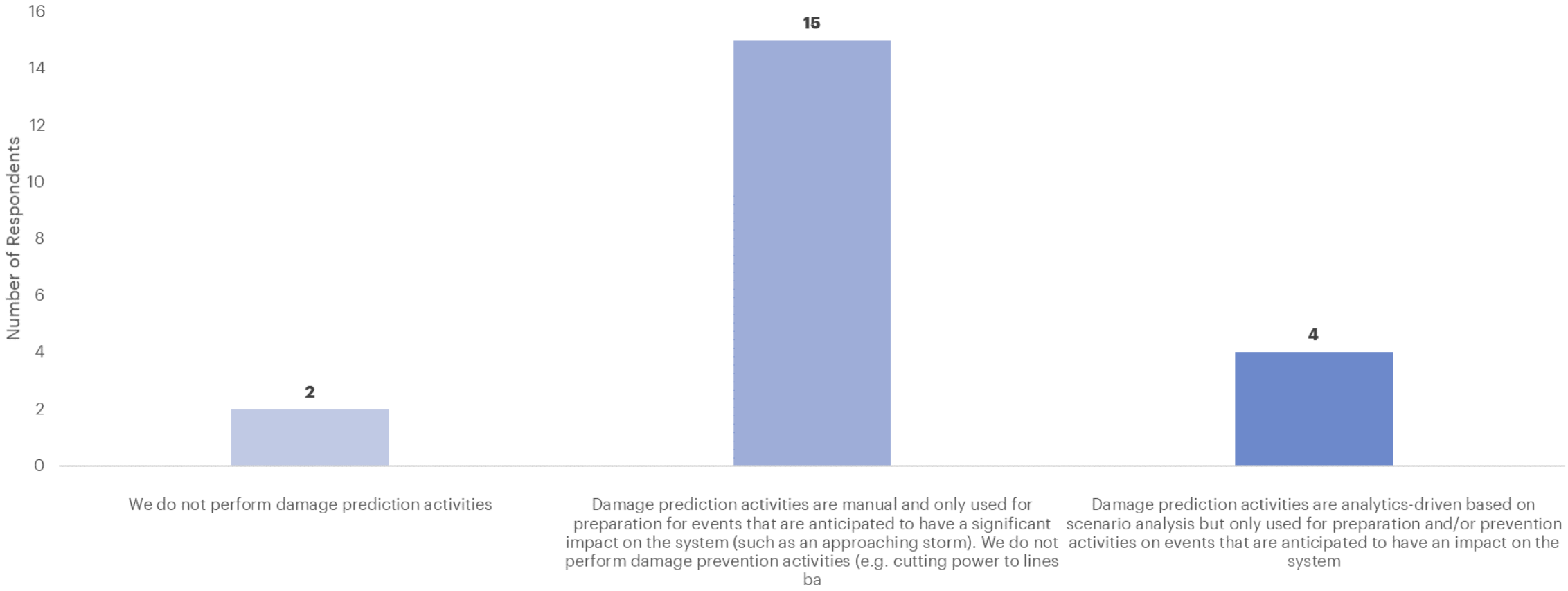
4.7) Weather Data

Question:	To what degree is weather data integrated into your operations (such as storm/wildfire preparations, damage prediction or damage assessment)?



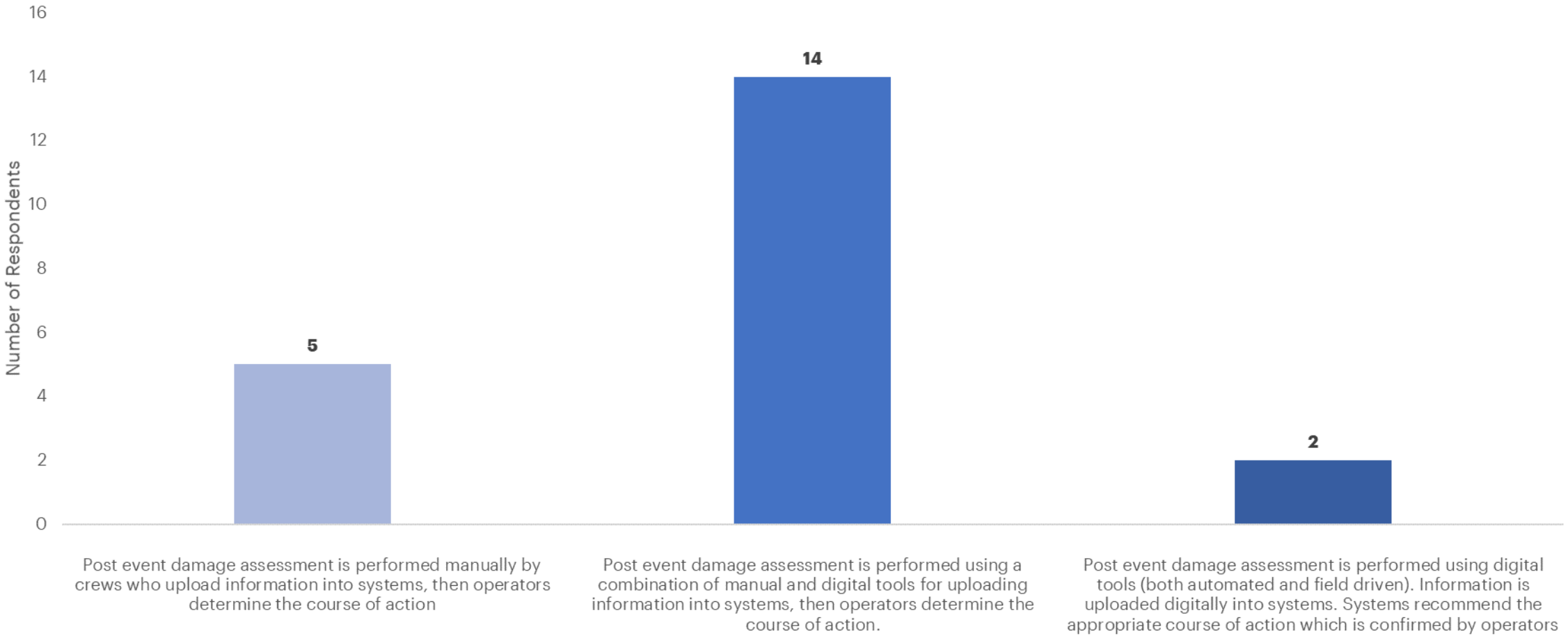
4.8) Major Event Damage Prediction and Prevention

Question:	Which of the following best describes your approach to damage prediction and prevention for major events?



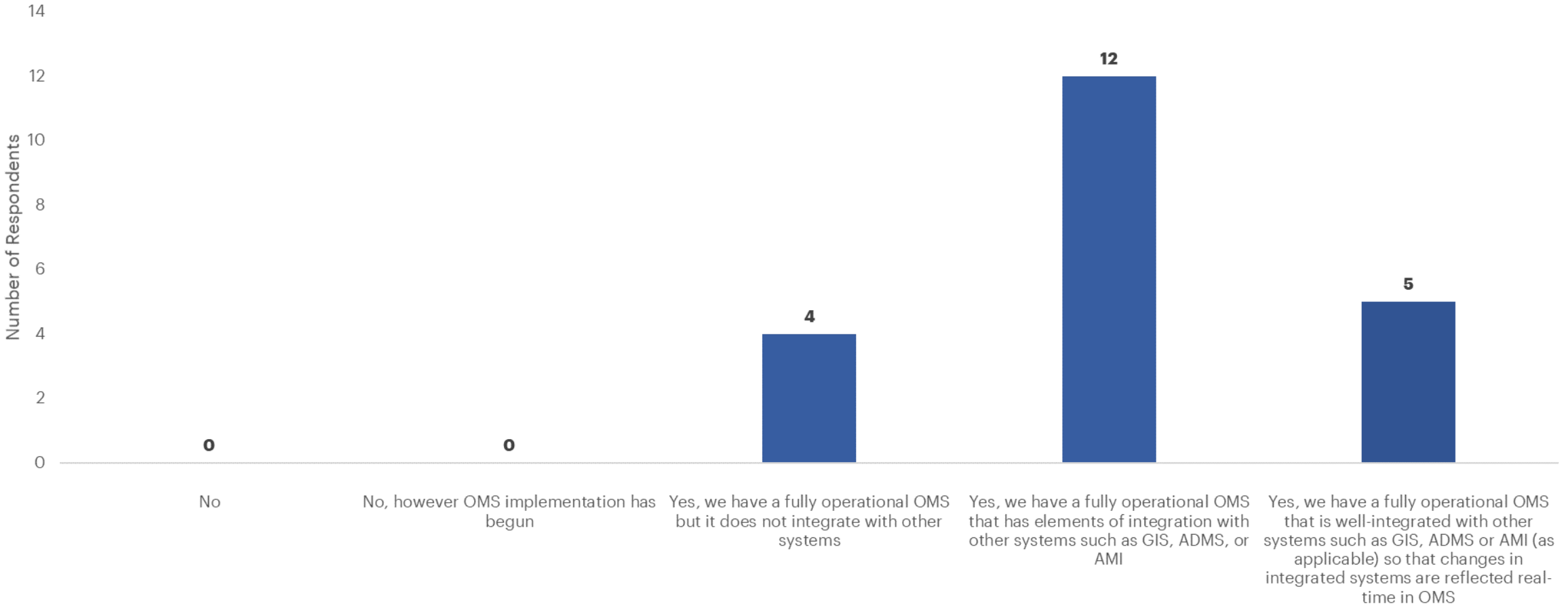
4.9) Major Event Damage Assessment

Question:	Which of the following best describes your damage assessment methods for major events?



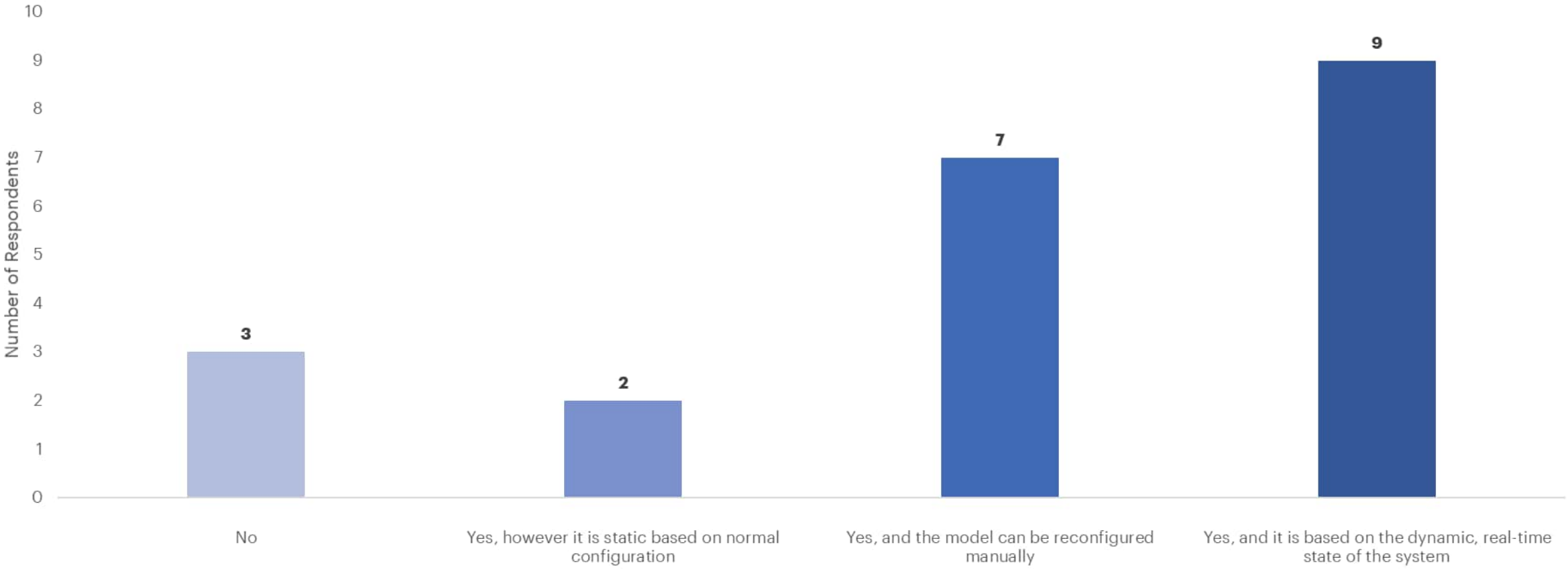
4.10) OMS

Question:	Do you have an outage management system (OMS)?



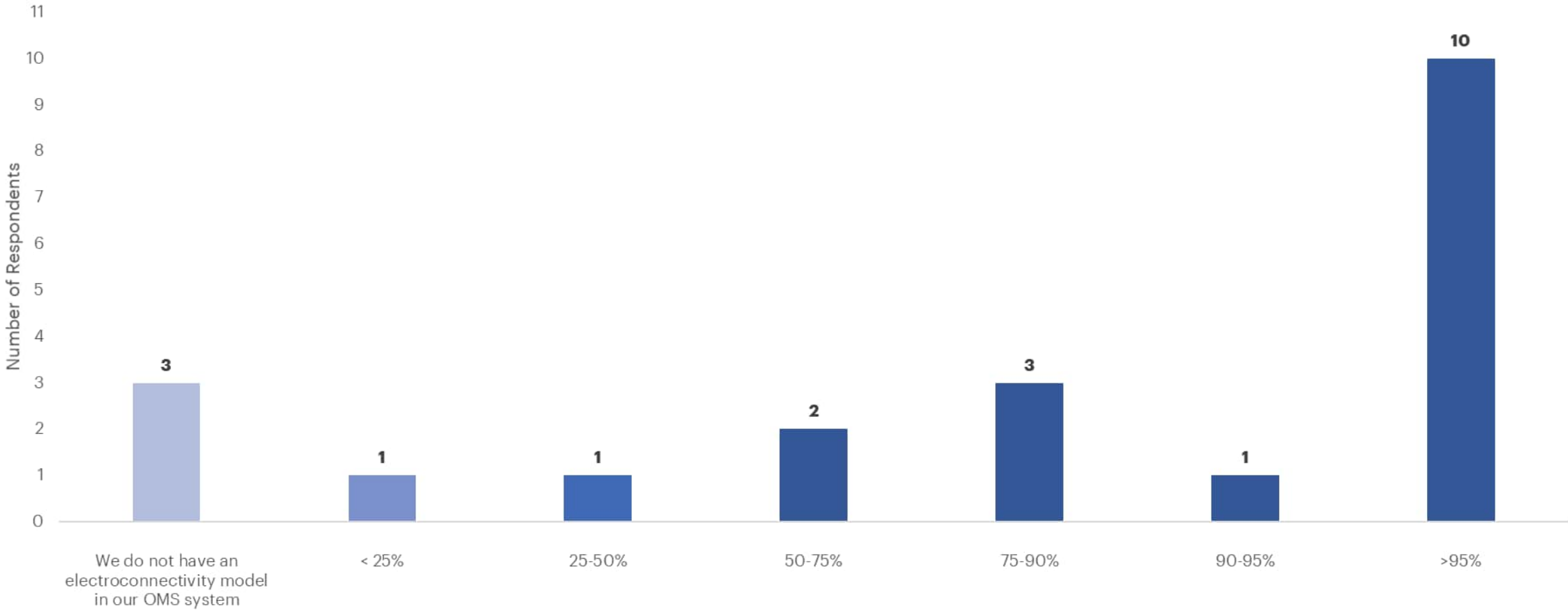
4.11) OMS Electroconnectivity

Question:	Does your OMS have an electroconnectivity model?



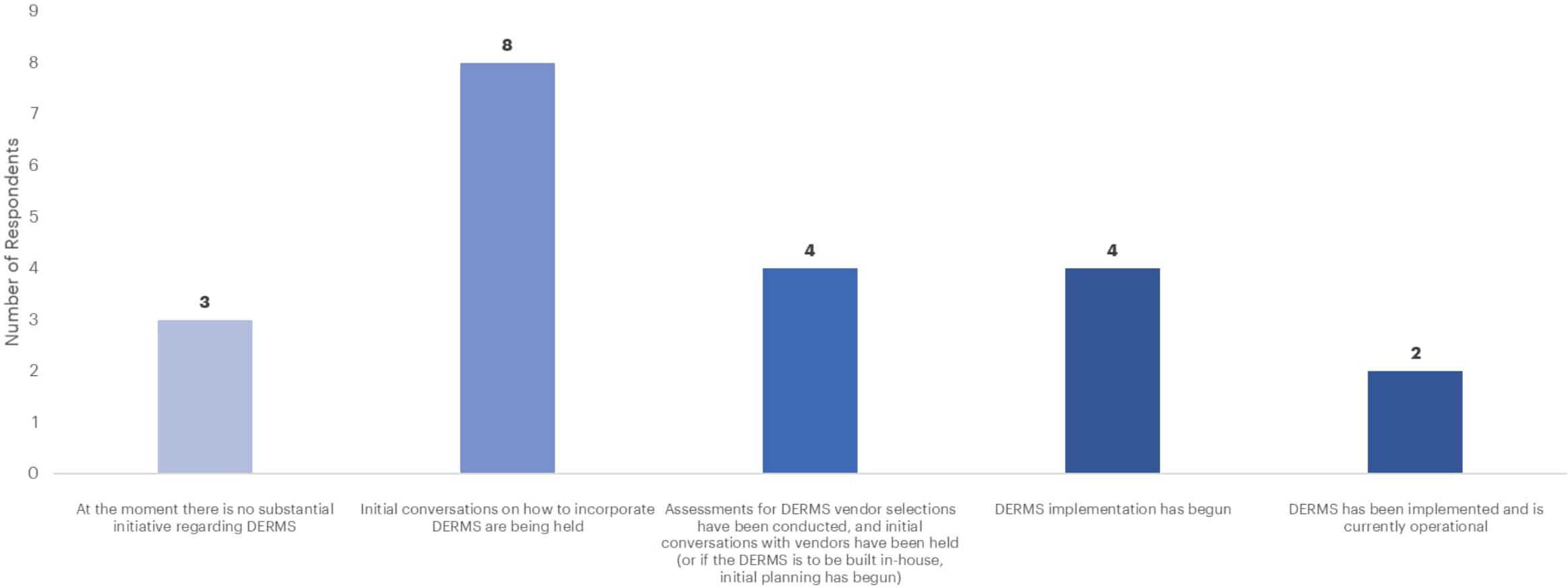
4.12) OMS Connectivity

Question:	How much of your system is modeled in your electroconnectivity model in your OMS system?



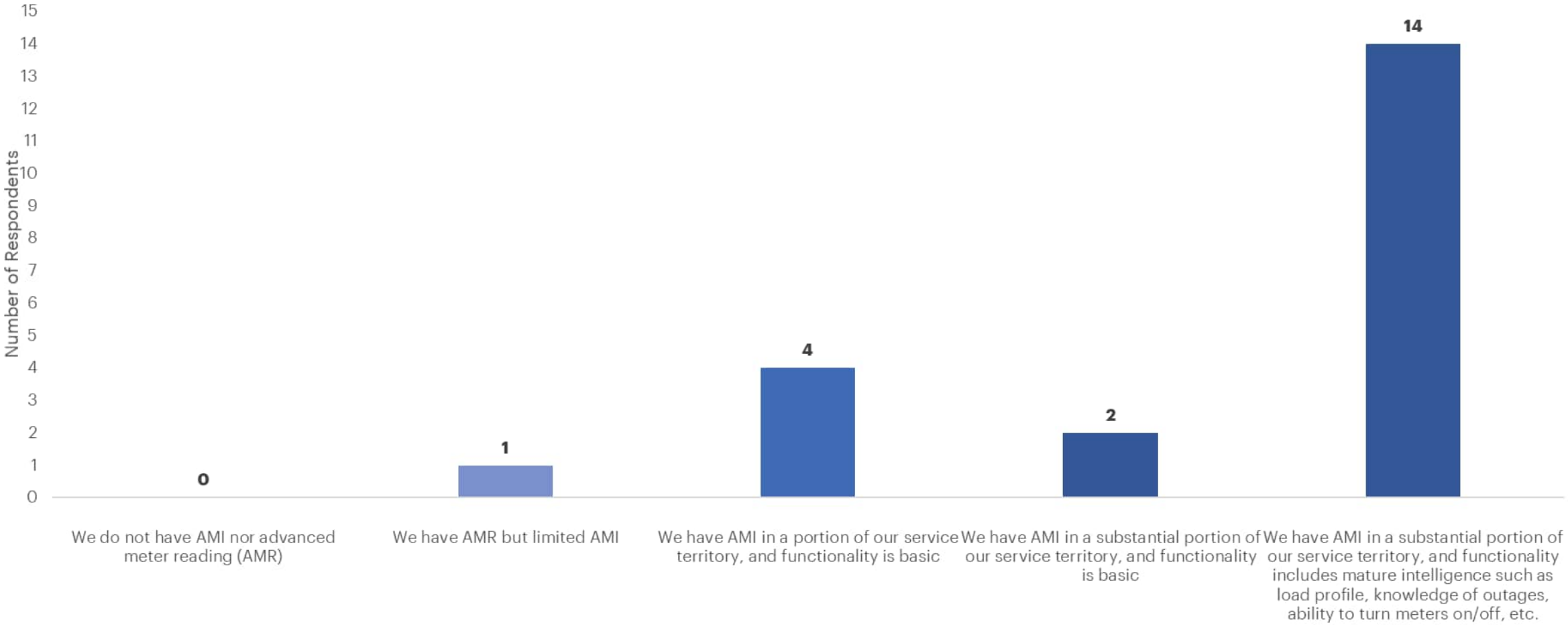
4.13) DERMS

Question:	Which of the following best describes your current state regarding a distributed energy resource management system (DERMS)? NOTE: This question does not necessarily refer to a unique DER management system, as some advanced distribution management systems (ADMSs) have features which address DER integration.



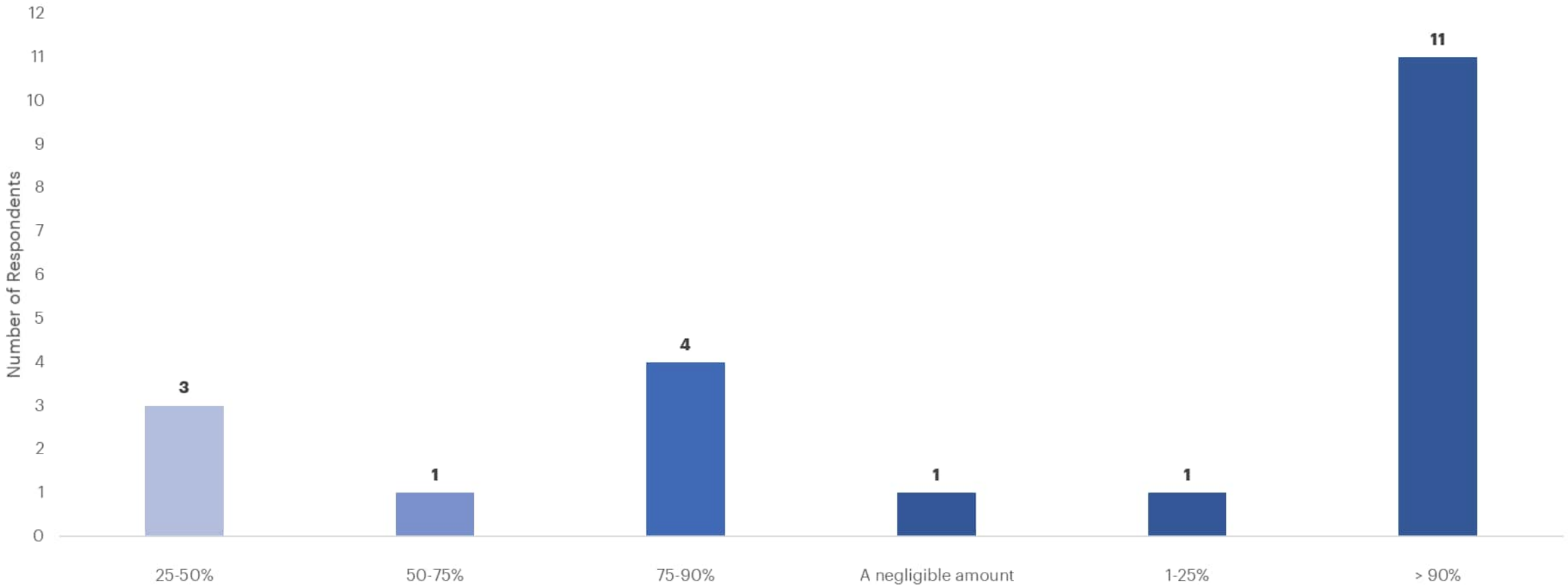
4.14) AMI

Question:	Which of the following best describes your advanced metering infrastructure (AMI)?



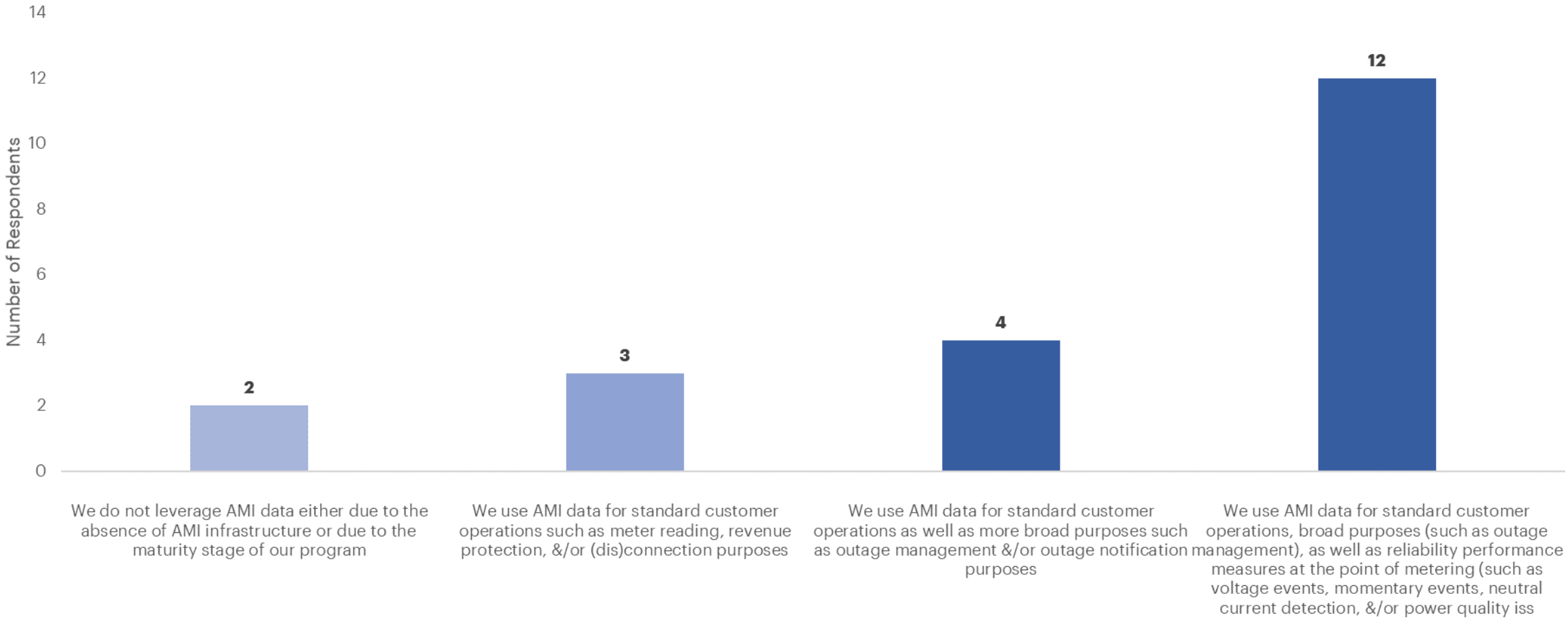
4.15) AMI Coverage

Question:	What percentage of your customer base is covered by AMI?



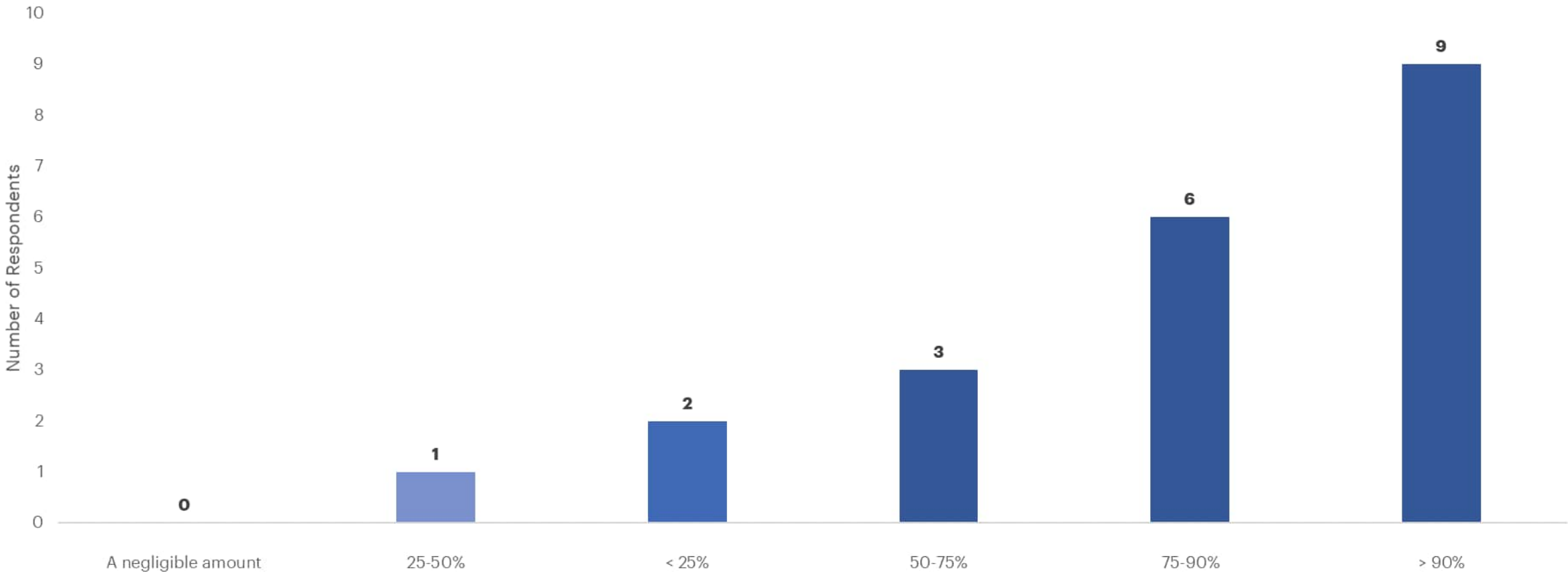
4.16) AMI Data Usage

Question:	Which of the following best describes usage of data and analytics from your AMI system?



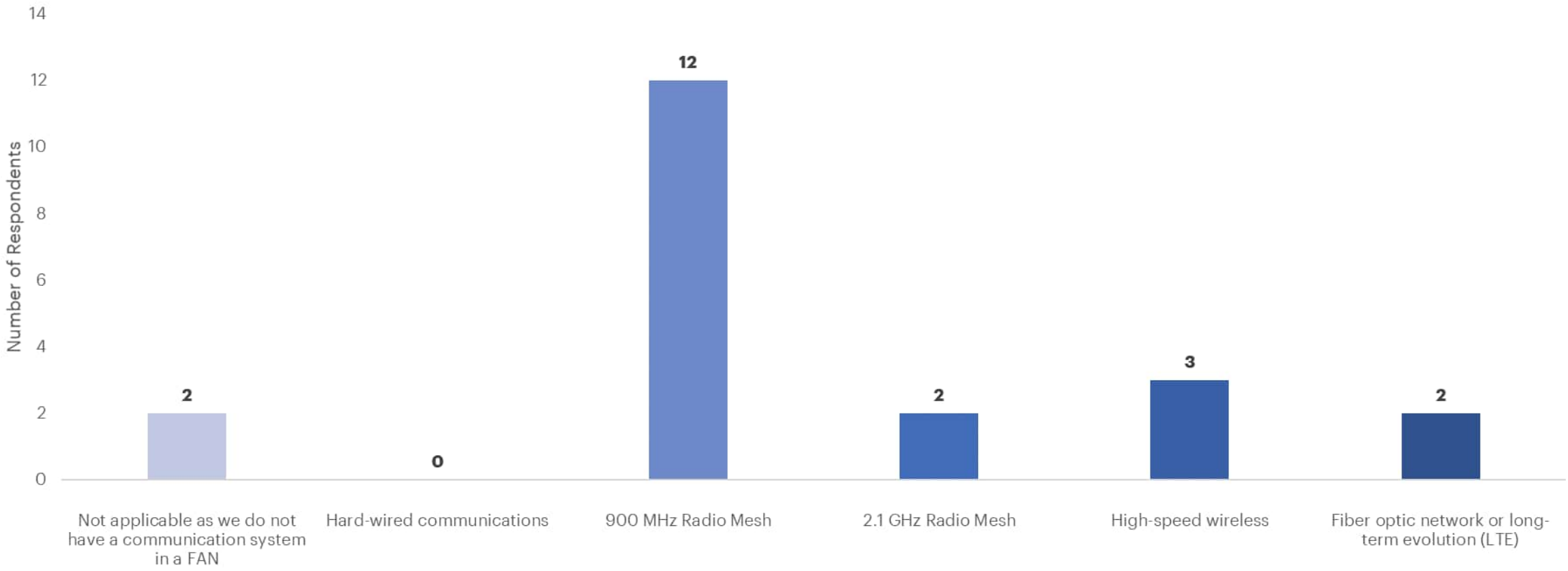
4.17) SCADA

Question:	What percentage of your substations that serve distribution are covered by SCADA? NOTE: Here, a substation that serves distribution is defined as having a distribution-level output voltage (approximately 12 to 25kV).



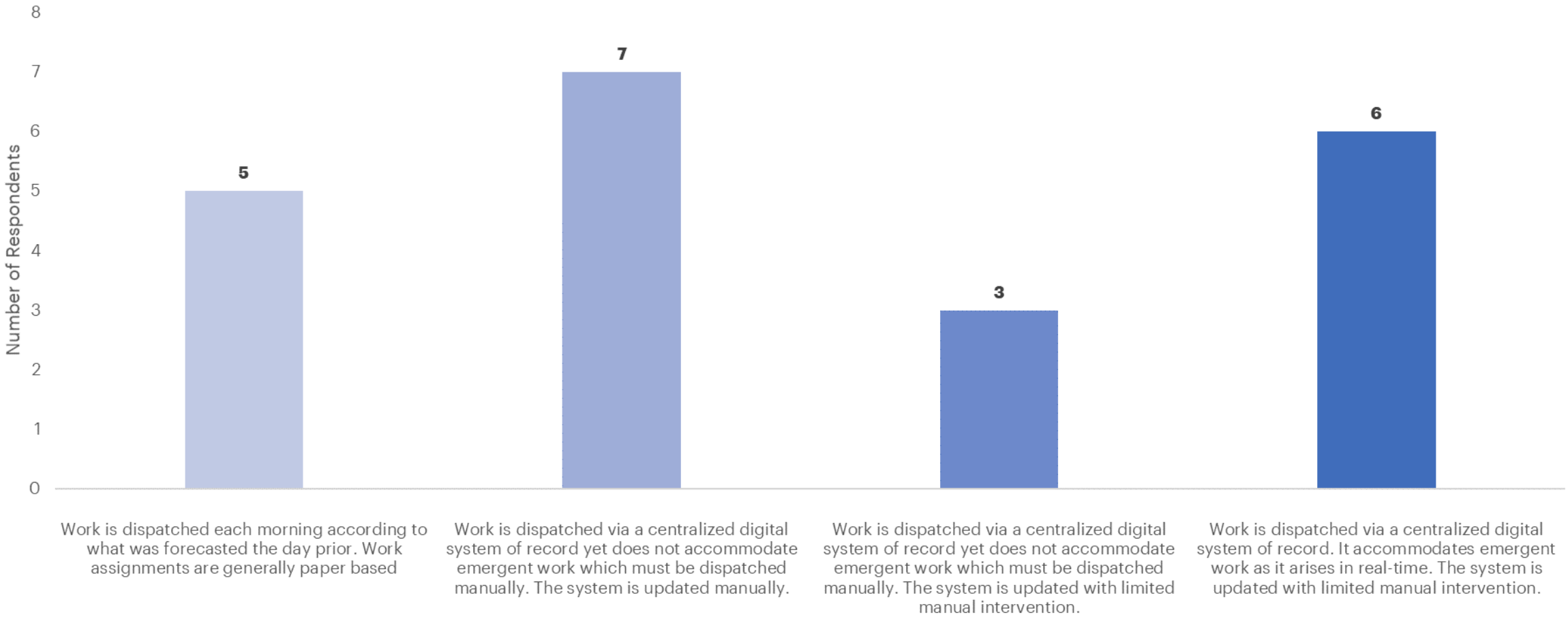
4.18) FAN Communication

Question:	What type of device-to-device communication system is most prominent in the field area network (FAN)?



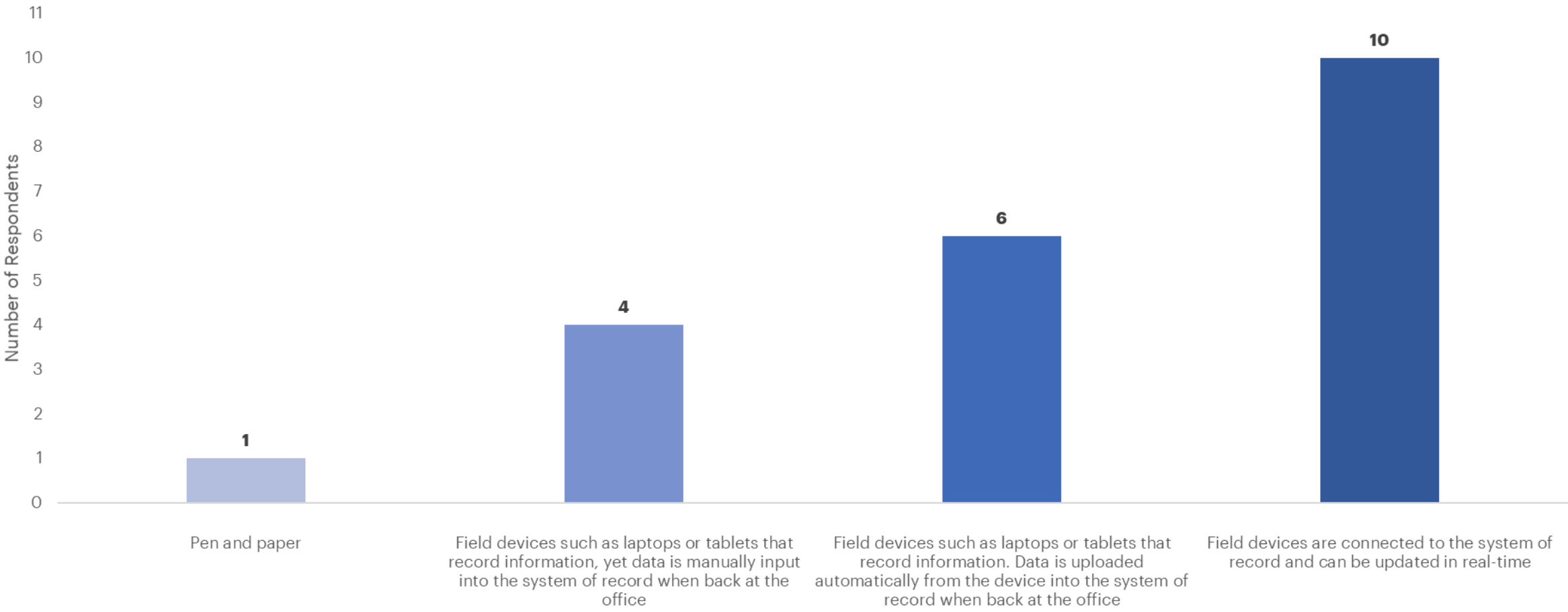
5.1) Field Work Dispatch

Question:	Which of the following best describes your field work assignment methods? NOTE: This is in reference to dispatch of your own employee workforce (as opposed to contractors) during blue sky days (as opposed to during restoration work).



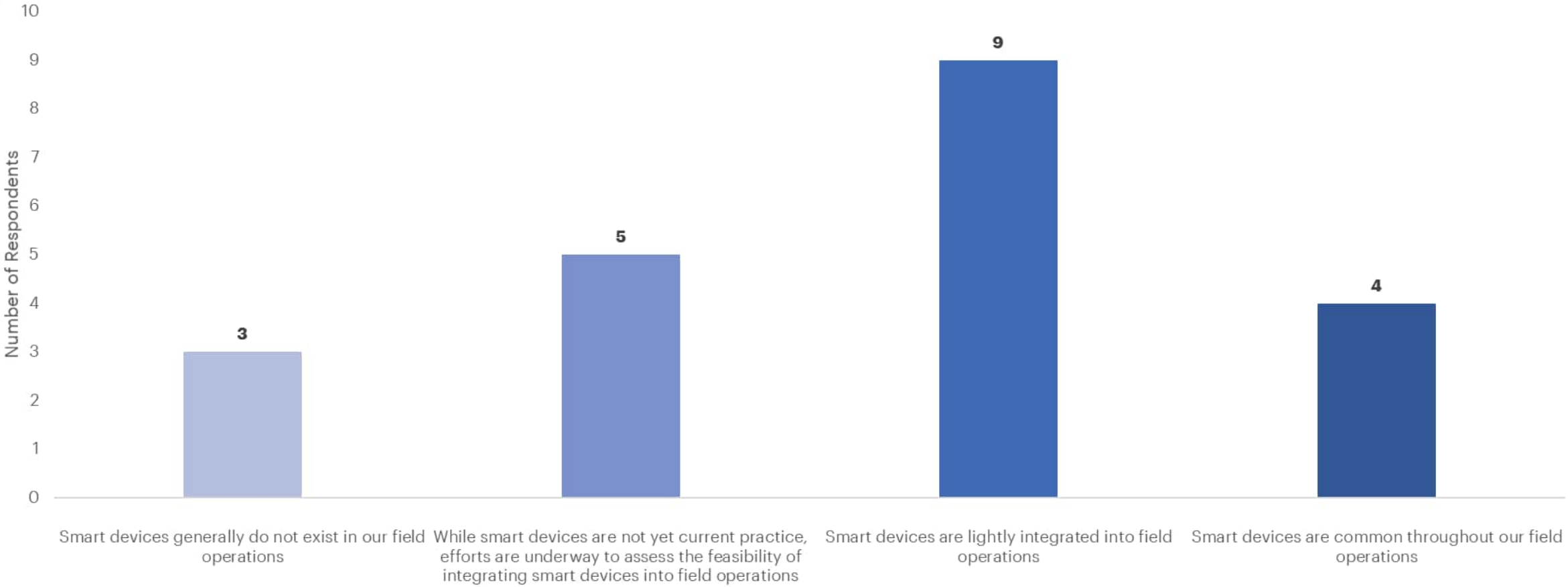
5.2) Field Data Recording

Question:	What is the most common medium used by field employees for recording field data?



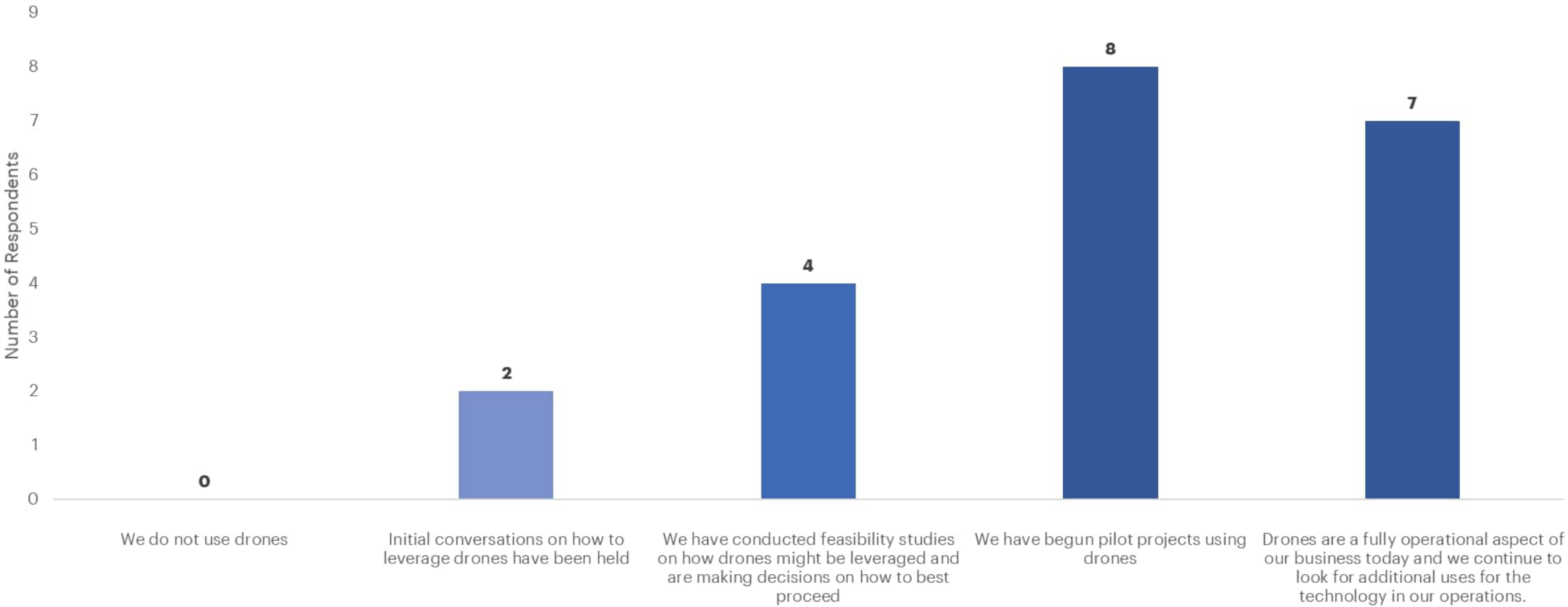
5.3) Smart Devices

Question:	How prevalent are smart devices in your field operations? NOTE: Here, "smart devices" refer to machinery/equipment that replaces human intervention (for the sake of safety &/or efficiency) such as a probe that sits inside a transformer and communicates an issue to field operations in lieu of conducting oil tests manually



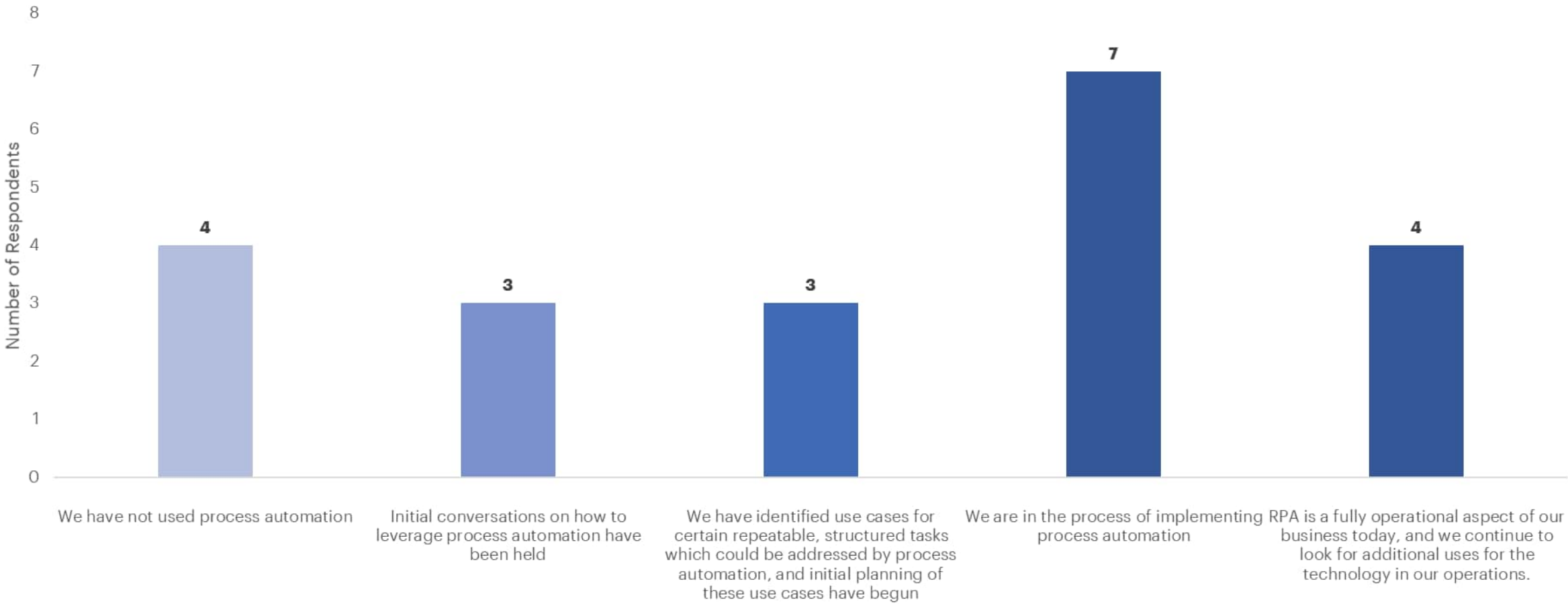
5.4) Drones

Question:	Which of the following best describes your use of drones for tasks such as inspections or damage assessments?



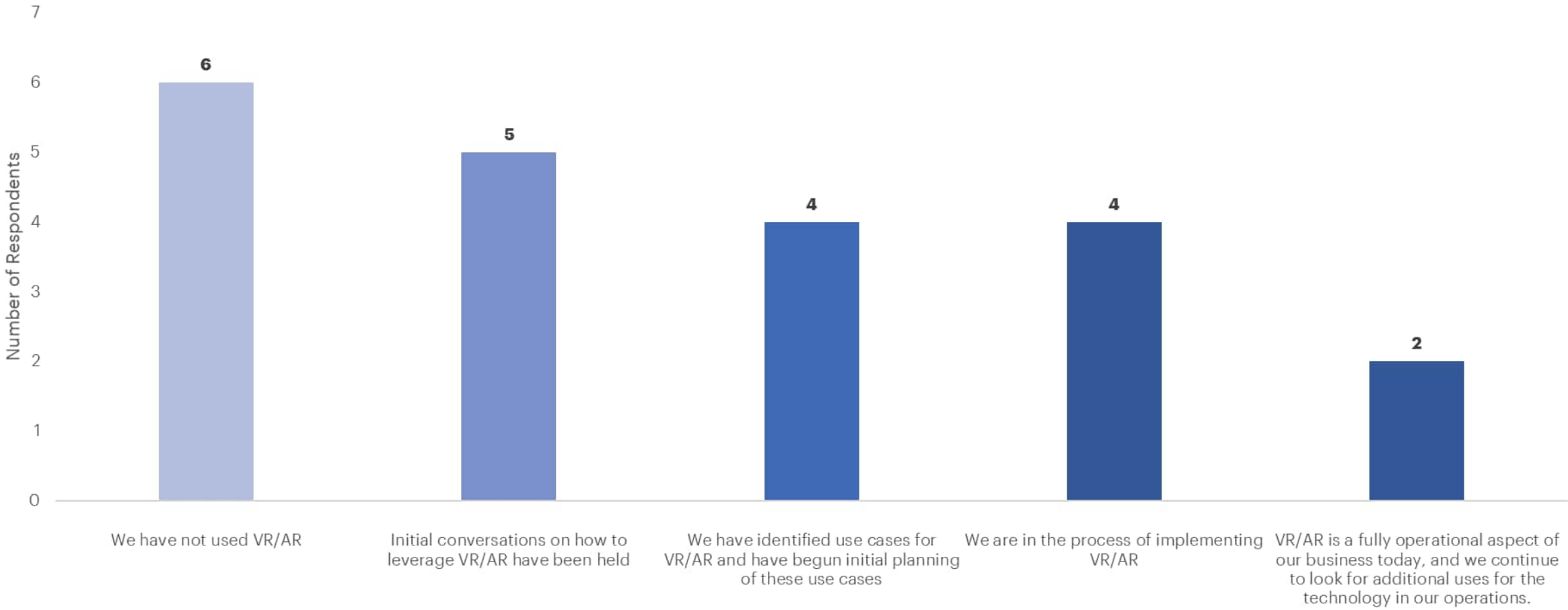
5.5) Process Automation Technology

Question:	Which of the following best describes the integration of process automation technology within your business, such as bots or robotic process automation (RPA)? NOTE: Process automation refers to the use of technology such as a bot or robotic process automation (RPA) to automate tasks.



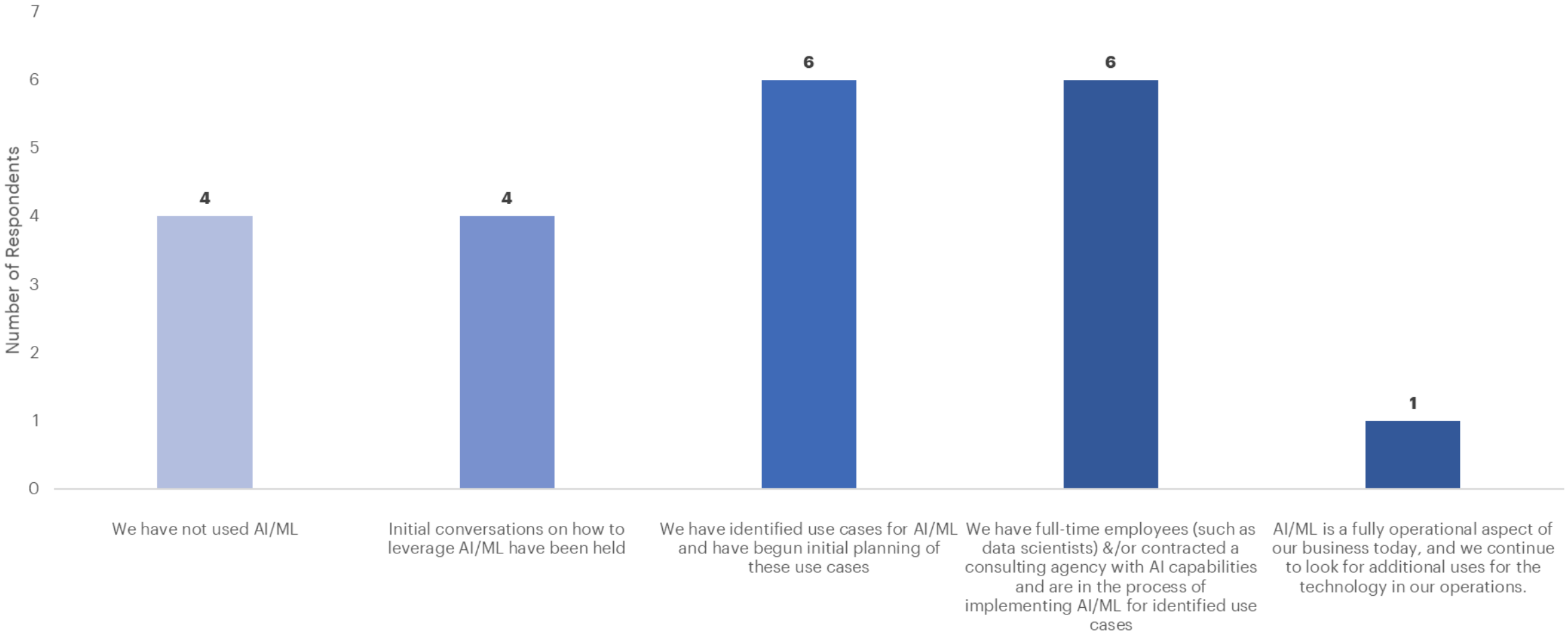
5.6) Virtual and Augmented Reality

Question:	Is virtual reality (VR) or augmented reality (AR) leveraged in operations, such as for training purposes or field use?



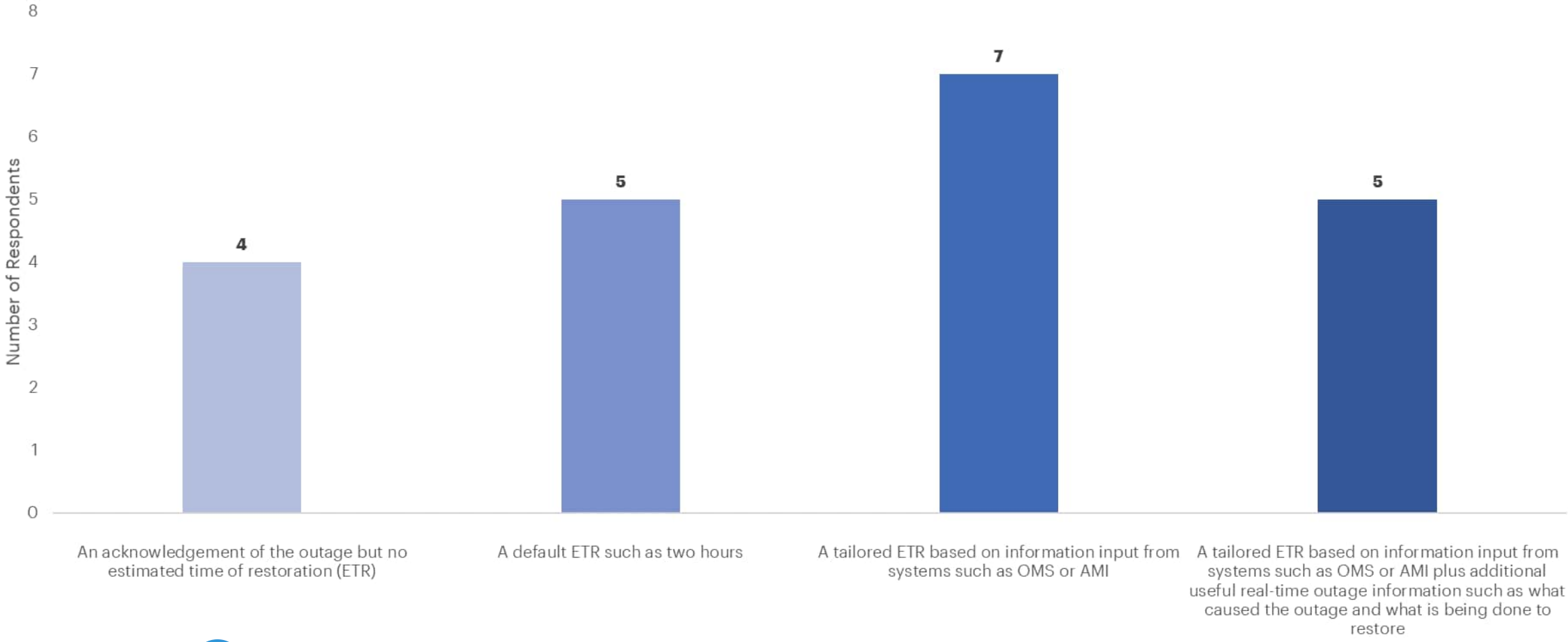
5.7) Artificial Intelligence / Machine Learning

Question:	Which of the following best describes your involvement with and use of artificial intelligence (AI) and machine learning (ML) within distribution operations?



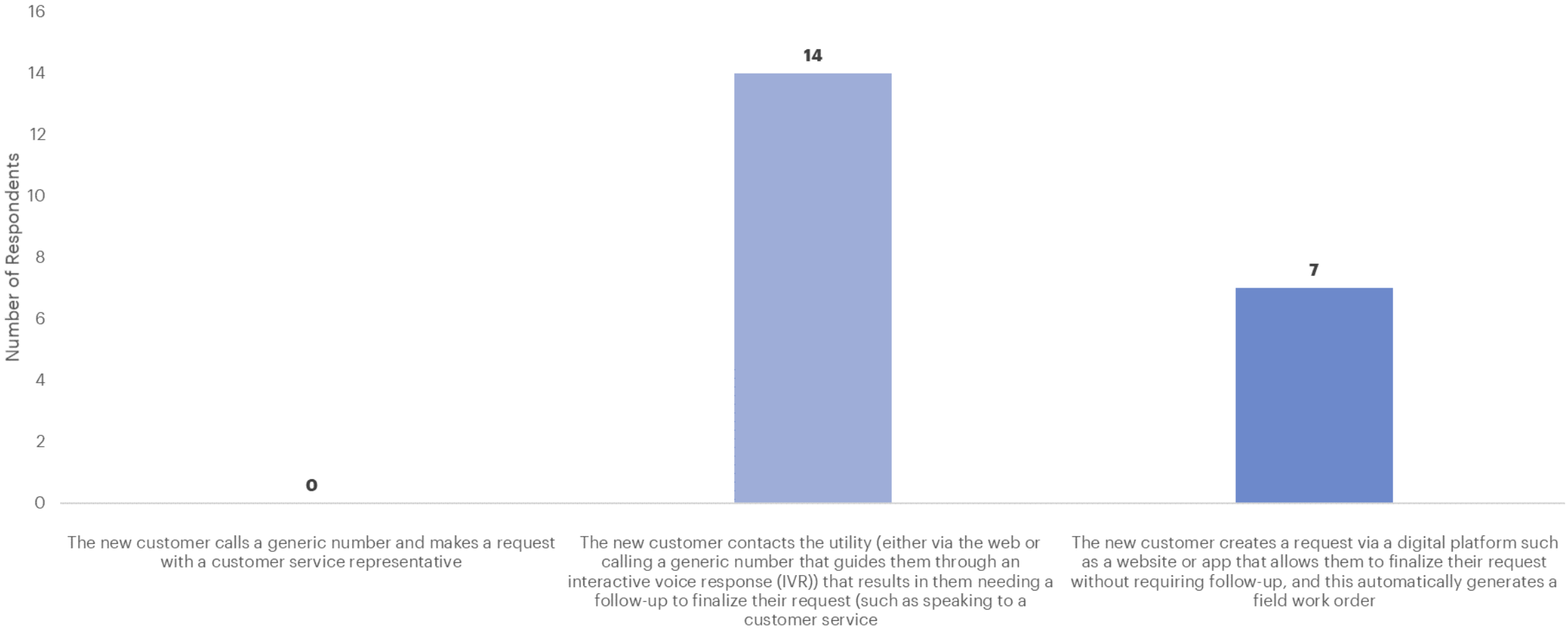
6.1) Outage Feedback

Question:	When a customer experiences an outage, what information is provided at their first touchpoint (e.g. their first call or visit to your website)?



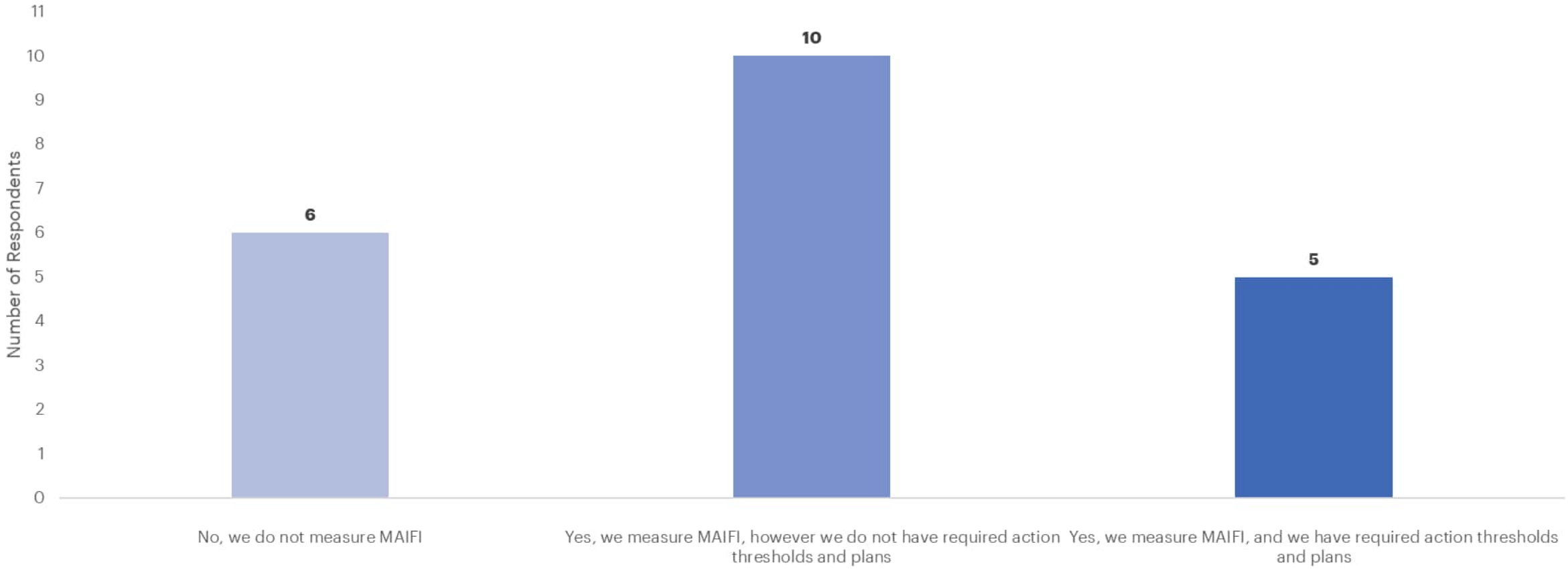
6.2) New Service Request

Question:	How does a new customer request service?



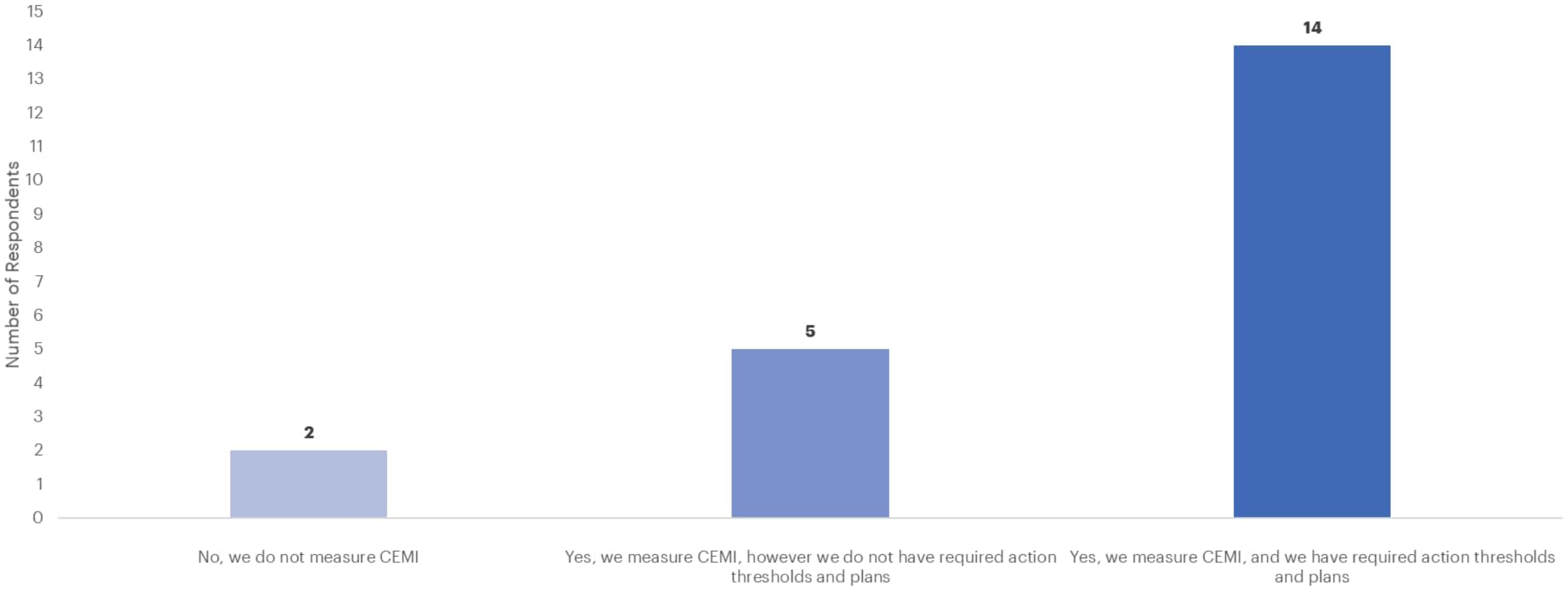
6.3) Distribution Breaker Momentary Response

Question:	Do you measure MAIFI (momentary average interruption frequency index) at the distribution breaker level, and do you have thresholds for required action? NOTE: “Thresholds for required action" would mean a prescribed action plan when a distribution breaker experiences multiple relay events.



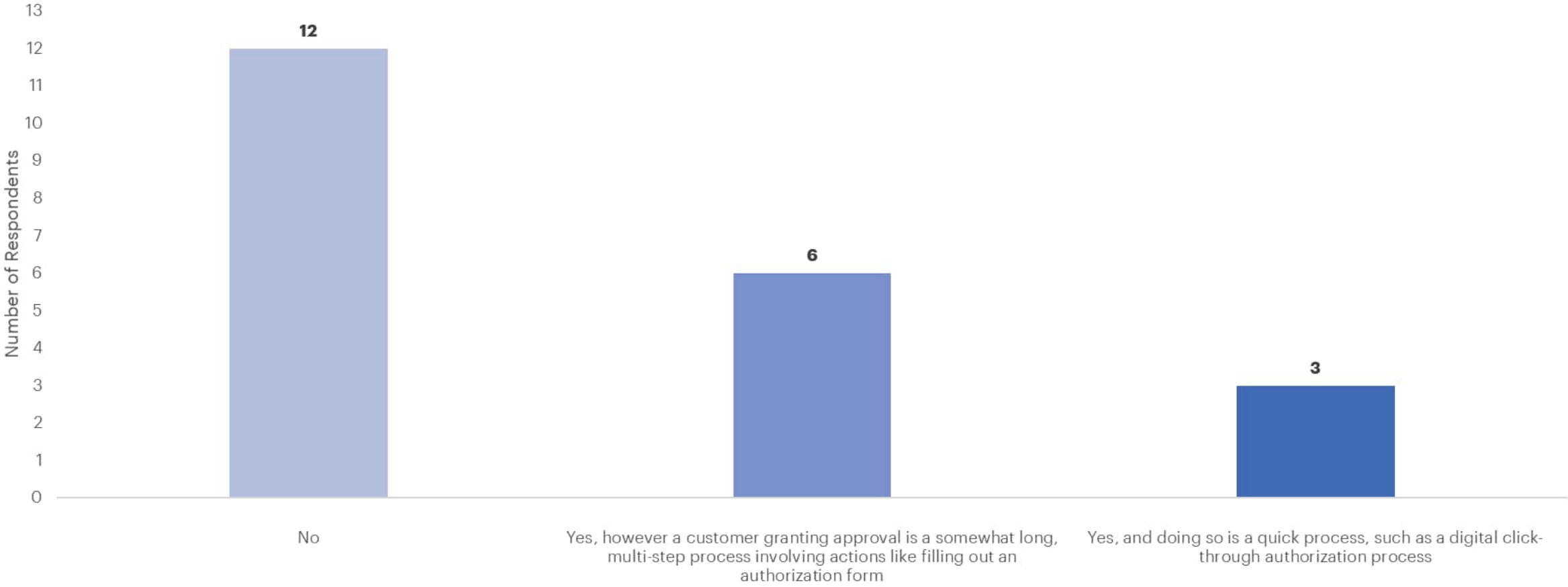
6.4) CEMI

Question:	Do you measure CEMI (customers experiencing multiple interruptions), and do you have thresholds for required action? NOTE: "Thresholds for required action" would mean a prescribed action plan when a customer reaches a given CEMI value



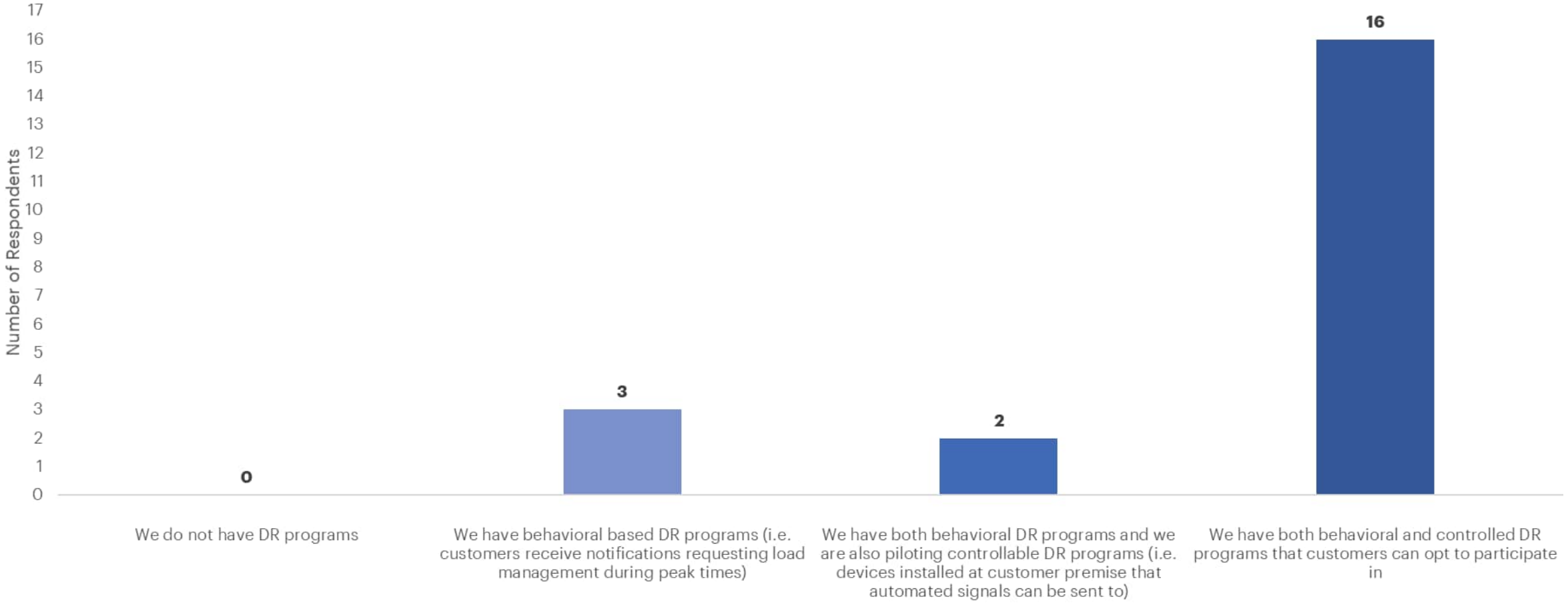
6.5) Data Access To Third Parties

Question:	Do you permit third party access to customer usage data upon customer approval?



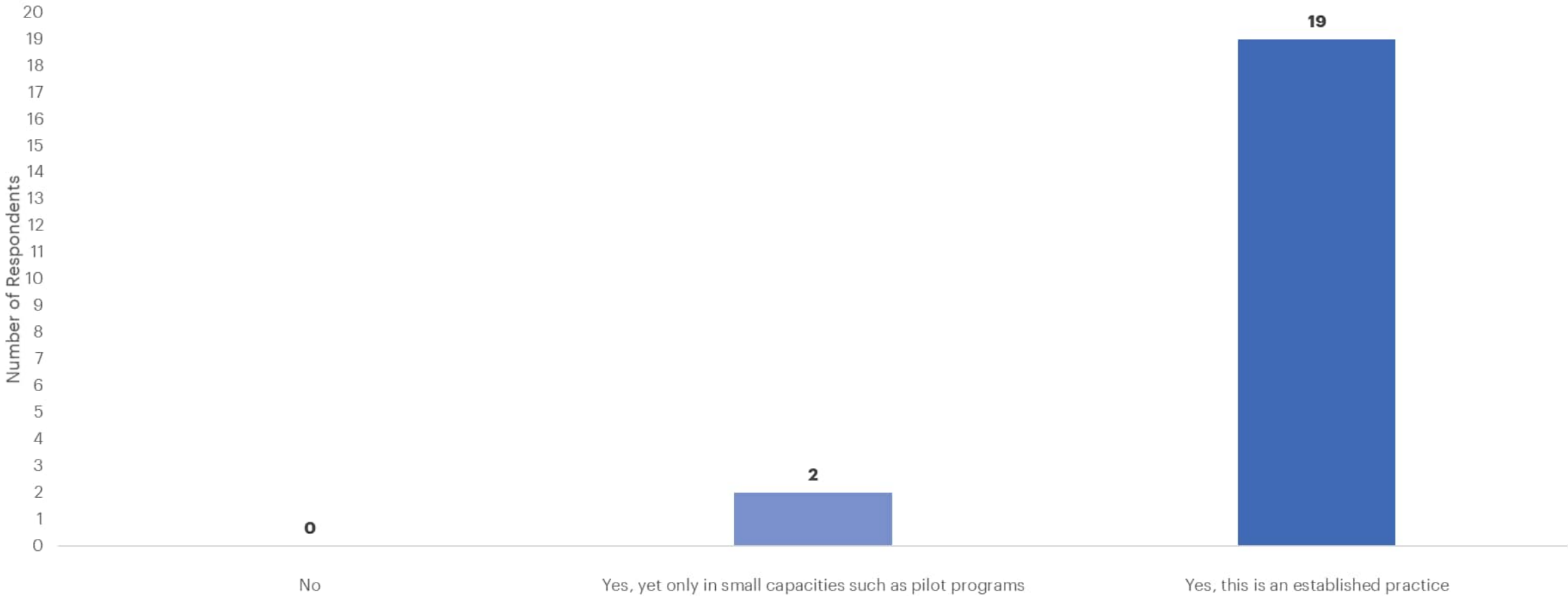
6.6) Demand Response Programs

Question:	Does your utility have demand response (DR) programs available to customer?



6.7) Energy Efficiency Programs

Question:	Does your utility have energy efficiency programs with your customers? NOTE: An example of an "energy efficiency program" would be a rebate program for a customer installing an energy efficient device in their home



RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-6

Reference: Exhibit 1B

Please provide a copy of all budget guidance documents that were issued regarding the budgets that underlie the application.

RESPONSE:

The requested information is provided in Appendices A to D of this interrogatory response. Please note that Toronto Hydro has redacted content that does not contain guidance related to the development of budgets (e.g. information with respect to process management) and information that was superseded and no longer reflects the utility's business plan (e.g. outdated planning and application filing timelines). Supporting evidence detailing Toronto Hydro's business planning process can be found at: (i) Exhibit 1B, Tab 1, Schedule 1, at pages 14-17; (ii) Exhibit 2B, Section E2, (iii) Exhibit 4, Tab 1, Schedule 1; and (iv) interrogatory responses 2B-SEC-32, 2B-SEC-33, 1B-CCC-14, and 4-CCC-58 (d). /C

2022 Investment Planning and Portfolio Reporting (IPPR) Kick-Off

Presented by Integrated Planning & Modernization

March 3, 2022

CONFIDENTIAL

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Agenda

- Introduction
- 2022 IPPR Timeline
- IPPR Changes
- Next Steps
- Questions & Appendices

2022 IPPR Introduction

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IPPR Process

WHAT?

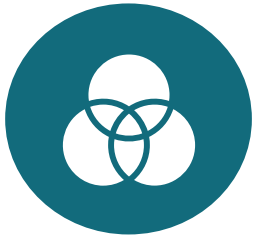
IPPR is a comprehensive and integrated annual planning process for all distribution system, fleet, facilities, and IT/OT investment programs.



Analyze
current state and future needs



Develop
short-term and long-term plans



Optimize
risks, outcomes, and cost

WHY?

- Ensure effective **execution** of the OEB-approved Distribution System Plan
- Identify and adapt to evolving **risks** and customer/stakeholder **needs**
- Enable effective short- and long-term **strategic** and **financial planning**
- Support efficient and effective development of future **regulatory evidence**
- Integrate **new** and **innovative** investment programs
- Facilitate **continuous improvement** in asset management and planning

Funding Cycle

Non-Application Year

Live Application Year



Re-baseline Plan for Funding Approval

Planning Discretion:
Current Rate Period: **Moderate**
Next Rate Period : **Very High**

Work the Plan

Planning Discretion:
Current Rate Period : **Low**
Next Rate Period : **Very High**

★ Plan for Next Funding Cycle

Planning Discretion:
Current Rate Period : **Low**
Next Rate Period : **High**

Draft and File Next Plan

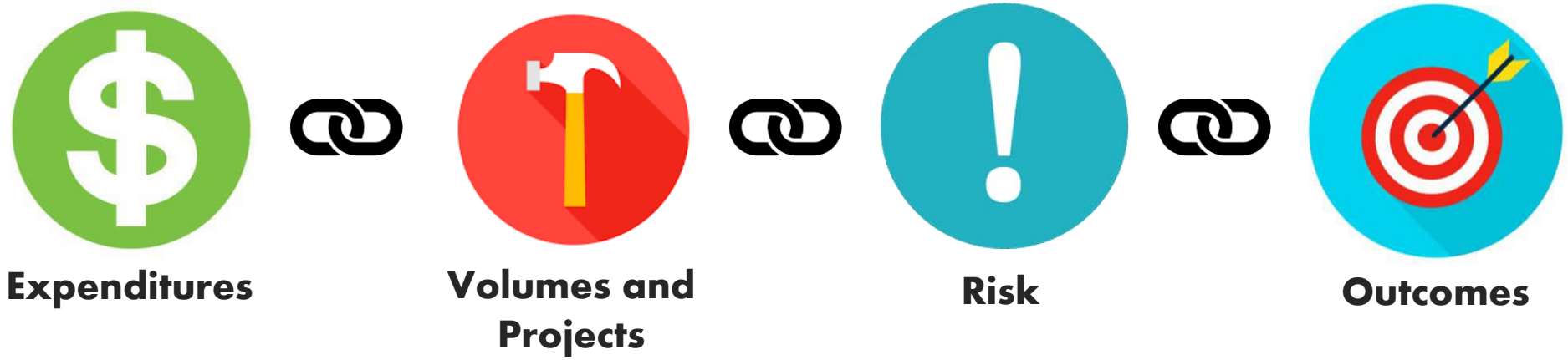
Planning Discretion:
Current Rate Period : **Very Low**
Next Rate Period : **Moderate**

Defend Next Plan

Planning Discretion:
Current Rate Period : **None**
Next Rate Period : **Moderate**

Planning Scenarios

Financially Constrained Scenarios (2020-2024)



Financially Unconstrained Scenarios (2025-2029)

Strategic Inputs

Planning for a more dynamic future...

- This year's IPPR is the beginning of an extended, iterative planning process that will result in the 2025-2029 Rate Application
- In parallel, we are running a number of industry-leading strategic projects that will help us sculpt a clear-eyed and objective-driven plan for a changing energy landscape
- Project owners will engage planners and their leaders as strategic inputs become available during the IPPR, Business Planning, and Rate Application Drafting processes





2022 IPPR Timelines

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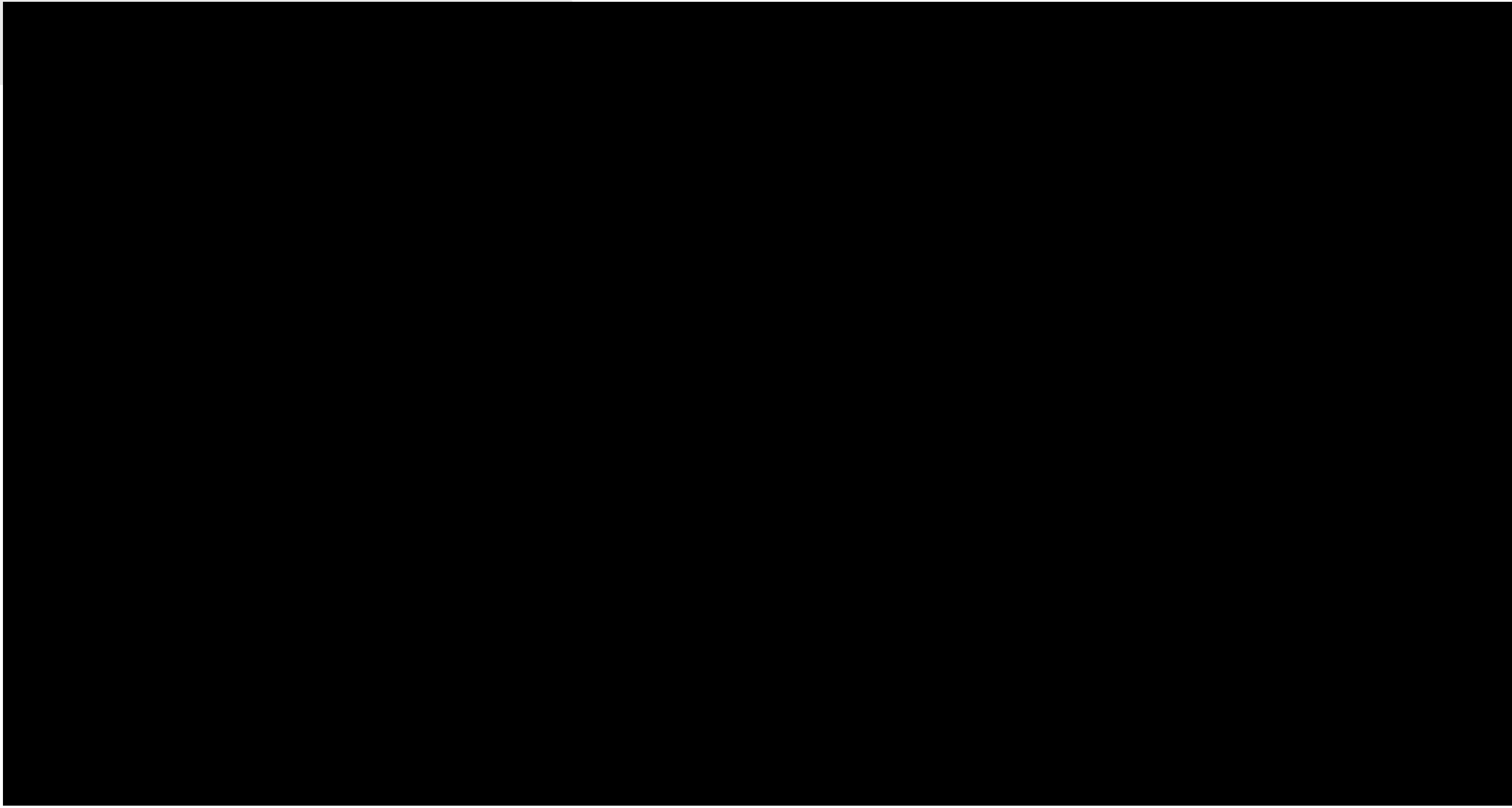

2022 Changes

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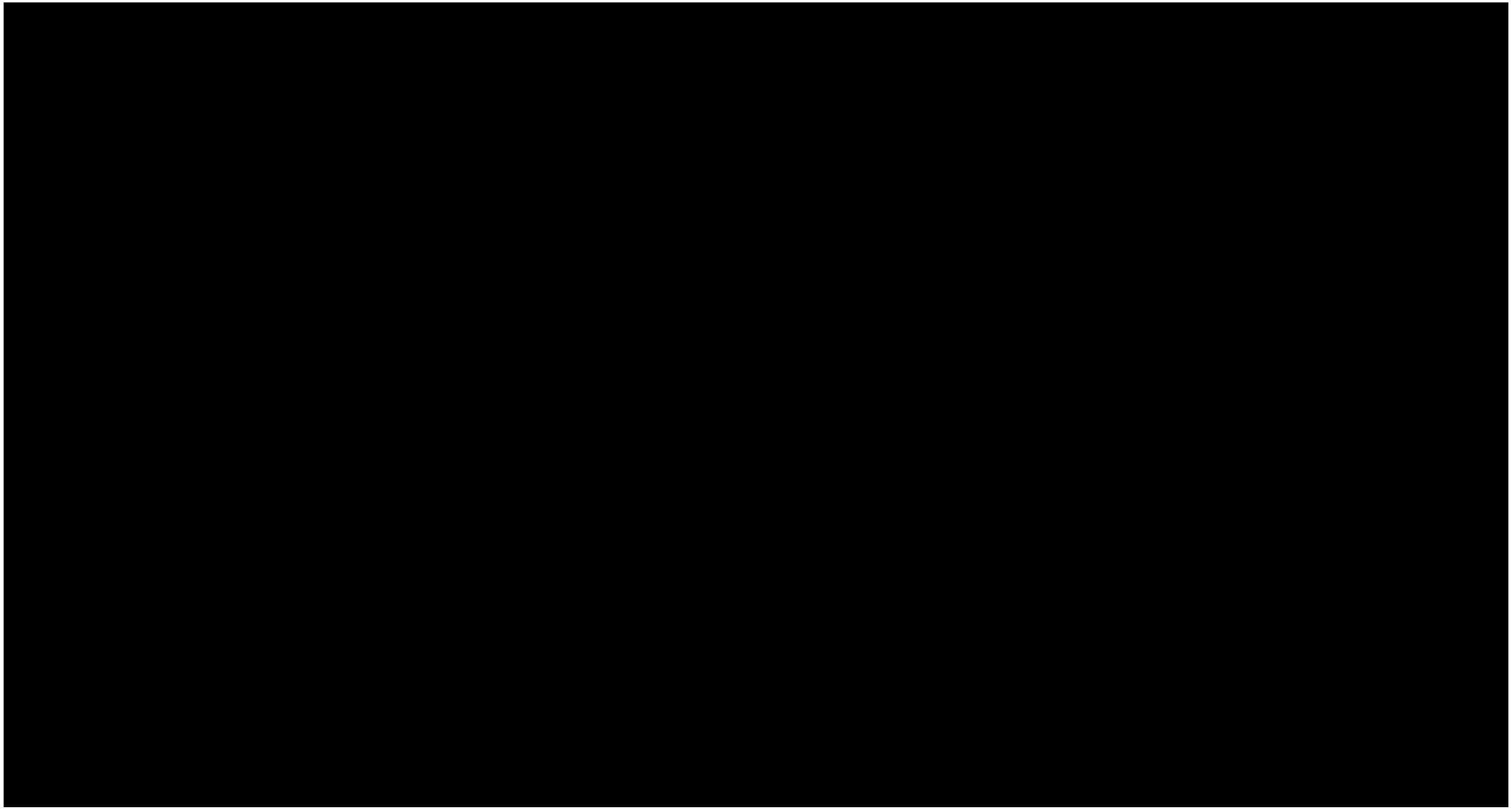

2022 Investment Options

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Options

Align with Business Plan

Unconstrained

Dependent on Segment Drivers

Driver

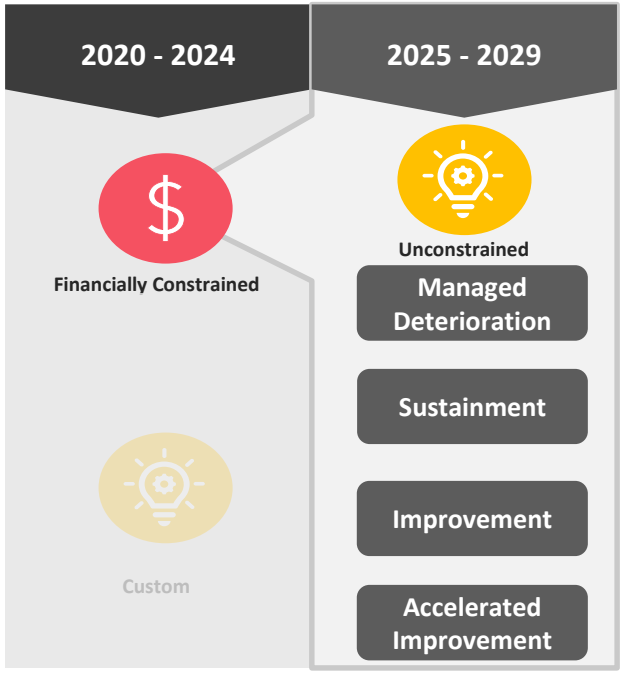
Risk driven, high TH discretion

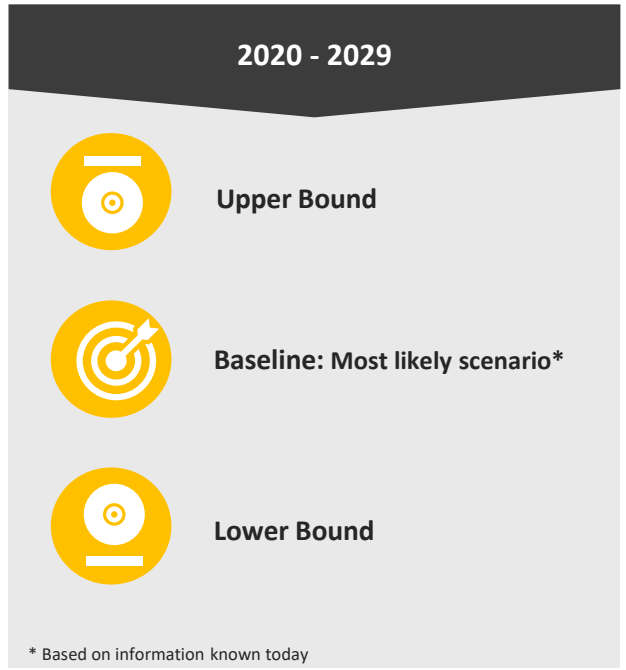
System Renewal, System Service, System Access (GPMC and Revenue Metering) Preventive and Predictive Mtce, Corrective Mtce, General Plant

Demand driven, low TH discretion

System Access (excl GPMC and Revenue Metering), Emergency Response, Customer Driven Work OpEx

Options





Roles and Responsibilities

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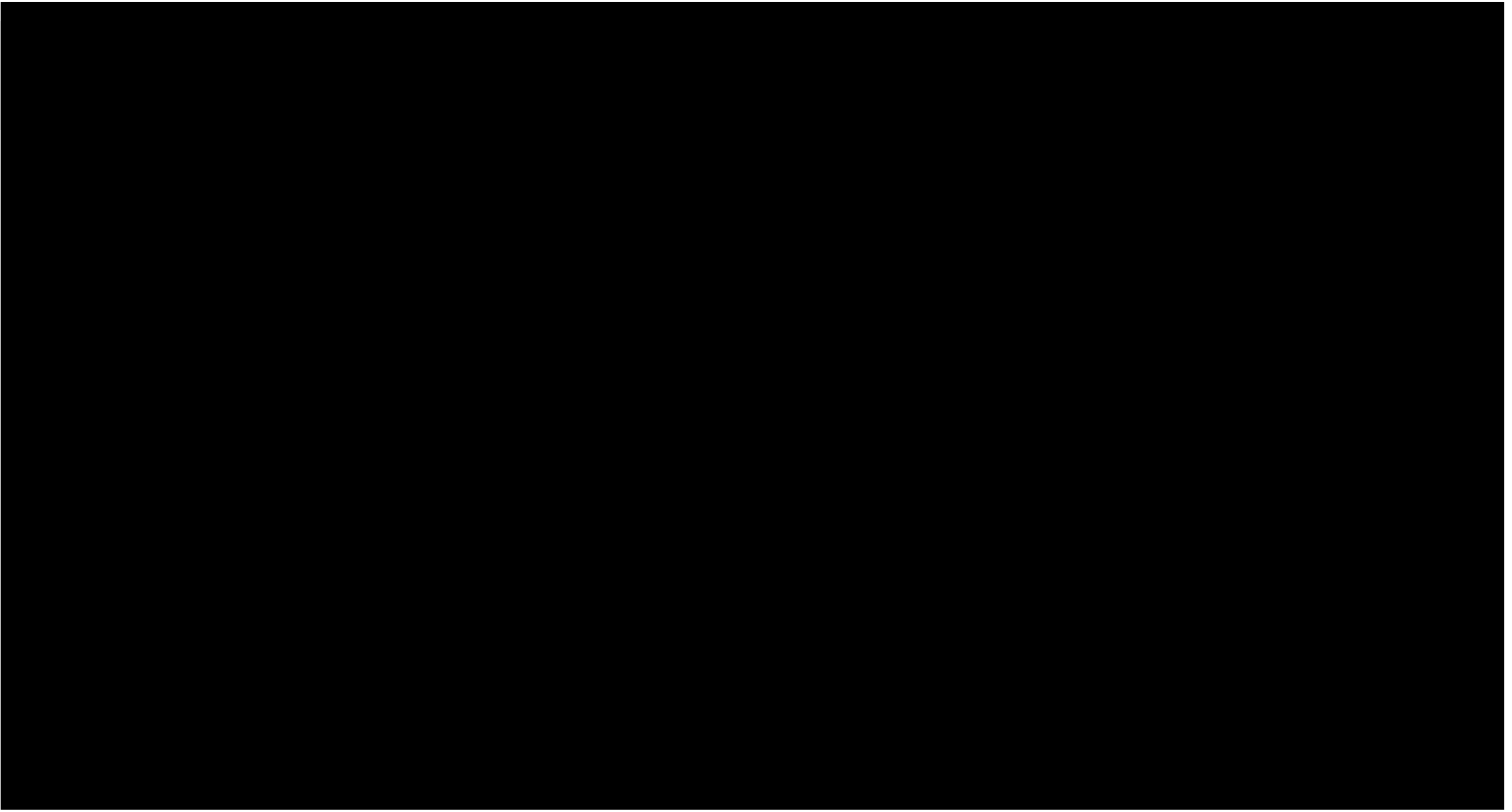

Next Steps

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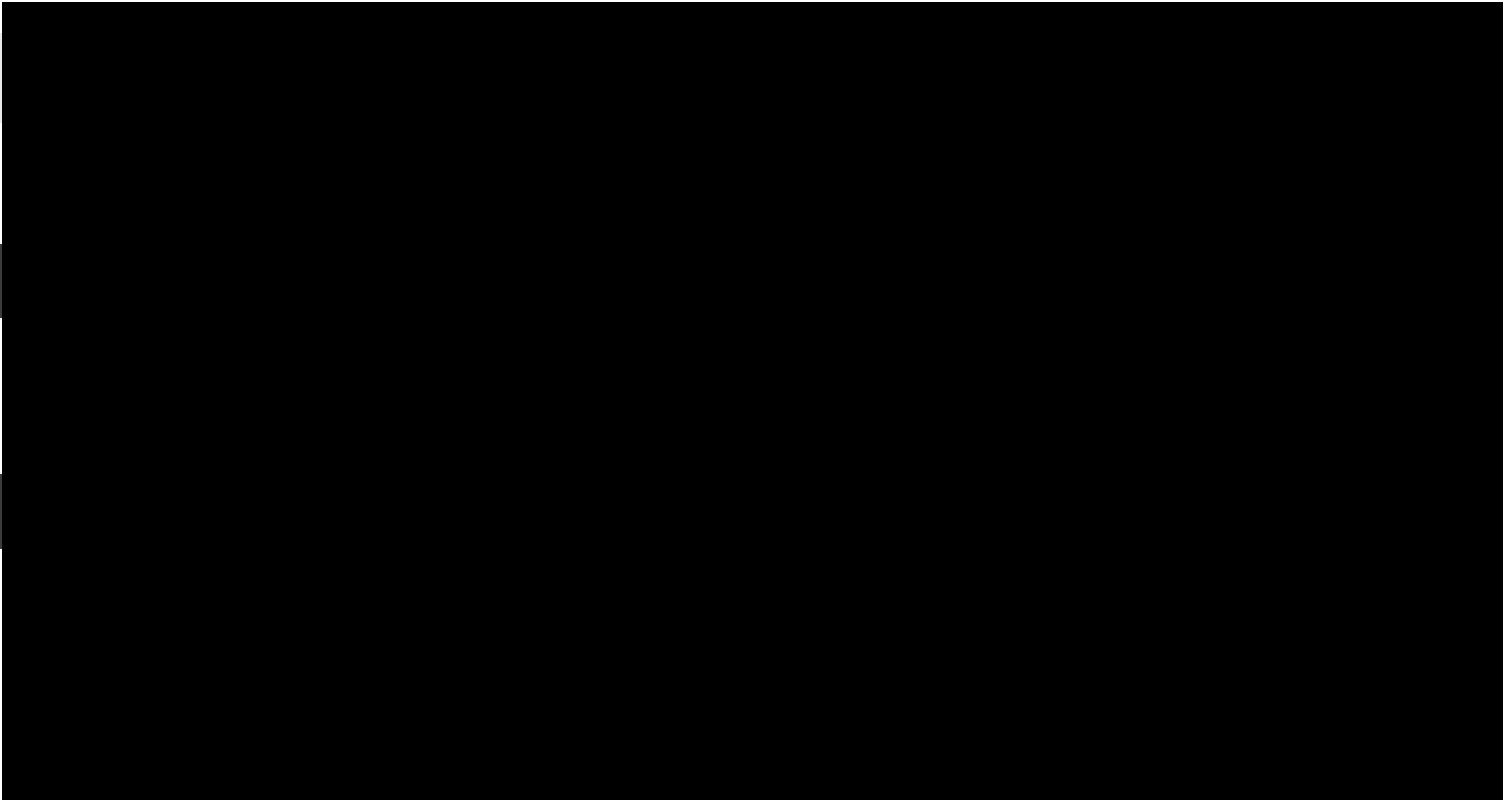



Thank You and Questions?



Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
1B-SEC-6
Appendix B
FILED: May 7, 2024
(19 Pages)

2025 Rate Application Customer Engagement

Phase I Results and Placemat Rollout

Presented by: **Elissar El-Hage,** Supervisor, Rate Applications
Sakaran Manivannan, Supervisor, Planning, Integration and Analytics

March 28 & 29 2022

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Agenda

1. **Customer Engagement Overview**
   Filing Requirements, CE Process; Phase I Methodology and the Placemat
2. **Phase I – Customer Engagement Results**
   Customer Needs and Preferences
3. **Next Steps**
   Planning Guidelines; Phase II - Customer Engagement

Customer Engagement Overview

Filing Requirements; Customer Engagement Process; Phase I Methodology and the Placemat

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Why Customer Engagement?

OEB Requirements and Utility Stewardship	
	Utilities are expected to develop a genuine understanding of their customers' interests and preferences
	Customer engagement is expected to inform the development of utility plans, and utilities are expected to demonstrate in their proposals how customer expectations have been integrated into their plans, including the trade-offs between outcomes and costs
	Utilities are expected to demonstrate value for money by delivering genuine benefits to customers and by providing services in a manner which is responsive to customer preferences.

Customer Engagement Process



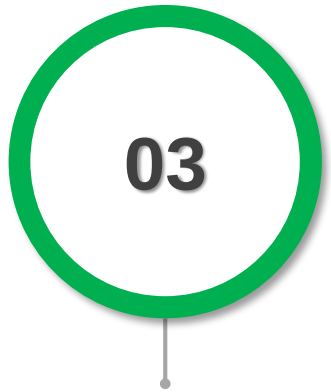
Phase I – Needs and Priorities

- *Assess customer needs and preferences in relation to outcomes relevant to our program and services.*
- *It a comprehensive view of customer priorities to as a front-end input to the Business and Investment Planning processes.*



Targeted Engagement

- *Strategically explore and seek feedback on key topics relative to specific customers and emerging issues.*
- *These engagements are intended to add another layer of understanding further driving inputs and strategy for the Plan.*



Phase II – Customer Feedback

- *Confirm Phase I customer needs, preferences, and priorities.*
- *Solicit feedback on our plans and their subsequent rate impacts including customer preferences on specific programs where trade-offs on pacing exist.*

Phase I Methodology

Qualitative research informs subsequent survey design

Qualitative Research



- 4 focus groups with residential customers
- 4 focus groups with small business customers
- 4 focus groups with C&I customers
- 14 in-depth interviews with Key Account customers

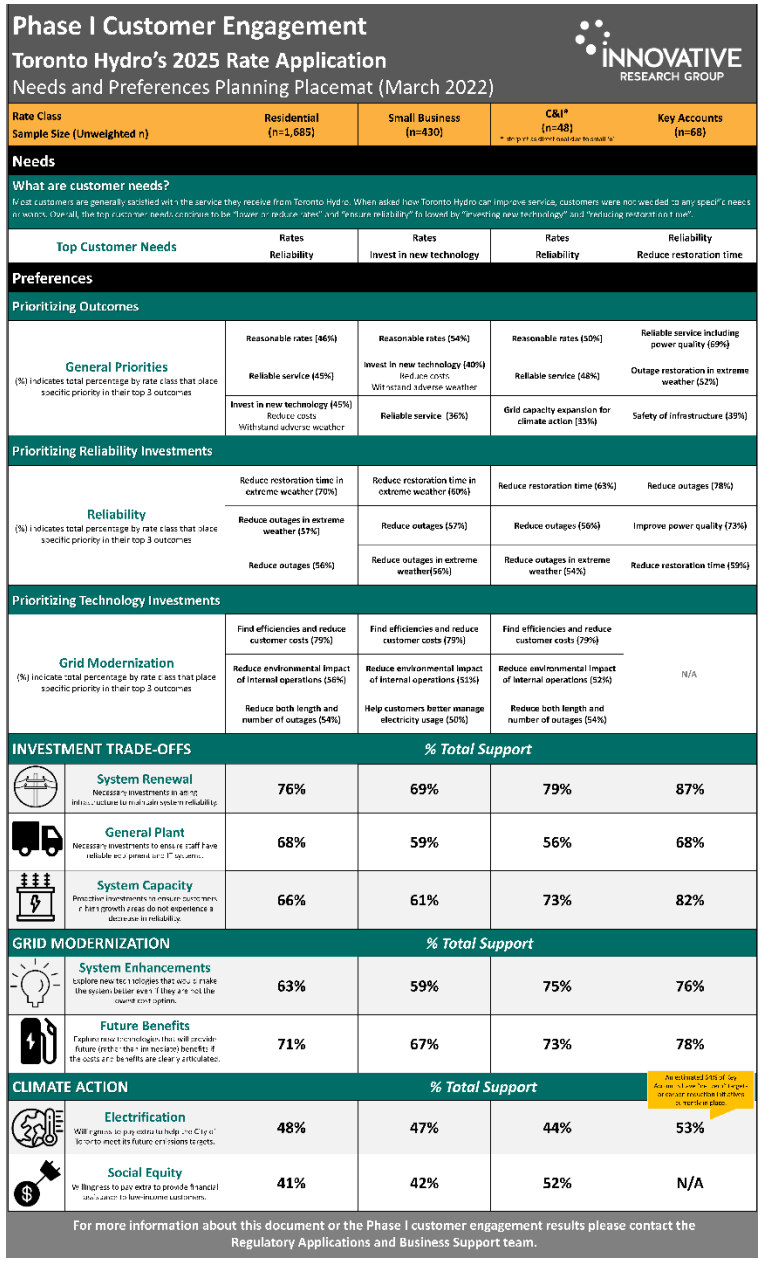
Quantitative Research



- **Residential**
  Telephone survey n=**1,006**
  Online survey n=**1,685**
- **Small Business**
  Telephone survey n=**401**
  Online survey n=**430**
- **C&I Customers (GS>50kW)***
  Online survey n=**48**
- **Key Account Customers**
  Online survey n=**68**

The Placemat

- A high-level, one-page “Placemat” summary of the findings, by rate-class (e.g. customer type).
- Placemat Structure:
  - Customer Needs;
  - Priorities: General; Reliability; and Technology
  - Investment Trade-Offs
  - Grid Modernization
  - Climate Action; and
  - Social Equity



Phase I Customer Engagement

Toronto Hydro’s 2025 Rate Application

Needs and Preferences Planning Placemat (March 2022)

INNOVATIVE RESEARCH GROUP

Rate Class / Sample Size (Unweighted n)	Residential (n=1,685)	Small Business (n=430)	C&I* (n=48)	Key Accounts (n=68)
Needs				
What are customer needs? Most customers are generally satisfied with the service they receive from Toronto Hydro. When asked how Toronto Hydro can improve service, customers were not wedded to any specific needs or wants. Overall, the top customer needs continue to be “lower or reduce rates” and “ensure reliability” followed by “investing new technology” and “reducing restoration time”.				
Top Customer Needs	Rates Reliability	Rates Invest in new technology	Rates Reliability	Reliability Reduce restoration time
Preferences				
Prioritizing Outcomes				
General Priorities (%) indicates total percentage by rate class that place specific priority in their top 3 outcomes	Reasonable rates (46%) Reliable service (45%) Invest in new technology (45%) Reduce costs Withstand adverse weather	Reasonable rates (54%) Invest in new technology (40%) Reduce costs Withstand adverse weather Reliable service (36%)	Reasonable rates (50%) Reliable service (48%) Grid capacity expansion for climate action (33%)	Reliable service including power quality (69%) Outage restoration in extreme weather (52%) Safety of infrastructure (39%)
Prioritizing Reliability Investments				
Reliability (%) indicates total percentage by rate class that place specific priority in their top 3 outcomes	Reduce restoration time in extreme weather (70%) Reduce outages in extreme weather (57%) Reduce outages (56%)	Reduce restoration time in extreme weather (60%) Reduce outages (57%) Reduce outages in extreme weather(56%)	Reduce restoration time (63%) Reduce outages (56%) Reduce outages in extreme weather (54%)	Reduce outages (78%) Improve power quality (73%) Reduce restoration time (59%)
Prioritizing Technology Investments				
Grid Modernization (%) indicate total percentage by rate class that place specific priority in their top 3 outcomes	Find efficiencies and reduce customer costs (79%) Reduce environmental impact of internal operations (56%) Reduce both length and number of outages (54%)	Find efficiencies and reduce customer costs (79%) Reduce environmental impact of internal operations (51%) Help customers better manage electricity usage (50%)	Find efficiencies and reduce customer costs (79%) Reduce environmental impact of internal operations (52%) Reduce both length and number of outages (54%)	N/A
INVESTMENT TRADE-OFFS		*% Total Support*		
System Renewal Necessary investments in aging infrastructure to maintain system reliability	76%	69%	79%	87%
General Plant Necessary investments to ensure staff have reliable tools, premises and IT systems	68%	59%	56%	68%
System Capacity Proactive investments to ensure customers in fast growth areas do not experience a decrease in reliability.	66%	61%	73%	82%
GRID MODERNIZATION		*% Total Support*		
System Enhancements Explore new technologies that would make the system better even if they are not the lowest cost option.	63%	59%	75%	76%
Future Benefits Explore new technologies that will provide future (rather than immediate) benefits if the costs and benefits are clearly articulated.	71%	67%	73%	78%
CLIMATE ACTION		*% Total Support*		An estimated 54% of key Actions to achieve Toronto’s targets are given priority for action in this area.
Electrification Willingness to pay extra to help the City of Toronto meet its future emissions targets.	48%	47%	44%	53%
Social Equity Willingness to pay extra to provide financial assistance to low-income customers.	41%	42%	52%	N/A

For more information about this document or the Phase I customer engagement results please contact the Regulatory Applications and Business Support team.

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Phase I – Customer Engagement Results

Customer Needs and Preferences

Privileged & Confidential

Customer Needs

Rate Class	Residential	Small Business	C&I*	Key Accounts
What are customer needs? Most customers are generally satisfied with the service they receive from Toronto Hydro. When asked how Toronto Hydro can improve service, customers were not wedded to any specific needs or wants. Overall, the top customer needs continue to be "lower or reduce rates" and "ensure reliability" followed by "investing new technology" and "reducing restoration time".				
Top Customer Needs	**Rates**	**Rates**	**Rates**	**Reliability**
	Reliability	**Invest in new technology**	**Reliability**	**Reduce restoration time**

Preferences: General Priorities

Rate Class	Residential	Small Business	C&I*	Key Accounts
Prioritizing Outcomes				
General Priorities (%) indicates total percentage by rate class that place specific priority in their top 3 outcomes	**Reasonable rates (46%)**	**Reasonable rates (54%)**	**Reasonable rates (50%)**	**Reliable service including power quality (69%)**
	Reliable service (45%)	**Invest in new technology (40%)** Reduce costs Withstand adverse weather	**Reliable service (48%)**	**Outage restoration in extreme weather (52%)**
	Invest in new technology (45%) Reduce costs Withstand adverse weather	**Reliable service (36%)**	**Grid capacity expansion for climate action (33%)**	**Safety of infrastructure (39%)**

Preferences: Reliability

Rate Class	Residential	Small Business	C&I*	Key Accounts
Prioritizing Reliability Investments				
Reliability (%) indicates total percentage by rate class that place specific priority in their top 3 outcomes	**Reduce restoration time in extreme weather (70%)**	**Reduce restoration time in extreme weather (60%)**	**Reduce restoration time (63%)**	**Reduce outages (78%)**
	Reduce outages in extreme weather (57%)	**Reduce outages (57%)**	**Reduce outages (56%)**	**Improve power quality (73%)**
	Reduce outages (56%)	**Reduce outages in extreme weather (56%)**	**Reduce outages in extreme weather (54%)**	**Reduce restoration time (59%)**

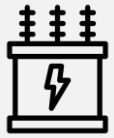
- *Consider options increase the resilience of the grid during extreme weather events. For example, increasing switching capability within the system can help reduce restoration times. Similarly, increasing proactive inspection and corrective action for storm guying requirements can help reduce pole failures during extreme wind events.*

Preferences: Technology

Rate Class	Residential	Small Business	C&I*	Key Accounts
Prioritizing Technology Investments				
Grid Modernization (%) indicate total percentage by rate class that place specific priority in their top 3 outcomes	**Find efficiencies and reduce customer costs (79%)**	**Find efficiencies and reduce customer costs (79%)**	**Find efficiencies and reduce customer costs (79%)**	N/A
	Reduce environmental impact of internal operations (56%)	**Reduce environmental impact of internal operations (51%)**	**Reduce environmental impact of internal operations (52%)**	
	Reduce both length and number of outages (54%)	**Help customers better manage electricity usage (50%)**	**Reduce both length and number of outages (54%)**	

- *Consider an increased pace of monitoring and control capabilities allowing for potential OPEX savings in the future, help identify oil spills early, and reducing service failures.*

Investment Trade-Offs

Rate Class		Residential	Small Business	C&I*	Key Accounts
INVESTMENT TRADE-OFFS		*% Total Support*			
	**System Renewal** Necessary investments in aging infrastructure to maintain system reliability.	**76%**	**69%**	**79%**	**87%**
	**General Plant** Necessary investments to ensure staff have reliable equipment and IT systems.	**68%**	**59%**	**56%**	**68%**
	**System Capacity** Proactive investments to ensure customers in high growth areas do not experience a decrease in reliability.	**66%**	**61%**	**73%**	**82%**

Grid Modernization

Rate Class		Residential	Small Business	C&I*	Key Accounts
GRID MODERNIZATION		*% Total Support*			
	**System Enhancements** Explore new technologies that would make the system better even if they are not the lowest cost option.	**63%**	**59%**	**75%**	**76%**
	**Future Benefits** Explore new technologies that will provide future (rather than immediate) benefits if the costs and benefits are clearly articulated.	**71%**	**67%**	**73%**	**78%**

- *For example, consider an option to increase the pace of investment in automation technologies like FLISR to allow Toronto Hydro to have greater flexibility within the distribution system and to leverage this technology to reduce outage impacts.*

Climate Action & Social Equity

Rate Class		Residential	Small Business	C&I*	Key Accounts
CLIMATE ACTION			*% Total Support*		
	**Electrification** Willingness to pay extra to help the City of Toronto meet its future emissions targets.	**48%**	**47%**	**44%**	**53%**
	**Social Equity** Willingness to pay extra to provide financial assistance to low-income customers.	**41%**	**42%**	**52%**	**N/A**

An estimated 64% of Key Accounts have "net zero" targets or carbon reduction initiatives currently in place.

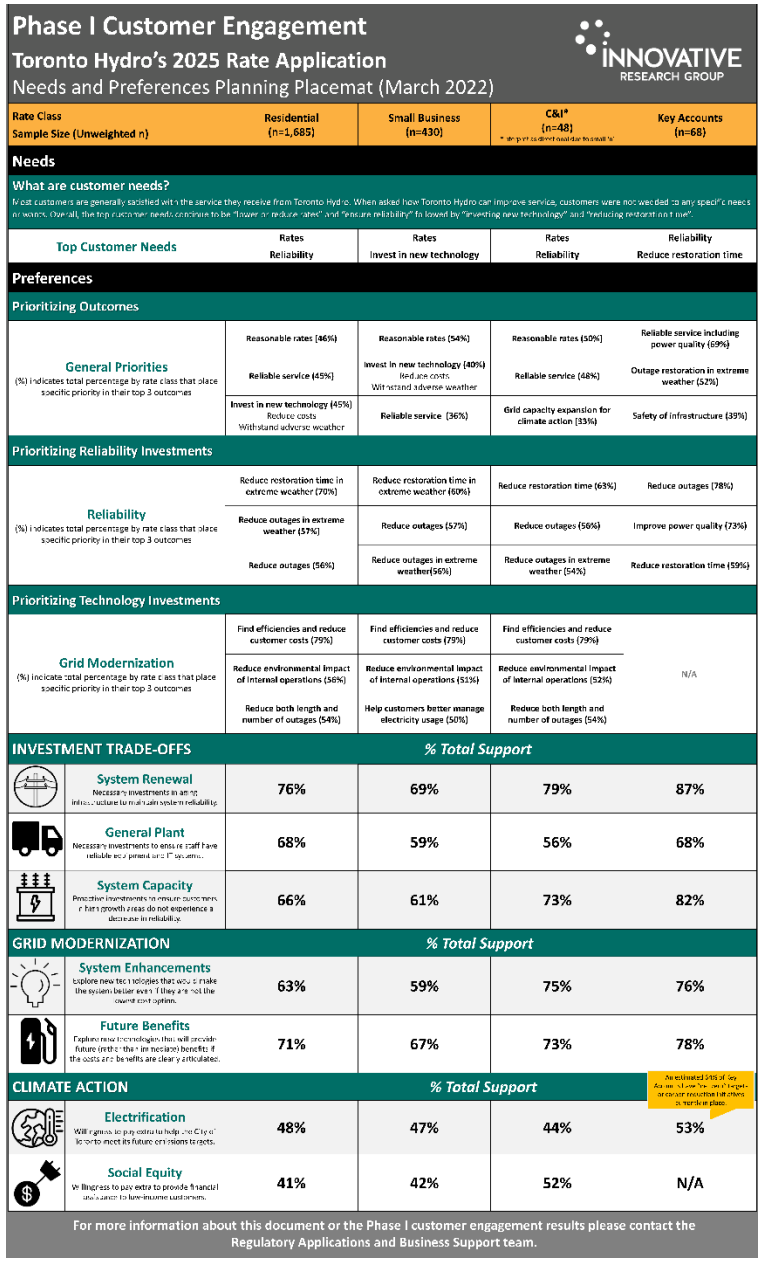
- *For example, consider investments that reduce Toronto Hydro's GHG emissions such as fleet electrification; as well as investments that support City electrification, such as renewable enabling investments like GPMC or system expansions.*

Next Steps

General Planning Guidance; Phase II - Customer Engagement

General Planning Guidance

- Phase I customer engagement results provide the general priorities for Toronto Hydro's customers
  - Review program investment options presented within IPPR to ensure general alignment with these priorities
  - Tie-in customer priorities clearly as part of IPPR narratives where applicable
- Articulate the balance of costs, risks, and benefits for the grid and the customer as part of narratives, especially for programs focused on new technologies that may have future benefits



Phase I Customer Engagement
Toronto Hydro's 2025 Rate Application
Needs and Preferences Planning Placemat (March 2022)
INNOVATIVE RESEARCH GROUP

Rate Class / Sample Size (Unweighted n)	Residential (n=1,685)	Small Business (n=430)	C&I* (n=48) * low sample size, directional only	Key Accounts (n=68)
Needs				
What are customer needs? Most customers are generally satisfied with the service they receive from Toronto Hydro. When asked how Toronto Hydro can improve service, customers were not wedded to any specific needs or wants. Overall, the top customer needs continue to be "lower or reduce rates" and "ensure reliability" followed by "investing new technology" and "reducing restoration outtime".				
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GRID MODERNIZATION		*% Total Support*		
System Enhancements — Explore new technologies that would make the system better even if they are not the lowest cost options	63%	59%	75%	76%
Future Benefits — Explore new technologies that will provide future (rather than immediate) benefits if the costs and benefits are clearly articulated.	71%	67%	73%	78%
CLIMATE ACTION		*% Total Support*		An estimated 54% of City Actions to Achieve Net Zero Emissions by 2040 or Earlier Reduction Initiatives is Outside of Toronto Hydro's Control
Electrification — Willingness to pay extra to help the City of Toronto meet its future emissions targets.	48%	47%	44%	53%
Social Equity — Willingness to pay extra to provide financial assistance to low-income customers.	41%	42%	52%	N/A

For more information about this document or the Phase I customer engagement results please contact the Regulatory Applications and Business Support team.

Customer Engagement Phase 2

01

Phase I – Needs and Priorities

- *Assess customer needs and preferences in relation to outcomes relevant to our program and services.*
- *It a comprehensive view of customer priorities to as a front-end input to the Business and Investment Planning processes.*

02

Targeted Engagement

- *Strategically explore and seek feedback on key topics relative to specific customers and emerging issues.*
- *These engagements are intended to add another layer of understanding further driving inputs and strategy for the Plan.*

03

Phase II – Customer Feedback

- *Confirm Phase I customer needs, preferences, and priorities.*
- *Solicit feedback on our plans and their subsequent rate impacts including customer preferences on specific programs where trade-offs on pacing exist.*

Thank you

For more information about the Placemat or the Phase I customer engagement results please contact the Regulatory Applications and Business Support team.

For additional insights into the integration of the results into Business and Investment Planning, please contact Elissar El-Hage and/or Sakaran Manivannan.

System Renewal, System Access (GPMC and Metering) Preventive and Predictive Mtce, Corrective Mtce, Emergency Response, General Plant

2020-2024

Option	Description
Baseline Minus*	This option represents a percent or dollar reduction to the Baseline Option(L1), where a 5-year budget, with annual targets, will be provided by PIA. Units, outcomes, short and long term impacts and risks will need to be determined.
Baseline*	This option is equivalent to the current Business Plan as approved by the Board of Directors, where the 5-year (2020-2024) dollars are known. Total funding considered under the baseline option must be equivalent to the 5-year Business Plan total. Units, outcomes, short and long term impacts and risks will need to be determined.
Custom	This represents a custom (i.e. unconstrained) option where planners have the ability to set spending, unit and outcome achievements. Short and long term impacts and risks will need to be determined.

* Constrained options.

System Renewal, System Access (GPMC and Metering) Preventive and Predictive Mtce, Corrective Mtce, Emergency Response, General Plant

2025-2029

Option	Description
Managed Deterioration	This option represents the management of the system without realizing the full outcomes, benefits and/or performance expected from the Sustainment Investment Strategy. This option must be at a level sufficient to maintain short-term performance of the system while allowing for some incremental risk. Funding levels considered for this option should not be sustainable over the long-term.
Sustainment	This option represents the baseline level of investment required to maintain the system at status quo as measured by key indicators of risk and performance that are most relevant to the program (i.e. reliability, asset condition, system capacity, customers connected on time etc.)
Improvement	This option achieves outcomes, benefits and/or performance beyond those achieved in the Sustainment Option, while accounting for the need to keep year-over-year spending changes within reasonable limits.

System Service

2020-2024

Option	Description
Baseline Minus *	This option represents a percent or dollar reduction to the Baseline Option(L1), where a 5-year budget, with annual targets, will be provided by PIA. Units, outcomes, short and long term impacts and risks will need to be determined.
Baseline*	This option is equivalent to the current Business Plan as approved by the Board of Directors, where the 5-year (2020-2024) dollars are known. Total funding considered under the baseline option must be equivalent to the 5-year Business Plan total. Units, outcomes, short and long term impacts and risks will need to be determined.
Custom	This represents a custom (i.e. unconstrained) option where planners have the ability to set spending, unit and outcome achievements. Short and long term impacts and risks will need to be determined.

*Constrained options.

System Service

2025-2029

Option	Description
Sustainment	This option represents the minimum amount of spending required to achieve minimize required outcome (e.g. meet long-term system capacity requirements) or otherwise advance the program (e.g. pilot level spending).
Improvement	This option achieves outcomes, benefits and/or performance beyond those achieved in the Sustainment Option, while accounting for the need to keep year-over-year spending changes within reasonable limits.
Accelerated Improvement	This option achieves outcomes, benefits and/or performance beyond those achieved in the Improvement Investment Strategy.

System Access (excl GPMC and Revenue Metering), Customer Driven Work OpEx

2020-2029

Option	Description
Lower Bound	This option must consider variation of assumptions from the baseline scenario to determine a reasonable lower bound on required spending.
Baseline -Most Likely	This option represents the most likely investment scenario based on the program forecast methodology.
Upper Bound	This option must consider variation of assumptions from the baseline scenario to determine a reasonable upper bound on required spending.

Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
1B-SEC-6
Appendix D
FILED: May 7, 2024

(16 Pages)

2023–2029
BUSINESS PLANNING



TORONTO HYDRO®

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AGENDA

1. Meeting Kick-off
2. Business Plan approach and assumptions overview
3. Regulatory Application Planning and timelines
4. Investment Planning approach
5. Enterprise Risk Management considerations
6. Next steps and Q&A



Critical Themes

Business Plan



- Capital Investment and Operational Requirements
- Utility of the Future
- Resource Strategy
- Inflationary Costs pressures
- COVID-19 ongoing impacts
- Climate Action Plan and Expanded Distributor

Integrated Business Plan



CORPORATE STRATEGY
The Interactive Grid

Alignment to the 10-year Utility of the Future Strategy and strategic priorities

BUSINESS NEEDS
Identification of Capital Investment and Operational needs that underpin the Corporate Pillars

PEOPLE STRATEGY
Workforce of Tomorrow

Build a culture of safety, sustainment and innovation that propels TH into the future



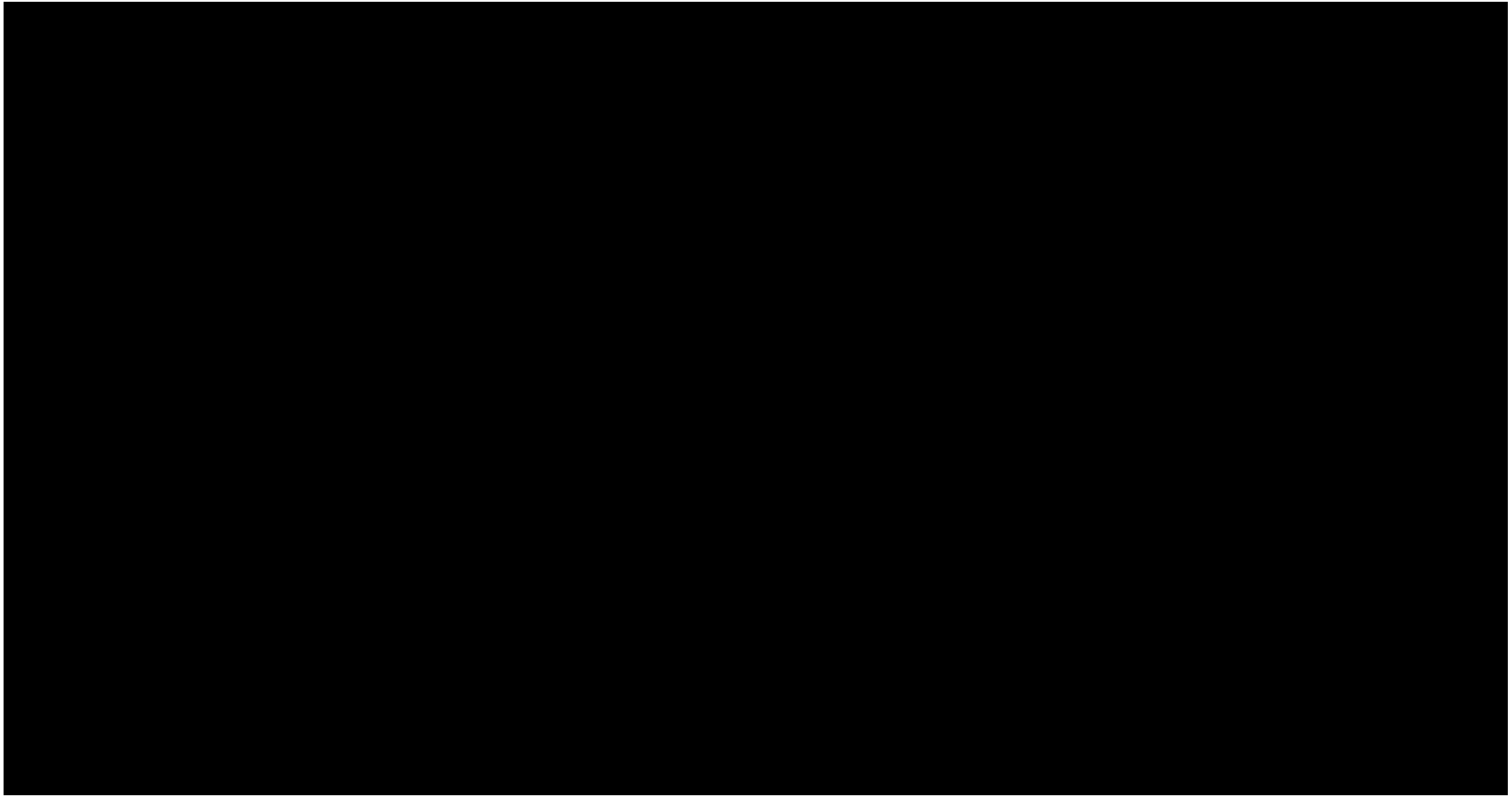
COMPLIANCE REVIEW
Consideration of compliance requirements and related mitigating actions

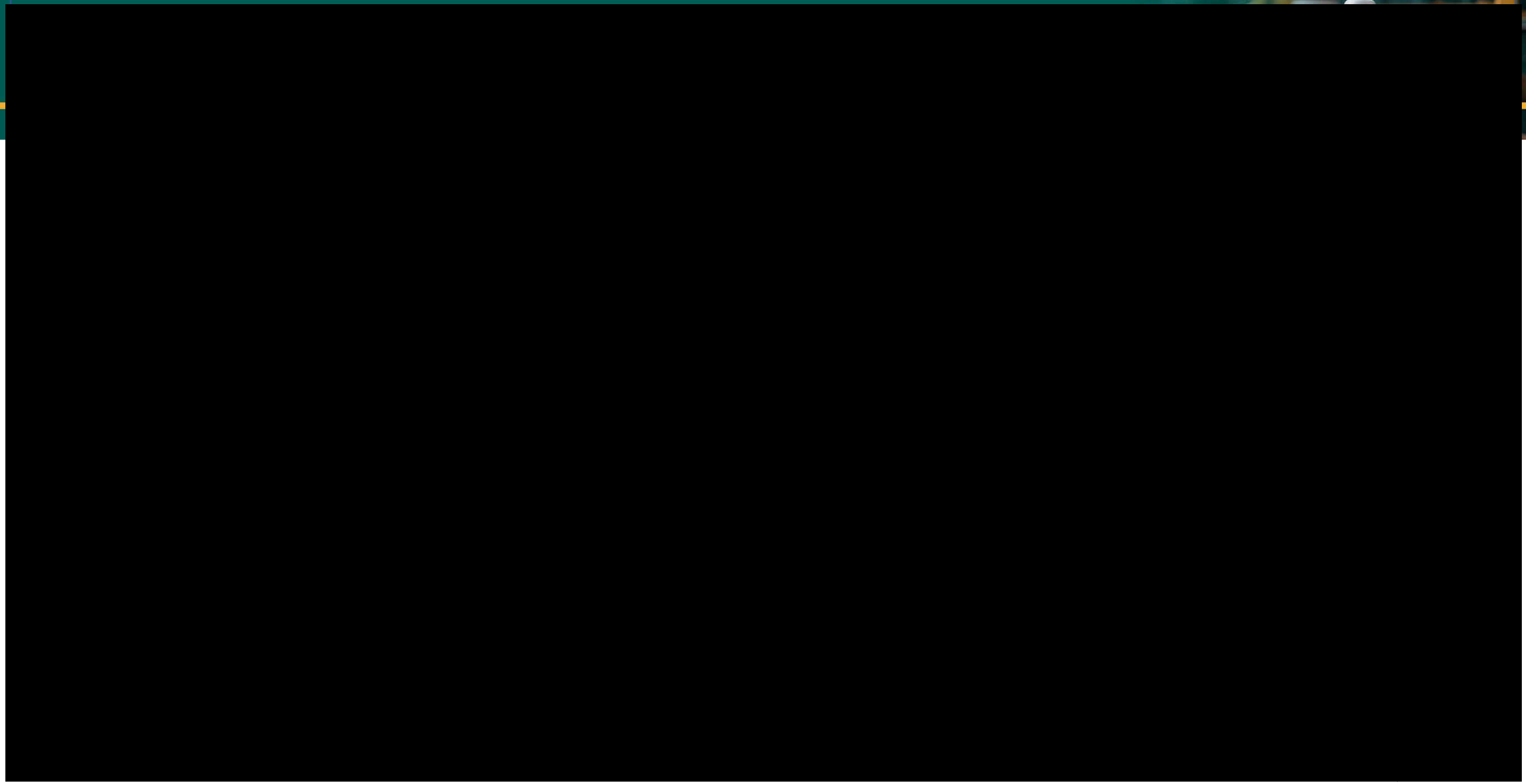
REGULATORY ALIGNMENT
- 2023-2024: Alignment to 2020-2024 OEB decision and inclusion of new emerging issues (e.g.: customer connections, inflation)
- 2025-2029: Alignment to 2025 rate application strategy

RISK ALIGNMENT
Ensure the Business Plan is grounded in ERM assessments and mitigation plans

CLIMATE ACTION PLAN
- Support to the Transform TO strategy and initiatives
- Expanded Distributor
- LED Conversion
- Other climate mandates





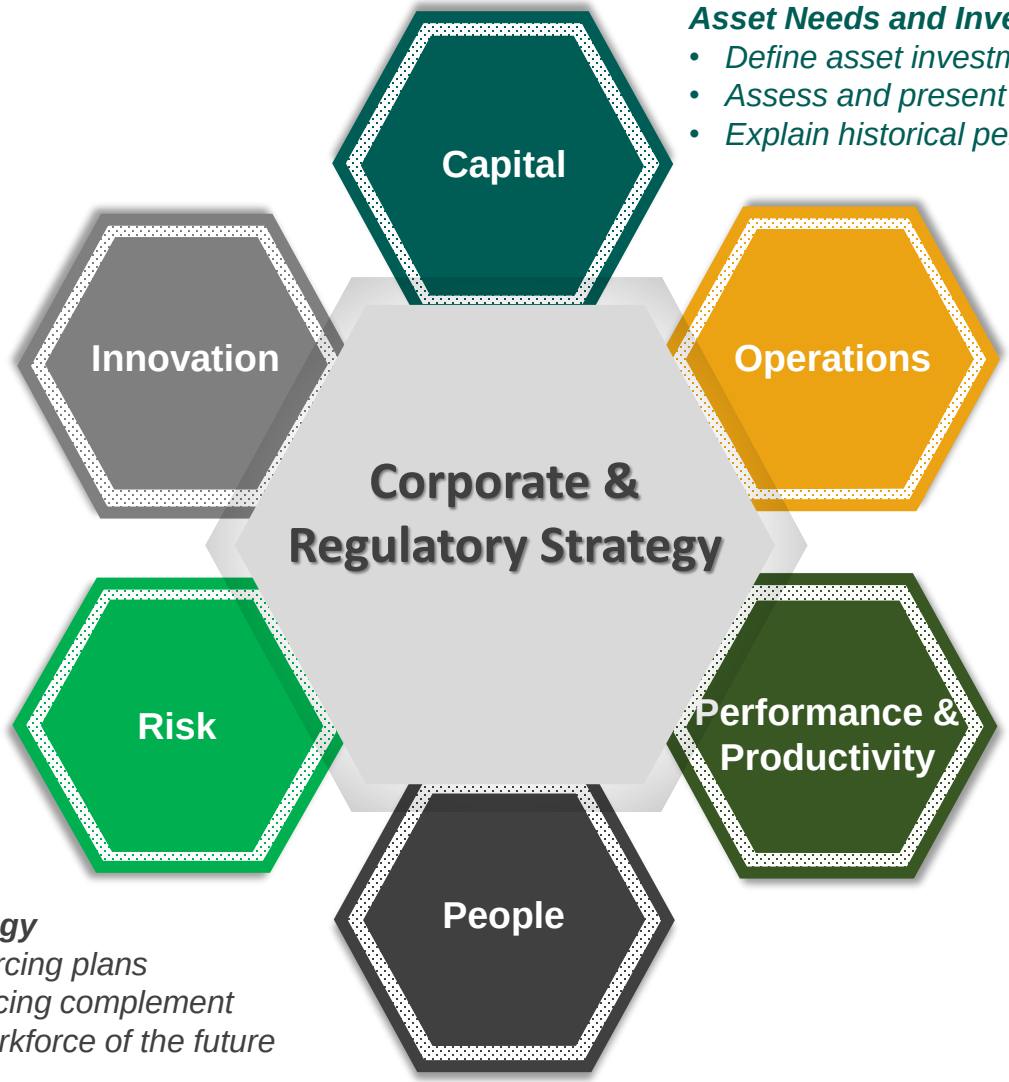


Regulatory
2025-29 Planning Focus



Asset Needs and Investment Drivers
- *Define asset investment needs and drivers for the 2023-2029*
- *Assess and present options to manage performance*
- *Explain historical performance and cost variances*

Innovation
- *New technologies and practices*
- *Non-Wires Alternatives/DERs*
- *Grid optimization and modernization*

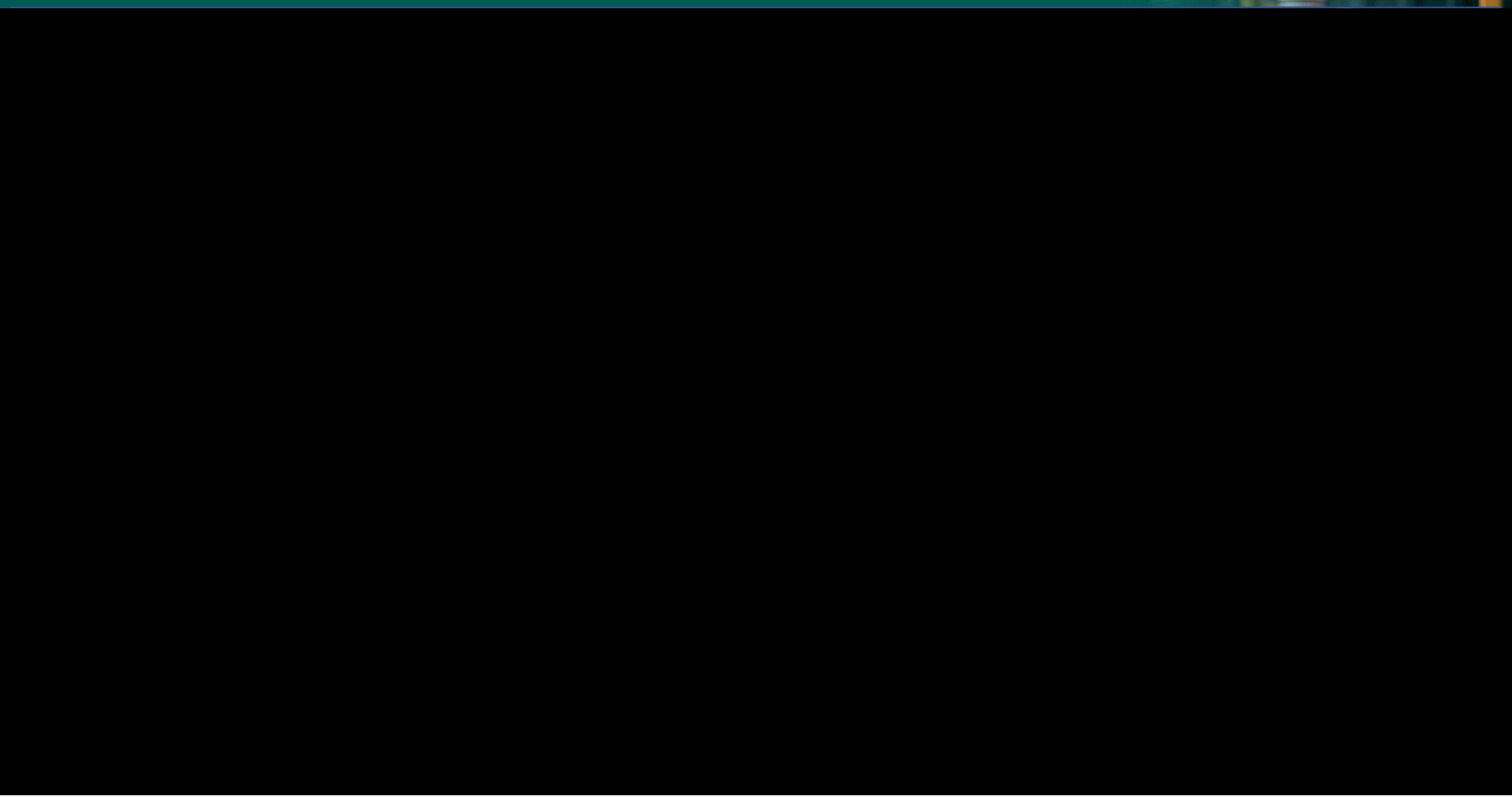


Operational Needs and Drivers.
- *Define business needs and drivers for 2023-2025*
- *Assess emerging trends and needs 2026-2029*
- *Explain historical performance and cost variances*

Enterprise Risk Framework
- *Manage oversight risk (e.g. disallowances)*
- *Develop a balanced risk-adjusted plan*

Performance & Productivity
- *Integrate performance objectives into planning analysis and decision-making*
- *Create direct links between planning and productivity/efficiency (e.g. benefits realization)*

Workforce Strategy
- *Optimize resourcing plans*
- *Balance resourcing complement*
- *Develop the workforce of the future*



Investment Planning & Portfolio Reporting



WHAT?

IPPR is a comprehensive and integrated annual planning process for all distribution system, fleet, facilities, and IT/OT investment programs.

Analyze
current state and future needs

Develop
short-term and long-term plans

Optimize
risks, outcomes, and cost

FOCUS

	2020-2024 Planning	Planning Discretion	2025-2029 Planning	Planning Discretion
Year 1	Re-baseline Plan	Moderate	Strategic Planning	Very High
Year 2	Work the Plan	Low	Strategic Planning	Very High
Year 3	**Work the Plan**	**Low**	**Penultimate Plan**	**High**
Year 4	Work the Plan	Very Low	Final Plan	Moderate
Year 5	Close-out the Plan	None	Prepare to Re-baseline	Moderate



Business Plan Risk Review

Overview



Goal

Ensure the 2023 Business Plan addresses the enterprise risks and mitigations as identified in the corporate risk assessment (RA) process

Collaborate

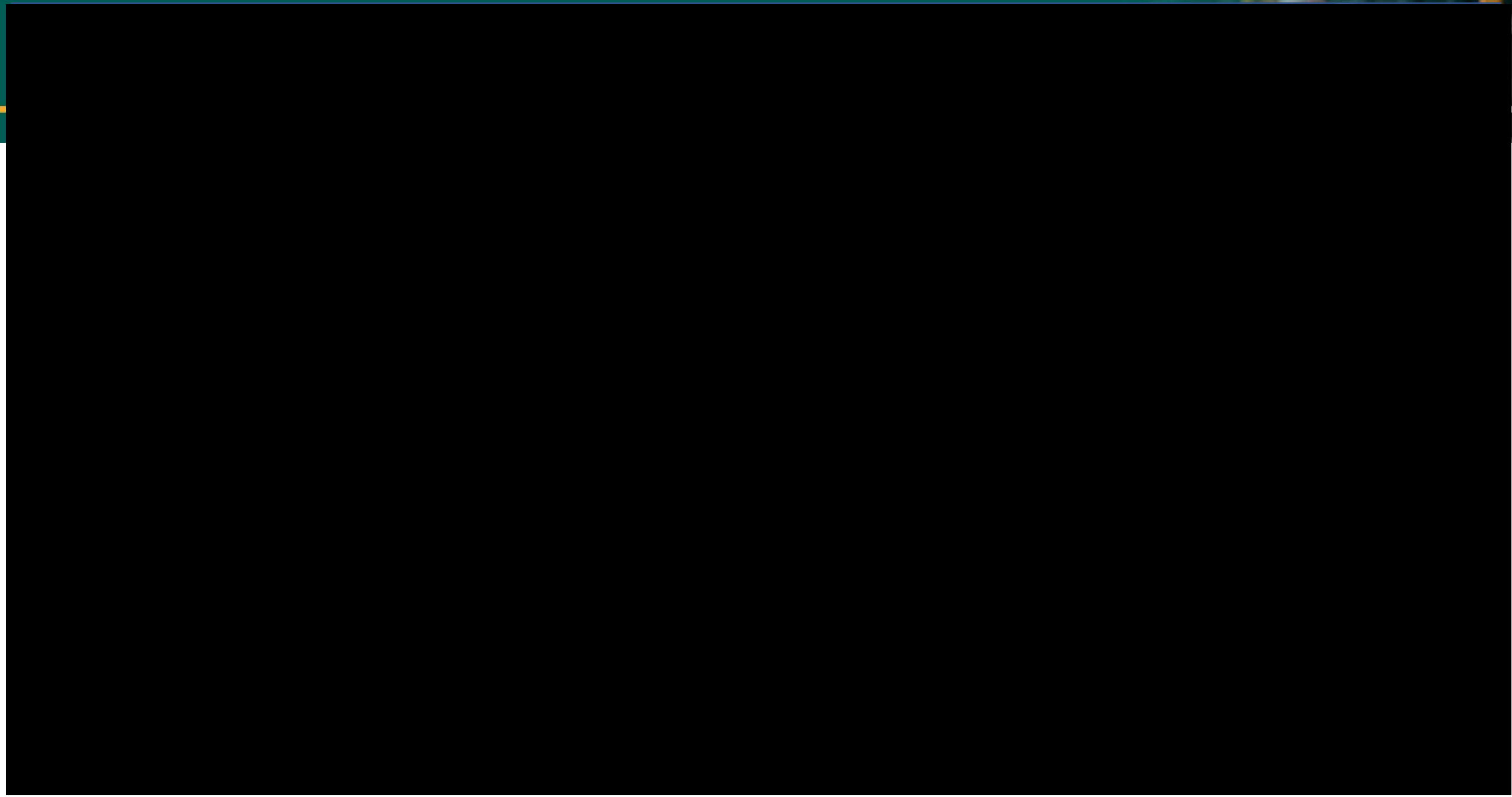
- Risk DRPs identified control weaknesses, mitigations and required actions during the annual RA process
- ERM key partner in business plan process at the outset

Process

- Critically examine proposed impacts to key mitigations
- Close control deficiencies identified during RA and test/implement action plans

Results

- Presentation on control deficiency closure and RA action plan implementation
- Consideration of RA heat map results
- Determine impact on risk position





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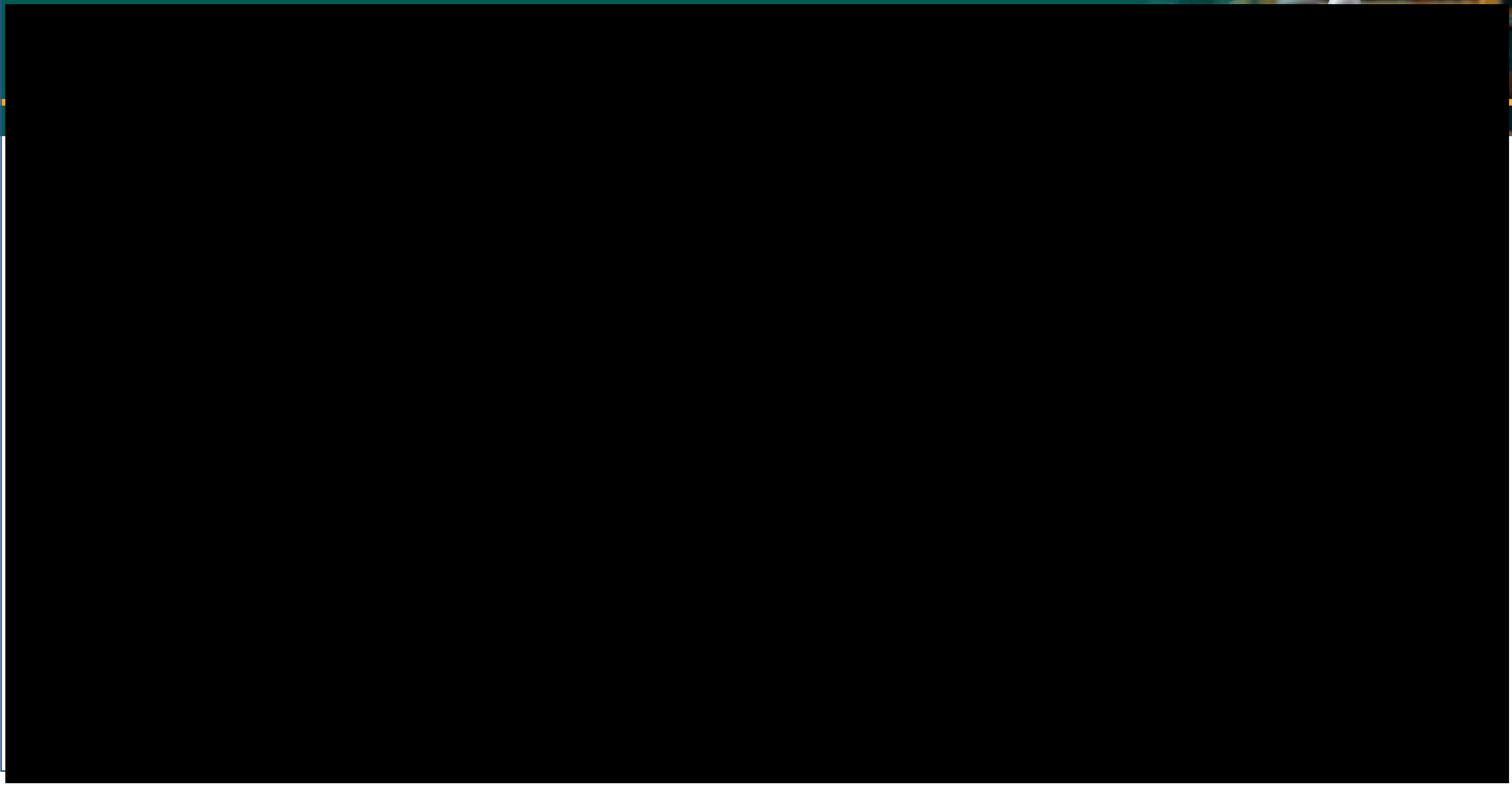
APPENDIX





RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-7

Reference: [Ex.1B]

QUESTION:

Please provide summaries of all internal audit reports conducted since 2020, related to any aspect that directly or indirectly relates to Toronto Hydro's business, their findings, recommendations, and the status of any actions that have or are to be taken.

RESPONSE:

Please refer to the attached appendix.

Insight: 29 reports were issued between 2020 and 2024 (February 2024), including 209 observations. 150 are remediated and 59 are unremediated but on track for timely completion.

Summary of Internal Audit Findings since 2020 with Status of Actions Taken by Management

Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date
07-May-20	Information Technology General Controls - 2020	Documentation of changes to IT Incidents	Changes, including delays and priorities, are not formally documented to ensure that IT incidents are resolved in a timely manner	**Completed**	31-Jan-21
07-May-20	Information Technology General Controls - 2020	Monitoring of application security logs	User application logs, pertaining to key applications, in some instances are not formally monitored by the Information Security Team using an appropriate monitoring application to ensure that security threats (such as unauthorized access) are identified and resolved on a timely basis	**In-Progress**	30-Sep-24
07-May-20	Information Technology General Controls - 2020	Password policy compliance	Password configurations for the Operational Data Store (ODS) application and MV90 database do not fully comply with Toronto Hydro password policies	**Completed**	30-Sep-23
07-May-20	Information Technology General Controls - 2020	Review of information security policy, standards and guidelines	IT Standards and Guidelines, in one instance, was not formally reviewed and signed off to ensure that published versions used by Toronto Hydro personnel are accurate and appropriately approved	**Completed**	30-Jun-21
07-May-20	Information Technology General Controls - 2020	Review of third-party Connexo database controls	Third party controls over the Connexo database, used to store hydro consumption data, are not being formally reviewed to ensure compliance with Toronto Hydro standards	**Completed**	30-Jun-21
07-May-20	Information Technology General Controls - 2020	SAP configuration change management	An opportunity exists to formalize the documentation and approval process for configuration changes, involving the locking and unlocking of the SAP production environment	**Completed**	30-Jun-21
31-Jul-20	IESO Settlement	IESO Invoice Review and Payment Approval	An opportunity exists to streamline and enhance the effectiveness of the IESO invoice review and payment approval process by incorporating high level analysis and insights to support the accuracy of the IESO invoice	**Completed**	31-Dec-20
31-Jul-20	IESO Settlement	Meter Data Review	The daily review of meter data accuracy does not currently include a completeness review to ensure that all grid supply point (GSP) meters are part of the review for load accuracy and reasonability	**Completed**	30-Sep-20
31-Jul-20	IESO Settlement	Purchase Load Completeness Reconciliation	The completeness of the monthly IESO purchase load is not validated by reconciling the total meters included within our monthly purchase load records to the total meters within the IESO records	**Completed**	30-Sep-20
31-Jul-20	IESO Settlement	Timeliness of Journal Entry Reviews	Monthly journal entries pertaining to the cost of power are not in all cases reviewed on a timely basis and the Accounting Policy does not define the deadline for the approval of standard journal entries	**Completed**	31-Dec-20
31-Jul-20	IESO Settlement	IESO Submission Review	Regulatory reporting activities pertaining to the monthly wholesale settlement submissions are not formally and independently reviewed prior to online submission to the IESO	**Completed**	5-Jun-20
31-Jul-20	IESO Settlement	IESO Website Access	Access, for approved Toronto Hydro personnel to login and submit regulatory reporting information to the IESO website, is not reviewed on a periodic basis in accordance with the IESO Market Participant Control Considerations	**Completed**	31-Jul-20
31-Jul-20	IESO Settlement	Monitoring Conservation Demand Management Claims and Receipts	Conservation Demand Management (CDM) claims and receipts from the IESO that are recorded within our financial records are not reconciled on a periodic (ie monthly) basis to ensure timely detection of misalignment requiring investigation	**Completed**	30-Sep-20
31-Jul-20	IESO Settlement	Process Map and Standard Operating Procedures	End-to-End documentation of process maps and standard operating procedures (SOP's) including internal controls are not formally documented	**Completed**	31-Dec-20
31-Jul-20	IESO Settlement	Review of System and Organization Controls (SOC) Report for IESO	IESO's System and Organization Controls (SOC) report is not reviewed to ensure reliance on IESO's control environment is appropriate	**Completed**	31-Dec-22
04-Aug-20	Ontario Cyber Security Framework Compliance	Compliance Documentation	An opportunity exists to establish a more structured and robust work program to ensure consistency, sufficiency and completeness of the documentation supporting compliance with the Ontario Cyber Security Framework	**Completed**	30-Sep-22
04-Aug-20	Ontario Cyber Security Framework Compliance	External Audit Coverage	An opportunity exists to document and report external risk assessment coverage across all cyber security risk domains, including those covered through the assessment of OCSF compliance	**Completed**	31-Dec-21
04-Aug-20	Ontario Cyber Security Framework Compliance	OEB Risk Assessment Tool	An opportunity exists to supplement Toronto Hydro internal Cyber Security risk assessment by utilizing the OEB recommended Inherent Risk Profile Tool to ensure that TH's risk assessment results are determined based on standardized criteria that can be compared with external benchmarks from other local distribution companies	**Completed**	24-Jun-20
04-Aug-20	Ontario Cyber Security Framework Compliance	Residual Risk Assessment	An opportunity exists to perform the residual risk assessment, as recommended by the Ontario Cyber Security Framework, to ensure that the residual risks after controls are appropriately managed	**Completed**	30-Sep-22
07-Aug-20	Employee Travel and Expense	Expense Auditing Methodology	An opportunity exists to assess if a risk-based sampling methodology can more efficiently reduce the residual risk of an inappropriate expense claim to an acceptable level	**Completed**	31-Dec-22

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Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date
07-Aug-20	Employee Travel and Expense	Manager review effectiveness	Employees are submitting a significant volume of reports containing errors and their Leaders are not consistently performing an effective review of their expense reports to ensure that these errors are detected and prevented	**Completed**	30-Apr-21
07-Aug-20	Employee Travel and Expense	Reporting and scorecarding of non-compliance with Expense Reimbursement Policy	Opportunity exists to improve the effectiveness of the existing non-compliance reporting process	**Completed**	31-Jan-21
07-Aug-20	Employee Travel and Expense	Sensitive T&E access	Access to perform highly sensitive T&E SAP transactions has not been appropriately restricted	**Completed**	31-Jan-21
07-Aug-20	Employee Travel and Expense	Standard Operating Procedures	Standard Operating Procedures (SOPs) are not reviewed and updated on timely basis	**Completed**	31-Mar-21
19-Nov-20	Engineering, Capital Planning & Execution - Phase 1	Access to Capital Planning and Budgeting files	Access to key capital planning and budgeting files (eg Capital Model, Capex Budget, etc) is not appropriately restricted to ensure that only authorised personnel have read/write access	**Completed**	31-Dec-20
19-Nov-20	Engineering, Capital Planning & Execution - Phase 1	Process Map and Standard Operating Procedures	End-to-End documentation of process maps and standard operating procedures (SOP's) are not formally documented	**Completed**	31-Dec-20
19-Nov-20	Engineering, Capital Planning & Execution - Phase 1	Reporting Root Causes for Change Requests	An opportunity exists to enhance the existing review process for the key budgetary documents including the Capital Expenditure Budget, In-Service Additions Budget and Capital Model	**Completed**	31-Dec-20
01-Feb-21	Data Loss Prevention	Information Classification Guidelines and Handling Procedures	Guidelines and information handling procedures to support the implementation of the Information Classification Policy have not been developed to ensure that all applicable Toronto Hydro users of information have sufficient awareness and practical guidance required to classify, transmit and store sensitive information in accordance with the policy	**Completed**	30-Jun-22
01-Feb-21	Data Loss Prevention	Third-Party DLP Awareness Program	Opportunities exist for the development of a third-party contractor DLP awareness program to ensure that third-party contractors (ie all vendors with access to our systems and/or handling our sensitive and confidential data) are aware of our requirements and expectations	**Completed**	31-Dec-22
01-Feb-21	Data Loss Prevention	Access to TH Facilities	Access to different parts of the TH facilities including data centers are not reviewed for adequacy, especially for employees who moved within Toronto Hydro organizational structure	**Completed**	31-Dec-21
01-Feb-21	Data Loss Prevention	Change Management for DLP Application	An opportunity exists to formalize the change management governance procedures for McAfee DLP application to address the confidentiality of data and configurations	**Completed**	30-Sep-21
01-Feb-21	Data Loss Prevention	Information Uploads through Cloud Services	Uploads to third party emails (eg Gmail) and cloud storage websites (eg Google Drive) are monitored but not blocked	**Completed**	31-Dec-22
01-Feb-21	Data Loss Prevention	Periodic Review of DLP Rulesets	An opportunity exists to formalize the periodic review procedures of DLP rulesets, including who, when and how the review is performed and documented	**Completed**	31-Dec-21
01-Feb-21	Data Loss Prevention	Retention and Disposal of Data stored by DLP Application	An opportunity exists to define and document the records retention period for data collected by the DLP Monitor application, which is used to scan the majority of data transmitted externally from within Toronto Hydro	**Completed**	31-Dec-21
01-Feb-21	Data Loss Prevention	Review of SOPs and Project Documents	An opportunity exists to review key documents such as the Standard Operating Procedures, Operational Project Documents and Incident Response Playbook(s) to ensure that the most recent versions, being used by personnel, are accurate and appropriately approved	**Completed**	30-Sep-21
01-Feb-21	Information Technology General Controls - 2021	Formalizing the Review and Reporting of Vulnerability Assessment Reports	Timely vulnerability remediation activities are being performed and documented, however monthly Vulnerability Assessment reports are not being formally prepared, reviewed and reported in compliance with the Vulnerability Management Standard	**Completed**	30-Nov-21
01-Feb-21	Information Technology General Controls - 2021	Additional Financial System Backups	Additional financial system's backups (ie an additional backup on top of the full back performed weekly) are not being performed on an annual basis in compliance with Toronto Hydro's Backup policy	**Completed**	30-Sep-21
01-Feb-21	Information Technology General Controls - 2021	Obsolete Guidance	A process that ensures timely decommissioning of obsolete system architecture standards and guidelines, stored on PluggedIn, has not been established	**Completed**	31-Dec-21
01-Feb-21	SCADA	Information Classification Guidelines and Handling Procedures (Remediation in progress)	Guidelines and information handling procedures to support the implementation of the Information Classification Policy have not been developed to ensure that all applicable Toronto Hydro users of information have sufficient awareness and practical guidance required to classify, transmit and store sensitive information in accordance with the policy	**Completed**	30-Jun-22
30-Jul-21	Unbilled Revenue	Journal Entry & Account Reconciliation Review	The journal entry and account reconciliation review controls did not prevent recording errors of Ontario Electricity Rebate (OER) reimbursements from the IESO that resulted in misclassifications between account receivable accounts (ie accounts receivable and unbilled revenue receivables) during Q2 and Q3 2020	**Completed**	30-Jun-21

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Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date
30-Jul-21	Unbilled Revenue	Unbilled Revenue Accrual Analysis	An opportunity exists to further substantiate the reasonability of the unbilled revenue accrual, determined by the Electricity Revenue Application, with a more robust analysis including the comparison of the estimated accrual to the subsequent actual billings	**Completed**	31-Dec-22
30-Jul-21	Unbilled Revenue	Unbilled Revenue Accrual Methodology	The methodology for calculating the unbilled revenue accrual, which varies across the electrical utility sector, is not periodically reviewed with a pre-defined frequency (eg annually or bi-annually) to ensure ongoing alignment with best and leading practices	**Completed**	31-Dec-22
30-Jul-21	Unbilled Revenue	Process Map and Standard Operating Procedures	End-to-End documentation of process maps and standard operating procedures (SOP's) including internal controls are not being maintained on a pre-defined frequency	**Completed**	31-Dec-22
30-Jul-21	Unbilled Revenue	Rate Change Assessment Documentation	Changes to rates in the CC&B billing system are reviewed for potential impacts to the unbilled revenue accrual according to Management, however the change assessment impacts are not documented in instances where rate changes are determined to have no impact	**Completed**	30-Sep-21
30-Jul-21	Unbilled Revenue	Retention and Disposal of Data Stored in ERA	An opportunity exists to define and document the records retention period for data collected in ERA	**Completed**	31-Dec-22
30-Jul-21	Unbilled Revenue	System Reconciliation Documentation	The ERA, used to calculate the Unbilled Revenue Accrual, relies on data from the billing system (CC&B), however management has not established a process to evidence the pre-existing monthly completion and review of the system reconciliation	**Completed**	30-Sep-21
05-Nov-21	Customer Billing	Documentation of Process Map and Standard Operating Procedures	End-to-end documentation of operational process maps) and Standard Operating procedures, including internal controls, are not being adequately documented, reviewed and maintained	**Completed**	31-Dec-22
05-Nov-21	Customer Billing	Review of Customer Communication Templates	Customer Letters pertaining to the applicability of the Ontario Energy Rebate and rate pricing options (ie time of use vs fixed rate) were not effectively reviewed prior to distribution and in some circumstances, the letters contained errors	**Completed**	31-Jan-22
05-Nov-21	Customer Billing	Third Party Control Reliance	Reliance is placed on third party vendors for bill processing in Toronto Hydro's CC&B Billing system and for printing customer hydro bills, however the third-party vendors' controls are not validated (via SOC 2 third party control report, control testing or periodic audit) on a predefined basis to ensure that reliance is appropriate	**Completed**	30-Aug-22
05-Nov-21	Customer Billing	Bill Adjustment Approval Access	Access to approve manual billing adjustments (including refunds) in CC&B has not been appropriately restricted	**Completed**	31-Dec-21
05-Nov-21	Customer Billing	Documentation of Billing Quality Assurance Monitoring	The Revenue Assurance and Compliance team performs quality assurance monitoring of Customer Bills on a monthly basis, however the results of expanded sampling, which are performed when exceptions are noted in the original sample, are not documented or included within the internal scorecard metric for billing accuracy	**Completed**	31-May-22
05-Nov-21	Customer Billing	Refund Adjustment Review	In some instances, the monthly review of refund adjustments below $2K is not completed within the control timeline and in some instances the review and approval of the refund adjustment is not documented in an unalterable format by the Supervisor, Accounts Receivable	**Completed**	31-Dec-21
05-Nov-21	SAP Security 2021	Access to development functionality	Access to sensitive development functions are not restricted to authorized personnel	**Completed**	30-Apr-22
05-Nov-21	SAP Security 2021	Firefighter access roles	Access within the Firefighter role in SAP ECC is not sufficiently restricted as it includes more sensitive administrative functions than required	**Completed**	30-Apr-22
05-Nov-21	SAP Security 2021	Access reviews of SAP ECC	Access to Supervisors and above is not included in the annual access review of SAP ECC	**Completed**	31-Jul-22
05-Nov-21	SAP Security 2021	Access reviews of SAP non-ECC systems	An opportunity exists to formalize the documentation for periodic review of access in non-ECC systems to ensure reviews are consistently performed	**Completed**	31-Dec-22
05-Nov-21	SAP Security 2021	Custom program access control	Custom programs & transaction codes in the SAP production environment, some of which may provide user access to update critical financial data and transactions (eg posting journal entries), are not appropriately secured using authorization checks to prevent execution by unauthorized users	**Completed**	31-Oct-22
05-Nov-21	SAP Security 2021	Review of Firefighter access logs	Review evidence of Firefighter access logs, which shows how sensitive access is used by authorized users, is not formally documented	**Completed**	31-Jul-22
05-Nov-21	SAP Security 2021	Review of SOPs	An opportunity exists to review Standard Operating Procedures (SOPs) to ensure that the most recent versions, being used by personnel, are accurate and appropriately approved	**Completed**	31-Jul-22

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Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date
05-Nov-21	Software Licensing	IT Software Procurement Guidance	The Procurement Policy provides guidance on IT software purchases greater than $25K, however, guidance for IT software purchases below $25K are not documented within the policy to ensure awareness of the requisite stakeholder workflow and process requirements (eg Review and approval of cloud-based solutions prior to contractual agreements)	**Completed**	30-Apr-22
05-Nov-21	Software Licensing	Software Request Intake and Documentation	In some cases, software requests are not being routed & tracked through the requisite centralized Remedy service ticketing system or being appropriately supported with the required software request scoping document template	**Completed**	31-Mar-22
05-Nov-21	Software Licensing	License Monitoring Program	Guidelines for Toronto Hydro's Licence Monitoring Program are not formally documented to clearly define the program parameters	**Completed**	31-May-22
05-Nov-21	Software Licensing	Software Cost Reporting	OPEX software costs are not tracked and monitored by business cost center or division to ensure cost awareness and collaborative efforts to monitor and control software costs	**Completed**	31-Aug-22
05-Nov-21	Software Licensing	Documentation of Process Maps	Process maps for business case and scoping document (the evaluation method for software requisitioning) are formally documented but do not reflect the current approval processes by the Center of Excellence and IT Senior Leadership	**Completed**	31-Mar-22
05-Nov-21	Software Licensing	Review of Service Request Management Guideline	Evidence of review and approval of the Service Request Management Guideline is not documented and retained	**Completed**	31-Oct-21
05-Nov-21	Software Licensing	Software Cost for Desktop Applications	Business cost center owners are not informed of individual software costs when approving the software access requisitions for desktop apps within Remedy IT ticketing system	**Completed**	31-Dec-21
05-Nov-21	Software Licensing	Software Utilization Review Documentation	Review of software licence utilization, which ensures that purchased software licences are being appropriately deployed and used, are in some cases not formally documented, including sign-off and dating	**Completed**	31-Mar-22
24-Mar-22	Customer Connections	Administrative Duties Management (Design & Billing)	Especially in the absence of an end-to-end integrated customer connection system, administrative duties and related processes within the Designer role require greater levels of diligence, timely execution and management oversight as they are substantially impacting all other downstream processes within the Customer Connection process	**Completed**	31-Dec-22
24-Mar-22	Customer Connections	Backlogged Customer Connection Requests (Intake & Design)	Customer Connection requests, pertaining to low and high voltage connections that are forwarded from Intake to the Design team for triage, are backlogged as they are not consistently being allocated to individual designers by the Design Supervisors (ie for high voltage) and Design Student (ie for low voltage) on a timely basis and/or within the OEB prescribed timelines	**Completed**	31-Dec-22
24-Mar-22	Customer Connections	CC&B Data Input and Integrity (Reporting)	Customer connection data (eg disconnection and connection dates, customer service request dates, etc) is not being consistently entered into the CC&B Billing system by the Office Administration Team on a timely basis as the operational data is not consistently communicated to them by Designers on a timely basis	**Completed**	30-Jun-22
24-Mar-22	Customer Connections	Green Construction Folders (Construction)	Green Construction Folders, which are used to maintain accurate site drawings and hydro asset locations in the GEAR System, are not consistently returned to the Enterprise Program Management Office (EPMO) group upon completion of customer connections projects	**Completed**	31-Jul-22
24-Mar-22	Customer Connections	Intake Process Bypass (Intake)	Complete and accurate records of all customer connection intake requests, required for end-to-end tracking of customer connection projects, are not being maintained in the CC&B system as the intake process is being bypassed in some instances (eg Direct Designer contact by customers instead of call center/online connection requests)	**Completed**	30-Jun-22
24-Mar-22	Customer Connections	System Alignment and Integration (Reporting)	The CRM Project Management System, CC&B System, and SAP Financial Recording System, used within the Customer Connection process, are not reconciled on a predefined basis or with a sufficiently robust process to consistently facilitate optimized data flow and data accuracy within customer billing, OEB reporting, ongoing project status monitoring and financial recording	**Completed**	31-Jul-24
24-Mar-22	Customer Connections	Customer Connection Estimate Disclosure (Design & Billing)	An opportunity exists to review, revise and standardize the documented guidance and practices for disclosing preliminary estimates to customers in advance of the review process, especially as it pertains to customer connections with higher pricing risk, such as large, material and non-routine projects	**Completed**	30-Jun-22
24-Mar-22	Customer Connections	Design Job Quotation Review for Non-OTC Connections Above 50K (Design & Billing)	The review of job quotations that do not require an OTC (eg temporary connections, isolations, demolitions, relocations, etc) is not consistently performed in accordance with the authorization level requirements with the Toronto Hydro Signing Policy for quotations above 50K	**Completed**	31-Mar-22

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Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date
24-Mar-22	Customer Connections	Design Work in Advance of Payment (Design & Billing)	Design work, in some circumstances, is performed in advance of payment received from customer without a defined process and/or documented approval for non-compliance with Toronto Hydro standards as documented within the Offer-to-Connect customer agreement	**Completed**	31-Jul-24
24-Mar-22	Customer Connections	Enhancement Work and Customer Connections (Design & Billing)	There are inconsistencies on when and how enhancement work (eg replacement of an aging transformer, asset or duct/cables) is being included in designs and on internal process forms (ie, Designer Input Form) and an opportunity exists to standardize the identification of enhancement work with the Customer Connection work	**Completed**	31-Dec-22
24-Mar-22	Customer Connections	Expanded Variance Analysis (Reporting)	There is an opportunity to expand the existing project variance analysis to periodically identify materials and labour variance trends, insights and anomalies by estimate preparer, estimate reviewer and customer over time	**Completed**	31-Dec-22
24-Mar-22	Customer Connections	Intake Channel Monitoring (Intake)	A process to track, monitor and metric customer connections by intake channel (ie online or call center) has not been established to encourage most cost-efficient channel utilization, establish baseline channel volumes ahead of the incoming improved online intake customer connection portal and identify connection requests received through unofficial channels (eg direct customer to designer contact)	**Completed**	30-Sep-22
24-Mar-22	Customer Connections	Project Variance Threshold Review (Reporting)	While customer connection projects exceeding predefined KPI thresholds are reviewed by the Enterprise Program Management Office on an annual basis, there may be an opportunity to lower/tighten the threshold and/or expand variance analysis using additional selection criteria to ensure that random coverage exists for variances outside of the predefined thresholds	**Completed**	30-May-22
24-Mar-22	Customer Connections	Regional Team Process Standardization (Design & Billing)	There is an opportunity to standardize and document the Designer and Construction team roles, responsibilities and best practices across the East, West and Central regional groups	**Completed**	31-Jul-23
24-Mar-22	Customer Connections	Regulatory Reporting of Service-level Metrics – Timely Completion of Connection Requests (Reporting)	There is an increased risk of inaccurate reporting to the OEB regarding percentage of low-voltage customer connection requests serviced within five days, due to management misinterpretations of the calculation inclusions (ie disconnections were incorrectly included within the calculations) which flowed into the review process	**Completed**	28-Feb-21
24-Mar-22	Customer Connections	Regulatory Reporting of Service-level Metrics – Timely Written Responses to Customer Enquiries and Appointment Scheduling (Reporting)	There is an increased risk of inaccurate reporting to the OEB due to inconsistencies in the methodology of metrics measuring the timeliness of responses to customer enquiries and booking of customer appointments	**Completed**	30-Jun-22
24-Mar-22	Customer Connections	Capital Contribution Rebates from Customers Connected to Assets Previously Expanded (Design & Billing)	There is no process established to identify capital contribution rebates to be collected from customers with Short Form Offers to Connect (OTC) who are being connected to an asset that was previously expanded through a pre-existing OTC	**Completed**	31-Dec-22
24-Mar-22	Customer Connections	Designer Input Form Review (Design & Billing)	A process to review and sign-off the Designer Input Form, the data of which is used to calculate design estimates, capital contributions and expansion deposits, has not been established	**Completed**	31-Jan-23
24-Mar-22	Customer Connections	Payment Instructions (Design & Billing)	An opportunity exists to revise the payment instructions, sent to Connection Customers along with their invoice, to explicitly limit cash payments to situations only allowed under OEB's Distribution System Code, and discourage cash payments	**Completed**	30-Sep-22
24-Mar-22	Customer Connections	Upstream Prerequisites Facilitating Automated Project Variance Analysis (Design & Billing)	The automation of Project Variance Calculations within SAP requires manual intervention to perform as Design Supervisors are not consistently inputting their paper-based customer connection estimate approvals into SAP, which is a prerequisite for the automation of the project variance calculations	**Completed**	31-Dec-22
24-Mar-22	Customer Connections	Work Allocation & Rotation (Design & Billing)	A standardized methodology for allocating design work and work rotation has not been established to ensure that design work is appropriately assigned and that customer familiarity risks are managed and mitigated	**Completed**	31-Dec-22
14-Apr-22	Information Technology General Controls - 2022	Access Approval for New Hires	In some cases, System Access for new hires is not being approved within the Remedy IT Service Ticketing System by the appropriate level of management, as required by the Internal Access Control Standard	**Completed**	30-Jun-22
14-Apr-22	Information Technology General Controls - 2022	Periodic review of Policies, Guidelines and Standards	Information Technology policies, guidelines and standards are not being reviewed within a defined timeline	**Completed**	31-Dec-22
22-Aug-22	Employee Travel and Expense 2022	Expense Auditing Methodology and Duplicate Expense Claim	An opportunity exists to assess if a risk-based sampling methodology can more efficiently reduce the residual risk of an inappropriate expense claim to an acceptable level and to automate the controls for detecting and preventing duplicate T&E claims	**Completed**	29-Dec-23
22-Aug-22	Employee Travel and Expense 2022	Duplicate Expense Claims	An opportunity exists to automate the controls for detecting and preventing duplicate T&E claims	**Completed**	29-Dec-23

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22-Aug-22	Employee Travel and Expense 2022	Non-Compliance Reporting (Repeat Observation)	Reporting of T&E Policy non-compliances, detected and corrected through the review process, are not consistently being reported to Executives on a quarterly basis	**Completed**	31-Jan-24
22-Aug-22	Road Cut Accrual	Differentiating Permits Requiring Restoration Accruals	A process to differentiate which permits require future restoration has not been sufficiently defined and documented to ensure completeness of PM Work Orders and accruals	**Completed**	31-Dec-22
22-Aug-22	Road Cut Accrual	Post-Restoration Accrual Reversal Process	A well-defined process to initiate the road cut accrual reversals in SAP, has not been maintained to ensure all completed projects, for which all invoices have been received, are communicated by the Project Owners to Finance on a timely basis	**Completed**	28-Feb-23
22-Aug-22	Road Cut Accrual	Project Ownership & Assignment	A sufficient process does not exist to ensure that all road cut restoration projects are assigned to a Project Owner upon initiation or to ensure that projects are reassigned in the event of change (ie employee turnover)	**Completed**	31-Dec-22
22-Aug-22	Road Cut Accrual	Reconciliation of Operational and Financial Records	Operational records of road cuts, which trigger the liability for restoration, are not formally reconciled to the road cut accruals recorded in SAP on a predefined frequency, to ensure completeness of the road cut accrual	**Completed**	31-Jan-23
22-Aug-22	Road Cut Accrual	Reconciliation of Toronto Hydro and City Permit Records	Reconciliations, comparing Toronto Hydro's permit records with the City's permit records, are not performed on a predefined frequency, to ensure all road cut permits are tracked and recorded on a timely basis	**Completed**	31-Dec-22
22-Aug-22	Road Cut Accrual	Road Cut Accrual Aging Analysis	A road cut accrual aging analysis has not been established to ensure long-outstanding accruals are identified, monitored and reviewed on a predefined frequency as required by TH policy	**Completed**	31-Oct-22
22-Aug-22	Road Cut Accrual	Timely Execution & Monitoring of Road Cut Restorations	Road cut restorations are not monitored for timely completion or to ensure compliance with the two-year permit deadline	**Completed**	31-Mar-23
22-Aug-22	Road Cut Accrual	Accrual Recording Process	There is an opportunity to increase the auditability, audit trail and transparency associated with road cut recording in SAP by aligning the process for accrual setup and reversal (ie either at the permit or accrual level)	**Completed**	30-Apr-23
22-Aug-22	Road Cut Accrual	Customer Enquiry Process	The Customer Enquiry process does not currently have a process for matching customer complaints with restoration projects and associated project owners to facilitate timely customer responses to complaints and enquiries	**Completed**	31-Dec-22
22-Aug-22	Road Cut Accrual	Management of Restorations Under Warranty	An opportunity exists to clarify the starting point for the two-year warranty period provided by Toronto Hydro (TH) to the City of Toronto for road cut restorations	**Completed**	28-Feb-23
22-Aug-22	Road Cut Accrual	Project Variance Analysis	Road restoration project variance analysis (PVA) are not performed to ensure that actual costs are reasonable when compared to budgeted (estimated) costs	**Completed**	31-Dec-23
22-Aug-22	Road Cut Accrual	Roles, Responsibilities and Process Governance Documentation	An opportunity exists to document the end-to-end road cut restoration accrual process and controls to ensure that roles and responsibilities are clearly defined	**Completed**	31-Dec-23
22-Aug-22	Warehousing and Inventory Management	Assessment of Excess and Obsolete Inventory	Opportunities exist to enhance the analysis of excess and obsolete inventory by including a slow-moving and aged inventory review	**In-Progress**	31-Mar-24
22-Aug-22	Warehousing and Inventory Management	Inventory Count Documentation	Surprise inventory counts, performed by Toronto Hydro personnel at third party (ie TOC Logistics Inc) warehouses, are not documented or performed on a predetermined minimum frequency	**Completed**	31-Dec-22
22-Aug-22	Warehousing and Inventory Management	Physical Access Review	Physical access records for Toronto Hydro warehouses are not reviewed on a predefined frequency and evidence of review is not consistently documented	**Completed**	30-Apr-22
22-Aug-22	Warehousing and Inventory Management	Purchase Requisition Change Access	Changes made to purchase requisitions by employees in the business, after Supply Chain Services has submitted purchase orders to suppliers, is not restricted in the system and a sufficient and standardized process for the business to advise Supply Chain Services of changes does not exist	**Completed**	31-Jul-23
22-Aug-22	Warehousing and Inventory Management	System Access and Segregation of Duties	Inventory system (ie Red Prairie) access provided to Warehouse Managers has not been appropriately segregated as some incompatible transactions in the system are not restricted through necessary system access controls	**Completed**	31-Jul-23
22-Aug-22	Warehousing and Inventory Management	Inventory Count Adjustment Analysis	Root-cause analysis of the inventory count adjustments is not formally documented and maintained	**Completed**	31-Jul-23
22-Aug-22	Warehousing and Inventory Management	Inventory Receipt Documentation	Inventory receipt documentation, including evidence of dated sign-off and validation of quantity received, is not being consistently performed	**Completed**	31-Jul-23
22-Aug-22	Warehousing and Inventory Management	Inventory Returns	Inventory returned to the warehouse is not consistently received into the system on a timely basis	**Completed**	31-Jul-23

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22-Aug-22	Warehousing and Inventory Management	Monitoring Purchase Order Changes	Buyers, within the Supply Chain Services team, have access to make changes to business-initiated purchase orders in emergency or time sensitive circumstances, however, no monitoring is performed to ensure changes are appropriate, approved and limited to allowable circumstances	**Completed**	31-Jul-23
22-Aug-22	Warehousing and Inventory Management	Relocated Inventory Recording	Relocation of inventory, associated with moving harness equipment for safety inspections, is not reflected in the inventory system which can compromise the accuracy of inventory counts or impact availability of inventory for shipping and/or use	**Completed**	31-Jul-23
22-Aug-22	Warehousing and Inventory Management	SAP System Access	System access to create material master data and set up re-order points in SAP has not been appropriately restricted	**Completed**	31-Mar-22
22-Aug-22	Warehousing and Inventory Management	Standard Operating Procedures	In some cases, Standard Operating Procedures are not formally documented, reviewed and updated on timely basis	**Completed**	31-Jul-23
22-Aug-22	Warehousing and Inventory Management	Warehousing Rate Agreement	The agreement with the third-party inventory provider (TOC Logistics Inc) requires an amendment to reflect the current labour rates being charged to and paid by Toronto Hydro	**Completed**	30-Nov-22
29-Aug-22	Customer Connections	Intake Channel Monitoring (Intake) - New issue opened to monitor implementation of KPIs	A process to track, monitor and metric customer connections by intake channel (ie online or call center) has not been established to encourage most cost-efficient channel utilization, establish baseline channel volumes ahead of the incoming improved online intake customer connection portal and identify connection requests received through unofficial channels (eg direct customer to designer contact)	**Completed**	30-Jun-23
14-Nov-22	Entity Level Controls	Fraud Risk Assessment	A fraud risk assessment is not being performed in accordance with the entity level control requirements for the Internal Controls over Financial Reporting (ICFR)	**In-Progress**	31-Dec-24
14-Nov-22	Entity Level Controls	Tracking and Approving Control Overrides	A process to track and approve control overrides, pertaining to ICFR has not been established	**Completed**	31-Jul-23
14-Nov-22	Entity Level Controls	Code of Conduct – Employee Sign-Off Frequency	An opportunity exists to review the three-year frequency for which employees are required to review and sign-off on the Code of Conduct against the annual best practice within the Canadian Hydro Utility sector	**In-Progress**	31-Dec-25
14-Nov-22	Entity Level Controls	Defining Governance Documentation Requirements	An opportunity exists to define the documentation requirements for critical governance, including Policies and Standard Operating Procedures (SOP)	**In-Progress**	31-Dec-24
14-Nov-22	Entity Level Controls	Financial Control Impact Assessment	An opportunity exists to formally evaluate the impact of significant changes to people, process and technology on the ICFR	**Completed**	1-May-23
14-Nov-22	Entity Level Controls	Joint Fraud Committee	An opportunity exists for the Joint Fraud Committee to establish a minimum meeting frequency to ensure ongoing consideration of fraud risk management and related activities	**In-Progress**	30-Apr-24
07-Feb-23	Capital Planning & Execution	Approval for Changes to Capital Projects	Capital Project Change Requests, pertaining to project cost, scope and schedule, are not consistently submitted and approved prior to execution and / or on a timely basis	**Completed**	30-Jun-23
07-Feb-23	Capital Planning & Execution	Reporting Root Causes for Change Requests	A formal process to document and report root causes for Capital Project Change Requests (CR) has not been established, however, is required to support the precision and accuracy of capital project scoping and costing within the Capital Plan	**Completed**	30-Nov-23
07-Feb-23	Capital Planning & Execution	Capital Planning Process SOP Documentation	Some areas of the long-term and short-term capital planning process are not formally documented	**Completed**	30-Sep-23
07-Feb-23	Capital Planning & Execution	Green Construction Folders SOP Documentation	An opportunity exists to formally document the standard operating procedures for returning electronic Green Construction Folders (eGCF)	**Completed**	31-Aug-23
14-Feb-23	Advanced Metering Infrastructure Remediation Review	Tracking and Monitoring of Cyber Security Gaps	Cyber security vulnerabilities identified through externally performed cyber security assessments have not been addressed by Non-SecOps stakeholders on a timely basis	**Completed**	1-Jun-23
15-Feb-23	Software Update Process (Change Management)	System Change Approvals	In one instance a material system change was implemented in advance of approval	**Completed**	1-Jun-23
15-Feb-23	Software Update Process (Change Management)	System Change Documentation, Detection and Monitoring	An opportunity exists to supplement the manual self-reporting process, used to monitor system changes, with an automated system change detection program, to ensure that a full record of system changes is maintained and can be monitored for appropriate pre-approval and potential post-implementation review/correction	**Completed**	1-Jul-23
15-Feb-23	Software Update Process (Change Management)	Validation Procedure and Documentation Standardization	System Change Validation Procedures (ie test requirements) are not formally documented and consistently applied across the Information Technology department	**Completed**	1-Jun-23
15-Feb-23	Software Update Process (Change Management)	Escalation of Latent Changes	An opportunity exists to implement a formal process for the escalation of latent changes to senior management	**Completed**	1-Jun-23
15-Feb-23	Software Update Process (Change Management)	Risk Criteria and Review	An opportunity exists to develop objective criteria to assess the risk associated with system changes and to regularly compare the risk levels assessed by the implementer against the actual incurred risks	**Completed**	1-Jul-23

Summary of Internal Audit Findings since 2020 with Status of Actions Taken by Management

Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date
28-Feb-23	Advanced Metering Infrastructure Remediation Review	Tracking and Monitoring of Cyber Security Gaps	Cyber security vulnerabilities identified through externally performed cyber security assessments have not been addressed by Non-SecOps stakeholders on a timely basis	**Completed**	1-Jun-23
26-Apr-23	Executive Expense Reimbursement	Expenses Posting on Toronto Hydro Website	An opportunity exists to define a reasonable timeline for posting the Executive and Board of Directors expenses on the external Toronto Hydro website	**Completed**	30-Jun-23
01-Jun-23	Capital Planning & Execution	Long-term Capital Planning Stakeholder Input Consideration (Materials Planning)	An opportunity exists to improve the long-term Investment Planning & Portfolio Reporting (IPPR) process by considering inputs from the Supply Chain Services team with respect to supply chain risks that have been elevated as a result of the pandemic	**Completed**	28-Feb-24
30-Jun-23	Customer Connections	Regional Team Process Standardization (Design & Billing)	Customer Connections & Key Account team has worked with PwC to develop formalized SOPs for customer connections processes	**In-Progress**	30-Apr-24
09-Aug-23	Customer Billing, Global Adjustment	GA Eligibility Governance (Eligibility Determination)	Sufficient governance (eg Internal Policies, Standard Operating Procedures, etc) to interpret the non-prescriptive, complex and evolving requirements of the GA, administered through the ICI program (Class A customers), have not been documented to support the accurate application of the regulation	**Completed**	31-Dec-23
09-Aug-23	Customer Billing, Global Adjustment	Load Aggregation Determination (Eligibility Determination)	Load aggregation (ie the summation of hydro load from customers with multiple accounts for the purpose of determining Class A eligibility for the GA) process and controls are not sufficiently designed and refined to identify all accounts belonging to the same customer and within the same facility	**In-Progress**	15-Apr-24
09-Aug-23	Customer Billing, Global Adjustment	Non-Interval Meters and Class A-Eligibility (Eligibility Determination)	The existing process for validating Class A eligibility does not take into consideration the OEB requirement to review and exclude non-internal meters (ie meters that do not measure when and how much consumption occurred during specific time-intervals)	**Completed**	29-Feb-24
09-Aug-23	Customer Billing, Global Adjustment	Review and Documentation of Load Aggregation (Eligibility Determination)	The algorithm programmed in Alteryx, a tool used to identify accounts in CC&B for load aggregation (ie the summation of hydro load from customers with multiple accounts for the purpose of determining Class A eligibility for the GA), has not been formally documented and reviewed to ensure that all the instances of eligible accounts for load aggregation are identified	**Completed**	29-Feb-24
09-Aug-23	Customer Billing, Global Adjustment	Review and Documentation of the Class A Eligibility Assessment Results (Eligibility Determination)	The procedures for the Class A eligibility assessment for the GA are not sufficiently defined and documented	**In-Progress**	30-Apr-24
09-Aug-23	Customer Billing, Global Adjustment	GA Billing Accuracy Review (Billing)	There is no review of GA billings for Class A customer to ensure that the individual customer billing in the new adjustment period is accurately set-up in CC&B and that the total annual value of GA is billed to the correct customers during the year	**In-Progress**	31-Aug-24
09-Aug-23	Customer Billing, Global Adjustment	Monitoring Changes in Market Participants (Billing)	Roles and responsibilities over monitoring of changes in market participants, that should be excluded from GA billing from Toronto Hydro through Class A, are not defined, assigned and formalized	**In-Progress**	31-Mar-24
09-Aug-23	Customer Billing, Global Adjustment	Review of System Billing Data Inputs (Billing) - Tracking long term action plan of physical review of Billing Data Inputs	Manual updates to Class A accounts in CC&B (ie flagging of Class A status and entry of PDF values) are not independently reviewed to ensure the accurate billing of GA charges	**In-Progress**	30-Sep-24
09-Aug-23	Customer Billing, Global Adjustment	Review of System Billing Data Inputs (Billing) - Tracking short term action plan of developing a review mechanism	Manual updates to Class A accounts in CC&B (ie flagging of Class A status and entry of PDF values) are not independently reviewed to ensure the accurate billing of GA charges	**Completed**	30-Jun-24
10-Aug-23	Payroll and Related Activities	Observation 1	For details, please refer the Payroll and Related Activities report	**In-Progress**	31-Mar-24
10-Aug-23	Payroll and Related Activities	Observation 2	For details, please refer the Payroll and Related Activities report	**Completed**	15-Jan-24
10-Aug-23	Payroll and Related Activities	Observation 3	For details, please refer the Payroll and Related Activities report	**Completed**	15-Jan-24
10-Aug-23	Payroll and Related Activities	Observation 10	For details, please refer the Payroll and Related Activities report	**Completed**	31-May-23
10-Aug-23	Payroll and Related Activities	Observation 4	For details, please refer the Payroll and Related Activities report	**Completed**	10-Nov-23
10-Aug-23	Payroll and Related Activities	Observation 5	For details, please refer the Payroll and Related Activities report	**Completed**	31-Dec-23
10-Aug-23	Payroll and Related Activities	Observation 6	For details, please refer the Payroll and Related Activities report	**Completed**	31-Dec-23
10-Aug-23	Payroll and Related Activities	Observation 7	For details, please refer the Payroll and Related Activities report	**Completed**	10-Jan-24
10-Aug-23	Payroll and Related Activities	Observation 8	For details, please refer the Payroll and Related Activities report	**Completed**	31-Dec-23
10-Aug-23	Payroll and Related Activities	Observation 9	For details, please refer the Payroll and Related Activities report	**Completed**	31-Mar-23

Summary of Internal Audit Findings since 2020 with Status of Actions Taken by Management

Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	Documentation of General Backup Requirements	General backup procedures for protecting data contained within operational technologies (eg remote terminal units used for collecting data from electric sensors and equipment, supervisory control systems used for monitoring electric equipment activity, and intelligent electronic devices, electronic sensors used to monitor equipment function) have not been documented within the IT departments Security Standards, which is used to document their processes and procedures	**In-Progress**	30-Apr-24
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	Documentation of Recovery Time and Recovery Point Objectives	Recovery time (i.e. the maximum acceptable amount of time that an organization is willing to wait for the recovery of its IT systems and services after a disaster or disruption) and recovery point (i.e. the maximum acceptable amount of data loss that an organization is willing to tolerate) objectives have not been documented within Toronto Hydro's Business Continuity and Recovery Plans.	**In-Progress**	30-Apr-24
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	Pre-Configuration Backup Requirements	Data backup procedures, that precede software configuration changes, have not been documented in the IT departments Security Standards document to ensure that data contained within operational technologies can be recovered in the event of an unsuccessful software configuration change	**In-Progress**	30-Apr-24
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	Asset Disposal and Decommissioning Management	Asset disposal and decommissioning procedures for IT/OT hardware and data storage do not include guidelines pertaining to OT assets to ensure compliance with the NIST requirements	**In-Progress**	30-Oct-24
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	Data-in-Transit Protection	The System Development Standards document, prepared by the Security Operations team, requires improvement in its data-at-rest section and the addition of baseline data flow diagram requirements to ensure compliance with the NIST requirements	**In-Progress**	30-Oct-24
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	Documentation of Access and Authentication Requirements	The Internal Access Control Standards document does not currently provide guidance pertaining to access parameters (eg changing default factory passwords, ongoing validation of superuser access, etc) for IP-based OT assets	**In-Progress**	30-Apr-24
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	Identification of Asset Vulnerabilities	Asset management requirements (eg security incident response simulations, log monitoring, patch management, configuration review etc) have not been documented for OT assets to ensure that vulnerabilities are identified and anaged on a timely basis	**In-Progress**	30-Oct-24
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	Inventory of Information Technology Systems	The inventory of information technology systems has not been documented to ensure cyber security threats from all systems is being tracked and monitored	**In-Progress**	30-Oct-24
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	Operational Technology Data Disposal	Procedures (eg, data sanitization and destruction, physical asset disposal, notification and communication, documentation and records etc) for the disposal and the decommissioning of data contained within OT assets have not been formally documented	**In-Progress**	30-Oct-24
07-Nov-23	Cyber Security, National Institute of Standards and Technology Compliance	System Development Life Cycle	The System Development Life Cycle (SDLC) requirements for OT assets has not been documented in accordance with NIST to ensure they are appropriately tracked, managed, utilized and protected	**In-Progress**	30-Oct-24
08-Nov-23	Accounts Receivable & Expected Credit Loss	Process Documentation – Accounts Receivable Operations (Customer Care)	Sufficient process governance has not been formally documented to support the Accounts Receivable Operations determination of the critical data inputs for the ECL calculation	**In-Progress**	15-Sep-24
08-Nov-23	Accounts Receivable & Expected Credit Loss	Approval of Inputs to Expected Credit Loss Calculations (Customer Care)	Evidence of approval of the quarterly inputs (eg, Winter Disconnection Moratorium, Arrears Payment Arrangement, write-off accruals, etc) to the ECL calculations prepared by the Accounts Receivable Operations team has not been formally retained in some instances	**Completed**	15-Dec-23
30-Dec-23	Road Cut Accrual	Roles, Responsibilities and Process Governance Documentation	An opportunity exists to document the end-to-end road cut restoration accrual process and controls to ensure that roles and responsibilities are clearly defined	**In-Progress**	30-Jun-24
20-Feb-24	Cyber Security, Cloud Storage	Cloud-Based Risk Assessments	An opportunity exists to perform risk reassessments for cloud-based applications on a pre-defined basis to enhance the existing framework which is event driven which may not sufficiently keep pace with application changes or the rapidly evolving cyber threats	**In-Progress**	31-Dec-24
20-Feb-24	Cyber Security, Cloud Storage	Vendor Cyber Security Requirements	Vendor Cyber Security requirements, as documented within Toronto Hydro's Security Checklist Template, are not being reviewed/revised on a regular basis or on a pre-defined frequency to ensure that evolving Cyber Security threats and organizational security standards are reflected in a timely manner	**In-Progress**	31-Oct-24
20-Feb-24	Cyber Security, Cloud Storage	Vendor Privacy Requirements	Vendor privacy requirements, as documented within Toronto Hydro's Privacy Checklist Template, are not being reviewed/revised on a regular basis or on a pre-defined frequency to ensure that evolving Cyber Security threats and organizational security standards are reflected on a timely basis	**In-Progress**	31-Oct-24

Summary of Internal Audit Findings since 2020 with Status of Actions Taken by Management

Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date
20-Feb-24	Cyber Security, Cloud Storage	Application Change Documentation	Minor changes and updates to cloud-based applications hosted by vendors are not consistently being tracked and documented in Remedy, Toronto Hydro's service request ticketing system	**In-Progress**	31-Oct-24
20-Feb-24	Cyber Security, Cloud Storage	Data Sensitivity Assessment	An opportunity exists to enhance the effectiveness of data sensitivity assessments by implementing a systematic and periodic review process for the Data Sensitivity Questionnaire template	**In-Progress**	31-Oct-24
20-Feb-24	Cyber Security, Cloud Storage	Total Data Sensitivity Ratings	There is an opportunity to enhance Cyber Security, for all data including data hosted in cloud applications, by implementing a process to consistently review and revise all total data sensitivity ratings, which are used to describe how sensitive data is for the organization	**In-Progress**	31-Jan-25
20-Feb-24	SAP Security - 2023	Periodic Review of Standard Operating Procedures	An opportunity exists to periodically review the standard operating procedures (SOP's) for SAP security to ensure that they remain current, reflect formal approval and include the current governance requirements and best practices	**In-Progress**	30-Sep-24
20-Feb-24	SAP Security - 2023	Standard Operating Procedures for SuccessFactors	There is an opportunity to improve the existing Standard Operating Procedures for SAP SuccessFactors by ensuring that they are periodically reviewed / approved and address critical inclusions such as access management, change management and governance procedures	**In-Progress**	30-Sep-24
23-Feb-24	Miscellaneous Accounts Receivable	Centralized Cheque Intake	The absence of a formalized, well-defined, and centralized process for handling cheque receipts pertaining to MAR has led to instances of misplaced cheques that were not deposited on a timely basis, became stale dated and required replacements from customers	**In-Progress**	15-Mar-24
23-Feb-24	Miscellaneous Accounts Receivable	Key Performance Indicators (KPI's)	Effective KPI's (e.g., percentage of overdue accounts receivable, timely cheque deposit, timely unapplied payments resolution, timely clearing of customer bank deposits, aging of accounts receivable, write-off rate, etc.) have not been established (i.e., to measure the performance of MAR processes) and are not being reported to key stakeholders on an ongoing basis	**In-Progress**	15-Feb-25
23-Feb-24	Miscellaneous Accounts Receivable	Overdue Receivables Collection Process	A formal process for the collection and management of overdue receivable balances has not been established to ensure that timely action is taken to collect outstanding receivables and minimize write-offs	**In-Progress**	15-Sep-24
23-Feb-24	Miscellaneous Accounts Receivable	Resourcing and Accounting Skillsets	Sufficient resources and requisite accounting skillsets within the MAR department are not in place following personnel turnover, interim resource streamlining attempts and challenges recruiting well suited resources	**In-Progress**	15-May-24
23-Feb-24	Miscellaneous Accounts Receivable	Unapplied Payments Backlog	There is a backlog of long-outstanding unapplied payments from customers, that have accumulated between 2019 to 2023, that have not been applied against customer accounts	**In-Progress**	15-Oct-24
23-Feb-24	Miscellaneous Accounts Receivable	Uncleared Bank Receipts	There is no validation process for ensuring that bank receipts are administratively cleared (i.e., each receipt is accurately applied against a customer invoice) in the SAP system and not over or under applied	**In-Progress**	15-Oct-24
23-Feb-24	Miscellaneous Accounts Receivable	Cheque Clearing Monitoring	A process to monitor and manage customer cheque payments that do not clear has not been established to ensure accurate recording of receivables at the customer account level	**In-Progress**	15-Apr-24
23-Feb-24	Miscellaneous Accounts Receivable	Cheque Deposit Roles and Responsibilities	Roles and responsibilities pertaining to the cheque deposit process have not been appropriately defined and documented to ensure that cheques are handled by appropriate personnel and deposited and recorded on a timely basis (e.g., deposit schedule, appropriate personnel performing, vacation backups, etc.)	**In-Progress**	15-Mar-25
23-Feb-24	Miscellaneous Accounts Receivable	Cheque Deposit Slips	There are cheque payment clearing delays as a result of the use of one deposit slip for multiple cheques, which requires that all cheque payments within the same deposit be properly identified and applied before any of them can be cleared in SAP	**Completed**	21-Aug-23
23-Feb-24	Miscellaneous Accounts Receivable	Cheque Image Record Keeping	Financial records pertaining images of cheques received from customers have not been consistently retained in accordance with TH's records retention policy	**Completed**	31-May-23
23-Feb-24	Miscellaneous Accounts Receivable	Cheque Register Process	A daily cheque register process, that record all cheques received and their details (i.e., payee information, job quote, invoice number, amount, date received, cheque #, etc.) has not been established to ensure that all cheques received, at the MAR department level, are tracked, recorded and deposited on a timely basis	**Completed**	31-May-23
23-Feb-24	Miscellaneous Accounts Receivable	Cheque Register Reconciliation and Review	A cheque register reconciliation, at the MAR department level, is not being prepared and reviewed to ensure a complete and accurate record of cheques received	**In-Progress**	15-Apr-24
23-Feb-24	Miscellaneous Accounts Receivable	Cheque Safekeeping	Cheques received from customers are not consistently being safeguarded and stored in secure location to ensure they are not misplaced, lost or accessible by unauthorized personnel	**Completed**	31-May-23
23-Feb-24	Miscellaneous Accounts Receivable	Customers' Remittance Process	Customers are not complying with remittance process (e.g., not providing sufficient payment details) and an opportunity to simplify the remittance process to encourage compliance exists	**In-Progress**	15-Jan-26
23-Feb-24	Miscellaneous Accounts Receivable	Operational Stakeholder Communication	An effective two-way communication process has not been established to ensure that Operational stakeholders and the MAR group are collaborating to resolve unmatched payments on a timely basis	**In-Progress**	15-Apr-24

Summary of Internal Audit Findings since 2020 with Status of Actions Taken by Management

Report Issue Date	Internal Audit Report Name	Title of Observation	Summary of Observation	Remediation Status	Agreed Completion Date
23-Feb-24	Miscellaneous Accounts Receivable	Payment Instruction Sheet Enhancement	There is an opportunity to enhance the delivery, format and communication of the payment instructions to facilitate customer compliance (i.e., the inclusion of payment identification information to facilitate the payment matching process)	**In-Progress**	15-Dec-24
23-Feb-24	Miscellaneous Accounts Receivable	Policy Documentation and Credit Memo's	A dedicated policy has not been established to address the unique characteristics and requirements of MAR's and there is no policy guidance pertaining to non-routine / emergency type credit memos	**In-Progress**	15-Jun-25
23-Feb-24	Miscellaneous Accounts Receivable	Receivables Aging Visibility	The accounts receivable aging report, which is included within the accounts receivable account reconciliation, combines all balances greater than 120 days into one category and therefore does not provide the account reconciliation reviewer with sufficient information and visibility to perform an effective review and analysis of the account receivable balance	**In-Progress**	15-Apr-24
23-Feb-24	Miscellaneous Accounts Receivable	Substantiating Long-Outstanding Unapplied Payments	Long-outstanding unapplied payments (i.e., a customer payment that has not been posted and cleared against a customer account/invoice in SAP) within the MAR aging report, are not substantiated with documented explanations to support the reviewer with assessing the validity of aged balances and documentation to support the aged account collection follow up and/or write off process	**In-Progress**	15-Jul-24
23-Feb-24	Miscellaneous Accounts Receivable	Timely Recording of Construction Receivables	Construction service receivables are being recorded when cash/payment is received, as opposed to when payment is owed, in accordance with the accrual basis of accounting	**In-Progress**	15-Sep-24
23-Feb-24	Miscellaneous Accounts Receivable	Uncollectible Write-Offs	A process has not been established to ensure that long-outstanding balances are written off on a timely basis in accordance with the Accounts Receivable policy	**In-Progress**	15-Oct-24
23-Feb-24	Miscellaneous Accounts Receivable	Unidentified Payment Intake	A front-end process to prevent payments without adequate identifying information from being processed and deposited to avoid subsequent payment matching delays and backlogs	**In-Progress**	15-Jan-26
23-Feb-24	Miscellaneous Accounts Receivable	Unidentified Payment Resolution	Unidentified payments are not being monitored, investigated and resolved on a timely basis, resulting in a backlog of unapplied payments	**In-Progress**	15-Jun-24
23-Feb-24	Miscellaneous Accounts Receivable	Bank Counter Cash Payments	The customer payment instructions do not include a cautionary note to help prevent customers from making cash payments at the bank counter to TH bank account	**In-Progress**	15-Dec-24
23-Feb-24	Miscellaneous Accounts Receivable	Cheque Deposit Review	There is no review of the weekly cheque deposits to ensure cheques are consistently deposited to the correct Toronto Hydro entity and for the correct amounts	**In-Progress**	15-Apr-24
23-Feb-24	Miscellaneous Accounts Receivable	Customer Compliance Monitoring	The tracking and monitoring of customer adherence to payment instructions are not in place to assess the efficacy of these instructions and the front-end management of the customer remittance process	**In-Progress**	15-Jan-25
23-Feb-24	Miscellaneous Accounts Receivable	Department Governance Sustainment Process	An opportunity exists to ensure ongoing compliance and maintenance of the central governance processes (e.g. KPI's, Standard Operating Procedures, Internal Controls, etc.) by tracking and reporting on these within the Operational Status Meetings and underlying department scorecard	**In-Progress**	15-Nov-24
23-Feb-24	Miscellaneous Accounts Receivable	Standard Operating Procedures (SOP) Documentation	A comprehensive SOP or procedure manual to show the step-by-step procedure of all aspects of the end-to-end MAR process does not exist	**In-Progress**	15-May-25
23-Feb-24	Miscellaneous Accounts Receivable	System Access Alignment with Roles and Responsibilities	There is an opportunity to review MAR personnel access to ensure that it is limited to their roles and responsibilities	**In-Progress**	15-Jul-24
23-Feb-24	Miscellaneous Accounts Receivable	Training and Reference Materials	Sufficient, formal and ongoing training and reference materials for new and existing personnel has not been established to ensure that MAR activities are consistently, accurately and efficiently performed	**In-Progress**	15-Jan-25

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-8

Reference: Exhibit 1B, Tab 1, Schedule 3, Table 9

QUESTION:

Please provide the details of the $5.5 million adjustments, by program for OM&A and by USoA for Other Revenue, which were made to the 2020 approved OM&A of $272.2 million and Other Revenue of $48.1 million, to normalize for the changes related to Accounts 4375 and 4380.

RESPONSE:

It is Toronto Hydro's understanding that in the interrogatory, SEC made a typo in referring to Other Revenues approved by the OEB. Toronto Hydro's OEB approved Other Revenues for 2020 before adjustment for shared services costs was $47.8 million[1].

Toronto Hydro made changes on how shared services costs are presented in accordance with the OEB's decision[2]. As a result, shared services expenses were recorded in USoA 4380 and therefore were reclassified from OM&A to revenue offsets as required by the Account Procedures Handbook.

The adjustments to the 2020 approved OM&A of $272.2 million are summarized in Table 1 below whereas, the adjustments to the 2020 approved Other Revenue of $47.8 million are summarized in Table 2.

[1] EB-2018-0165, Toronto Hydro-Electric System Limited ("Toronto Hydro"), 2020-2024 Custom Incentive Rate-setting ("Custom IR") Application – DRO Reply Submission & DRO Update (February 12, 2020), Schedule 11
[2] EB-2018-0165, Decision and Order (December 19, 2019) at page 131.

Table 1: Adjustment to OM&A

	($ Millions)
2020 OEB Approved OM&A	$272.2
Less: Reclass to USoA 4380 from Allocation and Recoveries Program; Shared Services Segment in OM&A	($5.5)
2020 Normalized OEB Approved OM&A	**$266.7**

The OM&A related revenue requirement approved by the OEB in 2020 was $266.7 (adjusted for Account 4380). The OEB approved this amount on an envelope basis, and therefore Toronto Hydro cannot provide a further breakdown as requested.

Table 2: Adjustment to Revenue Offset

	($ Millions)
2020 OEB Approved Revenue Offsets	$47.8
Less: Reclass to USoA 4380 from Allocation and Recoveries Program; Shared Services Segment	($5.5)
2020 Normalized OEB Approved Revenue Offsets	**$42.3**

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-9

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 12

With respect to Figure 1, please provide the data and underlying calculations and assumptions used.

RESPONSE:

Please see the response to interrogatory 1B-Staff-12(a) and (b) for the requested information.

For the IRM Scenario, Toronto Hydro determined the 2026-2029 revenue requirement by escalating the 2025 revenue requirement outlined in Exhibit 6 with the standard Price Cap IR parameters, namely: an inflation factor (based on a 2% forecast) minus a 0.6% X-factor. Please see the response to 1B-VECC-01 for a breakdown of the capital-related revenue under IRM.

For the CIR 1.0 scenario, Toronto Hydro determined the 2026-2029 revenue that would be collected through rates by escalating the 2025 revenue requirement (outlined in Exhibit 6 and summarized in 1B-Staff-03 at Table 1) with the Custom Price Cap Index (CPCI) approved by the OEB for the current 2020-2024 rate period, namely:

- For non-Capital Related Revenue Requirement (i.e. OM&A and Revenue Offsets) an inflation factor (based on a 2% forecast) minus a 0.6% X-factor (consistent with Price Cap IR parameters).
- For Capital Related Revenue Requirement (CRRR) (i.e. Amortization/Depreciation, Return on Equity, Interest Expense and PILS) the utility applied a 0.9% X-factor to reduce the 2026-2029 forecasted CRRR outlined in Exhibit 6.

Please see the response to interrogatory 1B-Staff-12(b) for a breakdown of the CPCI.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-10

References: EB-2018-0165, Decision and Order, p.24

Preamble

The OEB in its Decision and Order in EB-2018-0165 stated:

"The OEB notes that the Custom IR approach taken has required extensive evidence and time to consider the details provided. Toronto Hydro is encouraged to consider an alternative approach in the future that might be more efficient in establishing the revenue requirement for the base year and following years as well as meeting OEB RRF objectives, and improving the balance of risk between customers and the utility. Toronto Hydro should not assume that future panels will continue to accept Toronto Hydro's current proposed Custom IR framework."

QUESTIONS (A) – (C):

a. Did Toronto Hydro "consider an alternative approach in the future that might be more efficient in establishing the revenue requirement for the base year and following years as well as meeting OEB RRF objectives, and improving the balance of risk between customers and the utility"?
b. If the answer to part (a) is yes, please provide details including a copy of any analysis undertaken and the conclusions that Toronto Hydro drew from that analysis.
c. If the answer to part (a) is no, please explain why not.

RESPONSES (A) – (C):

Revenue requirement reflects the amount of funds that a utility needs to cover the costs of providing its services, namely: operating expenses, maintenance, debt service, and a fair return on investment for shareholders as determined by the cost of capital parameters.[1]

Toronto Hydro forecasted its 2025-2029 revenue requirement in accordance with existing approaches, prescribed rate models, and the OEB's expectations as set out in the *Renewed Regulatory Framework for Electricity Distributors ("*RRF*")* and in the *Handbook for Utility Rate Applications* ("Rate Handbook"):

- In the Custom IR method, rates are set based on a five-year forecast of a distributor's revenue requirement and sales volumes.[2]
- The Board expects that a distributor that applies under this method will file robust evidence of its cost and revenue forecasts over a five-year horizon, as well as detailed infrastructure investment plans over that same time frame.[3]
- The OEB sets just and reasonable rates based on a total revenue requirement that is informed by an assessment of a utility's spending proposals.[4]
- Historical and forecast information: Information filed in support of a rate application facilitates a thorough review of the utility's proposals and ensures continuity in the regulation of each utility over time. The filing of this information does not mean that the OEB will approve every aspect of what is filed in a rate application. The OEB assesses the utility's plans, and the resultant costs and revenue requirement, in order to consider the benefits to customers and a fair return for utilities in setting just and reasonable rates.[5]

In light of the OEB requirements summarized in the bullets above, Toronto Hydro did not explore other approaches to determining the revenue requirement. Rather, it responded to the OEB's

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[1] Ontario Energy Board, Handbook for Utility Rate Applications (October 13, 2016) at page vii ("Rate Handbook").
[2] Ontario Energy Board, *Report of the Board: Renewed Regulatory Framework for Electricity Distributors: A Performance- Based Approach* (October 18, 2012), at page 18.
[3] *Ibid* at page 19.
[4] Rate Handbook, *supra* note 1 at page 9.
[5] *Ibid* at page 6.

guidance in the 2020-2024 decision by challenging itself to innovate and evolve the custom rate framework to improve the balance of risk between customers and the utility in a way that is consistent with RRF objectives. That innovation is the Performance Incentive Mechanism (PIM) – an asymmetrical mechanism (to the benefit of customers) that shifts earnings and performance risk to the utility, ensures greater accountability to customers for outcomes, and maintains the utility's financial viability in accordance with the Fair Return Standard in providing Toronto Hydro the opportunity (*not the guarantee*) to earn the allowed rate of return by achieving target performance outcomes. For more information about how the proposed rate framework aligns with the OEB's requirements outlined in the RRF and the Rate Handbook please see Exhibit 1B, Tab 2, Schedule 2 at page 6.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-11

Reference: Exhibit 1B

For each third-party expert report filed in this proceeding, please provide a copy of a) the retainer and b) the specific instructions/direction provided to the expert regarding their work not included in the retainer.

RESPONSE:

Please see the table below. The scopes of work for each retainer are attached as appendices to the response. As noted in the March 11, 2024 cover letter accompanying the interrogatory responses, the utility is in the process of obtaining consent from the third-parties in question with respect to the disclosure and confidentiality of the underlying agreements, and will file this information an update to this interrogatory response, as soon as reasonably possible.

Table 1: Third Party Experts

Third Party Expert	Evidence	Evidence Reference	Scope of Work
Innovative Research Group	Customer Engagement Study	Exhibit 1B	App A
Clearspring Energy Advisors	Total Cost Benchmarking	Exhibit 1B	App B
	Reliability Benchmarking	Exhibit 1B	App B
UMS Group Inc.	Unit Cost Benchmarking	Exhibit 1B	App C
Scott Madden Associates	Rate Framework Review	Exhibit 1B	App D
Guidehouse	Lead/Lag Study	Exhibit 2A	App E
Concentric Advisors	Financial Useful Lives	Exhibit 2A	App F

Third Party Expert	Evidence	Evidence Reference	Scope of Work
EA Technology	Asset Condition Assessment (ACA) Review	Exhibit 2B	App G
Element Energy	Future Energy Scenarios	Exhibit 2B	App H
Gartner Consulting	IT Cost & Maturity Benchmarking	Exhibit 2B	App I
Stantec	Climate Change Vulnerability	Exhibit 2B	App J
Clearspring Energy Advisors	Load Forecast EV & DER Integration	Exhibit 3	App B
Mercer Canada	Compensation Benchmarking	Exhibit 4	App K

Agreement for Professional Consulting Services

THIS AGREEMENT is made this 22nd day of September, 2021,

BETWEEN:

Toronto Hydro-Electric System Limited,

a corporation incorporated under the laws of Ontario

(hereinafter called "Toronto Hydro")

and

Innovative Research Group Inc.,

a corporation incorporated under the laws of British Columbia

(hereinafter called the "Consultant")

WHEREAS:

A. Toronto Hydro has retained the Consultant to provide certain consulting services as detailed in SCHEDULE A (collectively, the "Services"); and

B. the Consultant has indicated to Toronto Hydro that it has the skill and expertise to provide the Services on the terms and conditions set forth herein;

NOW THEREFORE, in consideration of the mutual covenants set forth herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. INTERPRETATION

Unless otherwise indicated, all capitalized terms in this Agreement shall be as defined in SCHEDULE B and any reference to currency in this Agreement shall refer to lawful money of Canada.

2. RELATIONSHIP OF THE PARTIES

2.1 Retainer

Toronto Hydro hereby retains the Consultant to provide the Services, and the Consultant hereby agrees to provide the Services, during the Term, in accordance with the terms and conditions of this Agreement.

2.2 Independent Contractors

(a) Notwithstanding any provision hereof, this Agreement does not constitute and shall not be construed as constituting a partnership, joint venture, principal/agency relationship, or employer/employee relationship between the parties. The Consultant and Toronto Hydro shall at all times remain independent contractors of each other, and neither party shall represent itself to be an agent or employee of the other.

(b) Without limiting the generality of paragraph 2.2(a), the Consultant hereby acknowledges and agrees that neither it nor its Representatives shall be eligible or entitled, by reason of this Agreement, to participate in any employee-related program offered by Toronto Hydro or any of its Affiliates, including, without limitation, any benefit, insurance, compensation, health plan, bonus or retirement program.

(c) The Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities or claims whatsoever against Toronto Hydro or its Representatives resulting from or relating to the Consultant or its Representatives being deemed to be an employee of Toronto Hydro or any of its Affiliates.

2.3 Conflicts of Interest

The Parties acknowledge that there is potential for a conflict of interest based on services provided by the Consultant from time to time to Toronto Hydro. The Consultant agrees to take all such steps as Toronto Hydro deems necessary, acting reasonably, to remove, mitigate or minimize such conflict of interest.

3. TERM

3.1 Term

Unless otherwise terminated in accordance with the provisions hereof, this Agreement shall be for a term commencing on September 1, 2021 and terminating on June 30, 2024 (the "**Term**").

3.2 Renewal

Toronto Hydro may, at its sole option, and upon written notice to the Consultant at least thirty (30) Business Days before the end of the Initial Term, elect to renew the Agreement for two (2) one (1) year terms on the same terms and conditions contained herein (the "Renewal Term"). The Initial Term and Renewal Term, if any, shall hereinafter together be referred to as the "Term".

4. SERVICE REQUIREMENTS

4.1 Services

During the Term, the Consultant shall perform the Services as detailed in SCHEDULE A hereto.

4.2 Applicable Laws

(a) The Consultant shall, at its sole expense, obtain and maintain during the Term of this Agreement, all permits, licences and approvals required by all Applicable Laws to perform its obligations under this Agreement. The terms and conditions of this Agreement shall be carried out in strict compliance with all Applicable Laws and in the event of any conflict between any Applicable Laws, the Applicable Laws with the most stringent standard shall apply.

(b) Without limiting the generality of the foregoing, the Consultant shall comply with the *Municipal Freedom of Information and Protection of Privacy Act* (Ontario) ("MFIPPA"), the *Personal Information Protection and Electronic Documents Act* (Canada) ("PIPEDA") and any other applicable privacy legislation (collectively, "Privacy Laws") with respect to any personal information collected, used or disclosed in connection with this Agreement and shall indemnify and hold harmless Toronto Hydro and its Representatives from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments (including related expenses and legal costs) they may incur related to or arising out of any non-compliance therewith.

(c) Where any Deliverable is subject to the approval or review of any authority, department, government or agency other than Toronto Hydro, such applications for approval or review shall, unless otherwise authorized by Toronto Hydro in writing, be prepared by the Consultant to be approved and submitted by and through the offices of Toronto Hydro, and the Consultant shall not have any direct dealings with the authority, department, government or agency in question with regards to the Deliverable.

(d) The Consultant and the Consultant's personnel shall comply with all rules and direction of Toronto Hydro, whether specified in this Agreement or otherwise, while working on Toronto Hydro's premises or when accessing or connecting to Toronto Hydro's information technology systems, including rules and directions concerning health, safety, security and environmental protection, including without limitation, Toronto Hydro's *Code of Business Conduct*, Toronto Hydro's *Disclosure Policy*, Toronto Hydro's *Social Media and Digital Communication Guidelines*, Toronto Hydro's *Accessibility Policy*, Toronto Hydro's *Workplace Harassment Policy*, Toronto Hydro's *Violence Prevention in the Workplace Policy*, Toronto Hydro's *Alcohol and Drug Policy*, Toronto Hydro's *Environmental Policy*, Toronto Hydro's *Occupational Health & Safety Policy*, Toronto Hydro's *Physical Security* Policy, Toronto Hydro's *Privacy Policy Statement*, Toronto Hydro's *Cyber Security Policy*, Toronto Hydro's *Technology Use Guidelines*, Toronto Hydro's *Physical Security Policy*, Toronto Hydro's *COVID-19 Vaccination Policy* and the *Affiliate Relationships Code for Electricity Distributors and Transmitters* issued by the OEB (together, the "Guidelines"). The Consultant agrees to comply with and to direct its Representatives to comply with such Guidelines, as amended.

4.3 Performance

(a) The Services shall be performed to the satisfaction of Toronto Hydro, and Toronto Hydro shall have the right at all reasonable times, to inspect or otherwise review the Services

performed or being performed. The Consultant shall, upon the request of Toronto Hydro, acting reasonably, provide Toronto Hydro with written reports of the status of the Deliverables and the Consultant's progress in providing the Services.

(b) In the event of any dispute between Toronto Hydro and the Consultant relating to the quality or acceptability or rate of progress of any of the Services, or relating to the interpretation of any instructions or specifications concerning the Services, Toronto Hydro and the Consultant shall attempt to mutually reach a resolution in good faith. Failing a good faith resolution, the reasonable opinion of Toronto Hydro shall govern and be binding on the parties hereto.

5. REPRESENTATIONS, WARRANTIES, INDEMNITIES AND INSURANCE

5.1 Representations and Warranties

The Consultant hereby represents, warrants and agrees that:

(i) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has/have the necessary experience and qualifications to perform the Services;

(ii) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) will perform the Services in a diligent, expeditious and workmanlike manner, consistent with standards generally observed by reputable and competent members of the same industry providing similar services;

(iii) all Services shall be the Consultant's (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) original work and none of the Services or any invention, development, use, production, distribution or exploitation relating thereto will infringe, misappropriate or violate any intellectual property or other right of any person or entity.

5.2 Indemnity

a) The Consultant shall be liable for and shall indemnify and hold harmless Toronto Hydro and its Representatives from all claims, demands, actions, penalties, damages, losses, judgments and settlements, liabilities, costs, expenses, including legal fees and other related costs and expenses arising out of, related to, or incident to, the Consultant or any of its Representatives' performance of the Services under this Agreement, including, without limitation:

i. any breach, violation or non-performance by the Consultant or any of its Representatives of any terms, conditions, warranties, obligations or covenants contained in this Agreement;
ii. any breach or violation by the Consultant or any of its Representatives of any Applicable Laws; and
iii. any actions, omissions, negligence or wilful misconduct of the Consultant or any of its Representatives

except to the extent caused by the negligence or wilful misconduct of Toronto Hydro or its Representatives.

b) In no event shall either party be liable for loss of profit or use or for any indirect, special, incidental or consequential damages of any nature or kind including but not limited to delays, loss of revenue, loss of use, loss of data, loss of product, costs of capital or costs or replacement power, even if that party has been advised of the possibility of such damages.

c) Subject to section 5.2(d), the Consultant's liability for a claim for damages shall be limited to the amount payable by Toronto Hydro to the Consultant pursuant to this Agreement.

d) Notwithstanding the foregoing, no exclusion or limitation of liability shall apply to:

i. Breach of the confidentiality or privacy obligations in this Agreement
ii. Intentional misconduct or gross negligence;
iii. Breach of Applicable Law; or
iv. Breach of intellectual property indemnity in Section 9.

5.3 Insurance

(a) The Consultant shall, during the Term, and at its own expense, maintain and keep in full force and effect (and, when requested, provide Toronto Hydro with proof thereof):

(b) commercial general liability insurance on an occurrence basis having a minimum inclusive coverage limit, including personal injury and property damage, of not less than five million dollars ($5,000,000) per occurrence, which commercial general liability insurance shall be extended to cover contractual liability, products and completed operations liability, and owners/contractors protective liability;

(c) Automobile liability insurance on all owned and non-owned vehicles used in connection with this Agreement and such insurance coverage shall have a limit of not less than two million dollars ($2,000,000.00) per vehicle, in respect of bodily injury (including passenger hazard) and property damage inclusive of any one accident and mandatory accident benefits;

(i) Computer Security and Privacy Liability insurance covering actual or alleged acts, errors or omissions committed by the Vendor or its Representatives of not less than two million dollars ($2,000,000.00), and which shall also extend to include the intentional, fraudulent or criminal acts of the Vendor or its Representatives. The policy shall expressly provide, but not be limited to, coverage for the following perils:

i. unauthorized use/access of a computer system
ii. defense of any regulatory action involving a breach of privacy
iii. failure to protect confidential information (personal and commercial information) from disclosure notification costs, whether or not required by statute.

(d) All insurance coverages and limits required to be maintained hereunder shall: (i) be primary to any insurance maintained by Toronto Hydro, which insurance shall be excess and non-contributory; (ii) contain a cross liability clause and a severability of interest clause; and (iii) contain a thirty (30) day prior written notice to Toronto Hydro for any cancellation, non-renewal or adverse material change.

(e) The Consultant agrees that the insurance required hereunder in no way limits the Consultant's liability pursuant to the Liability and Indemnity provision in Section 5.3.

(f) A waiver of subrogation shall be provided by the insurer(s) to Toronto Hydro.

6. FEES

6.1 Fees

(a) Subject to paragraphs 6.1(c) - 6.1(f), in exchange for the performance of the Services in accordance with the terms hereof, Toronto Hydro shall pay the Consultant the rates outlined in SCHEDULE A, not including HST (the "Fee").

(b) The Fee noted in subsection 6.1(a) shall be the only fee payable by Toronto Hydro under this Agreement. Without limiting the generality of the foregoing, the Consultant hereby agrees and acknowledges that all out-of-pocket expenses, travelling costs, and other disbursements shall be at the sole expense of the Consultant, except with the prior written approval from Toronto Hydro.

(c) Any disbursements for additional incidentals incurred by the Consultant in relation to this Agreement ("Disbursements") must be pre-approved by Toronto Hydro in writing.

(d) The Consultant shall not incur or submit invoices for any work outside the scope of the Services without prior written approval from Toronto Hydro.

(e) The Consultant shall make all payment of taxes, employment insurance premiums, pension plan contributions and any other taxes or other payment of any nature, imposed by any authority in respect of the Fee paid by Toronto Hydro to the Consultant under this Agreement (together, the "Remittances"), and the Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities and claims whatsoever against Toronto Hydro or its Representatives, in any way arising out of or relating to any failure to deduct, withhold, or remit any Remittance.

(f) Without limiting the generality of paragraph 6.1(a), Toronto Hydro reserves the right to deduct any applicable non-resident withholding taxes from any Fee owing to the Consultant under this Agreement and remit such amounts to the applicable taxation authority.

6.2 Payment

The Consultant shall submit invoices to Toronto Hydro on a monthly basis containing:

(i) a description of the Services performed during the invoice period;

(ii) the monthly payment amount;

(iii) the total HST applicable to the Services during the invoice period, as well as the Consultant's HST registration number; and

(iv) a detailed description of the Disbursements incurred around the invoice period, supported by documentation in a form acceptable to Toronto Hydro.

Unless otherwise provided in this Agreement, the Consultant shall invoice Toronto Hydro after final inspection and acceptance by Toronto Hydro of the Services performed and subject to receipt of all documents required by this Agreement. **Invoices must be sent electronically to: AP@torontohydro.com.** Subject to approval of the invoice by Toronto Hydro, receipt of all documents required by this Agreement, and final review by Toronto Hydro, Toronto Hydro shall make payment to the Consultant via electronic funds transfer not later than thirty (30) days following receipt of an acceptable invoice and the EFT Information (as set out below). **The Consultant must provide Toronto Hydro with, in the case of the first payment only, (i) a void cheque, pre-printed deposit slip or bank confirmation letter and (ii) the email address where the Consultant wishes to receive remittance information (together, "EFT Information"). EFT Information must be sent electronically to efthelp@torontohydro.com or to 14 Carlton Street, Toronto, ON, M5B 1K5, Attention: Treasury Department.** Toronto Hydro reserves the right to pay the Consultant through other payment methods.

7. SUSPENSION OR TERMINATION

7.1 Suspension or Termination

(a) Toronto Hydro may, at any time during the Term by notice in writing, suspend all or a portion of the Services. Upon receipt of such written notice, the Consultant shall perform no further work other than as directed by Toronto Hydro, and shall be entitled to payment for time spent in performing the Services up to the date of suspension.

(b) Either party may terminate this Agreement immediately upon written notice where the other party enters into liquidation, whether compulsory or voluntarily, or where a proceeding in receivership, bankruptcy or insolvency has been instituted by or against such party or its property.

(c) Toronto Hydro, at its sole discretion, may terminate this Agreement immediately upon written notice where the Consultant or any of its Representatives has been in material default in the performance of its duties, obligations or undertakings under this Agreement, and has not taken immediate steps to remedy such default within two (2) Business Days following written notice of the specific default by Toronto Hydro. For the purposes of this section, a material default shall include, without limitation, a breach of any of the representations or warranties contained herein or the failure or refusal to provide the Services in accordance with the terms and conditions of this Agreement.

(d) Notwithstanding any other provision in this Agreement, Toronto Hydro, at its sole discretion, shall have the right to terminate this Agreement, for any reason, upon two (2) weeks written notice to the Consultant.

(e) In the event that this Agreement is terminated in accordance with this section 7.1 by either party, the Consultant shall be entitled to payment for time spent in performing the Services up to the date of suspension.

7.2 Effect of Termination

Upon the termination or expiration of this Agreement, upon Toronto Hydro's request, the Consultant shall return to Toronto Hydro and delete any and all electronic copies the Consultant may have of all documents and materials in its possession relating to the Services or this Agreement, including all Confidential Information and all Deliverables, whether completed or not.

8. CONFIDENTIALITY

8.1 Non-Disclosure

In performing the Services required by this Agreement, the Consultant may be provided access to Confidential Information. The Consultant acknowledges and agrees that:

(a) the Consultant shall not disclose, permit access to, transmit, or transfer the Confidential Information to any third party without the prior written authorization of Toronto Hydro;

(b) the Consultant shall protect the confidentiality of the Confidential Information in its possession by exercising the same security measures it normally exercises with respect to its own confidential information and at minimum a reasonable standard of care;

(c) upon the request of Toronto Hydro, and in any event upon the expiration or termination of this Agreement for any reason, the Consultant shall return (or delete, in the case of electronic documents) forthwith to Toronto Hydro all Confidential Information, including all copies and other materials containing the Confidential Information, which are in the possession or under the control of the Consultant; and

(d) the Consultant shall not use any Confidential Information for any purpose other than to perform the Services required by this Agreement. Without limiting the foregoing, the Consultant shall not, and shall not permit any of its Representatives to, use any Confidential Information in furtherance of its, or their, individual business or for its, or their, own benefit, profit or advantage, or for the benefit, profit or advantage of any other party.

Notwithstanding the foregoing, the Consultant may disclose such Confidential Information to any of the Representatives of the Consultant who agree to be bound by the obligations of confidentiality herein and who have a reasonable need to know such Confidential Information in the course of their duties for the Consultant but only for the purposes of the Consultant exercising its rights and obligations under this Agreement; and in the event that the Consultant believes it is required by law to disclose, or is requested by a governmental authority to disclose, any Confidential Information to a governmental authority; provided that the Consultant shall, to the extent permitted by law, first inform Toronto Hydro of the request or requirement for disclosure to allow an opportunity for Toronto Hydro to apply for an order to prohibit or restrict such disclosure.

8.2 Non-Solicitation

Unless Toronto Hydro's Chief Executive Officer provides prior written consent, the Consultant hereby covenants and agrees that during the term of this Agreement and for a period of two (2) years following the termination of the Agreement, however caused, the Consultant will not directly or indirectly, either individually or in partnership or jointly or in conjunction with any other Person,

a) hire or otherwise engage any Protected Employee who is currently employed by Toronto Hydro;

b) hire or otherwise engage any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause;

c) solicit or attempt to solicit any Protected Employee who is currently employed by Toronto Hydro or encourage any such person to leave his/her employment with Toronto Hydro; and

d) solicit or attempt to solicit any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause.

Given the unique expertise and intimate knowledge that the employees have of the operations of Toronto Hydro the Consultant acknowledges and agrees that the restrictions contained in this Subsection 8.2 are reasonable and necessary to preserve the value of Toronto Hydro's business.

9. INTELLECTUAL PROPERTY

9.1 Use

Nothing in this Agreement shall be deemed to transfer, license, assign, permit the use of, or otherwise convey an interest in whole or in part to the Consultant of any Intellectual Property belonging to Toronto Hydro or any of its Representatives or any third party whose Intellectual Property is in Toronto Hydro's custody or control, and the use by the Consultant of any such Intellectual Property shall be subject to the prior written approval of Toronto Hydro.

9.2 Ownership

Toronto Hydro shall at all times have full rights and title to the Deliverables, and may at all times take possession of or use any completed or partially completed Deliverables, notwithstanding any provision, express or implied, to the contrary. Without limiting the generality of the foregoing, Toronto Hydro shall own all Intellectual Property rights in all Deliverables, and the Consultant hereby waives and assigns to Toronto Hydro any such rights, and agrees to give Toronto Hydro and its Representatives all assistance as may be reasonably required to perfect such rights including, without limitation and where the Consultant is a corporation or partnership, obtaining waiver of moral rights from any of the Consultant's employees, partners or other Representatives.

10. HEALTH AND SAFETY

The Consultant shall be responsible for managing the health and safety of its own personnel and other Representatives. Neither Toronto Hydro, nor its Representatives, shall be liable for any loss, damages or claims arising directly or indirectly from the Consultant's access to or work in or around Toronto Hydro's facilities, and the Consultant hereby waives any claims to which it may become entitled for loss or damage and releases Toronto Hydro and its Representatives from any and all such claims.

11. MISCELLANEOUS

11.1 Survival

In addition to the terms in this Agreement that by their nature survive the expiry or termination of the Agreement, the terms of section 5 (Representations, Warranties and Indemnities), section 8 (Confidentiality), section 9 (Intellectual Property), and subsection 11.3 (Injunctive Relief) shall survive the expiry of this Agreement for a term of five (5) years.

11.2 Subcontracting

The Consultant may not subcontract the performance of any part of the Services without Toronto Hydro's prior written approval. Where Toronto Hydro provides its prior written approval to the Consultant to subcontract all or part of the Services, then the Consultant shall enter into agreements with such permitted subcontractor(s) to require the permitted subcontractor(s) to provide Services in accordance with all of the terms of this Agreement. Notwithstanding the foregoing, the Consultant shall remain liable for any and all acts or omissions of any subcontractor(s) as if such acts or omissions were those of Consultant.

11.3 Injunctive Relief

(a) The Consultant acknowledges and agrees that the terms of section 8 (Confidentiality) and section 9 (Intellectual Property) of this Agreement are reasonably necessary to protect the legitimate interests of Toronto Hydro, are reasonable in scope and duration, and are not unduly restrictive.

(b) The Consultant further acknowledges that a breach of any of the terms of section 8 (Confidentiality) or section 9 (Intellectual Property) would render irreparable harm to Toronto Hydro, and that a remedy at law for breach of these sections would be inadequate, and that Toronto Hydro shall therefore be entitled to any and all equitable relief, including, without limitation, injunctive relief, and any other remedy that may be available at law or in equity.

11.4 Force Majeure

Either party will be relieved of liability for delays in performance of its obligations hereunder where such delay is a result of Force Majeure. The party affected by the Force Majeure shall give prompt notice thereof to the other party and, upon cessation of the Force Majeure, shall take all reasonable steps to resume the performance of its obligations hereunder. If a delay in performance by reason of Force Majeure extends beyond thirty (30) Business Days, then either party may terminate this Agreement by written notice.

11.5 Non-Exclusive Agreement

This Agreement will not be interpreted to grant to the Consultant exclusive rights to provide the Services or to bind Toronto Hydro in any way to an exclusive relationship with the Consultant with regards to the Services or any other service.

11.6 Waiver

No delay on the part of either party in exercising any of its rights hereunder or failure to exercise the same, nor the acquiescence thereto shall operate as a waiver except in the specific instance for which it is given and where such waiver is provided in writing by the party waiving its rights.

11.7 Amendments

None of the terms, conditions or provisions of this Agreement shall be varied, modified or altered except by written agreement signed by an authorized representative of each parties.

11.8 Assignment

Save and except for Toronto Hydro's right to assign this Agreement to any of its Affiliates, neither party may assign this Agreement or any of their rights or obligations hereunder, without the prior written authorization of the other party, acting reasonably.

11.9 Enurement

This Agreement shall enure to the benefit of, and be binding upon, the parties hereto and their respective successors and permitted assigns.

11.10 Severability

In the event that any provision or portion of this Agreement is determined to be invalid or unenforceable for any reason, the remaining provisions or portions of this Agreement will be unaffected and will remain in full force and effect to the fullest extent permitted by law.

11.11 Neutral Construction

The parties to this Agreement agree that this Agreement was negotiated fairly between them at arm's length, that the final terms of this Agreement are the product of the parties' negotiations, and that this Agreement shall be deemed to have been jointly and equally drafted by them, and that the provisions thereof should not be construed against a party on the grounds that such party drafted the Agreement in whole or in part.

11.12 Entire Agreement

This Agreement constitutes the entire agreement between the parties relating to the subject matter hereof. This Agreement supersedes any and all prior correspondence, warranties, covenants, collateral undertakings, or agreements, oral or otherwise, express or implied, unless otherwise contained herein.

11.13 Notices

(a) All questions or other communications regarding this Agreement, including any notices required by this Agreement, are to be addressed to the following addresses:

to Toronto Hydro:

Name:	**Richard McCluskey**
Title:	Director, Public Relations, Litigation and Privacy
Address:	14 Carlton Street, Toronto, ON M5B 1K5
Telephone:	(416) 542-7893
Email:	mmccluskey@torontohydro.com

Name:	**Hasdeep Bhatia**
Title:	Manager, Media and Public Relations

Address: 14 Carlton Street, Toronto, ON M5B 1K5
Telephone: (416) 542-3100 ext. 30463
Email: hbhatia@torontohydro.com

with copy to:

Title: EVP, Public and Regulatory Affairs & Chief Legal Officer
Address: 14 Carlton, Toronto Hydro, ON M5B 1K5
Telephone: (416) 542-3000
Email: legal@torontohydro.com

to the Consultant:

Name: **Greg Lyle**
Title: President
Address: 56 The Esplande, Suite 310, Toronto, ON M5E 1A7
Telephone: 416-642-6340
Email: glyle@innovativeresearch.ca

(b) All notices or communications shall be deemed to be received on the date of acceptance (as evidenced by the signature of the party) if delivered by personal delivery or courier, on the fifth (5th) Business Day after mailing, if mailed by first class mail, or on the first (1st) Business Day after transmission, if sent by facsimile (provided the transmission is evidenced by documented proof of proper fax transmittal).

11.14 Governing Law

This Agreement shall be governed by and construed in accordance with the law of the Province of Ontario and the laws of Canada applicable therein.

11.15 Execution

This Agreement may be signed in counterparts and delivered by electronic means, each of which shall be deemed an original and all of which, together, shall have the same effect as if all constitute one and the same Agreement.

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the date first written above:

Innovative Research Group Inc.

Per: _____

Name: Greg Lyle

Title: President

I have authority to bind the Consultant.

Toronto Hydro-Electric System Limited

Per: _____

Name: Amanda Klein

Title: Executive Vice President, Public and Regulatory Affairs, and Chief Legal Counsel

I have authority to bind Toronto Hydro.

SCHEDULE A

SERVICES AND RATES

1. Services to be Performed

Services may include, but are not limited to the following:

- Pre-research consultation
- Survey and script development
- Consumer-based research
- Business-to-business based research
- Stakeholder-based research
- Surveying – phone, in-person, digital, customer advisory panel
    - Raw data, tables, models, online reporting tools
- Focus groups and interviews
    - video interviews, audio files, transcripts
- Screening criteria and quota recommendations
- List procurement and data management
- Reporting
    - Data models
    - Full written reports
    - Comprehensive slide decks
    - Onsite workshop and presentations
    - Interactive reporting tools
    - Executive briefings
    - Written management summaries
    - Translation services
    - Provide expert opinion to oversight committees or boards

2. Rates

[Please see attached.]

20P-0625
SCHEDULE H – Pricing Schedule
Market Research

Company Name: Innovative Research Group Inc.

15 minute telephone survey 100 residential customers	Price (No HST)
i. Research/Strategy/Project Mgmt.	$
ii. Survey Development (Assume 45 close-ended questions)	$
iii. Field work (Assume completing 100 residential telephone interviews; includes CATI survey system programming and testing)	$
iv. List procurement (Assume telephone numbers provided by Toronto Hydro)	$
v. Data management (Assume data preparation for CATI system upload and coding and cleaning for analysis)	$
vi. Analysis and reporting (Assume statistical analysis, banner table production, report writing in MS PowerPoint)	$
vii. Presentations (breakout travel if applicable) (Assumes no travel expenses)	$
Total:	**$**
Web-based survey **100 residential customers**	
i. Research/Strategy/Project Mgmt.	$
ii. Survey Development (Assume 10 close-ended questions, as stated in the Addendum)	$
iii. Field work (Assume completing 100 residential online surveys; includes CAWI survey system programming and testing)	$
iv. List procurement (Assume email addresses provided by Toronto Hydro)	$
v. Data management (Assume data preparation for CATI system upload and coding and cleaning for analysis)	$
vi. Analysis and reporting (Assume statistical analysis, banner table production, report writing in MS PowerPoint)	$
vii. Presentations (breakout travel if applicable) (Assumes no travel expenses)	$
Total:	**$**
Online Focus group (5 residential customers from Customer Advisory Panel)	
i. Research/Strategy/Project Mgmt.	$
ii. Discussion Guide Development (Assume 90 minute focus group)	$
iii. Field work (Assume recruiting 6 participants from CAP for 5 to show)	$
iv. Participant procurement (recruited from CAP; assumes an incentive of)	$
v. Data management (list management included above under project management)	$
vi. Analysis and reporting (Assume focus group faciliation by moderator and analyst/note-taker, transcription, and report writing)	$
vii. Presentations (breakout travel if applicable) (Assumes no travel expenses)	$
Total:	**$**
In-person Focus group (5 residential customers from Customer Advisory Panel)	
i. Research/Strategy/Project Mgmt.	$
ii. Discussion Guide Development (Assume 90 minute focus group)	$
iii. Field work (Assume recruiting 6 participants from CAP for 5 to show)	$
iv. Participant procurement (recruited from CAP; assumes an incentive of + **FACILITY RENTAL COSTS**)	$
v. Data management (list management included above under project management)	$
vi. Analysis and reporting (Assume focus group faciliation by moderator and analyst/note-taker, transcription, and report writing)	$
vii. Presentations (breakout travel if applicable) (Assumes no travel expenses)	$
Total:	**$**
Online Focus group (5 small business [GS] customers from Customer Advisory Panel)	
i. Research/Strategy/Project Mgmt.	$
ii. Discussion Guide Development (Assume 90 minute focus group)	$
iii. Field work (Assume recruiting 6 participants from CAP for 5 to show)	$
iv. Participant procurement (recruited from CAP; assumes an incentive of)	$
v. Data management (list management included above under project management)	$
vi. Analysis and reporting (Assume focus group faciliation by moderator and analyst/note-taker, transcription, and report writing)	$
vii. Presentations (breakout travel if applicable) (Assumes no travel expenses)	$
Total:	**$**
In-person Focus group (5 small business [GS] customers from Customer Advisory Panel)	
i. Research/Strategy/Project Mgmt.	$
ii. Discussion Guide Development (Assume 90 minute focus group)	$
iii. Field work (Assume recruiting 6 participants from CAP for 5 to show)	$
iv. Participant procurement (recruited from CAP; assumes an incentive of + **FACILITY RENTAL COSTS**)	$
v. Data management (list management included above under project management)	$
vi. Analysis and reporting (Assume focus group faciliation by moderator and analyst/note-taker, transcription, and report writing)	$
vii. Presentations (breakout travel if applicable) (Assumes no travel expenses)	$
Total:	**$**
Evaluation Based on 5 telephone and 5 web-based surveys and 10 focus groups each year for 3 years	
5 telephone surveys per year	$
Total for 3 years	**$**
5 web-based surveys per year	$
Total for 3 years	**$**
10 focus groups per year	$
Total for 3 years	**$**

NOTES ON PRICING SURVEYS

NOTES ON PRICING FOCUS GROUPS

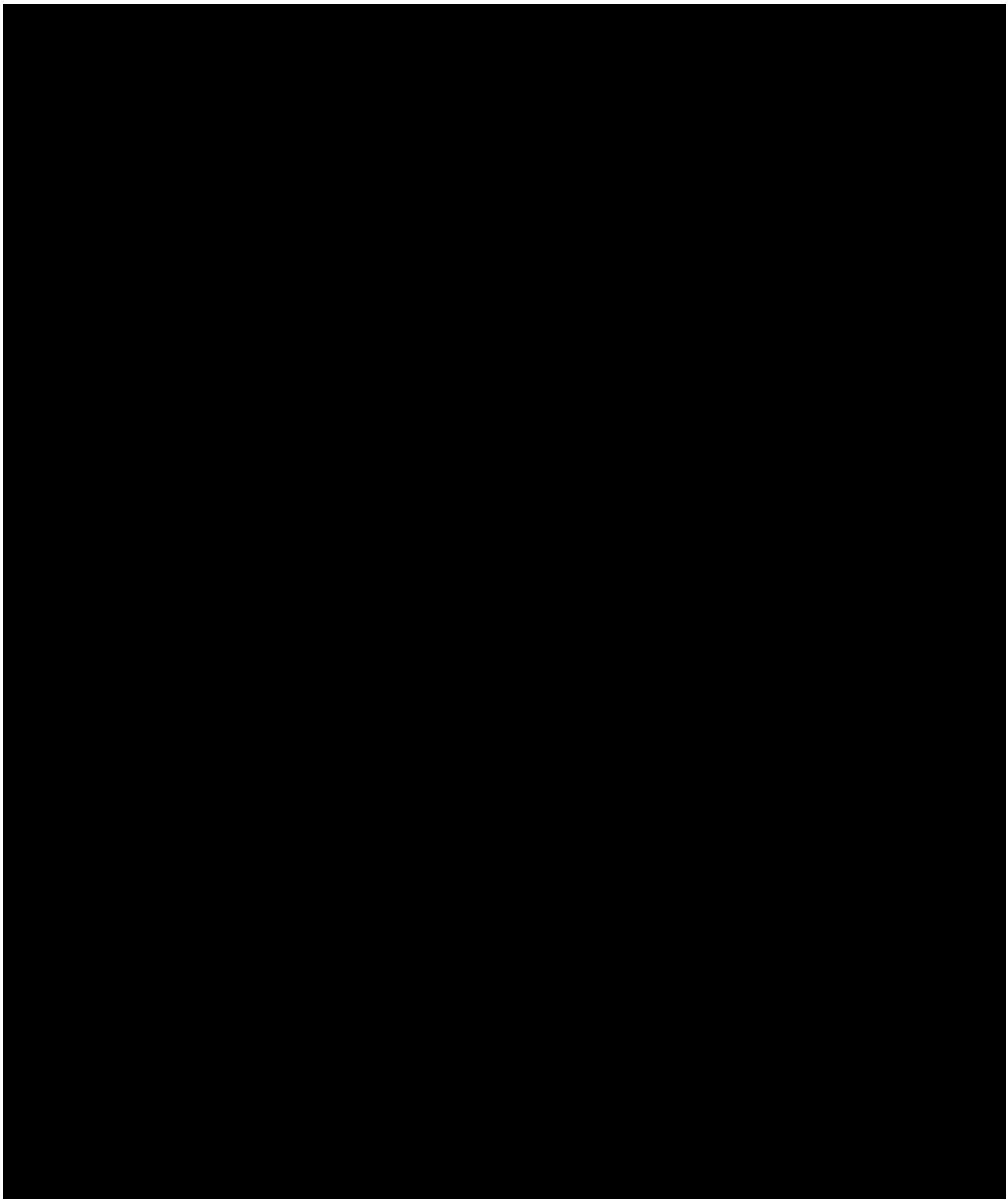
SCHEDULE B

DEFINITIONS

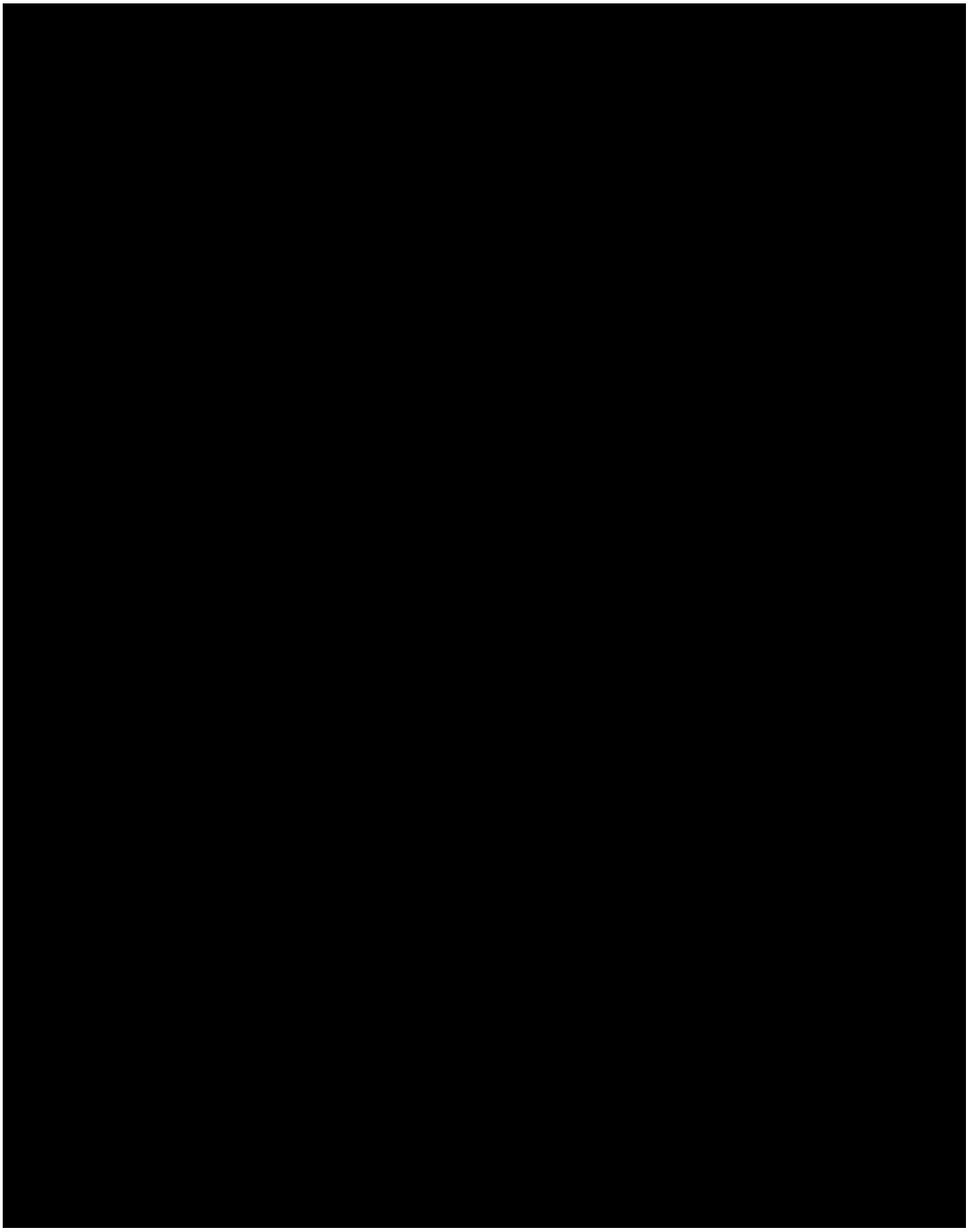
In this Agreement, the following definitions shall apply:

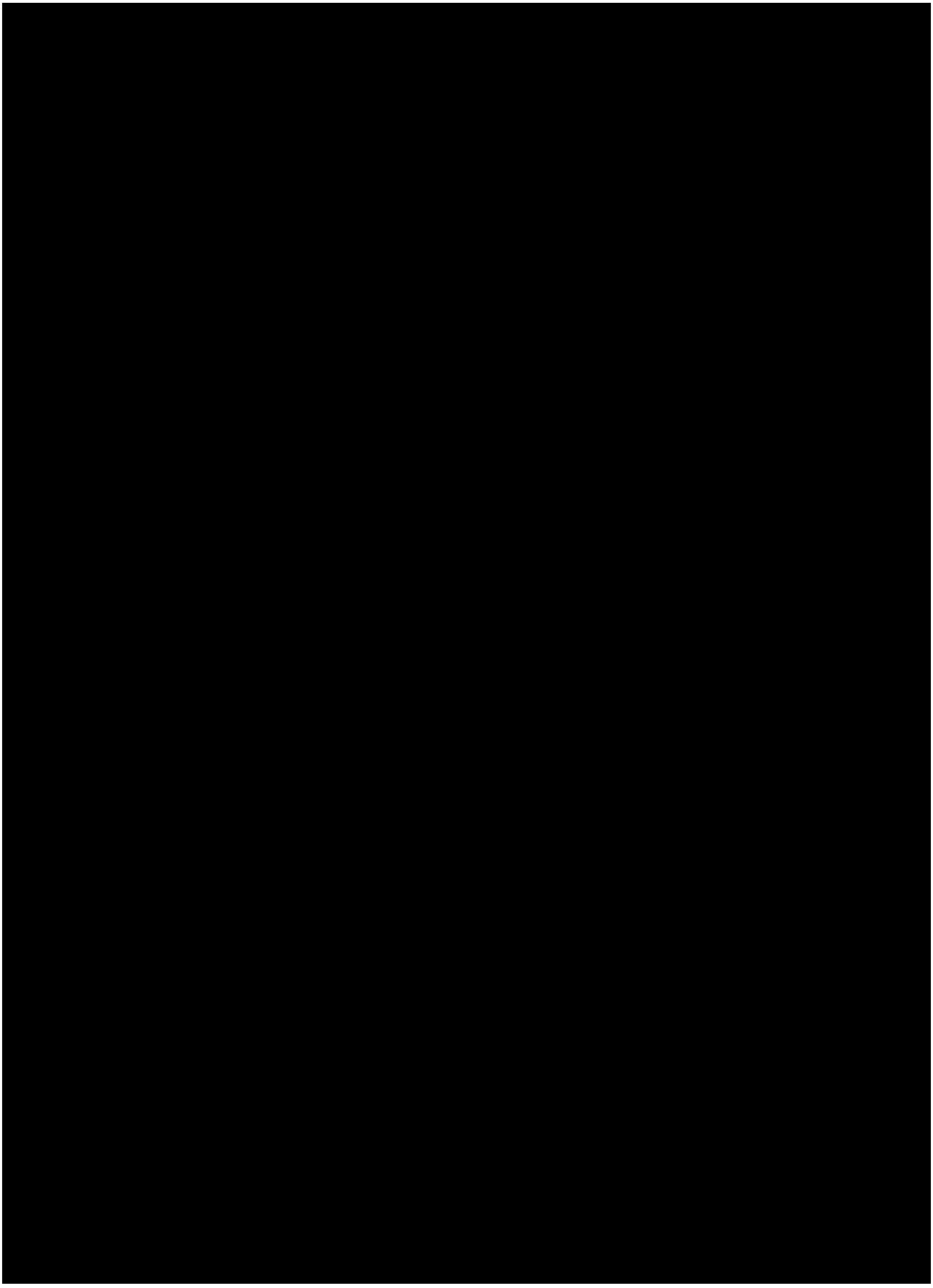
"Affiliates"	has the meaning prescribed to it in the *Business Corporations Act* of Ontario, as amended from time to time;
"Agreement"	means this Agreement for Professional Consulting Services, including all recitals, schedules and attachments thereto;
"Applicable Laws"	means all federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to this Agreement, including without limitation all applicable OEB codes, rules or guidelines;
"Business Day"	means a day on which banks are open for business in the City of Toronto, Ontario, but does not include a Saturday, Sunday, or a civic or statutory holiday in the Province of Ontario;
"Confidential Information"	means the terms of this Agreement and any and all data or information relating to the business, management or affairs of Toronto Hydro, its customers, employees, or any of its Affiliates disclosed by Toronto Hydro to the Consultant pursuant to this Agreement, whether or not such Confidential Information is expressly identified as confidential. Notwithstanding the foregoing, Confidential Information does not include any information or data which: (a) information or data that is or becomes publicly known through no breach of the terms or conditions of this Agreement; (b) information or data that is independently developed without reference to Confidential Information and without breach of the terms and conditions of this Agreement; or (c) Confidential Information that is required by court order or other legal compulsion to be disclosed, in which case the Consultant shall give Toronto Hydro prior written notice of such disclosure, as permitted by law;
"Consultant"	means The Innovation Research Group Inc.;
"Deliverable"	means any and all works prepared, generated, created or designed by the Consultant pursuant to this Agreement, including without limitation all drawings, models, designs, formulae, methods, documents, reports, software, specifications, or source codes, and any related works, enhancements, modifications or additions thereto;
"Disbursements"	shall have the meaning as prescribed in paragraph 6.1(c);
"Fees"	shall have the meaning as prescribed in paragraph 6.1(a);

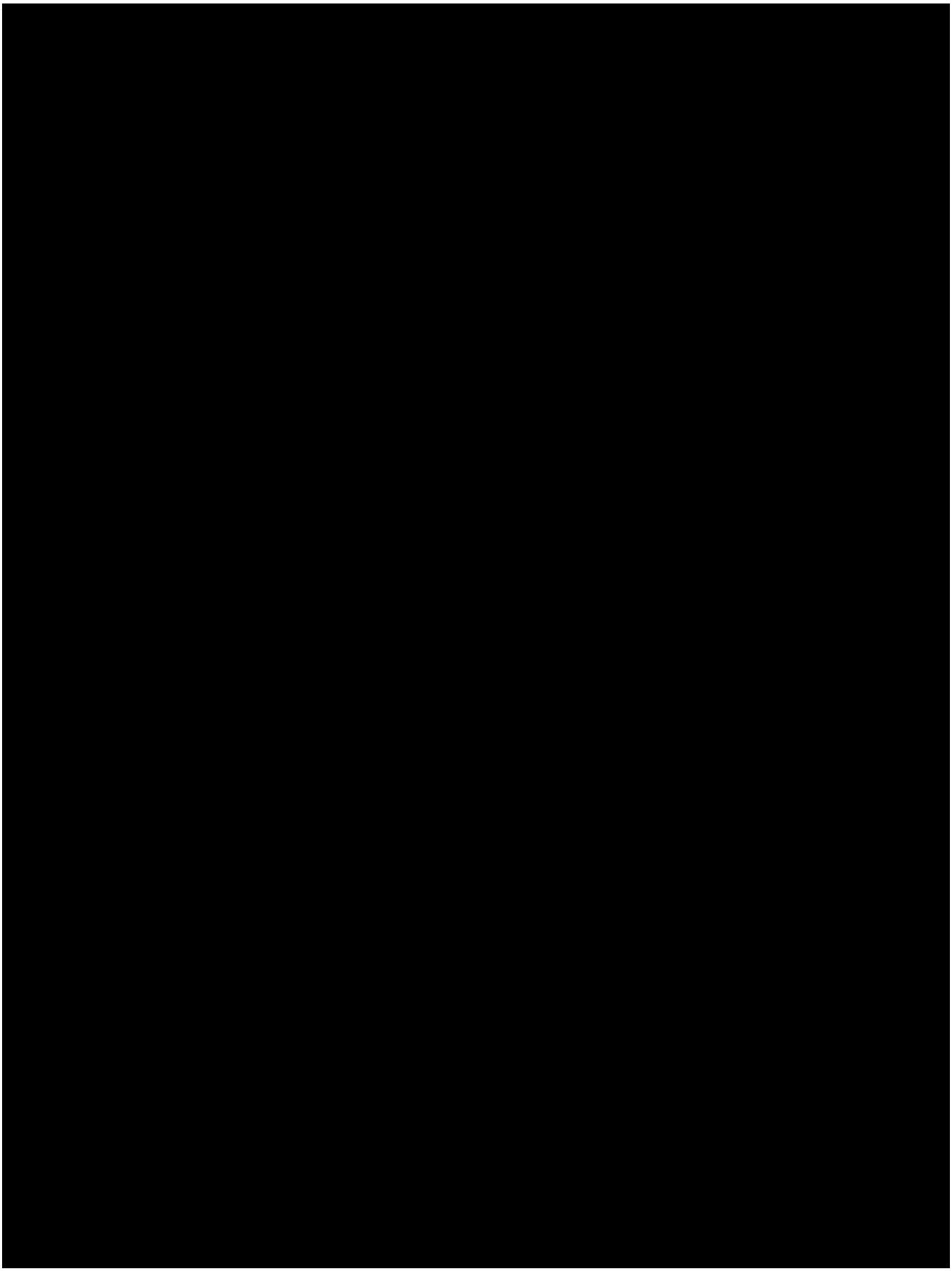
"Force Majeure"	means any impediments beyond the control of the applicable party due, wholly or in part, directly or indirectly, to: strikes, lockouts, riots, epidemics, war, governmental regulations, fire, explosions, acts of God, or any other impediment beyond the control of the party affected;
"Hourly Rate"	shall have the meaning prescribed in paragraph 6.1(a);
"HST"	means Harmonized Sales Tax;
"Guidelines"	has the meaning prescribed in paragraph 4.2(d);
"Intellectual Property"	includes all trademarks, copyrights, patents, business names, trade secrets, proprietary software, analysis or techniques (whether or not patented or patentable), confidential or secret designs and processes, source codes, plans or devices, or other proprietary and intellectual property rights;
"Intervenor"	means any interested group or individual who participates actively in an OEB proceeding either by submitting evidence, arguments or interrogatories (written questions) or by cross-examining a witness or witnesses at an oral hearing;
"Person"	means any individual, firm, corporation, unlimited liability company, partnership, limited liability partnership, joint venture, trust, unincorporated association, unincorporated syndicate, any governmental authority and any other legal or business entity.
"Protected Employee"	means any individual who, during the course of their employment with Toronto Hydro, was directly or indirectly involved in: i. the procurement of the Services of the Consultant on behalf of Toronto Hydro; ii. the negotiation of the Consultant's Agreement on behalf of Toronto Hydro; and/or the awarding and/or approval of the Consultant's Agreement on behalf of Toronto Hydro.
"Remittances"	has the meaning prescribed to it in paragraph 6.1(e);
"Term"	has the meaning prescribed to it in subsection 3.1; and
"Toronto Hydro"	means Toronto Hydro-Electric System Limited.

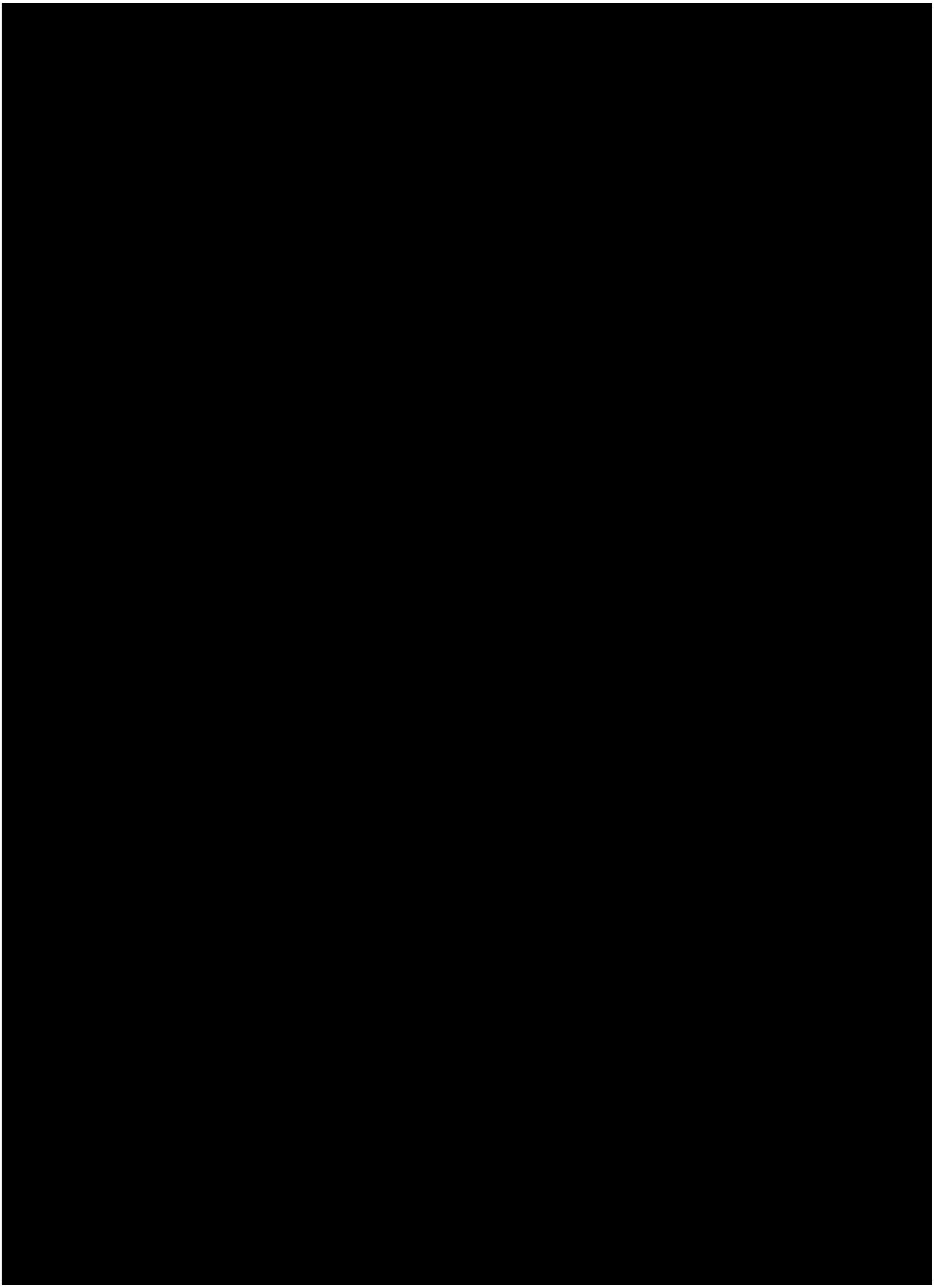


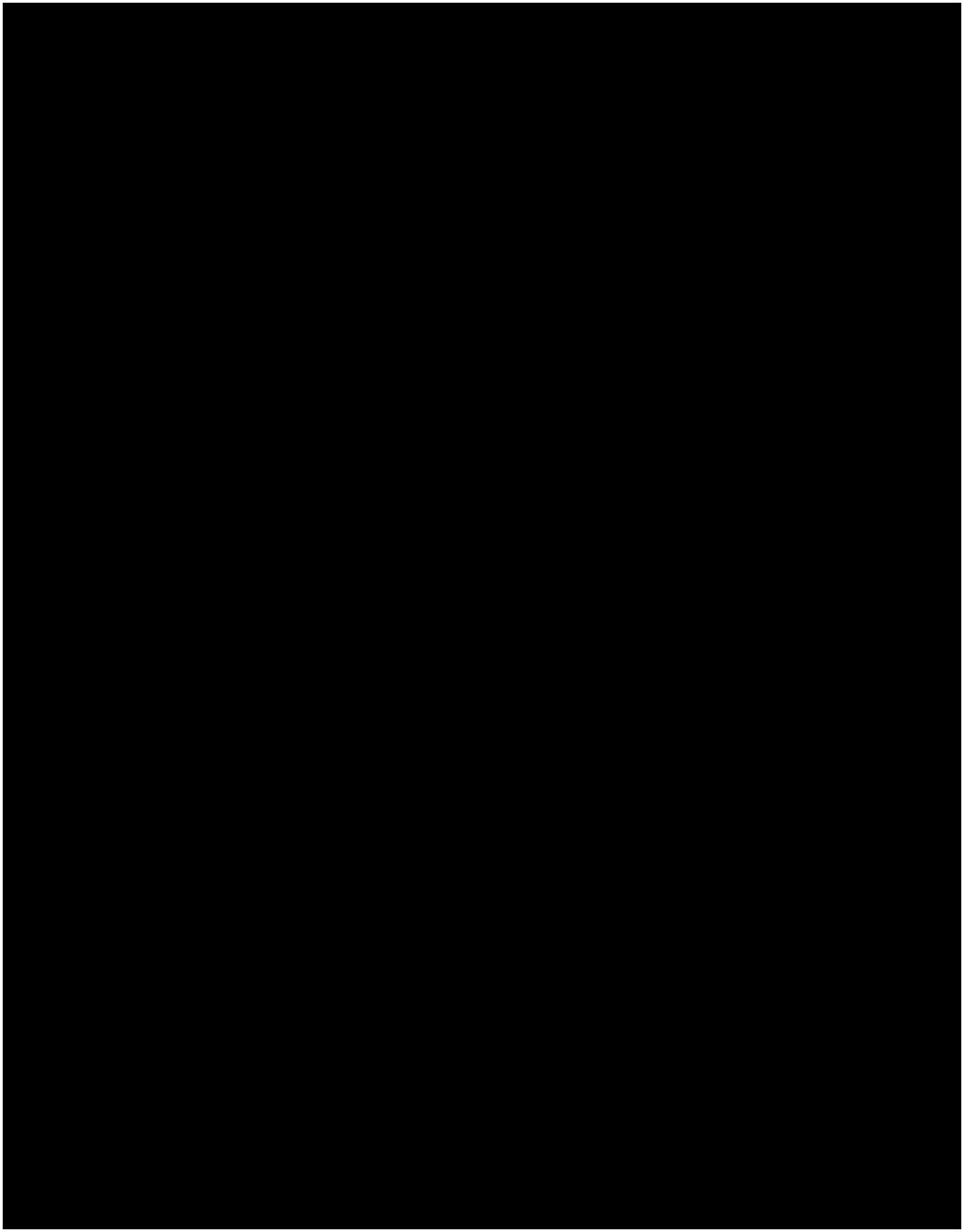


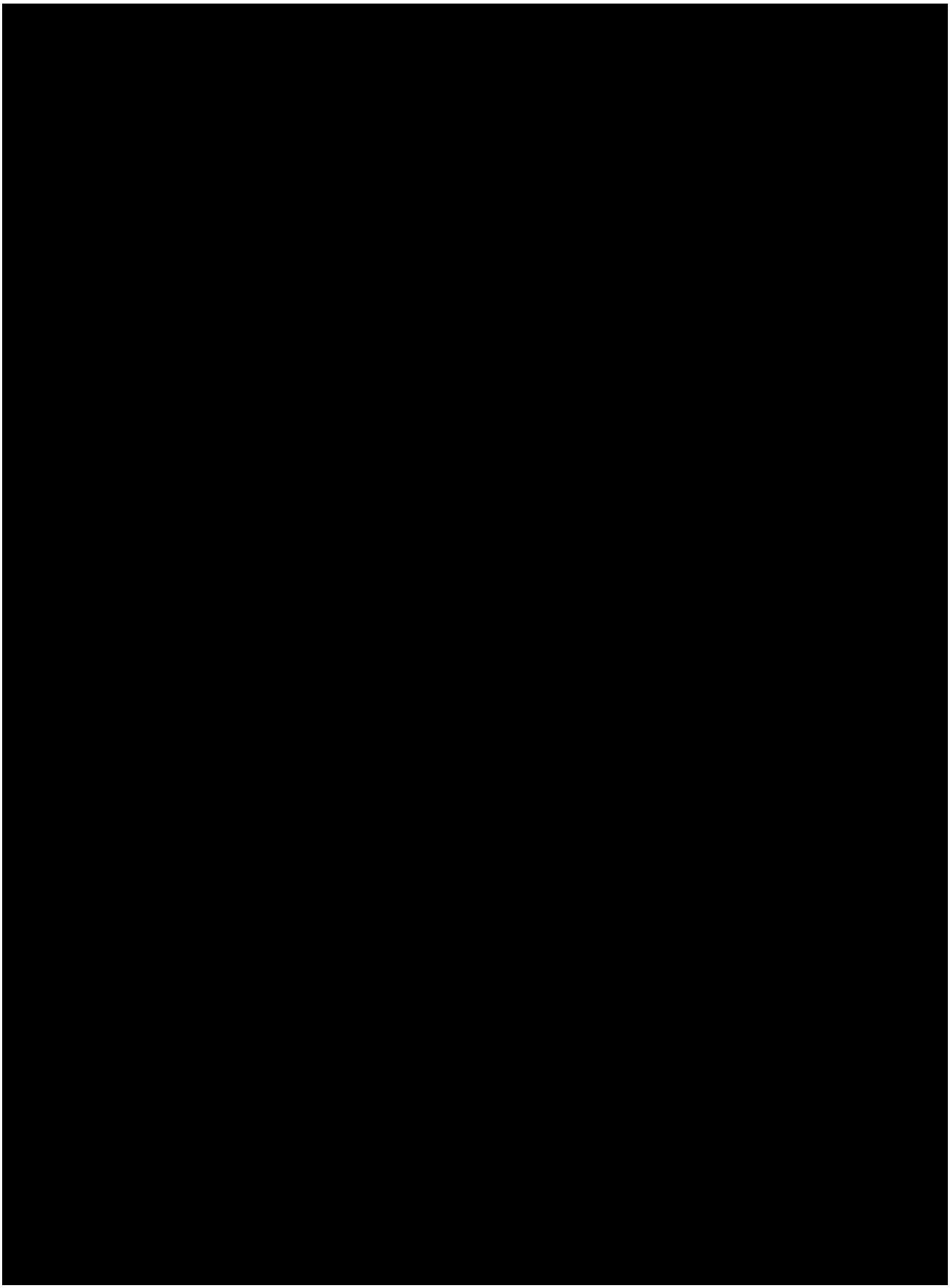


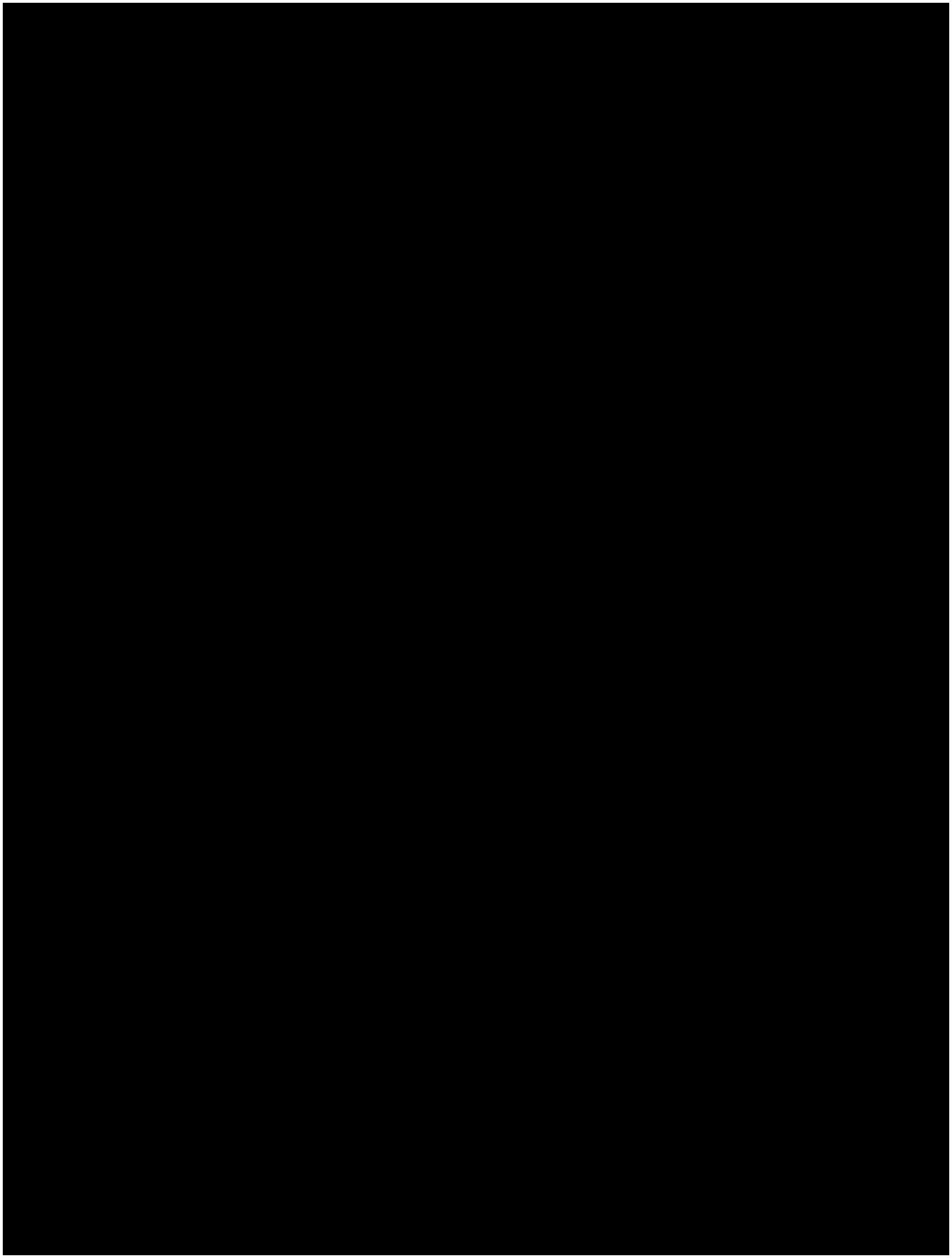














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SECOND AMENDING AGREEMENT

THIS SECOND AMENDING AGREEMENT (the "Second Amending Agreement") is made effective as of June 1, 2023 (the "Effective Date") between **INNOVATIVE RESEARCH GROUP INC.** ("Consultant") and **TORONTO HYDRO-ELECTRIC SYSTEM LIMITED** ("Toronto Hydro") (collectively, the "Parties").

WHEREAS:

1. Toronto Hydro and Consultant entered into an agreement for certain research-based consulting services (the "Services") dated September 22, 2021 (the "Purchase Agreement"); and

2. The Parties entered into an amending agreement dated November 30, 2022 to add Toronto Hydro's privacy terms and conditions to the Agreement (the "First Amending Agreement", and together with the Purchase Agreement, the "Agreement").

3. The Parties wish to further amend the Agreement by attaching the Ontario Energy Board's *Rules of Practice and Procedure* Rule 13A, and make associated amendments related to the Consultant's participation in Toronto Hydro's upcoming rate application, as provided herein.

NOW THEREFORE, THIS SECOND AMENDING AGREEMENT WITNESSES that in consideration of the mutual covenants contained herein and for other valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Toronto Hydro and Consultant agree as follows:

1. Any capitalized terms used but not defined herein shall be as defined in the Agreement. The recitals above are agreed by the Parties to be true and deemed to form part of this Second Amending Agreement as if specifically restated herein.

2. Section 4.2 of the Agreement is amended by adding the following subsection (e) immediately following subsection 4.2(d):

   (e) Without limiting the generality of subsection 4.2(a) above, the Consultant shall comply with Rule 13A Expert Evidence of the OEB's *Rules of Practice and Procedure*, attached as SCHEDULE C hereto, in the course of providing the Services and agrees to accept the responsibilities that are or may be imposed on them by that rule.

3. SCHEDULE A is amended by adding the following Section 3 immediately following Section 2:

   3. Participation in Toronto Hydro's Regulatory Application Process

   The Consultant shall be available to speak to the Services in a regulatory proceeding as required by Toronto Hydro and/or the Ontario Energy Board relating to Toronto Hydro's 2025 rate application.

   The degree of Consultant's participation shall be dependent on the degree of interest in the Services by OEB staff or any intervenors. Consultant's participation in such proceeding may entail, but is not limited to, preparation of expert report(s), responding to interrogatories and undertakings, provision of support prior to and during any hearings required by the OEB, and answers to any questions regarding the form, methodology, assumptions, and choices made in the provision of the Services, in either written or oral format (the latter in acting as a witness for Toronto Hydro).

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The Consultant shall comply with the requirements and agrees to accept the responsibilities set out in Rule 13A of the OEB's *Rules of Practice and Procedure*, attached as SCHEDULE C to this Agreement, when providing any Services relating to Toronto Hydro's 2025 rate application.

4. The Parties agree to add a new SCHEDULE C to the Agreement, attached hereto as Appendix 1 to this Second Amending Agreement.

5. All other terms and conditions of the Agreement remain continuously in full force and effect, unamended, and shall be deemed to apply to this Second Amending Agreement.

6. This Second Amending Agreement, together with the Agreement, shall hereinafter constitute the entire agreement between the Parties with respect to the Services as further described in the Agreement, and supersedes any and all other agreements, understandings, discussions, negotiations, representations and correspondence which may have been made by or between the Parties respecting the same.

IN WITNESS WHEREOF the Parties hereto have executed this Second Amending Agreement as of the date first written above.

INNOVATIVE RESEARCH GROUP INC.

Per: DocuSigned by: Greg Lyle 9E236D6798EC426...

Name:

Title:

I have the authority to bind the Consultant.

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

Per: RM'Cl

Name: Richard McCluskey

Title: Director, Public Relations, Litigation & Privacy

I have authority to bind Toronto Hydro.

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APPENDIX 1

SCHEDULE C

Ontario Energy Board *Rules of Practice and Procedure* Rule 13A

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the OEB impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

a. the expert's name, business name and address, and general area of expertise;
b. the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;
c. the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;
d. the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;
e. in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and
f. an acknowledgement of the expert's duty to the OEB in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the OEB may require two or more of the experts to:

a. in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and
b. at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the OEB and others as permitted by the OEB, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the OEB, including as to:

a. scope and timing;
b. the involvement of any expert engaged by the OEB;
c. the costs associated with the conduct of the activities;
d. the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of Rule **13A.04**; and
e. any issues in relation to confidentiality.

13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A.**

Agreement for Professional Consulting Services

THIS AGREEMENT is made this 21st day of March, 2022 ("Effective Date")

BETWEEN:

Toronto Hydro-Electric System Limited,

a corporation incorporated under the laws of Ontario

(hereinafter called "Toronto Hydro")

and

Clearspring Energy Advisors, LLC,

a corporation incorporated under the laws of Wisconsin

(hereinafter called the "Consultant")

WHEREAS:

A. Toronto Hydro has retained the Consultant to provide certain consulting services as detailed in SCHEDULE A (collectively, the "Services"); and

B. the Consultant has indicated to Toronto Hydro that it has the skill and expertise to provide the Services on the terms and conditions set forth herein;

NOW THEREFORE, in consideration of the mutual covenants set forth herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. INTERPRETATION

Unless otherwise indicated, all capitalized terms in this Agreement shall be as defined in SCHEDULE C and any reference to currency in this Agreement shall refer to lawful money of Canada.

2. RELATIONSHIP OF THE PARTIES

2.1 Retainer

Toronto Hydro hereby retains the Consultant to provide the Services, and the Consultant hereby agrees to provide the Services, during the Term, in accordance with the terms and subject to the conditions of this Agreement.

2.2 Independent Contractors

(a) Notwithstanding any provision hereof, this Agreement does not constitute and shall not be construed as constituting a partnership, joint venture, principal/agency relationship, or employer/employee relationship between the parties. The Consultant acts at all times in the capacity of an independent contractor, and neither party shall represent itself to be an agent or employee of the other. The Consultant and its Representatives have no authority to commit, act for or on behalf of Toronto Hydro, or to bind Toronto Hydro to any obligation or liability.

(b) Without limiting the generality of Section 2.2(a), the Consultant hereby acknowledges and agrees that neither it nor its Representatives shall be eligible or entitled, by reason of this Agreement, to participate in any employee-related program offered by Toronto Hydro or any of its Affiliates, including, without limitation, any benefit, insurance, compensation, health plan, bonus or retirement program.

(c) The Consultant hereby covenants and agrees to indemnify, defend and hold harmless Toronto Hydro and its Representatives from and against all costs, liabilities or claims whatsoever against Toronto Hydro or its Representatives resulting from or relating to the Consultant or its Representatives being deemed to be an employee of Toronto Hydro or any of its Affiliates.

(d) The Consultant hereby acknowledges and agrees that Toronto Hydro shall not be responsible for and shall not have control or charge of any means, methods, techniques, sequences or procedures used for or in respect of the Services, or for the safety precautions or programs required for the Services or otherwise prescribed hereunder.

2.3 Conflicts of Interest

The Parties acknowledge that there is potential for a conflict of interest based on services provided by the Consultant from time to time to Toronto Hydro. The Consultant agrees to take all such steps as Toronto Hydro deems necessary, acting reasonably, to remove, mitigate or minimize such conflict of interest. The parties acknowledge that the Consultant working for other utility clients will not constitute a conflict of interest unless the work involves a regulatory application put forth by Toronto Hydro.

3. TERM

3.1 Initial Term

This Agreement shall be effective as of the Effective Date and shall continue, unless terminated in accordance with the terms hereof or extended pursuant to Section 3.2, for a period of four (4) years (the "Initial Term").

3.2 Renewal

Toronto Hydro may, at its sole option, elect to renew this Agreement for two (2) additional one (1) year terms (each a "Renewal Term") by giving written notice to the Consultant at least thirty (30) days before the end of the Initial Term or the first Renewal Term (as applicable). The same terms and conditions contained herein shall apply during the Renewal Term(s), save and except as amended in writing by the parties.

3.3 Term

The Initial Term and Renewal Term, if any, shall hereinafter together be referred to as the "Term".

4. SERVICE REQUIREMENTS

4.1 Services

During the Term, the Consultant shall perform the Services as detailed in SCHEDULE A hereto

(a) in accordance with the terms and subject to the conditions set forth in this Agreement;

(b) using personnel of required skill, experience, licences and qualifications;

(c) in a workerlike and professional manner; and

(d) consistent with standards generally observed by reputable and competent members of the same industry providing similar services.

4.2 Revision to Services

(a) The parties acknowledge and agree that the Services to be undertaken and completed by the Consultant under this Agreement may be subject to revision or amendment from time to time during the Term: (i) as required by Toronto Hydro to comply with the Guidelines; (ii) as required by Toronto Hydro to comply with Applicable Laws or any order, instruction, directive or legal requirement of a Governmental Authority; or (iii) as required by Toronto Hydro to ensure that Toronto Hydro receives the expected funding and benefits with respect to the project to which the Services relate.

(b) Toronto Hydro agrees to provide the Consultant with written notice of any revision or amendment to the Services required pursuant to this Section 4.2, and the Consultant shall comply with all such directives.

(c) In the event that the Consultant fails to comply with a directive issued by Toronto Hydro pursuant to this Section 4.2, Toronto Hydro shall have the right, in addition to any other remedies which may be available to Toronto Hydro hereunder or otherwise at law, to terminate this Agreement by giving written notice of termination to the Consultant whereupon this Agreement shall terminate as at the effective date of termination specified in the notice and Section 7 shall apply.

4.3 Applicable Laws

(a) The Consultant shall, at its sole expense, obtain and maintain during the Term of this Agreement, all permits, licences and approvals required to perform its obligations under

this Agreement in accordance with Applicable Laws. The terms and conditions of this Agreement shall be carried out in strict compliance with all Applicable Laws and in the event of any conflict between any Applicable Laws, the Applicable Laws with the most stringent standard shall apply.

(b) Without limiting the generality of the foregoing, the Consultant shall comply with the *Municipal Freedom of Information and Protection of Privacy Act* (Ontario) ("MFIPPA"), the *Personal Information Protection and Electronic Documents Act* (Canada) ("PIPEDA") and any other applicable privacy legislation (collectively, "Privacy Laws") with respect to any personal information collected, used or disclosed in connection with this Agreement and shall indemnify and hold harmless Toronto Hydro and its Representatives from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments (including related expenses and legal costs) they may incur related to or arising out of any non-compliance therewith.

(c) Where any Deliverable is subject to the approval or review of any authority, department, government or agency other than Toronto Hydro, such applications for approval or review shall, unless otherwise authorized by Toronto Hydro in writing, be prepared by the Consultant to be approved and submitted by and through the offices of Toronto Hydro, and the Consultant shall not have any direct dealings with the authority, department, government or agency in question with regards to the Deliverable.

(d) The Consultant and the Consultant's personnel and Representatives shall comply with all rules and direction of Toronto Hydro, whether specified in this Agreement or otherwise, while working on Toronto Hydro's premises or when accessing or connecting to Toronto Hydro's information technology systems, including rules and directions concerning health, safety, security and environmental protection, including without limitation, Toronto Hydro's *Code of Business Conduct and Whistleblower Procedure,* Toronto Hydro's *Disclosure Policy*, Toronto Hydro's *Social Media and Digital Communication Policy,* Toronto Hydro's *Accessibility Policy,* Toronto Hydro's *Workplace Harassment Policy and Program*, Toronto Hydro's *Violence Prevention in the Workplace Policy*, Toronto Hydro's *Workplace Alcohol and Drug Policy*, Toronto Hydro's *Environmental Policy,* Toronto Hydro's *Occupational Health and Safety Policy*, Toronto Hydro's *Privacy Policy*, Toronto Hydro's *Cyber Security Policy*, Toronto Hydro's *Technology Use Guidelines*, Toronto Hydro's *Physical Security Policy*, Toronto Hydro's *COVID-19 Vaccination Policy*, and the *Affiliate Relationships Code for Electricity Distributors and Transmitters* issued by the OEB (together, the "Guidelines"). Toronto Hydro premises includes, but is not limited to, all Toronto Hydro-owned or leased buildings, sites, work centres, stations, substations, vaults, radio antenna sites, and any other location where Toronto Hydro stores or maintains physical assets. The Consultant agrees to comply with and to direct its Representatives to comply with such Guidelines, as amended.

4.4 Performance

(a) The Services shall be performed to the satisfaction of Toronto Hydro, and Toronto Hydro shall have the right at all reasonable times, to inspect or otherwise review the Services performed or being performed. The Consultant shall, upon the request of Toronto Hydro, acting reasonably, provide Toronto Hydro with written reports of the status of the Deliverables and the Consultant's progress in providing the Services.

(b) In the event of any dispute between Toronto Hydro and the Consultant relating to the quality or acceptability or rate of progress of any of the Services, or relating to the interpretation of any instructions or specifications concerning the Services, Toronto Hydro and the Consultant shall attempt to mutually reach a resolution in good faith. Failing a good faith resolution, the reasonable opinion of Toronto Hydro shall govern and be binding on the parties hereto.

5. REPRESENTATIONS, WARRANTIES, INDEMNITIES AND INSURANCE

5.1 Representations and Warranties

The Consultant hereby represents, warrants and agrees that:

(a) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has/have the necessary experience and qualifications to perform the Services;

(b) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) will perform the Services in a diligent, expeditious and workerlike manner, consistent with standards generally observed by reputable and competent members of the same industry providing similar services;

(c) all Services shall be the Consultant's (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) original work and none of the Services or any invention, development, use, production, distribution or exploitation relating thereto will infringe, misappropriate or violate any intellectual property or other right of any person or entity.

(d) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has the corporate power and authority to enter into this Agreement and to perform its obligations hereunder, and that this Agreement constitutes a legal, valid, and binding obligation of the Consultant, enforceable against the Consultant in accordance with its terms.

5.2 Indemnity

a) The Consultant shall be liable for and shall indemnify, defend and hold harmless Toronto Hydro and its Representatives from all claims, demands, actions, penalties, damages, losses, judgments and settlements, liabilities, costs, expenses, including legal fees and other related costs and expenses arising out of, related to, or incidental to, the Consultant or any of its Representatives' performance of the Services under this Agreement, including, without limitation:

i. any breach, violation or non-performance by the Consultant or any of its Representatives of any terms, conditions, warranties, obligations or covenants contained in this Agreement;
ii. any breach or violation by the Consultant or any of its Representatives of any Applicable Laws; and
iii. any actions, omissions, negligence or wilful misconduct of the Consultant or any of its Representatives

except to the extent caused by the negligence or wilful misconduct of Toronto Hydro or its Representatives.

b) In no event shall either party be liable for loss of profit or use or for any indirect, special, incidental or consequential damages of any nature or kind including but not limited to delays, loss of revenue, loss of use, loss of data, loss of product, costs of capital or costs or replacement power, even if that party has been advised of the possibility of such damages.

c) Subject to Section 5.2(d), the Consultant's liability for a claim for damages shall be limited to the maximum amounts payable by Toronto Hydro to the Consultant for the Term pursuant to SCHEDULE B.

d) Notwithstanding the foregoing, no exclusion or limitation of liability shall apply to:

i. Breach of the confidentiality or privacy obligations in this Agreement
ii. Intentional misconduct or gross negligence;
iii. Breach of Applicable Law; or
iv. Breach of intellectual property indemnity in Section 9.

5.3 Insurance

The Consultant shall, during the Term, and at its own expense, maintain and keep in full force and effect (and, when requested, provide Toronto Hydro with proof thereof):

(a) commercial general liability insurance on an occurrence basis having a minimum inclusive coverage limit, including personal injury and property damage, of not less than two million dollars ($2,000,000) per occurrence, which commercial general liability insurance shall be extended to cover contractual liability, products and completed operations liability, and owners/contractors protective liability;

(b) Errors and Omissions Insurance (Professional Liability) covering actual or alleged acts, errors or omissions committed by the Consultant or its Representatives, arising out of the performance of this Agreement, which shall also extend to include personal injury, bodily injury and property damage from the performance of professional services, in the amount of not less than two million dollars ($2,000,000);

(c) All insurance coverages and limits required to be maintained hereunder shall: (i) be primary to any insurance maintained by Toronto Hydro, which insurance shall be excess and non-contributory; (ii) contain a cross liability clause and a severability of interest clause; and (iii) contain a thirty (30) day prior written notice to Toronto Hydro for any cancellation, non-renewal or adverse material change.;

(d) The Consultant agrees that the insurance required hereunder in no way limits the Consultant's liability pursuant to the Liability and Indemnity provision in Section 5.3; and

(e) A waiver of subrogation shall be provided by the insurer(s) to Toronto Hydro.

6. FEES

6.1 Fees

(a) Subject to Sections 6.1(c) - 6.1(f), in exchange for the performance of the Services in accordance with the terms hereof, Toronto Hydro shall pay the Consultant the rates

outlined in SCHEDULE B, not including HST (the "Fees"). Fees shall not be in excess of the maximum amounts set out in SCHEDULE B.

(b) The Fees noted in Section 6.1(a) shall be the only fees payable by Toronto Hydro under this Agreement. Without limiting the generality of the foregoing, the Consultant hereby agrees and acknowledges that all out-of-pocket expenses, travelling costs, and other disbursements shall be at the sole expense of the Consultant, except with the prior written approval from Toronto Hydro.

(c) Any disbursements for additional incidentals incurred by the Consultant in relation to this Agreement ("Disbursements") must be pre-approved by Toronto Hydro in writing.

(d) The Consultant shall not incur or submit invoices for any work outside the scope of the Services without prior written approval from Toronto Hydro.

(e) The Consultant shall make all payment of taxes, employment insurance premiums, pension plan contributions and any other taxes or other payment of any nature, imposed by any authority in respect of the Fee paid by Toronto Hydro to the Consultant under this Agreement (together, the "Remittances"), and the Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities and claims whatsoever against Toronto Hydro or its Representatives, in any way arising out of or relating to any failure to deduct, withhold, or remit any Remittance.

(f) Without limiting the generality of Section 6.1(a), Toronto Hydro reserves the right to deduct any applicable non-resident withholding taxes from any Fee owing to the Consultant under this Agreement and remit such amounts to the applicable taxation authority.

6.2 Payment

The Consultant shall submit invoices to Toronto Hydro on a monthly basis containing:

(a) a description of the Services performed during the invoice period;

(b) the monthly payment amount;

(c) the total HST applicable to the Services during the invoice period, as well as the Consultant's HST registration number; and

(d) a detailed description of the Disbursements incurred around the invoice period, supported by documentation in a form acceptable to Toronto Hydro.

Unless otherwise provided in this Agreement, the Consultant shall invoice Toronto Hydro after final inspection and acceptance by Toronto Hydro of the Services performed and subject to receipt of all documents required by this Agreement. **Invoices must be sent electronically to: AP@torontohydro.com.** Subject to approval of the invoice by Toronto Hydro, receipt of all documents required by this Agreement, and final review by Toronto Hydro, Toronto Hydro shall make payment to the Consultant via electronic funds transfer not later than thirty (30) days following receipt of an acceptable invoice and the EFT Information (as set out below). **The Consultant must provide Toronto Hydro with, in the case of the first payment only, (i) a void**

cheque, pre-printed deposit slip or bank confirmation letter and (ii) the email address where the Consultant wishes to receive remittance information (together, "EFT Information"). EFT Information must be sent electronically to efthelp@torontohydro.com or to 14 Carlton Street, Toronto, ON, M5B 1K5, Attention: Treasury Department. Toronto Hydro reserves the right to pay the Consultant through other payment methods.

7. SUSPENSION OR TERMINATION

7.1 Suspension or Termination

(a) Toronto Hydro may, at any time during the Term by notice in writing, suspend all or a portion of the Services. Upon receipt of such written notice, the Consultant shall perform no further work other than as directed by Toronto Hydro, and shall be entitled to payment for time spent in performing the Services up to the date of suspension.

(b) Either party may terminate this Agreement immediately upon written notice where the other party enters into liquidation, whether compulsory or voluntarily, or where a proceeding in receivership, bankruptcy or insolvency has been instituted by or against such party or its property.

(c) Toronto Hydro, at its sole discretion, may terminate this Agreement immediately upon written notice where the Consultant or any of its Representatives has been in material default in the performance of its duties, obligations or undertakings under this Agreement, and has not taken immediate steps to remedy such default within two (2) Business Days following written notice of the specific default by Toronto Hydro. For the purposes of this section, a material default shall include, without limitation, a breach of any of the representations or warranties contained herein or the failure or refusal to provide the Services in accordance with the terms and conditions of this Agreement.

(d) Notwithstanding any other provision in this Agreement, Toronto Hydro, at its sole discretion, shall have the right to terminate this Agreement, for any reason, upon two (2) weeks written notice to the Consultant.

(e) In the event that this Agreement is terminated in accordance with this Section 7.1 by either party, the Consultant shall be entitled to payment for time spent in performing the Services up to the date of suspension.

7.2 Effect of Termination

Upon the termination or expiration of this Agreement, upon Toronto Hydro's request, the Consultant shall return to Toronto Hydro and delete any and all electronic copies the Consultant may have of all documents and materials in its possession relating to the Services or this Agreement, including all Confidential Information and all Deliverables, whether completed or not and shall, upon written request by Toronto Hydro, certify in writing to Toronto Hydro that it has complied with the requirements of this Section 7.2.

8. CONFIDENTIALITY

8.1 Non-Disclosure

In performing the Services required by this Agreement, the Consultant may be provided access to Confidential Information. The Consultant acknowledges and agrees that:

(a) the Consultant shall not disclose, permit access to, transmit, or transfer the Confidential Information to any third party without the prior written authorization of Toronto Hydro;

(b) the Consultant shall protect the confidentiality of the Confidential Information in its possession by exercising the same security measures it normally exercises with respect to its own confidential information and at minimum a reasonable standard of care;

(c) upon the request of Toronto Hydro, and in any event upon the expiration or termination of this Agreement for any reason, the Consultant shall return (or delete, in the case of electronic documents) forthwith to Toronto Hydro all Confidential Information, including all copies and other materials containing the Confidential Information, which are in the possession or under the control of the Consultant; and

(d) the Consultant shall not use any Confidential Information for any purpose other than to perform the Services required by this Agreement. Without limiting the foregoing, the Consultant shall not, and shall not permit any of its Representatives to, use any Confidential Information in furtherance of its, or their, individual business or for its, or their, own benefit, profit or advantage, or for the benefit, profit or advantage of any other party.

(e) Toronto Hydro is subject to MFIPPA and is governed by Governmental Authority such as IESO and the OEB and shall have the right to disclose Confidential Information in accordance with the provisions of MFIPPA or as required by the IESO or the OEB.

Notwithstanding the foregoing, the Consultant may disclose such Confidential Information to any of the Representatives of the Consultant who agree to be bound by the obligations of confidentiality herein and who have a reasonable need to know such Confidential Information in the course of their duties for the Consultant but only for the purposes of the Consultant exercising its rights and obligations under this Agreement; and in the event that the Consultant believes it is required by law to disclose, or is requested by a Governmental Authority to disclose, any Confidential Information to a Governmental Authority; provided that the Consultant shall, to the extent permitted by law, first inform Toronto Hydro of the request or requirement for disclosure to allow an opportunity for Toronto Hydro to apply for an order to prohibit or restrict such disclosure.

8.2 Non-Solicitation

Unless Toronto Hydro's Chief Executive Officer provides prior written consent, the Consultant hereby covenants and agrees that during the term of this Agreement and for a period of two (2) years following the termination of the Agreement, however caused, the Consultant will not directly or indirectly, either individually or in partnership or jointly or in conjunction with any other Person,

(a) hire or otherwise engage any Protected Employee who is currently employed by Toronto Hydro;

(b) hire or otherwise engage any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause;

(c) solicit or attempt to solicit any Protected Employee who is currently employed by Toronto Hydro or encourage any such person to leave his/her employment with Toronto Hydro; and

(d) solicit or attempt to solicit any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause.

8.3 Non-Compete

Given the unique expertise and intimate knowledge that the employees have of the operations of Toronto Hydro the Consultant acknowledges and agrees that the restrictions contained in this section are reasonable and necessary to preserve the value of Toronto Hydro's business.

(a) During the Term and for a period of ten (10) years following the termination of this Agreement, the Consultant shall not appear as an Intervenor, nor aid, assist, or provide services to an Intervenor (whether as an employee, contractor, consultant, agent, or officer) where the services are (i) related to a regulatory proceeding at the OEB involving Toronto Hydro; or (ii) likely to result in disclosure of Toronto Hydro's Confidential Information to an Intervenor or the use of Toronto Hydro's Confidential Information on behalf of an Intervenor;

(b) During the Term, the Consultant shall not aid, assist, or provide services to the OEB; and

(c) For a period of ten (10) years following the termination of this Agreement, the Consultant shall not aid, assist, or provide services to the OEB (whether as an employee, contractor, consultant, agent, or officer) where the services are (i) related to a regulatory proceeding at the Ontario Energy Board (the "OEB") involving Toronto Hydro; or (ii) likely to result in disclosure of Toronto Hydro's Confidential Information to the OEB or the use of Toronto Hydro's Confidential Information in the service of the OEB.

9. INTELLECTUAL PROPERTY

9.1 Use

Nothing in this Agreement shall be deemed to transfer, license, assign, permit the use of, or otherwise convey an interest in whole or in part to the Consultant of any Intellectual Property belonging to Toronto Hydro or any of its Representatives or any third party whose Intellectual Property is in Toronto Hydro's custody or control, and the use by the Consultant of any such Intellectual Property shall be subject to the prior written approval of Toronto Hydro.

9.2 Ownership

Toronto Hydro shall at all times have full rights and title to the Deliverables, and may at all times take possession of or use any completed or partially completed Deliverables, notwithstanding any provision, express or implied, to the contrary. Without limiting the generality of the foregoing,

Toronto Hydro shall own all Intellectual Property rights in all Deliverables, and the Consultant hereby waives and assigns to Toronto Hydro any such rights, and agrees to give Toronto Hydro and its Representatives all assistance as may be reasonably required to perfect such rights including, without limitation and where the Consultant is a corporation or partnership, obtaining waiver of moral rights from any of the Consultant's employees, partners or other Representatives.

9.3 Intellectual Property Protection

The Consultant expressly warrants that the manufacture, delivery, sale or use of the Consultant's Services will not infringe any Canadian or foreign patents, trademarks, copyrights, industrial design or other intellectual property rights and the Consultant shall indemnify and save Toronto Hydro harmless from all claims, judgments and decrees that may be entered against Toronto Hydro or its Representatives and against all damage, liability, costs and expenses (including legal fees and other attendant costs and expenses**)** Toronto Hydro incurs by reason of any infringement or claim thereof.

9.4 Pre-Existing Intellectual Property

Any pre-existing Intellectual Proprietary ("Pre-Existing IP") of Consultant or its licensors used to perform Services, or included in any Development, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of the Consultant and its licensors (collectively, "Consultant Information"). To the extent that Consultant incorporates any Consultant Information into the Development(s), Consultant hereby grants to Toronto Hydro a fully paid up, royalty free, irrevocable and non-cancellable, non-exclusive, assignable and transferable right to Use the Consultant Information without restriction, except that any such Use must be in conjunction with the Developments in which the Consultant Information is incorporated and not as a separate item. For the purpose of the foregoing, "Use" means one or more of the following rights to: use; modify; adapt; translate; create changes, alterations, modifications, improvements, adoptions, enhancements and derivative works based upon or derived from the Consultant Information; reproduce; copy; display; perform; communicate in any manner; license or sublicense. Consultant shall provide Toronto Hydro with a list of any freeware, shareware or open source software used in the Developments. Any pre-existing intellectual property of Toronto Hydro, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of Toronto Hydro.

10. HEALTH AND SAFETY

The Consultant shall be responsible for managing the health and safety of its own personnel and other Representatives. Neither Toronto Hydro, nor its Representatives, shall be liable for any loss, damages or claims arising directly or indirectly from the Consultant's access to or work in or around Toronto Hydro's facilities, and the Consultant hereby waives any claims to which it may become entitled for loss or damage and releases Toronto Hydro and its Representatives from any and all such claims.

11. MISCELLANEOUS

11.1 Survival

In addition to the terms in this Agreement that by their nature survive the expiry or termination of the Agreement, the terms of Section 5 (Representations, Warranties and Indemnities), Section 8

(Confidentiality), Section 9 (Intellectual Property), and Section 11.3 (Injunctive Relief) shall survive the expiry of this Agreement for a term of five (5) years.

11.2 Subcontracting

The Consultant shall not subcontract the performance of all or any part of the Services without Toronto Hydro's prior written approval. Where Toronto Hydro provides its prior written approval to the Consultant to subcontract all or part of the Services, then the Consultant shall enter into agreements with such permitted subcontractor(s) to require the permitted subcontractor(s) to provide Services in accordance with all of the terms of this Agreement. Notwithstanding the foregoing, the Consultant shall remain liable for any and all acts or omissions of any subcontractor(s) as if such acts or omissions were those of Consultant.

11.3 Injunctive Relief

(a) The Consultant acknowledges and agrees that the terms of Section 8 (Confidentiality) and Section 9 (Intellectual Property) of this Agreement are reasonably necessary to protect the legitimate interests of Toronto Hydro, are reasonable in scope and duration, and are not unduly restrictive.

(b) The Consultant further acknowledges that a breach of any of the terms of Section 8 (Confidentiality) or Section 9 (Intellectual Property) would render irreparable harm to Toronto Hydro, and that a remedy at law for breach of these sections would be inadequate, and that Toronto Hydro shall therefore be entitled to any and all equitable relief, including, without limitation, injunctive relief, and any other remedy that may be available at law or in equity.

11.4 Force Majeure

Either party will be relieved of liability for delays in performance of its obligations hereunder where such delay is a result of Force Majeure. The party affected by the Force Majeure shall give prompt notice thereof to the other party and, upon cessation of the Force Majeure, shall take all reasonable steps to resume the performance of its obligations hereunder as soon as reasonably practicable. If a delay in performance by reason of Force Majeure extends beyond thirty (30) Business Days, then either party may terminate this Agreement by written notice.

11.5 Non-Exclusive Agreement

This Agreement will not be interpreted to grant to the Consultant exclusive rights to provide the Services or to bind Toronto Hydro in any way to an exclusive relationship with the Consultant with regards to the Services or any other service.

11.6 Waiver

No delay on the part of either party in exercising any of its rights hereunder or failure to exercise the same, nor the acquiescence thereto shall operate as a waiver except in the specific instance for which it is given and where such waiver is provided in writing by the party waiving its rights.

11.7 Amendments

None of the terms, conditions or provisions of this Agreement shall be varied, modified or altered except by written agreement signed by an authorized representative of each parties.

11.8 Assignment

Save and except for Toronto Hydro's right to assign this Agreement to any of its Affiliates, neither party may assign this Agreement or any of their rights or obligations hereunder, without the prior written authorization of the other party, acting reasonably.

11.9 Enurement

This Agreement shall enure to the benefit of, and be binding upon, the parties hereto and their respective successors and permitted assigns.

11.10 Severability

In the event that any provision or portion of this Agreement is determined to be invalid or unenforceable for any reason, the remaining provisions or portions of this Agreement will be unaffected and will remain in full force and effect to the fullest extent permitted by law.

11.11 Neutral Construction

The parties to this Agreement agree that this Agreement was negotiated fairly between them at arm's length, that the final terms of this Agreement are the product of the parties' negotiations, and that this Agreement shall be deemed to have been jointly and equally drafted by them, and that the provisions thereof should not be construed against a party on the grounds that such party drafted the Agreement in whole or in part.

11.12 Entire Agreement

This Agreement constitutes the entire agreement between the parties relating to the subject matter hereof. This Agreement supersedes any and all prior correspondence, warranties, covenants, collateral undertakings, or agreements, oral or otherwise, express or implied, unless otherwise contained herein.

11.13 Notices

(a) All questions or other communications regarding this Agreement, including any notices required by this Agreement, are to be addressed to the following addresses:

to Toronto Hydro:

Name:	Anila Dumont
Title:	Manager, Regulatory Services
Address:	14 Carlton Street, Toronto ON 5B 1K5
Telephone:	416-542-2831
Email:	ADumont@TorontoHydro.com

with copy to:

Title:	EVP, Public and Regulatory Affairs & Chief Legal Officer

Address: 14 Carlton, Toronto Hydro, ON M5B 1K5
Telephone: (416) 542-3000
Email: legal@torontohydro.com

to the Consultant:

Name: Steve Fenrick
Title: Principal Consultant
Address: 1050 Regent Street, Suite L3, Madison, WI 53715
Telephone: 608-442-8668
Email: steve.fenrick@clearspringenergy.com

(b) All notices or communications shall be deemed to be received on the date of acceptance (as evidenced by the signature of the party) if delivered by personal delivery or courier, on the fifth (5th) Business Day after mailing, if mailed by first class mail, or on the first (1st) Business Day after transmission, if sent by facsimile (provided the transmission is evidenced by documented proof of proper fax transmittal).

11.14 Governing Law

This Agreement shall be governed by and construed in accordance with the law of the Province of Ontario and the laws of Canada applicable therein.

11.15 Execution

This Agreement may be signed in counterparts and delivered by electronic means, each of which shall be deemed an original and all of which, together, shall have the same effect as if all constitute one and the same Agreement.

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the date first written above:

Clearspring Energy Advisors LLC

Per: Steve Fenrick

Name: Steven Fenrick

Title: Executive Vice President

I have authority to bind the Consultant.

Toronto Hydro-Electric System Limited

Per: _____

Name: Amanda Klein

Title: Executive Vice President, Public and Regulatory Affairs, and Chief Lega Officer

I have authority to bind Toronto Hydro.

SCHEDULE A

SCOPE OF SERVICES

1. Services to be Performed

(a) Regulatory Applications and Advocacy

Toronto Hydro is retaining the Consultant to undertake technical analysis, provide advice and/or assist with preparatory activities for upcoming rate applications and regulatory filings at the OEB. Broadly, the Consultant will research and support Toronto Hydro in respect of the following:

- Analyzing regulatory policies, reports, decisions, laws and other energy policy proposals of governments or regulators in relevant jurisdictions;
- Developing advocacy positions and written submissions;
- Detailing application timeline, schedule and milestones;
- Managing the discovery and interrogatory processes;
- Delivering expert testimony in regulatory proceedings;
- Understanding new or modified policies and developing new or modified approach for implementation and compliance purposes;
- Evaluating and creating regulatory frameworks, paradigms and first mover policy ideas to advance the interests of Toronto Hydro; and
- Undertaking technical analysis, drafting evidence and other preparatory activities for rate applications and regulatory filings.

In addition to the foregoing, the Consultant has been retained to provide specific expertise in the areas below. Please note that the list of work or tasks in SCHEDULE A is not guaranteed to include the subjects listed, nor is it limited to the examples listed.

(b) Regulatory Analytics and Technical Services

Toronto Hydro requires support from the Consultant on rate design. The OEB sees a comprehensive rate application as consisting of three main components: the business plan (along with supporting documentation and reports), historical and forecast information, and rate models that show the derivation of specific proposed rates based on the data. The OEB's adjudicative process on Toronto Hydro's regulatory applications can involve a number of steps to ensure that Toronto Hydro's proposals are adequately examined and "tested" during the review to ensure that it is delivering cost effective, efficient, reliable and responsive services to customers. In relation to this, the Consultant will be relied on for its experience, skillsets, knowledge and training in the area of analytics and technical services focused on the following tasks:

- Business case development;
- Econometrics and benchmarking analysis and studies;
- Productivity studies; and
- Incentive regulation principles and frameworks.

Other areas of analytics and technical services may require advice or direction from the Consultant, such as:

- Load and Customer Forecast;
- Energy market analysis
- Lead Lag Study;
- Cost Allocation Model (CAM) review;
- Rate design review;
- Load Profile Analysis as part Cost Allocation Requirements;
- Transformer Allowance;
- Cost Study for Specific Service Charge;
- Standby rates;
- EV rates;
- Loss Adjustment Factor;
- Energy & Demand Load Research Analysis;
- Distributed Energy Resources;
- Line Loss Study;
- Load Profile Analysis;
- IESO market settlement;
- Rate design principles;
- Quantitative models; and
- Other analytics and technical matters that arise.

SCHEDULE B

RATES

Resource Type	**Resource Type Hourly Cost ($/hr)**	**Percentage of Duties**
Principal Consultant (>20 Years experience, Expert Witness)	[redacted]	
Economics Consultant (>10 Years experience)		
Data Analyst (<10 Years experience)		

SCHEDULE C

DEFINITIONS

In this Agreement, the following definitions shall apply:

"Affiliates"	has the meaning prescribed to it in the *Business Corporations Act* of Ontario, as amended from time to time;
"Agreement"	means this Agreement for Professional Consulting Services, including all recitals, schedules and attachments thereto;
"Applicable Laws"	means all federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to this Agreement, including without limitation all applicable OEB codes, rules or guidelines;
"Business Day"	means a day on which banks are open for business in the City of Toronto, Ontario, but does not include a Saturday, Sunday, or a civic or statutory holiday in the Province of Ontario;
"Confidential Information"	means the terms of this Agreement and any and all data or information relating to the business, management or affairs of Toronto Hydro, its customers, employees, or any of its Affiliates disclosed by Toronto Hydro to the Consultant pursuant to this Agreement, whether or not such Confidential Information is expressly identified as confidential. Notwithstanding the foregoing, Confidential Information does not include any information or data which: (a) information or data that is or becomes publicly known through no breach of the terms or conditions of this Agreement; (b) information or data that is independently developed without reference to Confidential Information and without breach of the terms and conditions of this Agreement; or (c) Confidential Information that is required by court order or other legal compulsion to be disclosed, in which case the Consultant shall give Toronto Hydro prior written notice of such disclosure, as permitted by law;
"Consultant"	means Clearspring Energy Advisors LLC;
"Consultant Information"	shall have the meaning as prescribed in Section 9.4
"Deliverable"	means any and all works prepared, generated, created or designed by the Consultant pursuant to this Agreement, including without limitation all drawings, models, designs, formulae, methods, documents, reports, software, specifications, or source codes, and any related works, enhancements, modifications or additions thereto;
"Disbursements"	shall have the meaning as prescribed in Section 6.1(c);
"Fees"	shall have the meaning as prescribed in Section 6.1(a);

"Force Majeure"	means any impediments beyond the control of the applicable party due, wholly or in part, directly or indirectly, to: strikes, lockouts, riots, epidemics (other than related to or associated with SARS-Co-V-2 or COVID-19 and any evolutions or mutations thereof), war, governmental regulations, fire, explosions, acts of God, or any other impediment beyond the control of the party affected;
"Governmental Authority"	means any government, legislature, municipality, regulatory authority, agency, commission, department, board or court or other law, regulation or rule-making public entity of similar authority, including, without limitation the OEB;
"Guidelines"	has the meaning prescribed in Section 4.3(d);
"Hourly Rate"	shall have the meaning prescribed in Section 6.1(a);
"HST"	means Harmonized Sales Tax;
"IESO"	Means the Independent Electricity System Operator;
"Initial Term"	has the meaning prescribed to it in Section 3.1;
"Intellectual Property"	includes all trademarks, copyrights, patents, business names, trade secrets, proprietary software, analysis or techniques (whether or not patented or patentable), confidential or secret designs and processes, source codes, plans or devices, or other proprietary and intellectual property rights;
"Intervenor"	means any interested group or individual who participates actively in an OEB proceeding involving Toronto Hydro either by submitting evidence, arguments or interrogatories (written questions) or by cross-examining a witness or witnesses at an oral hearing involving Toronto Hydro;
"MFIPPA"	means the *Municipal Freedom of Information Act*;
"OEB"	means the Ontario Energy Board;
"Person"	means any individual, firm, corporation, unlimited liability company, partnership, limited liability partnership, joint venture, trust, unincorporated association, unincorporated syndicate, any governmental authority and any other legal or business entity.
"Protected Employee"	means any individual who, during the course of their employment with Toronto Hydro, was directly or indirectly involved in: i. the procurement of the Services of the Consultant on behalf of Toronto Hydro;

ii. the negotiation of the Consultant's Agreement on behalf of Toronto Hydro; and/or

iii. the awarding and/or approval of the Consultant's Agreement on behalf of Toronto Hydro.

"Representative"	in respect of a party, means such party's directors, officers, employees, agents, contractors and advisors, the party's Affiliates, and all such Affiliates' respective directors, officers, employees, agents, contractors and advisors;
"Remittances"	has the meaning prescribed to it in Section 6.1(e);
"Renewal Term"	has the meaning prescribed to it in Section 3.2;
"Services"	means all of the Deliverables, services and specifications to be provided, performed and met by the Consultant under this Agreement, as more particularly described in SCHEDULE A;
"Term"	has the meaning prescribed to it in Section 3.3; and
"Toronto Hydro"	means Toronto Hydro-Electric System Limited.

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AMENDING AGREEMENT

THIS AMENDING AGREEMENT (the "Amending Agreement") is made effective as of June 1, 2023 (the "Effective Date") between **CLEARSPRING ENERGY ADVISORS, LLC** ("Consultant") and **TORONTO HYDRO-ELECTRIC SYSTEM LIMITED** ("Toronto Hydro") (collectively, the "Parties").

WHEREAS:

1. Toronto Hydro and Consultant entered into an agreement for professional consulting services dated March 21, 2022 (the "Agreement") pursuant to which the Consultant shall provide various regulatory applications, advocacy, analytics, and technical services (the "Services"); and

2. The Parties wish to amend the Agreement by attaching the Ontario Energy Board's *Rules of Practice and Procedure* Rule 13A, and make associated amendments related to the Consultant's participation in Toronto Hydro's upcoming rate application, as provided herein.

NOW THEREFORE, THIS AMENDING AGREEMENT WITNESSES that in consideration of the mutual covenants contained herein and for other valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Toronto Hydro and Consultant agree as follows:

1. Any capitalized terms used but not defined herein shall be as defined in the Agreement. The recitals above are agreed by the Parties to be true and deemed to form part of this Amending Agreement as if specifically restated herein.

2. Section 4.3 of the Agreement is amended by adding the following subsection (e) immediately following subsection 4.3(d):

   (e) Without limiting the generality of subsection 4.3(a) above, the Consultant shall comply with Rule 13A Expert Evidence of the OEB's *Rules of Practice and Procedure*, attached as SCHEDULE D hereto, in the course of providing the Services and agrees to accept the responsibilities that are or may be imposed on them by that rule.

3. The Parties agree to add a new SCHEDULE D to the Agreement, attached hereto as Appendix 1 to this Amending Agreement.

4. All other terms and conditions of the Agreement remain continuously in full force and effect, unamended, and shall be deemed to apply to this Amending Agreement.

5. This Amending Agreement, together with the Agreement, shall hereinafter constitute the entire agreement between the Parties with respect to the Services as further described in the Agreement, and supersedes any and all other agreements, understandings, discussions, negotiations, representations and correspondence which may have been made by or between the Parties respecting the same.

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IN WITNESS WHEREOF the Parties hereto have executed this Amending Agreement as of the date first written above.

CLEARSPRING ENERGY ADVISORS, LLC

Per: DocuSigned by: Steven Fenrick 13BD71201A7B419...

Name: _____

Title: _____

I have the authority to bind the Consultant.

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

Per: DocuSigned by: Daliana Coban E232C3948F5C435...

Name: Daliana Coban

Title: Director, Regulatory Applications & Business Support

I have authority to bind Toronto Hydro.

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APPENDIX 1

SCHEDULE D

Ontario Energy Board *Rules of Practice and Procedure* Rule 13A

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the OEB impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

a. the expert's name, business name and address, and general area of expertise;
b. the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;
c. the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;
d. the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;
e. in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and
f. an acknowledgement of the expert's duty to the OEB in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the OEB may require two or more of the experts to:

a. in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and
b. at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the OEB and others as permitted by the OEB, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the OEB, including as to:

a. scope and timing;
b. the involvement of any expert engaged by the OEB;
c. the costs associated with the conduct of the activities;
d. the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of Rule **13A.04**; and
e. any issues in relation to confidentiality.

13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A.**

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AGREEMENT FOR PROFESSIONAL CONSULTING SERVICES

THIS AGREEMENT is made as of the 24th day of March, 2023 between Toronto Hydro-Electric System Limited ("Toronto Hydro"), a corporation incorporated under the laws of the province of Ontario and UMS Group Inc., a corporation incorporated under the laws of the state of New Jersey in the United States of America (the "Consultant"), pursuant to which Toronto Hydro shall retain the Consultant to provide certain Services, and the Consultant shall provide such Services, during the Term, subject to the terms and conditions hereof;

NOW THEREFORE, in consideration of the mutual covenants set forth herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. INTERPRETATION

Unless otherwise indicated, all capitalized terms in this Agreement shall be as defined in C and any reference to currency in this Agreement shall refer to lawful money of Canada.

2. RELATIONSHIP OF THE PARTIES

2.1 Retainer

Toronto Hydro hereby retains the Consultant to provide the Services, and the Consultant hereby agrees to provide the Services, during the Term, in accordance with the terms and conditions of this Agreement.

2.2 Independent Contractors

(a) Notwithstanding any provision hereof, this Agreement does not constitute and shall not be construed as constituting a partnership, joint venture, principal/agency relationship, or employer/employee relationship between the parties. The Consultant and Toronto Hydro shall at all times remain independent contractors of each other, and neither party shall represent itself to be an agent or employee of the other.

(b) Without limiting the generality of Subsection 2.2(a), the Consultant hereby acknowledges and agrees that neither it nor its Representatives shall be eligible or entitled, by reason of this Agreement, to participate in any employee-related program offered by Toronto Hydro or any of its Affiliates, including, without limitation, any benefit, insurance, compensation, health plan, bonus or retirement program.

(c) The Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities or claims whatsoever against Toronto Hydro or its Representatives resulting from or relating to the Consultant or its Representatives being deemed to be an employee of Toronto Hydro or any of its Affiliates.

(d) The Consultant hereby acknowledges and agrees that Toronto Hydro shall not be responsible for and shall not have control or charge of any means, methods, techniques, sequences or procedures

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used for or in respect of the Services, or for the safety precautions or programs required for the Services or otherwise prescribed hereunder.

3. TERM

3.1 Initial Term

Unless otherwise terminated in accordance with the provisions hereof, this Agreement shall be for a term of approximately one (1) year and nine (9) months and seven (7) days commencing on March 24, 2023 and terminating on December 31, 2024 (the "Term").

4. SERVICE REQUIREMENTS

4.1 Services

During the Term, the Consultant shall perform the Services as detailed in SCHEDULE A hereto.

4.2 Time and Availability

(a) Unless otherwise directed in writing by Toronto Hydro, the Consultant shall have discretion in selecting the dates and times it performs the Services throughout the month, giving due regard to the needs of Toronto Hydro's business requirements and provided that any access to Toronto Hydro property shall be during regular business hours.

4.3 Key Employee

The Consultant acknowledges that Jeff Cummings and Nick Austin (the "Key Employee") are each a key employee of the Consultant and are integral to the successful performance of the Services by the Consultant under the Agreement. The Consultant acknowledges and agrees that the Key Employee will manage and be responsible for the performance of the Services and that a substantial portion of the Services will be performed by the Key Employee, unless Toronto Hydro otherwise consents in writing.

4.4 Revision to Services

(a) The Parties acknowledge and agree that the Services to be undertaken and completed by the Consultant under this Agreement may be subject to revision or amendment from time to time during the Term: (i) as required by Toronto Hydro to comply with the Guidelines; (ii) as required by Toronto Hydro to comply with the Applicable Laws or any order, instruction, directive or legal requirement of a Governmental Authority; or (iii) as required by Toronto Hydro to ensure that Toronto Hydro receives the expected funding and benefits with respect to the project to which the Services relate.

(b) Toronto Hydro agrees to provide the Consultant with written notice of any revision or amendment to the Services required pursuant to this Section 4.4 and the Consultant shall comply with all such directives.

(c) In the event that the Consultant fails to comply with a directive issued by Toronto Hydro pursuant to this Section 4.4, Toronto Hydro shall have the right, in addition to any other remedies which may be available to Toronto Hydro hereunder or otherwise at law, to terminate this Agreement by giving written notice of termination to the Consultant whereupon this Agreement shall terminate

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as at the effective date of termination specified in the notice and the provision of Section 7 shall apply.

4.5 Applicable Laws

(a) The Consultant shall, at its sole expense, obtain and maintain during the Term of this Agreement, all permits, licences and approvals required by all Applicable Laws to perform its obligations under this Agreement. The terms and conditions of this Agreement shall be carried out in strict compliance with all Applicable Laws and in the event of any conflict between any Applicable Laws, the Applicable Laws with the most stringent standard shall apply.

(b) Without limiting the generality of the foregoing, the Consultant shall comply with the *Municipal Freedom of Information Act* ("MFIPPA"), the *Personal Information Protection and Electronic Documents Act* (Canada) ("PIPEDA") and any other applicable privacy legislation (collectively, "Privacy Laws") with respect to any personal information collected, used or disclosed in connection with this Agreement and shall indemnify and hold harmless Toronto Hydro and its Representatives from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments (including related expenses and legal costs) they may incur related to or arising out of any non-compliance therewith.

(c) Where any Development is subject to the approval or review of any authority, department, government or agency other than Toronto Hydro, such applications for approval or review shall, unless otherwise authorized by Toronto Hydro in writing, be prepared by the Consultant to be approved and submitted by and through the offices of Toronto Hydro, and the Consultant shall not have any direct dealings with the authority, department, government or agency in question with regards to the Development.

(d) The Consultant and the Consultant's personnel shall comply with all rules and direction of Toronto Hydro, whether specified in this Agreement or otherwise, while working on Toronto Hydro's facilities: Toronto Hydro's *Code of Business Conduct and Whistleblower Procedure*, Toronto Hydro's *Disclosure Policy,* Toronto Hydro's *Social Media and Digital Communication Policy,* Toronto Hydro's *Accessibility Policy,* Toronto Hydro's *Workplace Harassment Policy and Program,* Toronto Hydro's *Violence Prevention in the Workplace Policy,* Toronto Hydro's *Workplace Alcohol and Drug Policy*, Toronto Hydro's *Environmental Policy,* Toronto Hydro's *Occupational Health and Safety Policy,* Toronto Hydro's *Privacy Policy,* Toronto Hydro's *Cyber Security Policy*, Toronto Hydro's *Technology Use Guidelines,* Toronto Hydro's *External Supplier Access to Application Services Policy,* Toronto Hydro's *Physical Security Policy* and the *Affiliate Relationships Code for Electricity Distributors and Transmitters* issued by the OEB (together, the "Guidelines"). The Consultant acknowledges that it has been provided with a copy of the Guidelines, has provided and will provide a copy of the Guidelines to each of its Representatives and that it agrees to comply with and to direct its Representatives to comply with such Guidelines, as amended.

4.6 Participation in Toronto Hydro's Regulatory Application Process

(a) The Consultant shall be available to speak to the work carried out as part of Services under this Agreement in a regulatory proceeding as required by the Ontario Energy Board as related to Toronto Hydro's 2025 Rate Application.

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(b) The degree of Consultant's participation shall be dependent on the degree of interest in the Benchmark Study or any other Service deliverable by OEB staff and any intervenors. Consultant's participation in such proceeding may entail, but is not limited to, response to interrogatories and undertakings, provision of support prior to and during any hearings required by the OEB, and answers to any questions regarding the Benchmark Study form, methodology, assumptions, and choices made, in either written or oral format (the latter in acting as a witness for Toronto Hydro). Where the Consultant is required to testify or otherwise provide evidence at a hearing before the OEB, the Consultant shall comply with the requirements set out in rules 13 and 13A of the OEB's Rules of Practice and Procedure, appended hereto as APPENDIX A.1 to this SCHEDULE A.

4.7 Performance

(a) The Services shall be performed to the satisfaction of Toronto Hydro, and Toronto Hydro shall have the right at all reasonable times, to inspect or otherwise review the Services performed or being performed. The Consultant shall, upon the request of Toronto Hydro, provide Toronto Hydro with written reports of the status of the Developments and the Consultant's progress in providing the Services.

(b) Toronto Hydro will have the right to reject any part thereof which is found to be inappropriate or otherwise not in accordance with specifications and of the Developments set out in the Agreement or otherwise required by law. The Consultant, at no additional cost to Toronto Hydro, will promptly redo any of the Services so rejected. This will include, but is not limited to, all reports, policy manuals, implementation plans and written work (howsoever recorded, that is, whether written or on digital media) and data prepared by the Consultant under the Agreement which are found, within a period of one year from date of transmittal to Toronto Hydro, to be incomplete or inaccurate due to a failure to comply with the Agreement or with said specifications and standards.

(c) In the event of any dispute between Toronto Hydro and the Consultant relating to the quality or acceptability or rate of progress of any of the Services, or relating to the interpretation of any instructions or specifications concerning the Services, the reasonable opinion of Toronto Hydro shall govern and be binding on the parties hereto.

4.8 Conflict of Interest

The Consultant is not engaged, and will not engage, in other commercial activities or retainers which conflict with the Services and/or its obligations hereunder. For clarity, the Consultant must obtain Toronto Hydro's consent in writing to provide services to any other entity in any capacity other than Toronto Hydro in relation to the 2025 Rate Application or any associated proceeding. Where Toronto Hydro is involved in an OEB proceeding as an intervenor and/or participant that is not the 2025 Rate Application, the Consultant may provide services to any other entity in any capacity provided that the Consultant utilizes confidentiality or other safeguards, including, but not limited to separate engagement teams and data access controls for the protection of Toronto Hydro's Confidential Information. Consultant commits to comply strictly with the confidentiality terms of this Agreement and to restrict access to – and use of – Toronto Hydro Confidential Information as set out in this Agreement.

4.9 ISNetworld

The Consultant shall subscribe with ISN Software Corporation as a registrant for ISNetworld, maintain such subscription throughout the Term, provide all records and information as required

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by ISN Software Corporation and Toronto Hydro to allow for the maintenance of such subscription and maintain a rating of B or higher on the ISNetworld during the performance of the Services.

4.10 Health and Safety

The Consultant shall be responsible for managing the health and safety of its own personnel and other Representatives. Neither Toronto Hydro, nor its Representatives, shall be liable for any loss, damages or claims arising directly or indirectly from the Consultant's access to or work in or around Toronto Hydro's facilities, and the Consultant hereby waives any claims to which it may become entitled for loss or damage and releases Toronto Hydro and its Representatives from any and all such claims.

4.8 Non-Solicitation

[Intentionally Deleted]

4.9 Security

[Intentionally Deleted]

5. REPRESENTATIONS, WARRANTIES, INDEMNITIES AND INSURANCE

5.1 Representations and Warranties

The Consultant hereby represents, warrants and agrees that:

(i) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has/have the necessary experience and qualifications to perform the Services;

(ii) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) will perform the Services in a diligent, expeditious and workmanlike manner, consistent with standards generally observed by reputable and competent members of the same industry providing similar services;

(iii) all Services shall be the Consultant's (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) original work and none of the Services or any invention, development, use, production, distribution or exploitation relating thereto will infringe, misappropriate or violate any intellectual property or other right of any person or entity;

(iv) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has the corporate power and authority to enter into this Agreement and to perform its obligations hereunder, and that this Agreement constitutes a legal, valid, and binding obligation of the Consultant, enforceable against the Consultant in accordance with its terms.

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5.2 Indemnity

The Consultant shall be liable for and shall indemnify and hold harmless Toronto Hydro and its Representatives from all claims, demands, actions, penalties, damages, losses, judgments and settlements, liabilities, costs, expenses, including legal fees and other related costs and expenses arising out of, related to, or incident to, the Consultant or any of its Representatives' performance of the Services under this Agreement, including, without limitation:

a) any breach, violation or non-performance by the Consultant or any of its Representatives of any terms, conditions, warranties, obligations or covenants contained in this Agreement;

b) any breach or violation by the Consultant or any of its Representatives of any Applicable Laws; and

c) any actions, omissions, negligence or wilful misconduct of the Consultant or any of its Representatives.

5.3 Insurance

(a) The Consultant shall, during the Term, and at its own expense, maintain and keep in full force and effect (and, when requested, provide Toronto Hydro with proof thereof) the following insurance:

(i) commercial general liability insurance on an occurrence basis having a minimum inclusive coverage limit, including personal injury and property damage, of not less than one million dollars ($1,000,000.00) per occurrence with property damage deductible of not more than fifty thousand dollars ($50,000.00), which commercial general liability insurance shall be extended to cover contractual liability, products and completed operations liability, contingent employer's liability, and owners/contractors protective liability;

(ii) Errors and Omissions Insurance (Professional Liability) in the amount of not less than four million dollars ($4,000,000.00); and

(iii) automobile liability insurance on all owned and non-owned vehicles used in connection with this Agreement, with such automobile insurance coverage having a limit of not less than one million dollars ($1,000,000.00) per vehicle, in respect of bodily injury (including passenger hazard), property damage and mandatory accident benefits.

(b) All insurance coverages and limits required to be maintained by the Consultant shall be primary to any insurance maintained by Toronto Hydro, which shall be excess and non-contributory. Prior to the commencement of the delivery of the Services, the Consultant shall deliver to Toronto Hydro a certificate of insurance which evidences the Consultant's compliance with this section, including the provision of a thirty (30) day prior written notice of cancellation, non-renewal or adverse material change, to Toronto Hydro.

(c) The Consultant agrees that the insurance described herein does in no way limit the Consultant's liability pursuant to the indemnity provisions of this Agreement.

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(d) A waiver of subrogation shall be provided by the insurer(s) to Toronto Hydro.

6. FEES

6.1 Fees

(a) In exchange for the performance of the Benchmarking Study, analysis and report Services detailed in Section 1 of SCHEDULE A and in accordance with the terms hereof, Toronto Hydro shall pay the Consultant a fee of [redacted] in accordance with the milestones detailed in SCHEDULE B, inclusive of all applicable taxes.

(b) In exchange for the performance of the Interrogatory Response and Expert Witness Services detailed in Section 2 of SCHEDULE A and in accordance with the terms hereof, Toronto Hydro shall pay the Consultant a fee on a time and material basis at the rates detailed in SCHEDULE B, inclusive of all applicable taxes.

(c) Without limiting the generality of the foregoing, the Consultant hereby agrees and acknowledges that all out-of-pocket expenses, travelling costs, and other disbursements shall be at the sole expense of the Consultant.

(d) The Consultant shall not incur or submit fees for any additional work outside the scope of the Services without prior written approval from Toronto Hydro.

6.2 Payment

The Consultant shall submit invoices to Toronto Hydro on a monthly basis or as otherwise agreed in Section 6.1(a) above, containing:

(i) a detailed description of the Services performed during the invoice period;

(ii) the dates and the amount of time spent by the Consultant for the provision of the Services;

(iii) the total HST applicable to the Services during the invoice period, as well as the Consultant's HST registration number; and

Unless otherwise provided in this Agreement, the Consultant shall invoice Toronto Hydro after final inspection and acceptance by Toronto Hydro of the Services performed and subject to receipt of all documents required by this Agreement. **Invoices must be sent electronically to: AP@torontohydro.com.** Subject to approval of the invoice by Toronto Hydro, receipt of all documents required by this Agreement, and final review by Toronto Hydro, Toronto Hydro shall make payment to the Consultant via electronic funds transfer not later than thirty (30) days following receipt of an acceptable invoice and the EFT Information (as set out below). **The Consultant must provide Toronto Hydro with, in the case of the first payment only, (i) a void cheque, pre-printed deposit slip or bank confirmation letter and (ii) the email address where the Consultant wishes to receive remittance information (together, "EFT Information"). EFT Information must be sent electronically to efthelp@torontohydro.com or to 14 Carlton Street, Toronto, ON, M5B 1K5, Attention: Treasury Department.** Toronto Hydro reserves the right to pay the Consultant through other payment methods.

6.3 Non-Residents: Permits and Withholding Tax

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(a) If applicable, the Consultant is responsible for applying, at its own expense, to Immigration Canada for admission of personnel into Canada and for obtaining work permits where required. All payments made by Toronto Hydro to non-residents of Canada will be made net of any required taxes or withholdings.

(b) Consultant acknowledges that it is a non-resident of Canada for income tax purposes and agrees that Toronto Hydro shall withhold any applicable non-resident withholding taxes from any amount owing hereunder and remit such taxes to the applicable federal taxing authority without provision for gross-up. Services provided in Canada should be detailed and separated from Services provided outside of Canada on invoices issued for payment.

7. SUSPENSION OR TERMINATION

7.1 Suspension or Termination

(a) Toronto Hydro may, at any time during the Term by notice in writing, suspend all or a portion of the Services. Upon receipt of such written notice, the Consultant shall perform no further work other than as directed by Toronto Hydro, and shall be entitled to payment for time spent in performing the Services up to the date of suspension.

(b) Either party may terminate this Agreement immediately upon written notice where the other party enters into liquidation, whether compulsory or voluntarily, or where a proceeding in receivership, bankruptcy or insolvency has been instituted by or against such party or its property.

(c) Toronto Hydro, at its sole discretion, may terminate this Agreement immediately upon written notice where the Consultant or any of its Representatives has been in default in the performance of its duties, obligations or undertakings under this Agreement, and has not taken immediate steps to remedy such default within five (5) Business Days following written notice of the specific default by Toronto Hydro. For the purposes of this section, a material default shall include, without limitation, a breach of any of the representations or warranties contained herein or the failure or refusal to provide the Services in accordance with the terms and conditions of this Agreement.

(d) Notwithstanding any other provision in this Agreement, Toronto Hydro, at its sole discretion, shall have the right to terminate this Agreement, for any reason, upon two (2) weeks written notice to the Consultant.

7.2 Effect of Termination

Upon the termination or expiration of this Agreement, the Consultant shall return to Toronto Hydro and delete any and all electronic copies the Consultant may have of all documents and materials in its possession relating to the Services or this Agreement, including all Confidential Information and all Developments, whether completed or not.

8. CONFIDENTIALITY

(a) In performing the Services required by this Agreement, the Consultant may be provided access to Confidential Information. The Consultant acknowledges and agrees that:

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(i) the Consultant shall not disclose, permit access to, transmit, or transfer the Confidential Information to any third party without the prior written authorization of Toronto Hydro;

(ii) the Consultant shall protect the confidentiality of the Confidential Information in its possession by exercising the same security measures it normally exercises with respect to its own confidential information and at minimum a reasonable standard of care;

(iii) upon the request of Toronto Hydro, and in any event upon the expiration or termination of this Agreement for any reason, the Consultant shall return (or delete, in the case of electronic documents) forthwith to Toronto Hydro all Confidential Information, including all copies and other materials containing the Confidential Information, which are in the possession or under the control of the Consultant;

(iv) the Consultant shall not use any Confidential Information for any purpose other than to perform the Services required by this Agreement. Without limiting the foregoing, the Consultant shall not, and shall not permit any of its Representatives to, use any Confidential Information in furtherance of its, or their, individual business or for its, or their, own benefit, profit or advantage, or for the benefit, profit or advantage of any other party; and

(v) Toronto Hydro is subject to MFIPPA and is governed by Governmental Authority such as the Independent Electricity System Operator ("IESO") and the Ontario Energy Board ("OEB") and shall have the right to disclose Confidential Information in accordance with the provisions of MFIPPA or as required by the IESO or the OEB.

(b) Notwithstanding the foregoing, the Consultant may disclose such Confidential Information:

(i) to any of the Representatives of the Consultant who agree to be bound by the obligations of confidentiality herein and who have a reasonable need to know such Confidential Information in the course of their duties for the Consultant but only for the purposes of the Consultant exercising its rights and obligations under this Agreement; and

(ii) in the event that the Consultant believes it is required by law to disclose, or is requested by a Governmental Authority to disclose, any Confidential Information to a Governmental Authority; provided that the Consultant shall, to the extent permitted by law, first inform Toronto Hydro of the request or requirement for disclosure to allow an opportunity for Toronto Hydro to apply for an order to prohibit or restrict such disclosure.

9. INTELLECTUAL PROPERTY

9.1 Use

Nothing in this Agreement shall be deemed to transfer, license, assign, permit the use of, or otherwise convey an interest in whole or in part to the Consultant of any Intellectual Property belonging to Toronto Hydro or any of its Representatives or any third party whose Intellectual Property is in Toronto Hydro's custody or control, and the use by the Consultant of any such Intellectual Property shall be subject to the prior written approval of Toronto Hydro.

9.2 Ownership

Toronto Hydro shall at all times have full rights and title to the Developments, and may at all times take possession of or use any completed or partially completed Developments, notwithstanding any

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provision, express or implied, to the contrary. Without limiting the generality of the foregoing, Toronto Hydro shall own all Intellectual Property rights in all Developments, and the Consultant hereby waives and assigns to Toronto Hydro any such rights, and agrees to give Toronto Hydro and its Representatives all assistance as may be reasonably required to perfect such rights including, without limitation and where the Consultant is a corporation or partnership, obtaining waiver of moral rights from any of the Consultant's employees, partners or other Representatives.

9.3 Intellectual Property Protection

The Consultant expressly warrants that the manufacture, delivery, sale or use of the Consultant's Services will not infringe any Canadian or foreign patents, trademarks, copyrights, industrial design or other intellectual property rights and the Consultant shall indemnify and save Toronto Hydro harmless from all claims, judgments and decrees that may be entered against Toronto Hydro or its Representatives and against all damage, liability, costs and expenses (including legal fees and other attendant costs and expenses**)** Toronto Hydro incurs by reason of any infringement or claim thereof.

9.4 Pre-Existing Intellectual Property

Any pre-existing Intellectual Proprietary ("Pre-Existing IP") of Consultant or its licensors used to perform Services, or included in any Development, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of the Consultant and its licensors (collectively, "Consultant Information"). To the extent that Consultant incorporates any Consultant Information into the Development(s), Consultant hereby grants to Toronto Hydro a fully paid up, royalty free, irrevocable and non-cancellable, non-exclusive, assignable and transferable right to Use the Consultant Information without restriction, except that any such Use must be in conjunction with the Developments in which the Consultant Information is incorporated and not as a separate item. For the purpose of the foregoing, "Use" means one or more of the following rights to: use; modify; adapt; translate; create changes, alterations, modifications, improvements, adoptions, enhancements and derivative works based upon or derived from the Consultant Information; reproduce; copy; display; perform; communicate in any manner; license or sublicense. Consultant shall provide Toronto Hydro with a list of any freeware, shareware or open source software used in the Developments. Any pre-existing intellectual property of Toronto Hydro, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of Toronto Hydro.

10. MISCELLANEOUS

10.1 Survival

In addition to the terms in this Agreement that by their nature survive the expiry or termination of the Agreement, the terms of Section 5 (Representations, Warranties and Indemnities), Section 8 (Confidentiality), Section 9 (Intellectual Property), and Section 10.2 (Injunctive Relief) shall survive the expiry of this Agreement for a term of five (5) years.

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10.2 Injunctive Relief

(a) The Consultant acknowledges and agrees that the terms of Section 8 (Confidentiality) and Section 9 (Intellectual Property) of this Agreement are reasonably necessary to protect the legitimate interests of Toronto Hydro, are reasonable in scope and duration, and are not unduly restrictive.

(b) The Consultant further acknowledges that a breach of any of the terms of Section 8 (Confidentiality) or Section 9 (Intellectual Property) would render irreparable harm to Toronto Hydro, and that a remedy at law for breach of these sections would be inadequate, and that Toronto Hydro shall therefore be entitled to any and all equitable relief, including, without limitation, injunctive relief without proof of actual damages, and any other remedy that may be available at law or in equity.

10.3 Subcontracting

The Consultant may not subcontract the performance of any part of the Services without Toronto Hydro's prior written approval. Where Toronto Hydro provides its prior written approval to the Consultant to subcontract all or part of the Services, then the Consultant shall enter into agreements with such permitted subcontractor(s) to require the permitted subcontractor(s) to provide Services in accordance with all of the terms of this Agreement. Notwithstanding the foregoing, the Consultant shall remain liable for any and all acts or omissions of any subcontractor(s) as if such acts or omissions were those of Consultant.

10.4 Force Majeure

Either party will be relieved of liability for delays in performance of its obligations hereunder where such delay is a result of Force Majeure. The party affected by the Force Majeure shall give prompt notice thereof to the other party and, upon cessation of the Force Majeure, shall take all reasonable steps to resume the performance of its obligations hereunder. If a delay in performance by reason of Force Majeure extends beyond thirty (30) Business Days, then either party may terminate this Agreement by written notice.

10.5 Waiver

No delay on the part of either party in exercising any of its rights hereunder or failure to exercise the same, nor the acquiescence thereto shall operate as a waiver except in the specific instance for which it is given and where such waiver is provided in writing by the party waiving its rights.

10.6 Amendments

None of the terms, conditions or provisions of this Agreement shall be varied, modified or altered except by written agreement signed by an authorized representative of each parties.

10.7 Assignment

Save and except for Toronto Hydro's right to assign this Agreement to any of its Affiliates, neither party may assign this Agreement or any of their rights or obligations hereunder, without the prior written authorization of the other party.

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10.8 Enurement

This Agreement shall enure to the benefit of, and be binding upon, the parties hereto and their respective successors and permitted assigns.

10.9 Severability

In the event that any provision or portion of this Agreement is determined to be invalid or unenforceable for any reason, the remaining provisions or portions of this Agreement will be unaffected and will remain in full force and effect to the fullest extent permitted by law.

10.10 Non-Exclusive Agreement

This Agreement will not be interpreted to grant to the Consultant exclusive rights to provide the Services or to bind Toronto Hydro in any way to an exclusive relationship with the Consultant with regards to the Services or any other service. However, Consultant shall not provide services to an Intervenor (whether as an employee, contractor, consultant, agent, or officer) that are (i) the same or similar to the services provided to the Client under this Agreement, or (ii) likely to result in disclosure of Client Confidential Information to an Intervenor or the use of Client Confidential Information on behalf of a Intervenor.

10.11 Neutral Construction

The parties to this Agreement agree that this Agreement was negotiated fairly between them at arm's length, that the final terms of this Agreement are the product of the parties' negotiations, and that this Agreement shall be deemed to have been jointly and equally drafted by them, and that the provisions thereof should not be construed against a party on the grounds that such party drafted the Agreement in whole or in part.

10.12 Entire Agreement

This Agreement constitutes the entire agreement between the parties relating to the subject matter hereof. This Agreement supersedes any and all prior correspondence, warranties, covenants, collateral undertakings, or agreements, oral or otherwise, express or implied, unless otherwise contained herein.

10.13 Notices

(a) All questions or other communications regarding this Agreement, including any notices required by this Agreement, are to be addressed to the following addresses:

to Toronto Hydro:

Name:	Daliana Coban
Title:	Director, Regulatory Applications & Business Support
Address:	14 Carlton Street, Toronto, ON M5B 1K5
Telephone:	(416) 542-2627

with copy to:

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Title:	EVP, Public and Regulatory Affairs & Chief Legal Officer
Address:	14 Carlton, Toronto Hydro, ON M5B 1K5
Telephone:	(416) 542-3000
Email:	legal@torontohydro.com

to the Consultant:

Name:	Nicholas Austin
Title:	V.P. of Consultancy
Address:	111 Littleton Road, Suite 111 Parsippany, NJ 07054
Telephone:	216-396-3179
Facsimile:	973-335-7738
Email:	naustin@umsgroup.com

(b) All notices or communications shall be deemed to be received on the date of acceptance (as evidenced by the signature of the party) if delivered by personal delivery or courier, on the fifth (5th) Business Day after mailing, if mailed by first class mail, or on the first (1st) Business Day after transmission, if sent by facsimile (provided the transmission is evidenced by documented proof of proper fax transmittal).

10.14 Governing Law

This Agreement shall be governed by and construed in accordance with the law of the Province of Ontario and the laws of Canada applicable therein.

10.15 Execution

This Agreement may be signed in counterparts and delivered by electronic means, each of which shall be deemed an original and all of which, together, shall have the same effect as if all constitute one and the same Agreement.

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the day and year first written above:

UMS Group Inc.

Per: DocuSigned by: Nicholas Austin 4A12A48F4EA448A...

Name: Nicholas Austin

Title: V.P. of Consultancy

I have authority to bind the Consultant.

Toronto Hydro-Electric System Limited

Per: DocuSigned by: Amanda Klein C9DD79AEAAA64A5...

Name: Amanda Klein

Title: Executive Vice-President, Public and Regulatory Affairs and Chief Legal Officer

I have authority to bind Toronto Hydro.

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SCHEDULE A

SERVICES

1. Benchmarking Services to be Performed

Consultant shall, for the fixed fee set out in Section 6.1(a) of the Agreement, supply Benchmark Study Services to assess the efficiency of Toronto Hydro's system investment and maintenance program execution and identify opportunities for continuous improvement, including:

- Reviewing and evaluating Toronto Hydro's methodology for deriving unit costs and comparing this methodology to industry best practices (either those already known to Consultant from previous work and / or those identified while performing this review).
- Producing a list of specific asset categories and maintenance practices to be benchmarked, such list to be finalized at the project kickoff meeting. Lists provided to Consultant in relation to previous requests for proposals for Overhead Pole Replacement, Underground Cable and Duct Replacement, Station Breaker and Switchgear Replacement, Vegetation Management, Pole Testing, Overhead Line Patrols, Overhead Switch Maintenance, and Underground Vault and Equipment Inspections may be used as a viable starting point for discussion.
- An assessment of the reasonableness of the derived and actual unit costs based on "normalized" industry comparisons. A peer group panel will form the basis of these comparisons, the composition of which will be firmed up during the Project Kickoff Meeting.
- Identifying any external factors (e.g., key technical, environmental, and regulatory drivers) that may need to be accounted for in either "normalizing" the comparisons or offering rationale for what could be deemed acceptable variances.
- The presentation of economic, technical, or other considerations that may be required if Consultant offers recommended practices to improve upon actual unit costs.
- A report of preliminary findings.
- A written report which, upon THESL's review and alignment with the preliminary findings, will be used to detail the methodology and analysis performed and ensuing findings and recommendations. The Consultant shall comply with the requirements set out in Rule 13A of the OEB's Rules of Practice and Procedure, appended hereto as Appendix A.1 in the preparation of the report.

2. Application Support and Expert Witness Services

Consultant shall, as per Section 6.1(b) of the Agreement, provide Application Support and Expert Witness Services on a time and material basis at the rates detailed in SCHEDULE B. Such Application Support and Expert Witness Services shall include:

- Respond to any interrogatories applicable to the report and appear at a technical conference if requested.
- If requested or required, testify to the study's findings as an expert witness in the hearing of the 2025 Rate Application at the OEB, and support providing undertakings resulting from the hearing.

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- Where the Consultant is required to testify or otherwise provide evidence at a hearing before the OEB, the Consultant shall comply with the requirements set out in rule 13A of the OEB's Rules of Practice and Procedure, appended hereto as APPENDIX A.1

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APPENDIX A.1

Rules of Practice and Procedure

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12. Affidavits

12.01 An affidavit shall be confined to the statement of facts within the personal knowledge of the person making the affidavit unless the facts are clearly stated to be based on the information and belief of the person making the affidavit.

12.02 Where a statement is made on information and belief, the source of the information and the grounds on which the belief is based shall be set out in the affidavit.

12.03 An exhibit that is referred to in an affidavit shall be marked as such by the person taking the affidavit, and the exhibit shall be attached to and filed with the affidavit.

12.04 The OEB may require the whole or any part of a document filed to be verified by affidavit.

13. Written Evidence

13.01 Other than oral evidence given at the hearing, where a party intends to submit evidence, or is required to do so by the OEB, the evidence shall be in writing and in a form approved by the OEB.

13.02 The written evidence shall include a statement of the qualifications of the person who prepared the evidence or under whose direction or control the evidence was prepared.

13.03 Where a party is unable to submit written evidence as directed by the OEB, the party shall:

(a) file such written evidence as is available at that time;

(b) identify the balance of the evidence to be filed; and

(c) state when the balance of the evidence will be filed.

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the OEB impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

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(a) the expert's name, business name and address, and general area of expertise;

(b) the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;

(c) the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;

(d) the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;

(e) in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and

(f) an acknowledgement of the expert's duty to the OEB in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the OEB may require two or more of the experts to:

(a) in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and

(b) at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the OEB and others as permitted by the OEB, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the OEB, including as to:

(a) scope and timing;

(b) the involvement of any expert engaged by the OEB;

(c) the costs associated with the conduct of the activities;

(d) the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of **Rule 13A.04**; and

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(e) any issues in relation to confidentiality.

13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A**.

14. Disclosure

14.01 A party who intends to rely on or refer to any document that has not already been filed in a proceeding shall file and serve the document 24 hours before using it in the proceeding, unless the OEB directs otherwise.

14.02 Any party who fails to comply with **Rule 14.01** shall not put the document in evidence or use it in the cross-examination of a witness, unless the OEB otherwise directs.

14.03 Where the good character, propriety of conduct or competence of a party is an issue in the proceeding, the party is entitled to be furnished with reasonable information of any allegations at least 15 calendar days prior to the hearing.

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SCHEDULE B

Purchase Price

a. In furtherance of Section 6.1(a) Fees, the Benchmarking Study and associated work, a base purchase price of [redacted], invoiced and paid as follows:
   i. [redacted] - Kickoff
   ii. [redacted] - Initiation of Benchmarking Effort
   iii. [redacted] - Conclusion of Benchmarking Effort
   iv. [redacted] - Delivery of Unit Cost Report

b. In furtherance of Section 6.1(b) Fees, Application Support and Expert Witness Services, hourly fees are as follows:
   i. SVP (Jeff Cummings): [redacted] (CAD)
   ii. VP (Nick Austin): [redacted] (CAD)
   iii. Senior Associate (Johnny Shearman) - [redacted] (CAD)

c. Any direct expenses will be additional to the fixed professional fees stated above in section (b), and will be invoiced monthly at cost (i.e., no administrative markup). All invoices will specify net thirty (30) days for payment, with offer of early payment discounts for 15 days of 0.5 percent.

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SCHEDULE C

DEFINITIONS

In this Agreement, the following definitions shall apply:

"Affiliates"	has the meaning prescribed to it in the *Business Corporations Act* of Ontario, as amended from time to time;
"Agreement"	means this Agreement for Professional Consulting Services, including all recitals, schedules and attachments thereto;
"Anticipated Hours"	has the meaning prescribed in Section 4.2;
"Applicable Laws"	means all federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to this Agreement, including without limitation all applicable OEB codes, rules or guidelines;
"Application Support and Expert Witness Services"	means the Services defined in Section 2 of SCHEDULE A;
"Benchmark Study"	means the Services defined in Section 1 of SCHEDULE A;
"Business Day"	means a day on which banks are open for business in the City of Toronto, Ontario, but does not include a Saturday, Sunday, or a civic or statutory holiday in the Province of Ontario;
"Confidential Information"	means the terms of this Agreement and any and all data or information relating to the business, management or affairs of Toronto Hydro, its customers, employees, or any of its Affiliates disclosed by Toronto Hydro to the Consultant pursuant to this Agreement, whether or not such Confidential Information is expressly identified as confidential. Notwithstanding the foregoing, Confidential Information does not include any information or data which: (a) information or data that is or becomes publicly known through no breach of the terms or conditions of this Agreement; (b) information or data that is independently developed without reference to Confidential Information and without breach of the terms and conditions of this Agreement; or (c) Confidential Information that is required by court order or other legal compulsion to be disclosed, in which case the Consultant shall give Toronto Hydro prior written notice of such disclosure, as permitted by law;
"Consultant"	Means UMS Group Inc.;
“Consultant Information”	has the meaning prescribed in Section 9.4;
"Development"	means any and all works prepared, generated, created or designed by the Consultant pursuant to this Agreement, including without limitation all drawings, models, designs, formulae, methods, documents, reports,

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	software, specifications, or source codes, and any related works, enhancements, modifications or additions thereto;
"Fees"	shall have the meaning as prescribed in Subsection 6.1(a);
"Force Majeure"	means any impediments beyond the control of the applicable party due, wholly or in part, directly or indirectly, to: strikes, lockouts, riots, epidemics, war, governmental regulations, fire, explosions, acts of God, or any other impediment beyond the control of the party affected;
"Governmental Authority"	means any government, legislature, municipality, regulatory authority, agency, commission, department, board or court or other law, regulation or rule-making public entity of similar authority, including, without limitation the OEB;
"Guidelines"	has the meaning prescribed in Subsection 4.5(d);
"HST"	means Harmonized Sales Tax;
"IESO"	means the Independent Electricity System Operator;
"Initial Term"	has the meaning prescribed to it in Section 3.1;
"Intellectual Property"	includes all trademarks, copyrights, patents, business names, trade secrets, proprietary software, analysis or techniques (whether or not patented or patentable), confidential or secret designs and processes, source codes, plans or devices, or other proprietary and intellectual property rights;
"Key Employee"	has the meaning prescribed in Section 4.3;
"MFIPPA"	means the *Municipal Freedom of Information Act;*
"OEB"	means the Ontario Energy Board;
"PIPEDA"	means the *Personal Information Protection and Electronic Documents Act* (Canada);
"Pre-Existing IP"	has the meaning prescribed to it in Section 9.4;
"Privacy Laws"	has the meaning prescribed to it in Section 4.5;
"Representative"	in respect of a party, means such party's directors, officers, employees, agents, contractors and advisors, the party's Affiliates, and all such Affiliates' respective directors, officers, employees, agents, contractors and advisors;

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"Remittances"	has the meaning prescribed to it in Subsection **Error! Reference source not found.**;
"Services"	means all of the Developments, services and specifications to be provided, performed and met by the Consultant under this Agreement, as more particularly described in SCHEDULE A;
“Service Level”	means the standards for the performance of the Services and for Vendor’s management of Security Incidents, as more particularly set out in this Agreement;
“Specifications”	means for any Service, deliverable, vendor system or vendor facility, the technical, functional, physical or other relevant specification, documentation, or requirements set out in the Agreement, otherwise in identified in writing by the parties, or otherwise inherent or necessarily included as part of the specification or requirements specifically set out herein or therein, including any operating manuals or operating plans referenced in a SOW;
"Term"	has the meaning prescribed to it in Section 3.1; and
"Toronto Hydro"	means Toronto Hydro-Electric System Limited.
"2025 Rate Application"	means the application filed by Toronto Hydro with the OEB for the approval of the 2025-2029 electricity rates.

Agreement for Professional Consulting Services

THIS AGREEMENT is made this 12th day of September, 2022 ("Effective Date")

BETWEEN:

Toronto Hydro-Electric System Limited,

a corporation incorporated under the laws of Ontario

(hereinafter called "Toronto Hydro")

and

ScottMadden Inc.,

a corporation incorporated under the laws of North Carolina

(hereinafter called the "Consultant")

WHEREAS:

A. Toronto Hydro has retained the Consultant to provide certain consulting services as detailed in SCHEDULE A (collectively, the "Services"); and

B. the Consultant has indicated to Toronto Hydro that it has the skill and expertise to provide the Services on the terms and conditions set forth herein;

NOW THEREFORE, in consideration of the mutual covenants set forth herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. INTERPRETATION

Unless otherwise indicated, all capitalized terms in this Agreement shall be as defined in SCHEDULE C and any reference to currency in this Agreement shall refer to lawful money of Canada.

2. RELATIONSHIP OF THE PARTIES

2.1 Retainer

Toronto Hydro hereby retains the Consultant to provide the Services, and the Consultant hereby agrees to provide the Services, during the Term, in accordance with the terms and subject to the conditions of this Agreement.

2.2 Independent Contractors

(a) Notwithstanding any provision hereof, this Agreement does not constitute and shall not be construed as constituting a partnership, joint venture, principal/agency relationship, or employer/employee relationship between the parties. The Consultant acts at all times in the capacity of an independent contractor, and neither party shall represent itself to be an agent or employee of the other. The Consultant and its Representatives have no authority to commit, act for or on behalf of Toronto Hydro, or to bind Toronto Hydro to any obligation or liability.

(b) Without limiting the generality of Section 2.2(a), the Consultant hereby acknowledges and agrees that neither it nor its Representatives shall be eligible or entitled, by reason of this Agreement, to participate in any employee-related program offered by Toronto Hydro or any of its Affiliates, including, without limitation, any benefit, insurance, compensation, health plan, bonus or retirement program.

(c) The Consultant hereby covenants and agrees to indemnify, defend and hold harmless Toronto Hydro and its Representatives from and against all costs, liabilities or claims whatsoever against Toronto Hydro or its Representatives resulting from or relating to the Consultant or its Representatives being deemed to be an employee of Toronto Hydro or any of its Affiliates.

(d) The Consultant hereby acknowledges and agrees that Toronto Hydro shall not be responsible for and shall not have control or charge of any means, methods, techniques, sequences or procedures used for or in respect of the Services, or for the safety precautions or programs required for the Services or otherwise prescribed hereunder.

2.3 Conflicts of Interest

Anything in this Agreement to the contrary notwithstanding and for avoidance of doubt, where Toronto Hydro is the Applicant in an Ontario Energy Board ("OEB") proceeding and has retained Consultant to support a component(s) of that Application, Consultant must obtain Toronto Hydro's consent in writing to provide services to any other entity in any capacity other than Toronto Hydro at the proceeding. Where Toronto Hydro is involved in an OEB proceeding as an intervenor and/or participant, but not as an Applicant, the Consultant may provide services to any other entity in any capacity provided that the Consultant utilizes confidentiality or other safeguards, including, but not limited to separate engagement teams and data access controls for the protection of Toronto Hydro's Confidential Information. Consultant commits to comply strictly with the confidentiality terms of this Agreement and to restrict access to – and use of – Toronto Hydro Confidential Information as set out in this Agreement.

3. TERM

3.1 Initial Term

This Agreement shall be effective as of the Effective Date and shall continue, unless terminated in accordance with the terms hereof or extended pursuant to Section 3.2, for a period of four (4) years (the "Initial Term").

3.2 Renewal

Toronto Hydro may, at its sole option, elect to renew this Agreement for two (2) additional one (1) year terms (each a "Renewal Term") by giving written notice to the Consultant at least thirty (30) days before the end of the Initial Term or the first Renewal Term (as applicable). The same terms and conditions contained herein shall apply during the Renewal Term(s), save and except as amended in writing by the parties.

3.3 Term

The Initial Term and Renewal Term, if any, shall hereinafter together be referred to as the "Term".

4. SERVICE REQUIREMENTS

4.1 Services

During the Term, the Consultant shall perform the Services as detailed in SCHEDULE A hereto

(a) in accordance with the terms and subject to the conditions set forth in this Agreement;

(b) using personnel of required skill, experience, licences and qualifications;

(c) in a workerlike and professional manner; and

(d) consistent with standards generally observed by reputable and competent members of the same industry providing similar services.

4.2 Revision to Services

(a) The Parties acknowledge and agree that the Services to be undertaken and completed by the Consultant under this Agreement may be subject to revision or amendment from time to time during the Term: (i) as required by Toronto Hydro to comply with the Guidelines; (ii) as required by Toronto Hydro to comply with Applicable Laws or any order, instruction, directive or legal requirement of a Governmental Authority; or (iii) as required by Toronto Hydro to ensure that Toronto Hydro receives the expected funding and benefits with respect to the project to which the Services relate.

(b) Toronto Hydro agrees to provide the Consultant with written notice of any revision or amendment to the Services required pursuant to this Section 4.2, and the Consultant shall comply with all such directives.

(c) In the event that the Consultant fails to comply with a directive issued by Toronto Hydro pursuant to this Section 4.2, Toronto Hydro shall have the right, in addition to any other

remedies which may be available to Toronto Hydro hereunder or otherwise at law, to terminate this Agreement by giving written notice of termination to the Consultant whereupon this Agreement shall terminate as at the effective date of termination specified in the notice and Section 7 shall apply.

4.3 Applicable Laws

(a) The Consultant shall, at its sole expense, obtain and maintain during the Term of this Agreement, all permits, licences and approvals required to perform its obligations under this Agreement in accordance with Applicable Laws. The terms and conditions of this Agreement shall be carried out in strict compliance with all Applicable Laws and in the event of any conflict between any Applicable Laws, the Applicable Laws with the most stringent standard shall apply.

(b) Without limiting the generality of the foregoing, the Consultant shall comply with the *Municipal Freedom of Information and Protection of Privacy Act* (Ontario) ("MFIPPA"), the *Personal Information Protection and Electronic Documents Act* (Canada) ("PIPEDA") and any other applicable privacy legislation (collectively, "Privacy Laws") with respect to any personal information collected, used or disclosed in connection with this Agreement and shall indemnify and hold harmless Toronto Hydro and its Representatives from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments (including related expenses and legal costs) they may incur related to or arising out of any non-compliance therewith.

(c) Where any Deliverable is subject to the approval or review of any authority, department, government or agency other than Toronto Hydro, such applications for approval or review shall, unless otherwise authorized by Toronto Hydro in writing, be prepared by the Consultant to be approved and submitted by and through the offices of Toronto Hydro, and the Consultant shall not have any direct dealings with the authority, department, government or agency in question with regards to the Deliverable.

(d) The Consultant and the Consultant's personnel and Representatives shall comply with all rules and direction of Toronto Hydro, whether specified in this Agreement or otherwise, while working on Toronto Hydro's premises or when accessing or connecting to Toronto Hydro's information technology systems, including rules and directions concerning health, safety, security and environmental protection, including without limitation, Toronto Hydro's *Code of Business Conduct and Whistleblower Procedure,* Toronto Hydro's *Disclosure Policy,* Toronto Hydro's *Social Media and Digital Communication Policy,* Toronto Hydro's *Accessibility Policy,* Toronto Hydro's *Workplace Harassment Policy and Program,* Toronto Hydro's *Violence Prevention in the Workplace Policy,* Toronto Hydro's *Workplace Alcohol and Drug Policy*, Toronto Hydro's *Environmental Policy,* Toronto Hydro's *Occupational Health and Safety Policy,* Toronto Hydro's *Privacy Policy,* Toronto Hydro's *Cyber Security Policy*, Toronto Hydro's *Technology Use Guidelines*, Toronto Hydro's *Physical Security Policy*, Toronto Hydro's *COVID-19 Vaccination Policy,* and the *Affiliate Relationships Code for Electricity Distributors and Transmitters* issued by the OEB (together, the "Guidelines"). Toronto Hydro premises includes, but is not limited to, all Toronto Hydro-owned or leased buildings, sites, work centres, stations, substations, vaults, radio antenna sites, and any other location where Toronto Hydro stores or maintains physical assets. The Consultant agrees to comply with and to direct its Representatives to comply with such Guidelines, as amended.

4.4 Performance

(a) The Services shall be performed to the satisfaction of Toronto Hydro, and Toronto Hydro shall have the right at all reasonable times, to inspect or otherwise review the Services performed or being performed. The Consultant shall, upon the request of Toronto Hydro, acting reasonably, provide Toronto Hydro with written reports of the status of the Deliverables and the Consultant's progress in providing the Services.

(b) In the event of any dispute between Toronto Hydro and the Consultant relating to the quality or acceptability or rate of progress of any of the Services, or relating to the interpretation of any instructions or specifications concerning the Services, Toronto Hydro and the Consultant shall attempt to mutually reach a resolution in good faith. Failing a good faith resolution, the reasonable opinion of Toronto Hydro shall govern and be binding on the parties hereto.

5. REPRESENTATIONS, WARRANTIES, INDEMNITIES AND INSURANCE

5.1 Representations and Warranties

The Consultant hereby represents, warrants and agrees that:

(a) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has/have the necessary experience and qualifications to perform the Services;

(b) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) will perform the Services in a diligent, expeditious and workerlike manner, consistent with standards generally observed by reputable and competent members of the same industry providing similar services;

(c) all Services shall be the Consultant's (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) original work and none of the Services or any invention, development, use, production, distribution or exploitation relating thereto will infringe, misappropriate or violate any intellectual property or other right of any person or entity.

(d) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has the corporate power and authority to enter into this Agreement and to perform its obligations hereunder, and that this Agreement constitutes a legal, valid, and binding obligation of the Consultant, enforceable against the Consultant in accordance with its terms.

5.2 Indemnity

a) The Consultant shall be liable for and shall indemnify, defend and hold harmless Toronto Hydro and its Representatives from all claims, demands, actions, penalties, damages, losses, judgments and settlements, liabilities, costs, expenses, including legal fees and other related costs and expenses arising out of, related to, or incidental to, the Consultant or any of its Representatives' performance of the Services under this Agreement, including, without limitation:

i. any breach, violation or non-performance by the Consultant or any of its Representatives of any terms, conditions, warranties, obligations or covenants contained in this Agreement;
ii. any breach or violation by the Consultant or any of its Representatives of any Applicable Laws; and
iii. any actions, omissions, negligence or wilful misconduct of the Consultant or any of its Representatives

except to the extent caused by the negligence or wilful misconduct of Toronto Hydro or its Representatives.

b) In no event shall either party be liable for loss of profit or use or for any indirect, special, incidental or consequential damages of any nature or kind including but not limited to delays, loss of revenue, loss of use, loss of data, loss of product, costs of capital or costs or replacement power, even if that party has been advised of the possibility of such damages.

c) Subject to Section 5.2(d), the Consultant's liability for a claim for damages shall be limited to the maximum amounts payable by Toronto Hydro to the Consultant for the Term pursuant to SCHEDULE B.

d) Notwithstanding the foregoing, no exclusion or limitation of liability shall apply to:

i. Breach of the confidentiality or privacy obligations in this Agreement
ii. Intentional misconduct or gross negligence;
iii. Breach of Applicable Law; or
iv. Breach of intellectual property indemnity in Section 9.

5.3 Insurance

The Consultant shall, during the Term, and at its own expense, maintain and keep in full force and effect (and, when requested, provide Toronto Hydro with proof thereof):

(a) commercial general liability insurance on an occurrence basis having a minimum inclusive coverage limit, including personal injury and property damage, of not less than five million dollars ($5,000,000) per occurrence, which commercial general liability insurance shall be extended to cover contractual liability, products and completed operations liability, and owners/contractors protective liability;

(b) Errors and Omissions Insurance (Professional Liability) covering actual or alleged acts, errors or omissions committed by the Consultant or its Representatives, arising out of the performance of this Agreement, which shall also extend to include personal injury, bodily injury and property damage from the performance of professional services, in the amount of not less than two million dollars ($2,000,000);

(c) All insurance coverages and limits required to be maintained hereunder shall: (i) be primary to any insurance maintained by Toronto Hydro, which insurance shall be excess and non-contributory; (ii) contain a cross liability clause and a severability of interest clause; and (iii) contain a thirty (30) day prior written notice to Toronto Hydro for any cancellation, non-renewal or adverse material change.;

(d) The Consultant agrees that the insurance required hereunder in no way limits the Consultant's liability pursuant to the Liability and Indemnity provision in Section 5.3; and

(e) A waiver of subrogation shall be provided by the insurer(s) to Toronto Hydro.

6. FEES

6.1 Fees

(a) Subject to Section 6.1(c) - 6.1(f), in exchange for the performance of the Services in accordance with the terms hereof, Toronto Hydro shall pay the Consultant the rates outlined in SCHEDULE B, not including HST (the "Fees"). Fees shall not be in excess of the maximum amounts set out in SCHEDULE B.

(b) The Fees noted in Section 6.1(a) shall be the only fees payable by Toronto Hydro under this Agreement. Without limiting the generality of the foregoing, the Consultant hereby agrees and acknowledges that all out-of-pocket expenses, travelling costs, and other disbursements shall be at the sole expense of the Consultant, except with the prior written approval from Toronto Hydro.

(c) Any disbursements for additional incidentals incurred by the Consultant in relation to this Agreement ("Disbursements") must be pre-approved by Toronto Hydro in writing.

(d) The Consultant shall not incur or submit invoices for any work outside the scope of the Services without prior written approval from Toronto Hydro.

(e) The Consultant shall make all payment of taxes, employment insurance premiums, pension plan contributions and any other taxes or other payment of any nature, imposed by any authority in respect of the Fee paid by Toronto Hydro to the Consultant under this Agreement (together, the "Remittances"), and the Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities and claims whatsoever against Toronto Hydro or its Representatives, in any way arising out of or relating to any failure to deduct, withhold, or remit any Remittance.

(f) Without limiting the generality of Section 6.1(a), Toronto Hydro reserves the right to deduct any applicable non-resident withholding taxes from any Fee owing to the Consultant under this Agreement and remit such amounts to the applicable taxation authority.

6.2 Payment

The Consultant shall submit invoices to Toronto Hydro on a monthly basis containing:

(a) a description of the Services performed during the invoice period;

(b) the monthly payment amount;

(c) the total HST applicable to the Services during the invoice period, as well as the Consultant's HST registration number; and

(d) a detailed description of the Disbursements incurred around the invoice period, supported by documentation in a form acceptable to Toronto Hydro.

Unless otherwise provided in this Agreement, the Consultant shall invoice Toronto Hydro after final inspection and acceptance by Toronto Hydro of the Services performed and subject to receipt of all documents required by this Agreement. **Invoices must be sent electronically to: AP@torontohydro.com.** Subject to approval of the invoice by Toronto Hydro, receipt of all documents required by this Agreement, and final review by Toronto Hydro, Toronto Hydro shall make payment to the Consultant via electronic funds transfer not later than thirty (30) days following receipt of an acceptable invoice and the EFT Information (as set out below). **The Consultant must provide Toronto Hydro with, in the case of the first payment only, (i) a void cheque, pre-printed deposit slip or bank confirmation letter and (ii) the email address where the Consultant wishes to receive remittance information (together, "EFT Information"). EFT Information must be sent electronically to efthelp@torontohydro.com or to 14 Carlton Street, Toronto, ON, M5B 1K5, Attention: Treasury Department.** Toronto Hydro reserves the right to pay the Consultant through other payment methods.

7. SUSPENSION OR TERMINATION

7.1 Suspension or Termination

(a) Toronto Hydro may, at any time during the Term by notice in writing, suspend all or a portion of the Services. Upon receipt of such written notice, the Consultant shall perform no further work other than as directed by Toronto Hydro, and shall be entitled to payment for time spent in performing the Services up to the date of suspension.

(b) Either party may terminate this Agreement immediately upon written notice where the other party enters into liquidation, whether compulsory or voluntarily, or where a proceeding in receivership, bankruptcy or insolvency has been instituted by or against such party or its property.

(c) Toronto Hydro, at its sole discretion, may terminate this Agreement immediately upon written notice where the Consultant or any of its Representatives has been in material default in the performance of its duties, obligations or undertakings under this Agreement, and has not taken immediate steps to remedy such default within two (2) Business Days following written notice of the specific default by Toronto Hydro. For the purposes of this section, a material default shall include, without limitation, a breach of any of the representations or warranties contained herein or the failure or refusal to provide the Services in accordance with the terms and conditions of this Agreement.

(d) Notwithstanding any other provision in this Agreement, Toronto Hydro, at its sole discretion, shall have the right to terminate this Agreement, for any reason, upon two (2) weeks written notice to the Consultant.

(e) In the event that this Agreement is terminated in accordance with this Section 7.1 by either party, the Consultant shall be entitled to payment for time spent in performing the Services up to the date of suspension.

7.2 Effect of Termination

Upon the termination or expiration of this Agreement, upon Toronto Hydro's request, the Consultant shall return to Toronto Hydro and delete any and all electronic copies the Consultant may have of all documents and materials in its possession relating to the Services or this Agreement, including all Confidential Information and all Deliverables, whether completed or not and shall, upon written request by Toronto Hydro, certify in writing to Toronto Hydro that it has complied with the requirements of this Section 7.2.

8. CONFIDENTIALITY

8.1 Non-Disclosure

In performing the Services required by this Agreement, the Consultant may be provided access to Confidential Information. The Consultant acknowledges and agrees that:

(a) the Consultant shall not disclose, permit access to, transmit, or transfer the Confidential Information to any third party without the prior written authorization of Toronto Hydro;

(b) the Consultant shall protect the confidentiality of the Confidential Information in its possession by exercising the same security measures it normally exercises with respect to its own confidential information and at minimum a reasonable standard of care;

(c) upon the request of Toronto Hydro, and in any event upon the expiration or termination of this Agreement for any reason, the Consultant shall return (or delete, in the case of electronic documents) forthwith to Toronto Hydro all Confidential Information, including all copies and other materials containing the Confidential Information, which are in the possession or under the control of the Consultant; and

(d) the Consultant shall not use any Confidential Information for any purpose other than to perform the Services required by this Agreement. Without limiting the foregoing, the Consultant shall not, and shall not permit any of its Representatives to, use any Confidential Information in furtherance of its, or their, individual business or for its, or their, own benefit, profit or advantage, or for the benefit, profit or advantage of any other party.

(e) Toronto Hydro is subject to MFIPPA and is governed by Governmental Authority such as IESO and the OEB and shall have the right to disclose Confidential Information in accordance with the provisions of MFIPPA or as required by the IESO or the OEB.

Notwithstanding the foregoing, the Consultant may disclose such Confidential Information to any of the Representatives of the Consultant who agree to be bound by the obligations of confidentiality herein and who have a reasonable need to know such Confidential Information in the course of their duties for the Consultant but only for the purposes of the Consultant exercising its rights and obligations under this Agreement; and in the event that the Consultant believes it is required by law to disclose, or is requested by a Governmental Authority to disclose, any Confidential Information to a Governmental Authority; provided that the Consultant shall, to the extent permitted by law, first inform Toronto Hydro of the request or requirement for disclosure to allow an opportunity for Toronto Hydro to apply for an order to prohibit or restrict such disclosure.

8.2 Non-Solicitation

Unless Toronto Hydro's Chief Executive Officer provides prior written consent, the Consultant hereby covenants and agrees that during the term of this Agreement and for a period of two (2) years following the termination of the Agreement, however caused, the Consultant will not directly or indirectly, either individually or in partnership or jointly or in conjunction with any other Person,

(a) hire or otherwise engage any Protected Employee who is currently employed by Toronto Hydro;

(b) hire or otherwise engage any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause;

(c) solicit or attempt to solicit any Protected Employee who is currently employed by Toronto Hydro or encourage any such person to leave his/her employment with Toronto Hydro; and

(d) solicit or attempt to solicit any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause.

8.3 Non-Compete

Given the unique expertise and intimate knowledge that the employees have of the operations of Toronto Hydro the Consultant acknowledges and agrees that the restrictions contained in this section are reasonable and necessary to preserve the value of Toronto Hydro's business.

(a) During the Term and for a period of ten (10) years following the termination of this Agreement, the Consultant shall not appear as an Intervenor, nor aid, assist, or provide services to an Intervenor (whether as an employee, contractor, consultant, agent, or officer) in accordance with the conditions agreed to in section 2.3 of this Agreement and where the services are likely to result in disclosure of Toronto Hydro's Confidential Information to an Intervenor or the use of Toronto Hydro's Confidential Information on behalf of an Intervenor;

(b) During the Term, the Consultant shall not aid, assist, or provide services to the OEB; and

(c) For a period of ten (10) years following the termination of this Agreement, the Consultant shall not aid, assist, or provide services to the OEB (whether as an employee, contractor, consultant, agent, or officer) in accordance with the conditions agreed to in section 2.3 of this Agreement and where the services are likely to result in disclosure of Toronto Hydro's Confidential Information to the OEB or the use of Toronto Hydro's Confidential Information in the service of the OEB.

9. INTELLECTUAL PROPERTY

9.1 Use

Nothing in this Agreement shall be deemed to transfer, license, assign, permit the use of, or otherwise convey an interest in whole or in part to the Consultant of any Intellectual Property belonging to Toronto Hydro or any of its Representatives or any third party whose Intellectual Property is in Toronto Hydro's custody or control, and the use by the Consultant of any such Intellectual Property shall be subject to the prior written approval of Toronto Hydro.

9.2 Ownership

Toronto Hydro shall at all times have full rights and title to the Deliverables, and may at all times take possession of or use any completed or partially completed Deliverables, notwithstanding any provision, express or implied, to the contrary. Without limiting the generality of the foregoing, Toronto Hydro shall own all Intellectual Property rights in all Deliverables, and the Consultant hereby waives and assigns to Toronto Hydro any such rights, and agrees to give Toronto Hydro and its Representatives all assistance as may be reasonably required to perfect such rights including, without limitation and where the Consultant is a corporation or partnership, obtaining waiver of moral rights from any of the Consultant's employees, partners or other Representatives.

9.3 Intellectual Property Protection

The Consultant expressly warrants that the manufacture, delivery, sale or use of the Consultant's Services will not infringe any Canadian or foreign patents, trademarks, copyrights, industrial design or other intellectual property rights and the Consultant shall indemnify and save Toronto Hydro harmless from all claims, judgments and decrees that may be entered against Toronto Hydro or its Representatives and against all damage, liability, costs and expenses (including legal fees and other attendant costs and expenses) Toronto Hydro incurs by reason of any infringement or claim thereof.

9.4 Pre-Existing Intellectual Property

Anything contained in this Agreement to the contrary notwithstanding, Consultant and Toronto Hydro shall each retain ownership of their respective pre-existing intellectual property. To the extent that such pre-existing intellectual property is included in the products of the Work, Consultant hereby grants to Toronto Hydro a fully paid up, irrevocable and non-cancellable, non-exclusive, non-transferable, royalty-free license to use such intellectual property for Toronto Hydro's internal business purposes only. Also, nothing in this Agreement shall prevent Consultant from utilizing – on behalf of itself or its future customers – any general know-how, ideas, techniques, concepts, methods, processes, or other knowledge applied in performing the Work. Consultant may perform the same or similar services for others, provided that any of Toronto Hydro's confidential information is treated in accordance with the confidentiality requirements of this Agreement.

10. <u>HEALTH AND SAFETY</u>

The Consultant shall be responsible for managing the health and safety of its own personnel and other Representatives. Neither Toronto Hydro, nor its Representatives, shall be liable for any loss, damages or claims arising directly or indirectly from the Consultant's access to or work in or around Toronto Hydro's facilities, and the Consultant hereby waives any claims to which it may become entitled for loss or damage and releases Toronto Hydro and its Representatives from any and all such claims.

11. MISCELLANEOUS

11.1 Survival

In addition to the terms in this Agreement that by their nature survive the expiry or termination of the Agreement, the terms of Section 5 (Representations, Warranties and Indemnities), section 8 (Confidentiality), Section 9 (Intellectual Property), and Section 11.3 (Injunctive Relief) shall survive the expiry of this Agreement for a term of five (5) years.

11.2 Subcontracting

The Consultant shall not subcontract the performance of all or any part of the Services without Toronto Hydro's prior written approval. Where Toronto Hydro provides its prior written approval to the Consultant to subcontract all or part of the Services, then the Consultant shall enter into agreements with such permitted subcontractor(s) to require the permitted subcontractor(s) to provide Services in accordance with all of the terms of this Agreement. Notwithstanding the foregoing, the Consultant shall remain liable for any and all acts or omissions of any subcontractor(s) as if such acts or omissions were those of Consultant.

11.3 Injunctive Relief

(a) The Consultant acknowledges and agrees that the terms of Section 8 (Confidentiality) and Section 9 (Intellectual Property) of this Agreement are reasonably necessary to protect the legitimate interests of Toronto Hydro, are reasonable in scope and duration, and are not unduly restrictive.

(b) The Consultant further acknowledges that a breach of any of the terms of Section 8 (Confidentiality) or Section 9 (Intellectual Property) would render irreparable harm to Toronto Hydro, and that a remedy at law for breach of these sections would be inadequate, and that Toronto Hydro shall therefore be entitled to any and all equitable relief, including, without limitation, injunctive relief, and any other remedy that may be available at law or in equity.

11.4 Force Majeure

Either party will be relieved of liability for delays in performance of its obligations hereunder where such delay is a result of Force Majeure. The party affected by the Force Majeure shall give prompt notice thereof to the other party and, upon cessation of the Force Majeure, shall take all reasonable steps to resume the performance of its obligations hereunder as soon as reasonably practicable. If a delay in performance by reason of Force Majeure extends beyond thirty (30) Business Days, then either party may terminate this Agreement by written notice.

11.5 Non-Exclusive Agreement

This Agreement will not be interpreted to grant to the Consultant exclusive rights to provide the Services or to bind Toronto Hydro in any way to an exclusive relationship with the Consultant with regards to the Services or any other service.

11.6 Waiver

No delay on the part of either party in exercising any of its rights hereunder or failure to exercise the same, nor the acquiescence thereto shall operate as a waiver except in the specific instance for which it is given and where such waiver is provided in writing by the party waiving its rights.

11.7 Amendments

None of the terms, conditions or provisions of this Agreement shall be varied, modified or altered except by written agreement signed by an authorized representative of each parties.

11.8 Assignment

Save and except for Toronto Hydro's right to assign this Agreement to any of its Affiliates, neither party may assign this Agreement or any of their rights or obligations hereunder, without the prior written authorization of the other party, acting reasonably.

11.9 Enurement

This Agreement shall enure to the benefit of, and be binding upon, the parties hereto and their respective successors and permitted assigns.

11.10 Severability

In the event that any provision or portion of this Agreement is determined to be invalid or unenforceable for any reason, the remaining provisions or portions of this Agreement will be unaffected and will remain in full force and effect to the fullest extent permitted by law.

11.11 Neutral Construction

The parties to this Agreement agree that this Agreement was negotiated fairly between them at arm's length, that the final terms of this Agreement are the product of the parties' negotiations, and that this Agreement shall be deemed to have been jointly and equally drafted by them, and that the provisions thereof should not be construed against a party on the grounds that such party drafted the Agreement in whole or in part.

11.12 Entire Agreement

This Agreement constitutes the entire agreement between the parties relating to the subject matter hereof. This Agreement supersedes any and all prior correspondence, warranties, covenants, collateral undertakings, or agreements, oral or otherwise, express or implied, unless otherwise contained herein.

11.13 Notices

(a) All questions or other communications regarding this Agreement, including any notices required by this Agreement, are to be addressed to the following addresses:

to Toronto Hydro:

Name:	Anila Dumont
Title:	Manager, Regulatory Services
Address:	14 Carlton Street, Toronto ON 5B 1K5
Telephone:	416-542-2831
Email:	ADumont@TorontoHydro.com

with copy to:

Title:	EVP, Public and Regulatory Affairs & Chief Legal Officer
Address:	14 Carlton, Toronto Hydro, ON M5B 1K5
Telephone:	(416) 542-3000
Email:	legal@torontohydro.com

to the Consultant:

Name:	Logan Toms
Title:	Partner, Finance and Risk
Address:	2626 Glenwood Avenue, Suite 480, Raleigh, NC 27608
Telephone:	(919) 227-3814
Email:	contracts@scottmadden.com

(b) All notices or communications shall be deemed to be received on the date of acceptance (as evidenced by the signature of the party) if delivered by personal delivery or courier, on the fifth (5th) Business Day after mailing, if mailed by first class mail, or on the first (1st) Business Day after transmission, if sent by facsimile (provided the transmission is evidenced by documented proof of proper fax transmittal).

11.14 Governing Law

This Agreement shall be governed by and construed in accordance with the law of the Province of Ontario and the laws of Canada applicable therein.

11.15 Execution

This Agreement may be signed in counterparts and delivered by electronic means, each of which shall be deemed an original and all of which, together, shall have the same effect as if all constitute one and the same Agreement.

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the date first written above:

ScottMadden Inc.

Per: Logan Toms

Name: Logan Toms

Title: Partner, Finance and Risk

I have authority to bind the Consultant.

Toronto Hydro-Electric System Limited

Per: _____

Name: Amanda Klein

Title: Executive Vice President, Public and Regulatory Affairs, and Chief Lega Officer

I have authority to bind Toronto Hydro.

SCHEDULE A

SCOPE OF SERVICES

1. Services to be Performed

(a) Regulatory Applications and Advocacy

Toronto Hydro is retaining the Consultant to undertake technical analysis, provide advice and/or assist with preparatory activities for upcoming rate applications and regulatory filings at the OEB. Broadly, the Consultant will research and support Toronto Hydro in respect of the following:

- Analyzing regulatory policies, reports, decisions, laws and other energy policy proposals of governments or regulators in relevant jurisdictions;
- Developing advocacy positions and written submissions;
- Detailing application timeline, schedule and milestones;
- Managing the discovery and interrogatory processes;
- Delivering expert testimony in regulatory proceedings;
- Understanding new or modified policies and developing new or modified approach for implementation and compliance purposes;
- Evaluating and creating regulatory frameworks, paradigms and first mover policy ideas to advance the interests of Toronto Hydro; and
- Undertaking technical analysis, drafting evidence and other preparatory activities for rate applications and regulatory filings.

In addition to the foregoing, the Consultant has been retained to provide specific expertise in the areas below. Please note that the list of work or tasks in SCHEDULE A is not guaranteed to include the subjects listed, nor is it limited to the examples listed.

(b) Energy Policy Analysis

Toronto Hydro's business activities are subject to the actions of regulatory authorities or by changes in regulation, including amendments to Ontario's regulatory model, manner of regulation, and/or broader climate change and energy policy framework. Ontario's electricity industry regulatory and other energy policy developments may affect the electricity distribution rates charged by Toronto Hydro, the costs Toronto Hydro is permitted to recover and the activities Toronto Hydro and others may undertake.

Toronto Hydro actively participates in industry engagement efforts in order to anticipate changes in regulatory, climate change and energy policy development. Through these types of engagements, Toronto Hydro monitors proposed regulatory, climate change and energy policy changes. The Consultant will be relied on for its experience, skillsets, knowledge and training in the area of energy policy for the following tasks:

- Regulatory and energy policy analysis and advocacy;
- Jurisdictional research & comparative analysis;
- Developing the context and history of the policy;
- Conducting interviews with key Toronto Hydro personnel on policy implications;

- Developing a matrix of policy implications for the parties participating in the proceeding;
- Cost-benefit allocation frameworks and studies;
- Rate-setting frameworks and principles;
- Rate design principles;
- Rate design review;
- Rate application strategy, evidence drafting, editing, witness training; and
- Other energy policy matters that arise.

(c) Regulatory Analytics and Technical Services

Toronto Hydro requires support from the Consultant on rate design. The OEB sees a comprehensive rate application as consisting of three main components: the business plan (along with supporting documentation and reports), historical and forecast information, and rate models that show the derivation of specific proposed rates based on the data. The OEB's adjudicative process on Toronto Hydro's regulatory applications can involve a number of steps to ensure that Toronto Hydro's proposals are adequately examined and "tested" during the review to ensure that it is delivering cost effective, efficient, reliable and responsive services to customers. In relation to this, the Consultant will be relied on for its experience, skillsets, knowledge and training in the area of analytics and technical services for the following tasks:

- Business case development;
- Econometrics and benchmarking analysis and studies;
- Productivity studies;
- Load and Customer Forecast;
- Energy market analysis
- Lead Lag Study;
- Cost Allocation Model (CAM) review;
- Rate design review;
- Load Profile Analysis as part Cost Allocation Requirements;
- Transformer Allowance;
- Cost Study for Specific Service Charge;
- Standby rates;
- EV rates;
- Loss Adjustment Factor;
- Energy & Demand Load Research Analysis;
- Distributed Energy Resources;
- Line Loss Study;
- Load Profile Analysis;
- IESO market settlement;
- Rate design principles;
- Quantitative models; and
- Other analytics and technical matters that arise.

SCHEDULE B

RATES

Position	Professional Fees ($/hr) for Services Performed in Each Calendar Year			
	2022	2023	2024	2025-2026
Partner	[redacted]			
Director				
Manager				
Senior Associate				
Director of Research				
Associate				
Benchmarking Manager				
Clean Tech Manager				
Senior Analyst				
Analyst				
Administrative Assistant				

Note all professional Fees quoted in the table above are in US dollars. All applicable taxes, including HST, are not included and will be added to the monthly bill at the time of invoicing.

SCHEDULE C

DEFINITIONS

In this Agreement, the following definitions shall apply:

"Affiliates"	has the meaning prescribed to it in the *Business Corporations Act* of Ontario, as amended from time to time;
"Agreement"	means this Agreement for Professional Consulting Services, including all recitals, schedules and attachments thereto;
"Applicable Laws"	means all federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to this Agreement, including without limitation all applicable OEB codes, rules or guidelines;
"Applicant"	means Toronto Hydro when Toronto Hydro has initiated a proceeding by application to the OEB.
"Business Day"	means a day on which banks are open for business in the City of Toronto, Ontario, but does not include a Saturday, Sunday, or a civic or statutory holiday in the Province of Ontario;
"Confidential Information"	means the terms of this Agreement and any and all data or information relating to the business, management or affairs of Toronto Hydro, its customers, employees, or any of its Affiliates disclosed by Toronto Hydro to the Consultant pursuant to this Agreement, whether or not such Confidential Information is expressly identified as confidential. Notwithstanding the foregoing, Confidential Information does not include any information or data which: (a) information or data that is or becomes publicly known through no breach of the terms or conditions of this Agreement; (b) information or data that is independently developed without reference to Confidential Information and without breach of the terms and conditions of this Agreement; or (c) Confidential Information that is required by court order or other legal compulsion to be disclosed, in which case the Consultant shall give Toronto Hydro prior written notice of such disclosure, as permitted by law;
"Consultant"	means ScottMadden Inc.;
"Deliverable"	means any and all works prepared, generated, created or designed by the Consultant pursuant to this Agreement, including without limitation all drawings, models, designs, formulae, methods, documents, reports, software, specifications, or source codes, and any related works, enhancements, modifications or additions thereto;
"Disbursements"	shall have the meaning as prescribed in Section 6.1(c);

"Fees"	shall have the meaning as prescribed in Section 6.1(a);
"Force Majeure"	means any impediments beyond the control of the applicable party due, wholly or in part, directly or indirectly, to: strikes, lockouts, riots, epidemics (other than related to or associated with SARS-Co-V-2 or COVID-19 and any evolutions or mutations thereof), war, governmental regulations, fire, explosions, acts of God, or any other impediment beyond the control of the party affected;
"Governmental Authority"	means any government, legislature, municipality, regulatory authority, agency, commission, department, board or court or other law, regulation or rule-making public entity of similar authority, including, without limitation the OEB;
"Guidelines"	has the meaning prescribed in Section 4.3(d);
"Hourly Rate"	shall have the meaning prescribed in Section 6.1(a);
"HST"	means Harmonized Sales Tax;
"IESO"	Means the Independent Electricity System Operator;
"Initial Term"	has the meaning prescribed to it in Section 3.1;
"Intellectual Property"	includes all trademarks, copyrights, patents, business names, trade secrets, proprietary software, analysis or techniques (whether or not patented or patentable), confidential or secret designs and processes, source codes, plans or devices, or other proprietary and intellectual property rights;
"Intervenor"	means any interested group or individual who participates actively in an OEB proceeding either by submitting evidence, arguments or interrogatories (written questions) or by cross-examining a witness or witnesses at an oral hearing;
"MFIPPA"	means the *Municipal Freedom of Information Act*;
"OEB"	means the Ontario Energy Board;
"Person"	means any individual, firm, corporation, unlimited liability company, partnership, limited liability partnership, joint venture, trust, unincorporated association, unincorporated syndicate, any governmental authority and any other legal or business entity.
"Protected Employee"	means any individual who, during the course of their employment with Toronto Hydro, was directly or indirectly involved in:

i. the procurement of the Services of the Consultant on behalf of Toronto Hydro;

ii. the negotiation of the Consultant's Agreement on behalf of Toronto Hydro; and/or

iii. the awarding and/or approval of the Consultant's Agreement on behalf of Toronto Hydro.

"Representative"	in respect of a party, means such party's directors, officers, employees, agents, contractors and advisors, the party's Affiliates, and all such Affiliates' respective directors, officers, employees, agents, contractors and advisors;
"Remittances"	has the meaning prescribed to it in Section 6.1(e);
"Renewal Term"	has the meaning prescribed to it in Section 3.2;
"Services"	means all of the Deliverables, services and specifications to be provided, performed and met by the Consultant under this Agreement, as more particularly described in SCHEDULE A;
"Term"	has the meaning prescribed to it in Section 3.3; and
"Toronto Hydro"	means Toronto Hydro-Electric System Limited.

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AMENDING AGREEMENT

THIS AMENDING AGREEMENT (the "Amending Agreement") is made effective as of June 1, 2023 (the "Effective Date") between **SCOTTMADDEN INC.** ("Consultant") and **TORONTO HYDRO-ELECTRIC SYSTEM LIMITED** ("Toronto Hydro") (collectively, the "Parties").

WHEREAS:

1. Toronto Hydro and the Consultant previously entered into an Agreement for Professional Consulting Services effective September 12, 2022 (the "Agreement"), pursuant to which the Consultant provides Toronto Hydro with various technical analysis, advisory, and preparatory services related to upcoming rate applications and regulatory filings (the "Services"); and

2. The Parties now wish to amend the Agreement by attaching the Ontario Energy Board's *Rules of Practice and Procedure* Rule 13A, and make associated amendments related to the Consultant's participation in Toronto Hydro's upcoming rate application, as provided herein.

NOW THEREFORE, THIS AMENDING AGREEMENT WITNESSES that in consideration of the mutual covenants contained herein and for other valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Toronto Hydro and Consultant agree as follows:

1. Any capitalized terms used but not defined herein shall be as defined in the Agreement. The recitals above are agreed by the Parties to be true and deemed to form part of this Amending Agreement as if specifically restated herein.

2. Section 4.3 of the Agreement is amended by adding the following subsection (e) immediately following subsection 4.3(d):

   (e) Without limiting the generality of subsection 4.3(a) above, the Consultant shall comply with Rule 13A Expert Evidence of the OEB's *Rules of Practice and Procedure*, attached as SCHEDULE C hereto, in the course of providing the Services and agrees to accept the responsibilities that are or may be imposed on them by that rule.

3. The Parties agree to add a new SCHEDULE C to the Agreement, attached hereto as Appendix 1 to this Amending Agreement.

4. All other terms and conditions of the Agreement remain continuously in full force and effect, unamended, and shall be deemed to apply to this Amending Agreement.

5. This Amending Agreement, together with the Agreement, shall hereinafter constitute the entire agreement between the Parties with respect to the Services as further described in the Agreement, and supersedes any and all other agreements, understandings, discussions, negotiations, representations and correspondence which may have been made by or between the Parties respecting the same.

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IN WITNESS WHEREOF the Parties hereto have executed this Amending Agreement as of the date first written above.

SCOTTMADDEN INC.

Per: Logan Toms

Name: Logan Toms

Title: Partner, Finance and Risk

I have the authority to bind the Consultant.

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

Per: DocuSigned by: E232C3948F5C435...

Name: Daliana Coban

Title: Director, Regulatory Applications and Business Support

I have authority to bind Toronto Hydro.

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APPENDIX 1

SCHEDULE C

Ontario Energy Board *Rules of Practice and Procedure* Rule 13A

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the OEB impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

a. the expert's name, business name and address, and general area of expertise;
b. the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;
c. the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;
d. the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;
e. in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and
f. an acknowledgement of the expert's duty to the OEB in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the OEB may require two or more of the experts to:

a. in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and
b. at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the OEB and others as permitted by the OEB, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the OEB, including as to:

a. scope and timing;
b. the involvement of any expert engaged by the OEB;
c. the costs associated with the conduct of the activities;
d. the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of Rule **13A.04**; and
e. any issues in relation to confidentiality.

13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A.**

79 Wellington St. W., 30th Floor
Box 270, TD South Tower
Toronto, Ontario M5K 1N2 Canada
P. 416.865.0040 | F. 416.865.7380
www.torys.com

Charles Keizer
ckeizer@torys.com
P. 416.865.7512

January 30, 2023

PRIVILEGED AND CONFIDENTIAL
EMAIL

ScottMadden, Inc.
1900 West Part Drive, Suite 250
Westborough, MA 01581

Attention: Tim Lyons

Dear Sirs/Mesdames:

Re: Letter Agreement – Toronto Hydro-Electric System Limited – ScottMadden, Inc.

Torys LLP ("Torys" or "we") is engaged as legal counsel to Toronto Hydro-Electric System Limited ("Toronto Hydro") in connection with its planned 2025-2029 electricity distribution rate application (the "Application") to the Ontario Energy Board (the "Board").

On behalf of and to assist us in providing legal advice to Toronto Hydro in connection with the Application, Torys requests that you to provide independent consulting services to Torys, effective as of January 10, 2023 (the "Effective Date"). By signing back a copy of this letter (the "Letter Agreement"), which has been acknowledged and agreed to by Toronto Hydro below, you acknowledge and agree that (i) you have been engaged directly by Toronto Hydro to provide consulting services in respect of the Application, (ii) the consulting services you provide in respect of that engagement shall be as further described herein, including with respect to the agreed-upon scope of work, and (iii) the terms of this Letter Agreement shall further govern any consulting services or work product to be provided under the terms of your engagement with Toronto Hydro.

1. No Conflict

The Consultant does not have any conflict of interest or other constraints on its ability to provide expert advice in connection with the Application. You confirm that you are free to provide the consulting services in connection with Torys' representation of Toronto Hydro in the Application. You agree that during the engagement you will not provide, directly or indirectly, any services to any other party to the Application (except Toronto Hydro) in connection with the matters at issue in the Application.

2. Consultant Expertise

The Consultant will provide consulting services to Torys in connection with the Application as further described in Section 3 below. The sponsors of the work of the Consultant and the

persons who have the relevant expertise will be:

- Tim Lyons Partner

(collectively referred to as the "Sponsors").

3. **Scope of Services and Work Product**

The Consultant will:

(a) summarize key findings related electricity sector PBR frameworks and plans approved by regulators in other jurisdictions. The purpose of this work is to collect and analyze materials on how electric utilities with PBR plans – or similar ratemaking mechanisms – have used PBR approaches to address changes in cost and revenue drivers in the electric distribution industry, particularly related to the clean energy transition. Specific activities include:

- Review materials related to electricity sector PBR frameworks and plans in other jurisdictions
- Summarize treatment of costs & revenues under the PBR frameworks and plans reviewed
- Discern the regulatory principles that underlie the PBR frameworks and plans reviewed

(b) discuss the findings and preliminary results of the Study with Torys and Toronto Hydro on a date and at a location to be agreed upon (the "Discussion of Findings");

(c) if requested by Torys, produce draft and/or final written report(s) detailing the Study's methodology, analysis performed and the Consultant's findings and recommendations (the "Report(s)"), which (i) shall be delivered to Torys no later than: March 10, 2023 for the draft Report and March 24, 2023 for the final Report, unless otherwise agreed to by the parties, and (ii) may be filed by Torys with the Board in connection with the Application; and

(d) if requested by Torys, with the consent of Toronto Hydro pursuant to your engagement by Toronto Hydro, provide support during the hearing of Application, which may include:

(i) assistance in responding to interrogatories applicable to the Report;

(ii) appearance at a technical conference to respond to oral questions on the Report;

(iii) testifying about the Report as an expert witness either orally or in writing;

(iv) responding to undertakings (i.e., written questions during a technical conference or hearing) on the Report; and

(v) assistance in connection with the preparation of argument (oral or written) on the issues addressed in the Report.

4. Fees and Invoices

The Consultant acknowledges that the Consultant shall direct all invoices relating to services performed by it, including services performed pursuant to the terms of this Letter Agreement, to Toronto Hydro and that Torys LLP shall have no obligation whatsoever for the invoices rendered in this regard.

5. Confidentiality

This Letter Agreement and all work performed by the Consultant in connection with the consulting services, including all findings, opinions and conclusions the Consultant reaches in relation to the consulting services, and any communications relating thereto, are strictly privileged and confidential and shall not be disclosed to any other person or party without the prior written consent of Torys or Toronto Hydro. The Consultant agrees to designate all written communications and material accordingly. The Consultant further agrees to promptly notify Torys in the event that the Consultant receives a request to disclose information relating to this matter, and agrees to cooperate with Torys, to the fullest extent permitted by law, to prevent or limit the disclosure of such material or otherwise preserve the privileged and confidential status of such material.

The Consultant agrees to hold in confidence: (a) all information provided to the Consultant, and (b) the Consultant's opinions to Torys and to Toronto Hydro as they relate to the information, whether the information or opinions are documentary or oral (collectively, the "Confidential Information"). The Consultant will not disclose the Confidential Information to any person unless Torys or Toronto Hydro authorizes you in writing to do so. All documents given to the Consultant in connection with the consulting services remain the property of Torys or of Toronto Hydro and are held in trust by the Consultant as agent. The Consultant agrees to return these documents on request.

The Consultant will not refer to Torys or to Toronto Hydro, directly or indirectly, in connection with the promotion of its services, without obtaining the prior written consent of Torys or Toronto Hydro, as the case may be.

6. Intellectual Property

Nothing in this Letter Agreement shall be deemed to transfer, license, assign, permit the use of, or otherwise convey an interest in whole or in part to the Consultant of any intellectual property belonging to Toronto Hydro or any of its representatives or any third party whose intellectual property is in Toronto Hydro's custody or control, and the use by the Consultant of any such intellectual property shall be subject to the prior written approval of Toronto Hydro.

Torys and Toronto Hydro shall at all times have full rights and title to all works prepared, generated or created by the Consultant from the consulting services, including without limitation any reports or other documents created by the Consultant, and any related works,

modifications or additions thereto (the "Work Product"), and may at all times take possession of or use any completed or partially completed Work Product, notwithstanding any provision, express or implied, to the contrary. Without limiting the generality of the foregoing, Toronto Hydro shall own all intellectual property rights in all Work Product, and the Consultant hereby waives and assigns to Toronto Hydro any such rights and agrees to give Toronto Hydro and its representatives all assistance as may be reasonably required to perfect such rights including, without limitation, obtaining waiver of moral rights from any of the Consultant's employees, partners or other representatives. Notwithstanding the foregoing, the Consultant shall retain sole and exclusive ownership of any pre-existing Consultant tools, methodologies, proprietary research and data, together will all intellectual property rights therein (the "Consultant Property"). Consultant grants to Torys and Toronto Hydro a fully paid up, irrevocable, perpetual, non-exclusive, royalty-free license to use the Consultant Property contained within the Work Product for the purposes intended in this Letter Agreement.

The Consultant expressly warrants that the delivery, sale or use of the Consultant's services will not infringe any Canadian or foreign patents, trademarks, copyrights, industrial design or other intellectual property rights and the Consultant shall indemnify and save Toronto Hydro harmless from all claims, judgments and decrees that may be entered against Toronto Hydro or its representatives and against all damage, liability, costs and expenses (including legal fees and other attendant costs and expenses) Toronto Hydro incurs by reason of any infringement or claim thereof.

7. **Termination**

Torys may terminate this Letter Agreement at any time on written notice to the Consultant. If not otherwise terminated, this Letter Agreement shall be in effect from the Effective Date and shall expire on the date that is 60 days after a final decision of the Board has been issued on the Application. Upon the termination or expiration of this Letter Agreement, the Consultant shall return to Torys and delete any and all electronic copies the Consultant may have of all non-public documents and materials in its possession acquired from Torys or Toronto Hydro relating to the consulting services or this Letter Agreement, including all Confidential Information (defined above) and Work Product, whether completed or not. The Consultant shall, upon request, provide Torys with a certificate of an officer of the Consultant certifying such deletion of electronic copies.

8. **Independence**

By entering into this Letter Agreement, the Consultant acknowledges and agrees that the Sponsors have received a copy of Rule 13A of the Board's *Rules of Practice and Procedure* concerning expert evidence, and agree to accept the responsibilities that are or may be imposed on them by that rule with respect to testimony before the Board. A copy of the rule and the relevant form are attached as Schedules 'A' and 'B' hereto. When returning an executed copy of this Letter Agreement, the Consultant shall include signed copies of Schedule 'B' for each of the Sponsors.

9. **Responsibility Statement**

The Consultant agrees that the services provided for herein will be performed in a timely, competent, professional manner in accordance with recognized professional consulting standards for similar services to be performed by a leading consulting advisory firm, and that adequate

qualified personnel will be assigned for that purpose. If, during the performance of the services or prior to the Board's issuance of final, non-appealable order(s) disposing of all relevant relief sought in the Application, such services prove to be faulty or defective by reason of a failure to meet such standards, the Consultant agrees that upon prompt written notification from Torys, such faulty or defective portion of the services will be redone at no cost to Torys or Toronto Hydro, up to a maximum amount equivalent to the cost of the services rendered under this Retainer Agreement, or, at Torys' request, the Consultant will refund an amount equal to the amount paid for the faulty or defective portion of the services.

10. **Governing Law**

This Letter Agreement shall be construed and otherwise governed pursuant to the laws of the Province of Ontario and the federal laws of Canada applicable therein.

Sincerely,

TORYS LLP

Per: _____
Name: Charles Keizer

This Letter Agreement is acknowledged and agreed to by TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

Signed _____

Name (please print) Daliana Coban

(I have the authority to bind the Company)

This Letter Agreement is acknowledged and agreed to by SCOTTMADDEN, INC.

Signed Logan Toms

Name (please print) Logan Toms

(I have the authority to bind the Company)

SCHEDULE 'A'

Rule 13A of the Board's Rules of Practice and Procedure

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the Board impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

(a) the expert's name, business name and address, and general area of expertise;

(b) the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;

(c) the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;

(d) the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;

(e) in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and

(f) an acknowledgement of the expert's duty to the Board in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the Board may require two or more of the experts to:

(a) in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and

(b) at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the Board and others as permitted by the Board, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the Board, including as to:

(a) scope and timing;

(b) the involvement of any expert engaged by the Board;

(c) the costs associated with the conduct of the activities;

(d) the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of **Rule 13A.04**; and

(e) any issues in relation to confidentiality.

13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A**[1].

[1] Attached as Schedule 'B' herein.

SCHEDULE 'B'

FORM A

Proceeding: .....

ACKNOWLEDGMENT OF EXPERT'S DUTY

1. My name is ..... (*name)*. I live at ..... (*city)*, in the ..... (*province/state*) of .....

2. I have been engaged by or on behalf of ..... (*name of party/parties)* to provide evidence in relation to the above-noted proceeding before the Ontario Energy Board.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the Board may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date.....

_____

Signature

AGREEMENT FOR PROFESSIONAL CONSULTING SERVICES

THIS AGREEMENT is made as of the 31st day of October, 2022 between **Toronto Hydro-Electric System Limited** ("Toronto Hydro"), a corporation incorporated under the laws of the province of Ontario and **Guidehouse Canada Ltd.**, a corporation incorporated under the laws of Ontario (the "Consultant"), pursuant to which Toronto Hydro shall retain the Consultant to provide certain Services, and the Consultant shall provide such Services, during the Term, subject to the terms and conditions hereof;

NOW THEREFORE, in consideration of the mutual covenants set forth herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. INTERPRETATION

Unless otherwise indicated, all capitalized terms in this Agreement shall be as defined in SCHEDULE B and any reference to currency in this Agreement shall refer to lawful money of Canada.

2. RELATIONSHIP OF THE PARTIES

2.1 Retainer

Toronto Hydro hereby retains the Consultant to provide the Services, and the Consultant hereby agrees to provide the Services, during the Term, in accordance with the terms and conditions of this Agreement.

2.2 Independent Contractors

(a) Notwithstanding any provision hereof, this Agreement does not constitute and shall not be construed as constituting a partnership, joint venture, principal/agency relationship, or employer/employee relationship between the parties. The Consultant and Toronto Hydro shall at all times remain independent contractors of each other, and neither party shall represent itself to be an agent or employee of the other.

(b) Without limiting the generality of Subsection 00, the Consultant hereby acknowledges and agrees that neither it nor its Representatives shall be eligible or entitled, by reason of this Agreement, to participate in any employee-related program offered by Toronto Hydro or any of its Affiliates, including, without limitation, any benefit, insurance, compensation, health plan, bonus or retirement program.

(c) The Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities or claims whatsoever against Toronto Hydro or its Representatives resulting from or relating to the Consultant or its Representatives being deemed to be an employee of Toronto Hydro or any of its Affiliates.

(d) The Consultant hereby acknowledges and agrees that Toronto Hydro shall not be responsible for and shall not have control or charge of any means, methods, techniques, sequences or

procedures used for or in respect of the Services, or for the safety precautions or programs required for the Services or otherwise prescribed hereunder.

3. TERM

3.1 Term

Unless otherwise terminated in accordance with the provisions hereof, this Agreement shall be for a term of two (2) years and seven (7) months commencing on October 31, 2022 and terminating on May 30, 2025 (the "Term").

4. SERVICE REQUIREMENTS

4.1 Services

During the Term, the Consultant shall perform the Services as detailed in SCHEDULE A hereto.

4.2 Time and Availability

Unless otherwise directed in writing by Toronto Hydro, the Consultant shall have discretion in selecting the dates and times it performs the Services throughout the month, giving due regard to the needs of Toronto Hydro's business requirements and provided that any access to Toronto Hydro property shall be during regular business hours.

4.3 [Intentionally Deleted]

4.4 Revision to Services

(a) The Parties acknowledge and agree that the Services to be undertaken and completed by the Consultant under this Agreement may be subject to revision or amendment from time to time during the Term: (i) as required by Toronto Hydro to comply with the Guidelines; (ii) as required by Toronto Hydro to comply with the Applicable Laws or any order, instruction, directive or legal requirement of a Governmental Authority; or (iii) as required by Toronto Hydro to ensure that Toronto Hydro receives the expected funding and benefits with respect to the project to which the Services relate.

(b) Toronto Hydro agrees to provide the Consultant with written notice of any revision or amendment to the Services required pursuant to this Section 4.4, and subject to the terms of Subsection 4.40 below, the Consultant shall comply with all such directives.

(c) In the event that the Consultant fails to comply with a directive issued by Toronto Hydro pursuant to this Section 4.4, Toronto Hydro shall have the right, in addition to any other remedies which may be available to Toronto Hydro hereunder or otherwise at law, to terminate this Agreement by giving written notice of termination to the Consultant whereupon this Agreement shall terminate as at the effective date of termination specified in the notice and the provision of Section 7 shall apply.

(d) Notwithstanding Subsection 4.40, where a directive from Toronto Hydro results in a material change in the scope and/or implementation of the Services, then the Consultant shall have the right to terminate this Agreement by giving notice of termination to Toronto Hydro whereupon

the Agreement shall terminate as at the effective date of termination specified in the notice and the provisions of Section 7 shall apply.

4.5 Applicable Laws

(a) The Consultant shall, at its sole expense, obtain and maintain during the Term of this Agreement, all permits, licences and approvals required by all Applicable Laws to perform its obligations under this Agreement. The terms and conditions of this Agreement shall be carried out in strict compliance with all Applicable Laws and in the event of any conflict between any Applicable Laws, the Applicable Laws with the most stringent standard shall apply.

(b) Without limiting the generality of subsection 4.5(a) above, the Consultant shall comply with Rule 13A Expert Evidence of the Ontario Energy Board's *Rules of Practice and Procedure*, attached as SCHEDULE C hereto, and agree to accept the responsibilities that are or may be imposed on them by that rule with respect to any testimony before the Ontario Energy Board.

(c) Without limiting the generality of the foregoing, the Consultant shall comply with the *Municipal Freedom of Information Act* ("MFIPPA"), the *Personal Information Protection and Electronic Documents Act* (Canada) ("PIPEDA")and any other applicable privacy legislation (collectively, "Privacy Laws") with respect to any personal information collected, used or disclosed in connection with this Agreement and shall indemnify and hold harmless Toronto Hydro and its Representatives from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments (including related expenses and legal costs) they may incur related to or arising out of any non-compliance therewith.

(d) Where any Development is subject to the approval or review of any authority, department, government or agency other than Toronto Hydro, such applications for approval or review shall, unless otherwise authorized by Toronto Hydro in writing, be prepared by the Consultant to be approved and submitted by and through the offices of Toronto Hydro, and the Consultant shall not have any direct dealings with the authority, department, government or agency in question with regards to the Development.

(e) The Consultant and the Consultant's personnel shall comply with all rules and direction of Toronto Hydro, whether specified in this Agreement or otherwise, while working on Toronto Hydro's facilities: Toronto Hydro's *Code of Business Conduct and Whistleblower Procedure*, Toronto Hydro's *Disclosure Policy,* Toronto Hydro's *Social Media and Digital Communication Policy,* Toronto Hydro's *Accessibility Policy,* Toronto Hydro's *Workplace Harassment Policy and Program,* Toronto Hydro's *Violence Prevention in the Workplace Policy,* Toronto Hydro's *Workplace Alcohol and Drug Policy*, Toronto Hydro's *Environmental Policy*, Toronto Hydro's *Occupational Health and Safety Policy*, Toronto Hydro's *Privacy Policy,* Toronto Hydro's *Cyber Security Policy*, Toronto Hydro's *Technology Use Guidelines*, Toronto Hydro's *External Supplier Access to Application Services Policy,* Toronto Hydro's *Physical Security Policy*, Toronto Hydro's *COVID-19 Vaccination Policy,* and the *Affiliate Relationships Code for Electricity Distributors and Transmitters* issued by the OEB (together, the "Guidelines"). The Consultant acknowledges that it has been provided with a copy of the Guidelines, has provided and will provide a copy of the Guidelines to each of its Representatives and that it agrees to comply with and to direct its Representatives to comply with such Guidelines, as amended.

4.6 Performance

(a) The Services shall be performed to the satisfaction of Toronto Hydro, and Toronto Hydro shall have the right at all reasonable times, to inspect or otherwise review the Services performed or being performed. The Consultant shall, upon the request of Toronto Hydro, provide Toronto Hydro with written reports of the status of the Developments and the Consultant's progress in providing the Services.

(b) In the event of any dispute between Toronto Hydro and the Consultant relating to the quality or acceptability or rate of progress of any of the Services, or relating to the interpretation of any instructions or specifications concerning the Services, the reasonable opinion of Toronto Hydro shall govern and be binding on the parties hereto.

4.7 Health and Safety

The Consultant shall be responsible for managing the health and safety of its own personnel and other Representatives. Neither Toronto Hydro, nor its Representatives, shall be liable for any loss, damages or claims arising directly or indirectly from the Consultant's access to or work in or around Toronto Hydro's facilities, and the Consultant hereby waives any claims to which it may become entitled for loss or damage and releases Toronto Hydro and its Representatives from any and all such claims.

4.8 [Intentionally Deleted]

4.9 Security

a) Vendor shall implement and comply with controls ("Security Controls") for the protection of Toronto Hydro's Representatives, customers, systems integrity, systems availability, Confidential Information and Toronto Hydro property, including Toronto Hydro Data, accessed, received or used by Consultant or its Personnel, or that otherwise comes into the possession of Consultant or its Personnel, in accordance with:

   i. the physical safeguards requirements set forth in Toronto Hydro's *Physical Security Policy* in section 4.5(e) of this Agreement ("Physical Security Controls");
   ii. the data security requirements set forth in Schedule D ("Cybersecurity Controls");
   iii. the public cloud requirements set forth in Schedule E ("Public Cloud Controls");

b) The Physical Security and the Cybersecurity Controls include the requirements for identifying, responding to, resolving and reporting on, Security Incidents.

c) A Security Incident is Confidential Information of Toronto Hydro subject to the requirements of this Agreement.

d) In the event of a Security Incident,

   i. Consultant shall promptly investigate such Security Incident and, if the Security Incident is a Cybersecurity Incident, it shall conduct such investigation as set out in Schedule D – Cybersecurity Controls; and
   ii. Consultant shall cooperate with Toronto Hydro in its efforts to (i) investigate the Security Incident, (ii) comply with statutory notice and other legal obligations

applicable to Toronto Hydro or its customers arising out of the Security Incident, and (iii) investigate or bring legal action against third parties in an effort to protect Toronto Hydro's rights. If a Security Incident involves any Personal Information, then if requested by Toronto Hydro, Consultant will assist Toronto Hydro in Toronto Hydro's communication with the media, any affected persons (by press release, telephone, letter, website or any other method of communication), and any Governmental Authorities. The content and method of any such communications will be reasonably determined by Toronto Hydro.

e) Consultant policies to be maintained by Consultant will include current and comprehensive written security policies detailing Consultant's security processes, programs and procedures that are in compliance with Applicable Law and the Security Controls (collectively, "Security Policies"). Upon Toronto Hydro's request, Consultant will provide to Toronto Hydro copies of the Security Policies. During the Term of this Agreement, Consultant shall not amend or modify any part of the Security Policies to diminish the Security Controls then in effect without Toronto Hydro's prior written consent.

f) Not more than once per calendar year, Toronto Hydro reserves the right, upon reasonable notice and at Toronto Hydro's expense, to review Consultant's compliance with the Security Policies and this Agreement. Toronto Hydro may exercise this right directly or use the services of a third party with recognized ability in the area to conduct such review. In the event of a Security Incident, the calendar limitation above shall not apply and Toronto Hydro may conduct such review at any time subsequent to such Security Incident.

5. REPRESENTATIONS, WARRANTIES, INDEMNITIES AND INSURANCE

5.1 Representations and Warranties

The Consultant hereby represents, warrants and agrees that:

(i) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has/have the necessary experience and qualifications to perform the Services;

(ii) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) will perform the Services in a diligent, expeditious and workmanlike manner, consistent with standards generally observed by reputable and competent members of the same industry providing similar services;

(iii) all Services shall be the Consultant's (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) original work and none of the Services or any invention, development, use, production, distribution or exploitation relating thereto will infringe, misappropriate or violate any intellectual property or other right of any person or entity;

(iv) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has the corporate power and authority to enter into this Agreement and to perform its obligations hereunder, and that this Agreement constitutes a legal, valid, and binding obligation of the Consultant, enforceable against the Consultant in accordance with its terms.

Save and except for all warranties set out in this Agreement, the foregoing warranties are in lieu of any other warranties, express or implied, of the Vendor and all such warranties are hereby disclaimed.

5.2 Indemnity

a) The Consultant shall be liable for and shall indemnify and hold harmless Toronto Hydro and its Representatives from all claims, demands, actions, penalties, damages, losses, judgments and settlements, liabilities, costs, expenses, including legal fees and other related costs and expenses arising out of, related to, or incident to, the Consultant or any of its Representatives' performance of the Services under this Agreement, including, without limitation:

   i. any breach, violation or non-performance by the Consultant or any of its Representatives of any terms, conditions, warranties, obligations or covenants contained in this Agreement;

   ii. any breach or violation by the Consultant or any of its Representatives of any Applicable Laws; and

   iii. any actions, omissions, negligence or wilful misconduct of the Consultant or any of its Representatives.

b) The Consultant's aggregate liability under this Agreement shall not exceed three times the value of all amounts paid or payable by Toronto Hydro under the Agreement.

c) Except for losses covered by insurance of the types and to the limits required in this Agreement, the liability of the Consultant is limited to direct damages only, and in no event shall the Consultant be liable for loss of profit or use and for any indirect, special, incidental or consequential damages of any nature or kind howsoever caused or arising.

d) No exclusion or limitation on liability for the Consultant shall apply to:
   i. gross negligence or intentional misconduct;
   ii. death, personal injury, or property damage;
   iii. breach of applicable law; or
   iv. intellectual property indemnity in Section 9.

e) However in case of breach of the confidentiality or privacy obligations as included in this Agreement, Consultant's aggregate liability shall not exceed a value of $5,000,000.

5.3 Insurance

(a) The Consultant shall, during the Term, and at its own expense, maintain and keep in full force and effect (and, when requested, provide Toronto Hydro with proof thereof) the following insurance:

   (i) commercial general liability insurance on an occurrence basis having a minimum inclusive coverage limit, including personal injury and property damage, of not less than two million dollars ($2,000,000) per occurrence with property damage deductible of not more than fifty thousand dollars ($50,000.00) which commercial general liability insurance shall be extended to cover contractual liability, products

and completed operations liability, contingent employer's liability, and owners/contractors protective liability;

(ii) Errors and Omissions Insurance (Professional Liability) in the amount of not less than five million dollars ($5,000,000.00);

(iii) Computer Security and Privacy Liability insurance covering actual or alleged acts, errors or omissions committed by the Vendor or its Representatives of not less than three million dollars ($3,000,000.00) in the aggregate, and which shall also extend to include the intentional, fraudulent or criminal acts of the Vendor or its Representatives. The policy shall expressly provide, but not be limited to, coverage for the following perils:

1) unauthorized use/access of a computer system

2) defense of any regulatory action involving a breach of privacy

3) failure to protect confidential information (personal and commercial information) from disclosure

4) notification costs, whether or not required by statute; and

(iv) automobile liability insurance on all owned and non-owned vehicles used in connection with this Agreement, with such automobile insurance coverage having a limit of not less than two million dollars ($2,000,000.00) per vehicle, in respect of bodily injury (including passenger hazard), property damage and mandatory accident benefits.

(b) All insurance coverages and limits required to be maintained by the Consultant shall be primary to any insurance maintained by Toronto Hydro, which shall be excess and non-contributory. Prior to the commencement of the delivery of the Services, the Consultant shall deliver to Toronto Hydro a certificate of insurance which evidences the Consultant's compliance with this section, and Consultant shall make best efforts to provide a thirty (30) day prior written notice of cancellation, non-renewal or adverse material change, to Toronto Hydro.

(c) The Consultant agrees that the insurance described herein does in no way limit the Consultant's liability pursuant to the indemnity provisions of this Agreement.

(d) A waiver of subrogation shall be provided by the insurer(s) to Toronto Hydro, except with respect to the error and omissions insurance policy.

6. FEES

6.1 Fees

(a) Subject to Subsections 00, 00 and 00, in exchange for the performance of the Services in accordance with the terms hereof, Toronto Hydro shall pay the Consultant the fees set out in SCHEDULE A (plus applicable taxes), (the "Fees"), subject to invoicing as outlined in Section 0.

(b) The Fee noted in subsection 00 shall be the only fee payable by Toronto Hydro under this Agreement. Without limiting the generality of the foregoing, the Consultant hereby agrees and acknowledges that all out-of-pocket expenses, travelling costs, and other disbursements shall be at the sole expense of the Consultant, except with the prior written approval from Toronto Hydro.

(c) Any disbursements for additional incidentals incurred by the Consultant in relation to this Agreement ("Disbursements") must be pre-approved by Toronto Hydro in writing.

(d) The Consultant shall not incur or submit Fees for any work outside the scope of the Services, or exceed the Fees listed in Subsection 6.10 without prior written approval from Toronto Hydro.

(e) The Consultant shall make all payment of taxes, employment insurance premiums, pension plan contributions and any other taxes or other payment of any nature, imposed by any authority in respect of the Fees paid by Toronto Hydro to the Consultant under this Agreement (together, the "Remittances"), and the Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities and claims whatsoever against Toronto Hydro or its Representatives, in any way arising out of or relating to any failure to deduct, withhold, or remit any Remittance.

(f) Without limiting the generality of Subsection 00, Toronto Hydro reserves the right to deduct any applicable non-resident withholding taxes from any Fees owing to the Consultant under this Agreement and remit such amounts to the applicable taxation authority.

6.2 Payment

The Consultant shall submit invoices to Toronto Hydro in accordance with SCHEDULE A of this Agreement containing:

(i) a detailed description of the Services performed during the invoice period;

(ii) the dates and the amount of time spent by the Consultant for the provision of the Services;

(iii) the Hourly Rate (if applicable); and

(iv) the total HST applicable to the Services during the invoice period, as well as the Consultant's HST registration number.

Unless otherwise provided in this Agreement, the Consultant shall invoice Toronto Hydro after final inspection and acceptance by Toronto Hydro of the Services performed and subject to receipt of all documents required by this Agreement. **Invoices must be sent electronically to: AP@torontohydro.com.** Subject to approval of the invoice by Toronto Hydro, receipt of all documents required by this Agreement, and final review by Toronto Hydro, Toronto Hydro shall make payment to the Consultant via electronic funds transfer not later than thirty (30) days following receipt of an acceptable invoice and the EFT Information (as set out below). **The Consultant must provide Toronto Hydro with, in the case of the first payment only, (i) a void cheque, pre-printed deposit slip or bank confirmation letter and (ii) the email address where the Consultant wishes to receive remittance information (together, "EFT Information"). EFT Information must be sent electronically to efthelp@torontohydro.com or to 14 Carlton Street, Toronto, ON, M5B 1K5, Attention: Treasury Department.** Toronto Hydro reserves the right to pay the Consultant through other payment methods.

Any objection to an invoice shall be made within sixty (60) days from the invoice date; lack of timely objection shall indicate Toronto Hydro's agreement to such invoiced amounts. If any amounts remain unpaid for sixty (60) or more days from the invoice date, the Consultant shall have the right to suspend services until payment in full is made.

7. SUSPENSION OR TERMINATION

7.1 Suspension or Termination

(a) Toronto Hydro may, at any time during the Term by notice in writing, suspend all or a portion of the Services. Upon receipt of such written notice, the Consultant shall perform no further work other than as directed by Toronto Hydro, and shall be entitled to payment for time spent in performing the Services up to the date of suspension.

(b) Either party may terminate this Agreement immediately upon written notice where the other party enters into liquidation, whether compulsory or voluntarily, or where a proceeding in receivership, bankruptcy or insolvency has been instituted by or against such party or its property.

(c) Toronto Hydro, at its sole discretion, may terminate this Agreement immediately upon written notice where the Consultant or any of its Representatives has been in default in the performance of its duties, obligations or undertakings under this Agreement, and has not taken immediate steps to remedy such default within five (5) Business Days following written notice of the specific default by Toronto Hydro. For the purposes of this section, a material default shall include, without limitation, a breach of any of the representations or warranties contained herein or the failure or refusal to provide the Services in accordance with the terms and conditions of this Agreement.

(d) Notwithstanding any other provision in this Agreement, Toronto Hydro, at its sole discretion, shall have the right to terminate this Agreement, for any reason, upon two (2) weeks written notice to the Consultant.

7.2 Effect of Termination

Upon the termination or expiration of this Agreement, the Consultant shall return to Toronto Hydro and delete any and all electronic copies the Consultant may have of all documents and materials in its possession relating to the Services or this Agreement, including all Confidential Information and all Developments, whether completed or not.

8. CONFIDENTIALITY

(a) In performing the Services required by this Agreement, the Consultant may be provided access to Confidential Information. The Consultant acknowledges and agrees that:

(i) the Consultant shall not disclose, permit access to, transmit, or transfer the Confidential Information to any third party without the prior written authorization of Toronto Hydro;

(ii) the Consultant shall protect the confidentiality of the Confidential Information in its possession by exercising the same security measures it normally exercises with respect to its own confidential information and at minimum a reasonable standard of care;

(iii) upon the request of Toronto Hydro, and in any event upon the expiration or termination of this Agreement for any reason, the Consultant shall return (or delete, in the case of

electronic documents) forthwith to Toronto Hydro all Confidential Information, including all copies and other materials containing the Confidential Information, which are in the possession or under the control of the Consultant;

(iv) the Consultant shall not use any Confidential Information for any purpose other than to perform the Services required by this Agreement. Without limiting the foregoing, the Consultant shall not, and shall not permit any of its Representatives to, use any Confidential Information in furtherance of its, or their, individual business or for its, or their, own benefit, profit or advantage, or for the benefit, profit or advantage of any other party; and

(v) Toronto Hydro is subject to MFIPPA and is governed by Governmental Authority such as the Independent Electricity System Operator ("IESO") and the Ontario Energy Board ("OEB") and shall have the right to disclose Confidential Information in accordance with the provisions of MFIPPA or as required by the IESO or the OEB.

(b) Notwithstanding the foregoing, the Consultant may disclose such Confidential Information:

(i) to any of the Representatives of the Consultant who agree to be bound by the obligations of confidentiality herein and who have a reasonable need to know such Confidential Information in the course of their duties for the Consultant but only for the purposes of the Consultant exercising its rights and obligations under this Agreement; and

(ii) in the event that the Consultant believes it is required by law to disclose, or is requested by a Governmental Authority to disclose, any Confidential Information to a Governmental Authority; provided that the Consultant shall, to the extent permitted by law, first inform Toronto Hydro of the request or requirement for disclosure to allow an opportunity for Toronto Hydro to apply for an order to prohibit or restrict such disclosure.

9. INTELLECTUAL PROPERTY

9.1 Use

Nothing in this Agreement shall be deemed to transfer, license, assign, permit the use of, or otherwise convey an interest in whole or in part to the Consultant of any Intellectual Property belonging to Toronto Hydro or any of its Representatives or any third party whose Intellectual Property is in Toronto Hydro's custody or control, and the use by the Consultant of any such Intellectual Property shall be subject to the prior written approval of Toronto Hydro.

9.2 Ownership

Toronto Hydro shall at all times have full rights and title to the Developments, and may at all times take possession of or use any completed or partially completed Developments, notwithstanding any provision, express or implied, to the contrary. Without limiting the generality of the foregoing, Toronto Hydro shall own all Intellectual Property rights in all Developments, and the Consultant hereby waives and assigns to Toronto Hydro any such rights, and agrees to give Toronto Hydro and its Representatives all assistance as may be reasonably required to perfect such rights including, without limitation and where the Consultant is a corporation or partnership, obtaining waiver of moral rights from any of the Consultant's employees, partners or other Representatives.

9.3 Intellectual Property Protection

The Consultant expressly warrants that the manufacture, delivery, sale or use of the Consultant's Services will not infringe any Canadian or foreign patents, trademarks, copyrights, industrial design or other intellectual property rights and the Consultant shall indemnify and save Toronto Hydro harmless from all claims, judgments and decrees that may be entered against Toronto Hydro or its Representatives and against all damage, liability, costs and expenses (including legal fees and other attendant costs and expenses**)** Toronto Hydro incurs by reason of any infringement or claim thereof.

9.4 Pre-Existing Intellectual Property

Any pre-existing Intellectual Proprietary ("Pre-Existing IP") of Consultant or its licensors used to perform Services, or included in any Development, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of the Consultant and its licensors (collectively, "Consultant Information"). To the extent that Consultant incorporates any Consultant Information into the Development(s), Consultant hereby grants to Toronto Hydro a fully paid up, royalty free, irrevocable and non-cancellable, non-exclusive, and non-transferable right to Use the Consultant Information solely for Toronto Hydro's internal business purposes and for any specific purposes identified in the Agreement. For the purpose of the foregoing, "Use" means one or more of the following rights to: use; translate; reproduce; copy; display; perform; communicate in any manner. All Developments and Services provided by the Consultant shall be only for Toronto Hydro's internal business purposes and for any specific purposes identified in the Agreement. Consultant shall have no liability to any third parties who rely on any of its Developments or Services. Consultant shall provide Toronto Hydro with a list of any freeware, shareware or open source software used in the Developments. Any pre-existing intellectual property of Toronto Hydro, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of Toronto Hydro.

10. MISCELLANEOUS

10.1 Survival

In addition to the terms in this Agreement that by their nature survive the expiry or termination of the Agreement, the terms of Section 5 (Representations, Warranties and Indemnities), Section 8 (Confidentiality), Section 9 (Intellectual Property), and Section 0 (Injunctive Relief) shall survive the expiry of this Agreement for a term of five (5) years.

10.2 Injunctive Relief

(a) The Consultant acknowledges and agrees that the terms of Section 8 (Confidentiality) and Section 9 (Intellectual Property) of this Agreement are reasonably necessary to protect the legitimate interests of Toronto Hydro, are reasonable in scope and duration, and are not unduly restrictive.

(b) The Consultant further acknowledges that a breach of any of the terms of Section 8 (Confidentiality) or Section 9 (Intellectual Property) would render irreparable harm to Toronto Hydro, and that a remedy at law for breach of these sections would be inadequate, and that Toronto Hydro shall therefore be entitled to any and all equitable relief, including, without limitation,

injunctive relief without proof of actual damages, and any other remedy that may be available at law or in equity.

10.3 Subcontracting

The Consultant may not subcontract the performance of any part of the Services without Toronto Hydro's prior written approval. Where Toronto Hydro provides its prior written approval to the Consultant to subcontract all or part of the Services, then the Consultant shall enter into agreements with such permitted subcontractor(s) to require the permitted subcontractor(s) to provide Services in accordance with all of the terms of this Agreement. Notwithstanding the foregoing, the Consultant shall remain liable for any and all acts or omissions of any subcontractor(s) as if such acts or omissions were those of Consultant.

10.4 Force Majeure

Either party will be relieved of liability for delays in performance of its obligations hereunder where such delay is a result of Force Majeure. The party affected by the Force Majeure shall give prompt notice thereof to the other party and, upon cessation of the Force Majeure, shall take all reasonable steps to resume the performance of its obligations hereunder. If a delay in performance by reason of Force Majeure extends beyond thirty (30) Business Days, then either party may terminate this Agreement by written notice.

10.5 Waiver

No delay on the part of either party in exercising any of its rights hereunder or failure to exercise the same, nor the acquiescence thereto shall operate as a waiver except in the specific instance for which it is given and where such waiver is provided in writing by the party waiving its rights.

10.6 Amendments

None of the terms, conditions or provisions of this Agreement shall be varied, modified or altered except by written agreement signed by an authorized representative of each parties.

10.7 Assignment

Save and except for Toronto Hydro's right to assign this Agreement to any of its Affiliates, neither party may assign this Agreement or any of their rights or obligations hereunder, without the prior written authorization of the other party.

10.8 Enurement

This Agreement shall enure to the benefit of, and be binding upon, the parties hereto and their respective successors and permitted assigns.

10.9 Severability

In the event that any provision or portion of this Agreement is determined to be invalid or unenforceable for any reason, the remaining provisions or portions of this Agreement will be unaffected and will remain in full force and effect to the fullest extent permitted by law.

10.10 Non-Exclusive Agreement

This Agreement will not be interpreted to grant to the Consultant exclusive rights to provide the Services or to bind Toronto Hydro in any way to an exclusive relationship with the Consultant with regards to the Services or any other service.

10.11 Neutral Construction

The parties to this Agreement agree that this Agreement was negotiated fairly between them at arm's length, that the final terms of this Agreement are the product of the parties' negotiations, and that this Agreement shall be deemed to have been jointly and equally drafted by them, and that the provisions thereof should not be construed against a party on the grounds that such party drafted the Agreement in whole or in part.

10.12 Entire Agreement

This Agreement constitutes the entire agreement between the parties relating to the subject matter hereof. This Agreement supersedes any and all prior correspondence, warranties, covenants, collateral undertakings, or agreements, oral or otherwise, express or implied, unless otherwise contained herein.

10.13 Notices

(a) All questions or other communications regarding this Agreement, including any notices required by this Agreement, are to be addressed to the following addresses:

to Toronto Hydro:

Name:	Ekaterina Dolzhenkova
Title:	Senior Manager, Regulatory Analytics
Address:	14 Carlton Street, Toronto, Ontario M5B 1K5
Telephone:	(416) 275-8574
Email:	edolzhenkova@torontohydro.com

with copy to:

Title:	EVP, Public and Regulatory Affairs & Chief Legal Officer
Address:	14 Carlton, Toronto Hydro, ON M5B 1K5
Telephone:	(416) 542-3000
Email:	legal@torontohydro.com

to the Consultant:

Name:	Kevin Willerton
Title:	Director
Address:	Suite 4950, 100 King St. W. Toronto, ON Canada M5X 1B1
Telephone:	+1 403-816-5714
Email:	kevin.willerton@guidehouse.com

(b) All notices or communications shall be deemed to be received on the date of acceptance (as evidenced by the signature of the party) if delivered by personal delivery or courier, on the fifth

(5th) Business Day after mailing, if mailed by first class mail, or on the first (1st) Business Day after transmission, if sent by facsimile (provided the transmission is evidenced by documented proof of proper fax transmittal).

10.14 Governing Law

This Agreement shall be governed by and construed in accordance with the law of the Province of Ontario and the laws of Canada applicable therein.

10.15 Execution

This Agreement may be signed in counterparts and delivered by electronic means, each of which shall be deemed an original and all of which, together, shall have the same effect as if all constitute one and the same Agreement.

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the day and year first written above:

Guidehouse Canada Ltd.	**Toronto Hydro-Electric System Limited**
Per: 	Per: _____
Name: Benjamin Grunfeld	Name: Daliana Coban
Title: Partner	Title: Director, Regulatory Applications & Business Support
I have authority to bind the Consultant.	I have authority to bind Toronto Hydro.

SCHEDULE A

SERVICES

1. Services to be Performed

Toronto Hydro requires the Consultant to complete a lead lag study to determine the appropriate level of working capital for Toronto Hydro's 2025-2029 rate application, in accordance with OEB requirements. The final report will be filed with the OEB as expert evidence in Toronto Hydro's rate application in support of Working Capital Allowance. In preparing this report the Consultant shall examine probable future impacts on the working capital, and shall outline material changes compared to prior studies. The Consultant may be required to respond to interrogatories and/or testify before the OEB in relation to the study.

Use in Toronto Hydro's rate applications, OEB proceedings, and related matters shall be deemed a specific purpose of the Services and Developments for the purposes of Section 9.4 of the Agreement.

2. Specifications

The Consultant shall provide the Services to Toronto Hydro through the following two-phase work plan:

Phase 1: Draft Results
The Consultant shall create a preliminary working capital figure that Toronto Hydro can use for the purposes of preparing its regulatory application.

Task	Consultant Actions	Benefits/Outcomes Overview
Task 1: Project Mobilization	• Kick-off meeting • Complete data request templates • Identify key points of contact at Toronto Hydro	• Clear understanding of communication protocols, points of contact, timelines, and expectations
Task 2: Data Review & Confirmation	• Review data from Toronto Hydro • Populate initial model • Benchmark initial model outputs against past studies and peer utilities • Staff interviews to ensure understanding of data and initial results	• Team has a solid understanding of Toronto Hydro's data and drivers behind initial results • Initial model results are compared against multiple reference points to identify areas of improvement and potential points of contention
Task 3: Finalize Model & Present Initial Results	• Integrate Toronto Hydro staff feedback into the model • Complete independent QA/QC of the model • Present initial study results including comparison to previous study results	• Model is developed with robust processes to ensure an accurate reflection of utility operations • Results are reviewed by Toronto Hydro staff

		• Risks are identified early to help formulate regulatory strategy
Task 4: Preliminary Results	• Integrate Toronto Hydro staff feedback from initial study results into the model • Present, in person at Toronto Hydro offices, preliminary study results along with key underlying assumptions in PPT form	• Results and key underlying assumptions will be understood by Toronto Hydro staff

Phase 2: Draft and Final Reports
Based on the results of Phase 1 and feedback provided by Toronto Hydro, the Consultant shall prepare a final report.

Task	Consultant Actions	Benefits/Outcomes Overview
Task 5: Draft Reports	• Incorporate results of Phase 1 and Toronto Hydro feedback into first draft report • Submit to Toronto Hydro for feedback and create a second draft report. Submit second draft to Toronto Hydro for comment.	• Toronto Hydro staff has two opportunities to provide feedback
Task 6: Final Report	• Produce final report	• Multiple iterations of report ensures completeness and improves robustness for submission to OEB

3. Timetable / Developments

a) The Consultant shall provide the following Development as part of the Services:
   i. **Draft Results:** A preliminary working capital figure based on an initial study that Toronto Hydro can use for the purposes of preparing its regulatory application.
   ii. **Final Report**: Final report detailing the methodology and procedures used while conducting the study; assumptions (if any); calculations supporting the working capital amount; the final working capital amount.

b) The Services shall be completed on the following timeline:

Work Plan Stage	Completion Date:
Phase 1	10 weeks post-execution of this Agreement
Phase 2	8 weeks post-completion of Phase 1

The above timeline is conditional upon Toronto Hydro providing responses to data requests within a reasonable time period and feedback on draft reports within 10 business days.

4. Fees

Toronto Hydro shall pay the Consultant a fixed fee of [redacted] for the Services, exclusive of HST. The Consultant shall invoice Toronto Hydro in accordance with Section 6.2 of this Agreement and the following milestones:

Milestone	Invoice Amount
Completion of Task 2	[redacted]
Completion of Task 4	[redacted]
Delivery of Final Report (Task Six)	[redacted]

5. Additional Services

a) In addition to the Services as set out above in this SCHEDULE A, the Consultant shall further provide additional services (the "Additional Services") on an as-needed basis per the request of Toronto Hydro. Additional Services shall be billed on an hourly basis at the following Hourly Rates:

i. For general work outside of the scope of the Services described in sections 2 and 3 above, including any potential scenario or sensitivity analysis:

Level	[redacted]
Partner	
Director	
Associate Director	
Managing Consultant	
Senior Consultant	
Consultant	

ii. For work directly related to a regulatory application, including but not limited to responding to IRs and testifying:

Level	[redacted]
Partner	
Director	
Associate Director	
Managing Consultant	
Senior Consultant	
Consultant	

The Hourly Rates set out in this Section 4(a)(i) are subject to a 5% annual increase starting July 1, 2023.

b) The Consultant shall invoice Toronto Hydro on a monthly basis in accordance with Section 6 of this Agreement for all Additional Services provided.

SCHEDULE B

DEFINITIONS

In this Agreement, the following definitions shall apply:

“Additional Services”	has the meaning prescribed to it in SCHEDULE A;
"Affiliates"	has the meaning prescribed to it in the *Business Corporations Act* of Ontario, as amended from time to time;
"Agreement"	means this Agreement for Professional Consulting Services, including all recitals, schedules and attachments thereto;
"Anticipated Hours"	has the meaning prescribed in Section 0;
"Applicable Laws"	means all federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to this Agreement, including without limitation all applicable OEB codes, rules or guidelines;
"Business Day"	means a day on which banks are open for business in the City of Toronto, Ontario, but does not include a Saturday, Sunday, or a civic or statutory holiday in the Province of Ontario;
"Confidential Information"	means the terms of this Agreement and any and all data or information relating to the business, management or affairs of Toronto Hydro, its customers, employees, or any of its Affiliates disclosed by Toronto Hydro to the Consultant pursuant to this Agreement, whether or not such Confidential Information is expressly identified as confidential. Notwithstanding the foregoing, Confidential Information does not include any information or data which: (a) information or data that is or becomes publicly known through no breach of the terms or conditions of this Agreement; (b) information or data that is independently developed without reference to Confidential Information and without breach of the terms and conditions of this Agreement; or (c) Confidential Information that is required by court order or other legal compulsion to be disclosed, in which case the Consultant shall give Toronto Hydro prior written notice of such disclosure, as permitted by law;
"Consultant"	means Guidehouse Canada Ltd.;
“Consultant Information”	has the meaning prescribed in Section 0;
“Cybersecurity Incident”	has the meaning prescribed to it in SCHEDULE D;
"Development"	means any and all works prepared, generated, created or designed by the Consultant pursuant to this Agreement, including without limitation all drawings, models, designs, formulae, methods, documents, reports,

	software, specifications, or source codes, and any related works, enhancements, modifications or additions thereto;
"Fees"	shall have the meaning as prescribed in Subsection 0;
"Force Majeure"	means any impediments beyond the control of the applicable party due, wholly or in part, directly or indirectly, to: strikes, lockouts, riots, epidemics, war, governmental regulations, fire, explosions, acts of God, or any other impediment beyond the control of the party affected;
"Governmental Authority"	means any government, legislature, municipality, regulatory authority, agency, commission, department, board or court or other law, regulation or rule-making public entity of similar authority, including, without limitation the OEB;
"Guidelines"	has the meaning prescribed in Subsection 0;
"Hourly Rate"	shall have the meaning prescribed in SCHEDULE A;
"HST"	means Harmonized Sales Tax;
"IESO"	means the Independent Electricity System Operator;
"Industry Standards"	means the then-current industry standards and best practices used or observed by leading Canadian and United States providers of services to companies similar to Toronto Hydro and which are the same or similar to the Services;
"Intellectual Property"	includes all trademarks, copyrights, patents, business names, trade secrets, proprietary software, analysis or techniques (whether or not patented or patentable), confidential or secret designs and processes, source codes, plans or devices, or other proprietary and intellectual property rights;
"MFIPPA"	means the *Municipal Freedom of Information Act;*
"OEB"	means the Ontario Energy Board;
"Personal Information"	means information from or about an individual (or any information that is combined with such information) including information that can be used to authenticate that individual, that is: (i) provided to Vendor by Toronto Hydro; or (ii) collected, accessed, used, stored or disclosed by Vendor on behalf of Toronto Hydro in connection with Consultant's obligations pursuant to the Agreement;

“PIPEDA”	means the *Personal Information Protection and Electronic Documents Act* (Canada);
“Pre-Existing IP”	has the meaning prescribed to it in Section 0;
"Privacy Laws"	has the meaning prescribed to it in Section 4.5;
"Representative"	in respect of a party, means such party’s directors, officers, employees, agents, contractors and advisors, the party’s Affiliates, and all such Affiliates’ respective directors, officers, employees, agents, contractors and advisors;
"Remittances"	has the meaning prescribed to it in Subsection 0;
“Security Incident”	means any set of facts or circumstances that would lead a reasonable person to conclude that there has been the loss of or improper, unauthorized or unlawful access to, use of, destruction of, or disclosure of Toronto Hydro Data, including, but not limited to, a Cybersecurity Incident;
"Services"	means all of the Developments, services and specifications to be provided, performed and met by the Consultant under this Agreement, as more particularly described in SCHEDULE A;
“Service Level”	means the standards for the performance of the Services and for Vendor’s management of Security Incidents, as more particularly set out in this Agreement;
“Specifications”	means for any Service, deliverable, vendor system or vendor facility, the technical, functional, physical or other relevant specification, documentation, or requirements set out in the Agreement, otherwise in identified in writing by the parties, or otherwise inherent or necessarily included as part of the specification or requirements specifically set out herein or therein, including any operating manuals or operating plans referenced in a SOW;
“System”	means any computer system, including any network, used in connection with the provision of the Services;
"Term"	has the meaning prescribed to it in Section **Error! Reference source not found.**;
"Toronto Hydro"	means Toronto Hydro-Electric System Limited; and
“Toronto Hydro Data”	means (i) Personal Information and (ii) any other related data that Consultant collects, uses, or stores pursuant to the Agreement that contains the confidential or proprietary information of Toronto Hydro.

SCHEDULE C

Ontario Energy Board *Rules of Practice and Procedure* Rule 13A

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the OEB impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

a. the expert's name, business name and address, and general area of expertise;
b. the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;
c. the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;
d. the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;
e. in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and
f. an acknowledgement of the expert's duty to the OEB in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the OEB may require two or more of the experts to:

a. in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and
b. at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the OEB and others as permitted by the OEB, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the OEB, including as to:

a. scope and timing;
b. the involvement of any expert engaged by the OEB;
c. the costs associated with the conduct of the activities;
d. the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of Rule **13A.04**; and
e. any issues in relation to confidentiality.

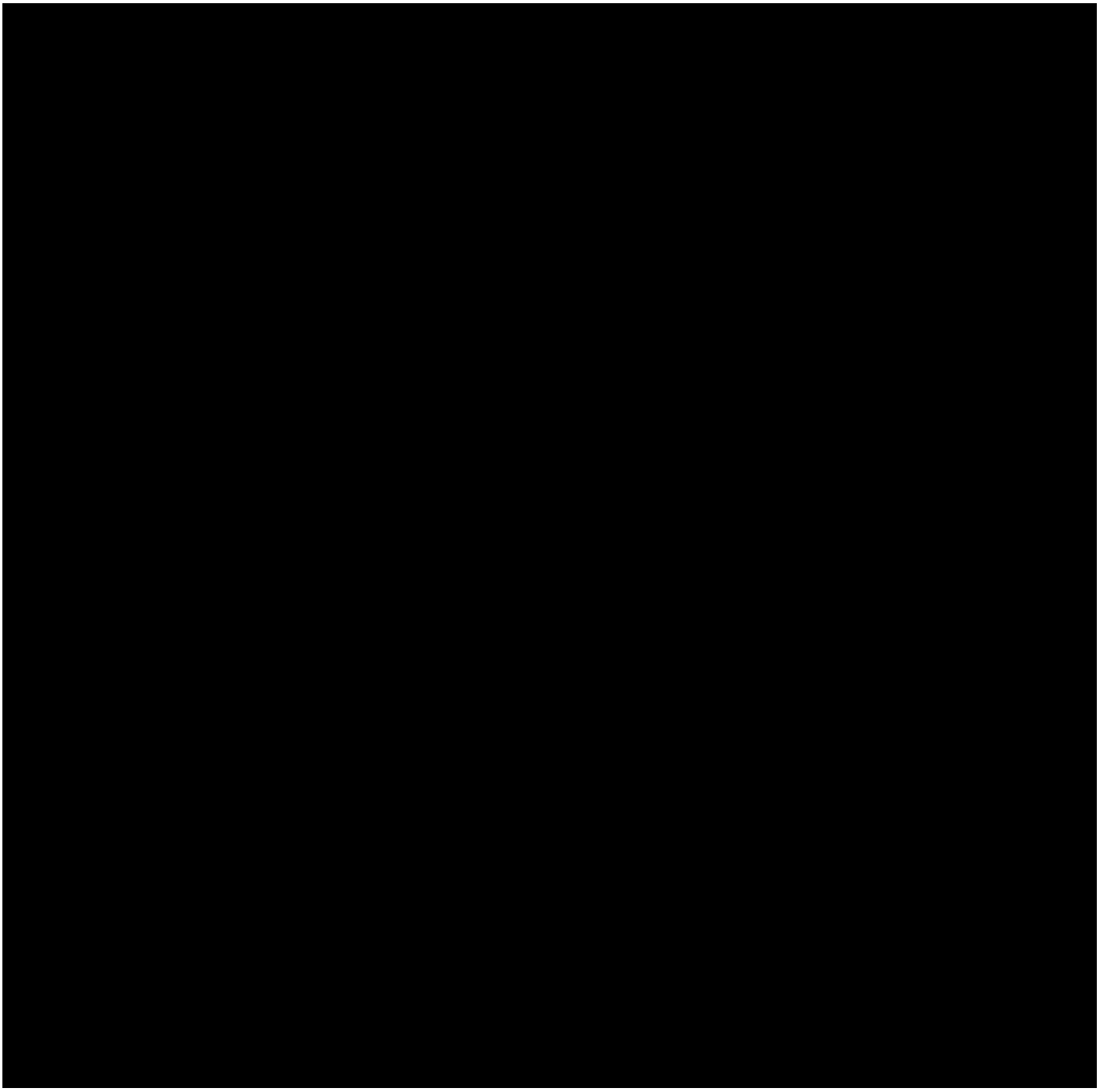
13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A**.

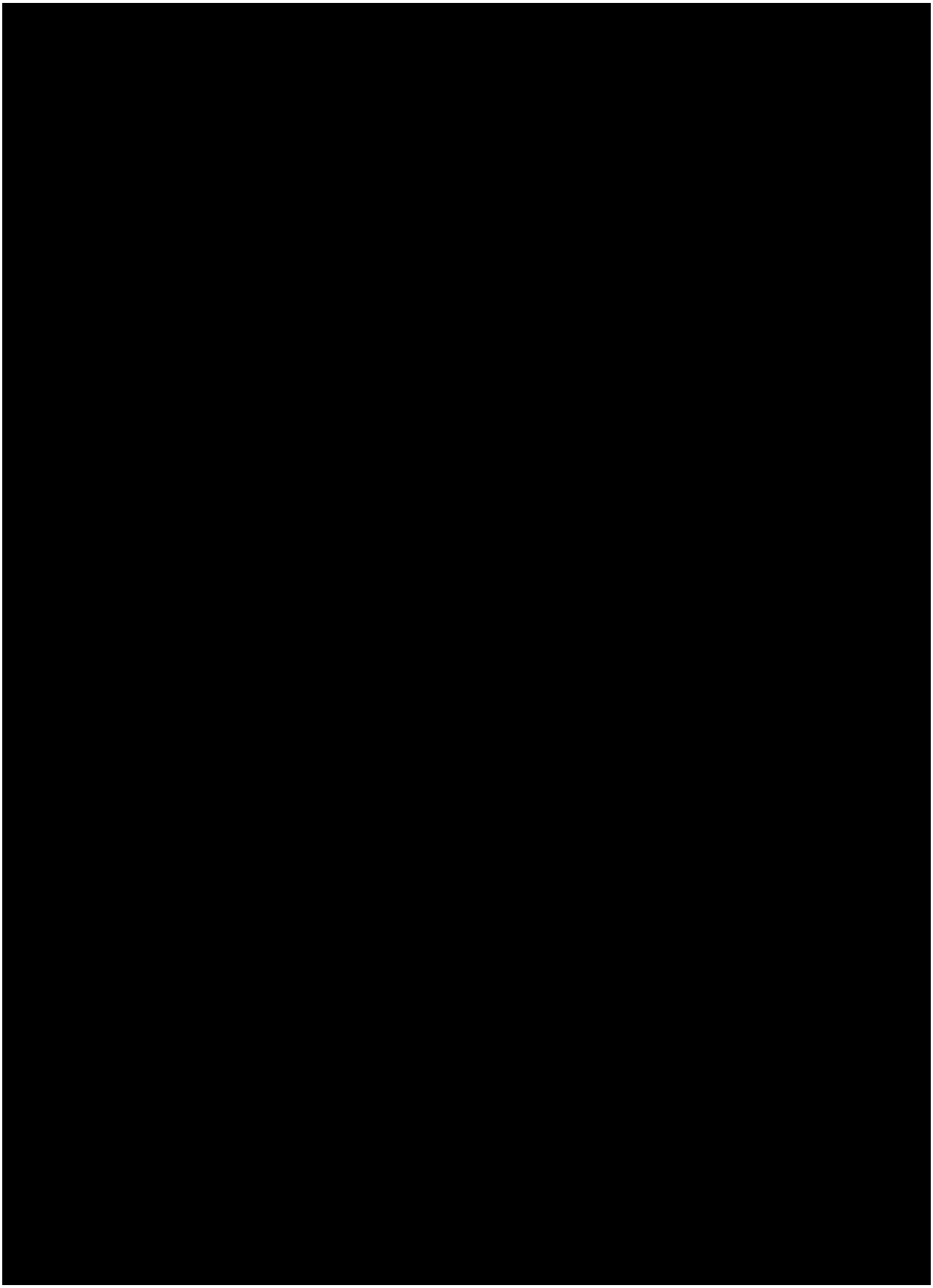
SCHEDULE D

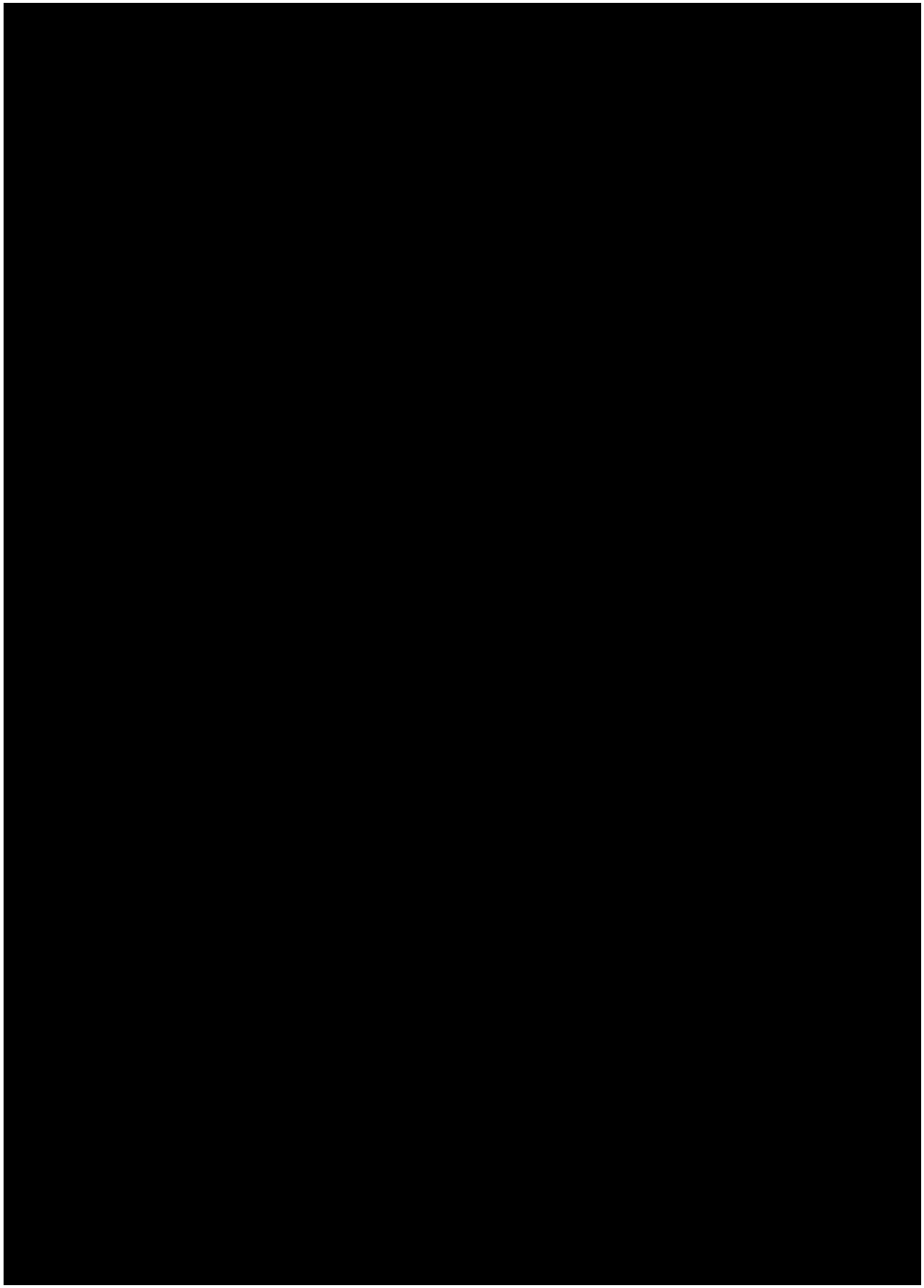
Cybersecurity Controls

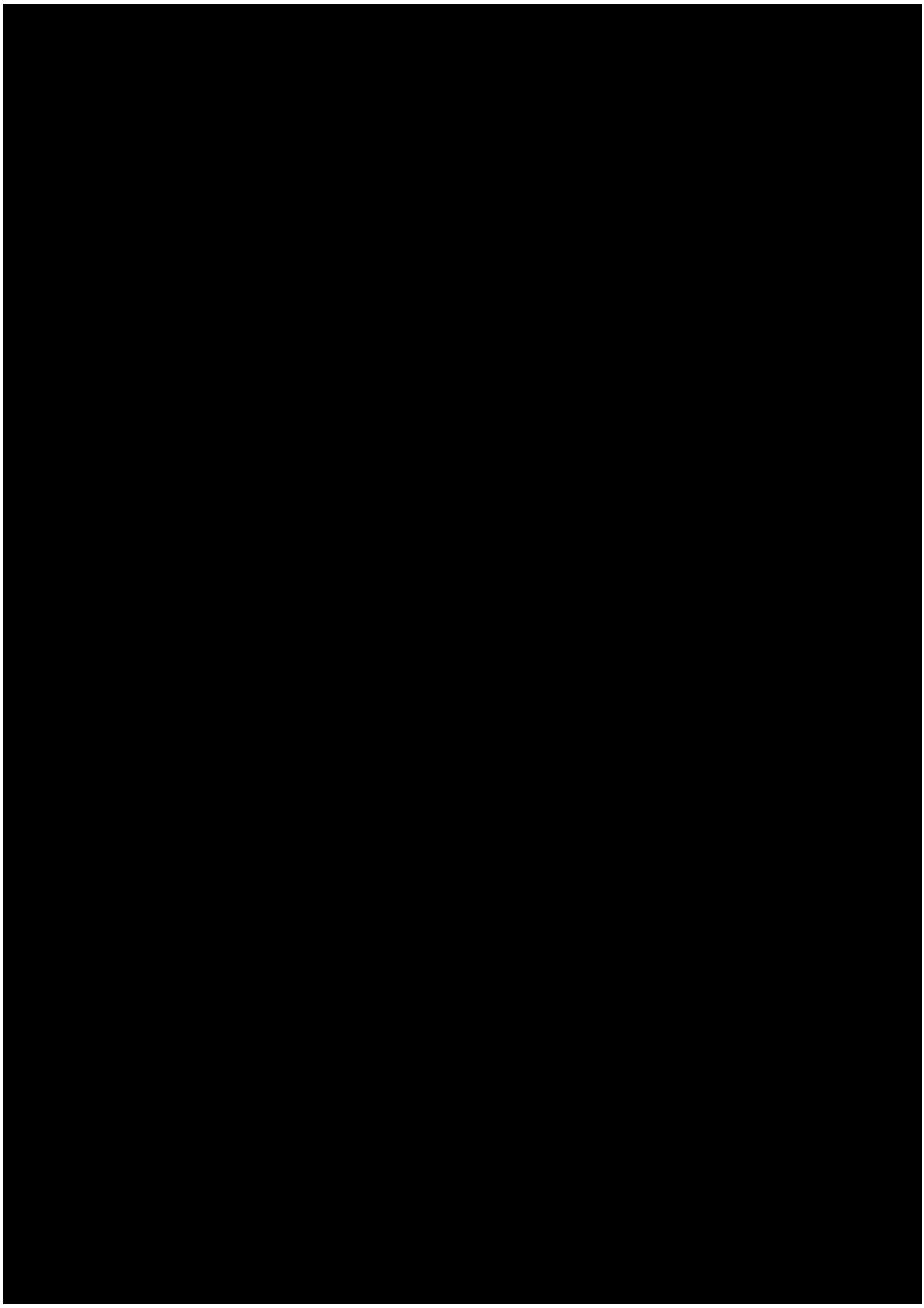
This Schedule D ("**Schedule**") is attached to, and made part of, the Agreement for Professional Consulting Services dated as of October 31, 2022 (the "**Agreement**") by and between Toronto Hydro-Electric System ("**Toronto Hydro**") and Guidehouse Canada Ltd. ("**Vendor**"). All capitalized terms used in this Schedule and not defined in this Schedule have the same meaning as set forth in the Agreement.

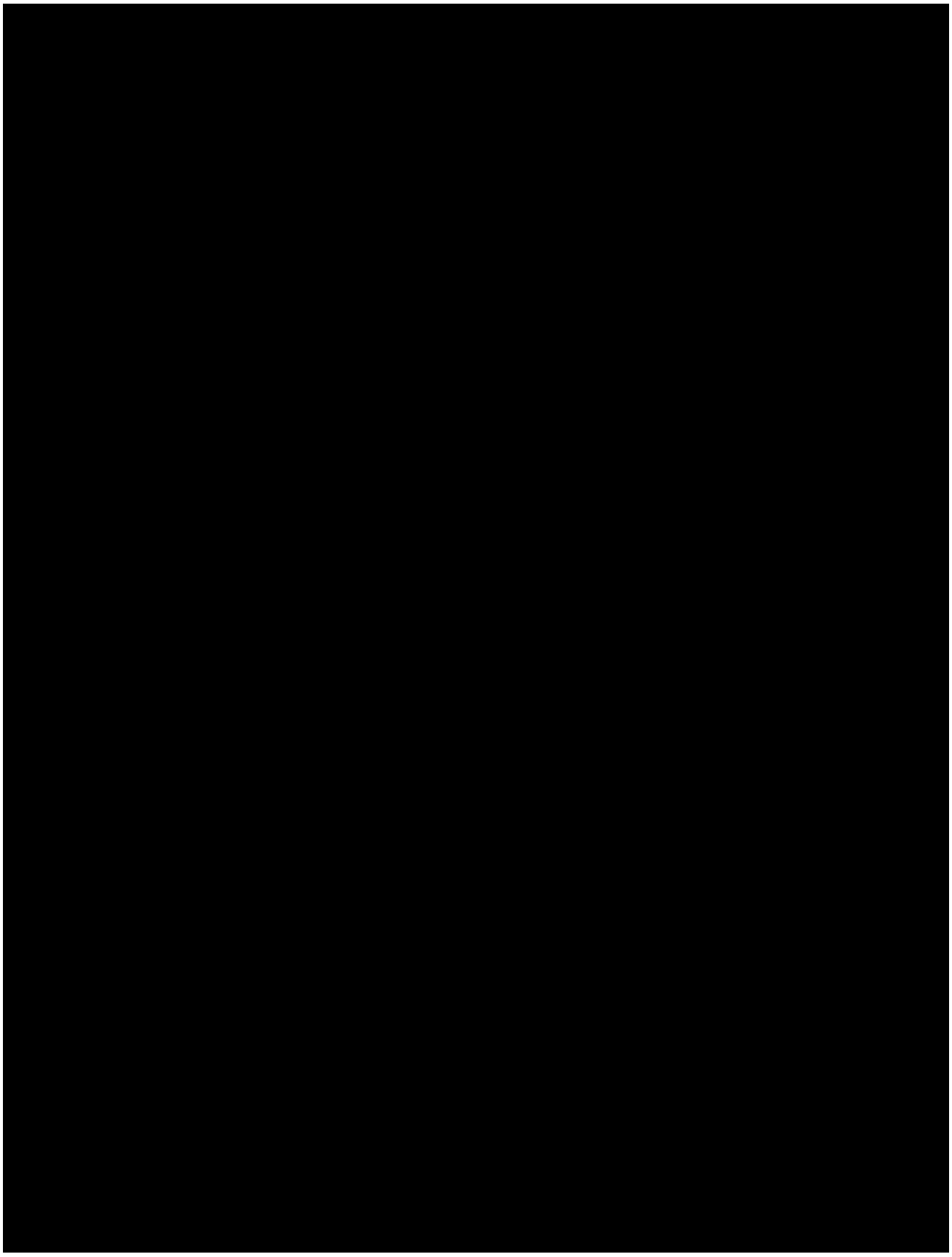
Vendor will provide Cybersecurity Controls in accordance with the requirements set forth in this Schedule.

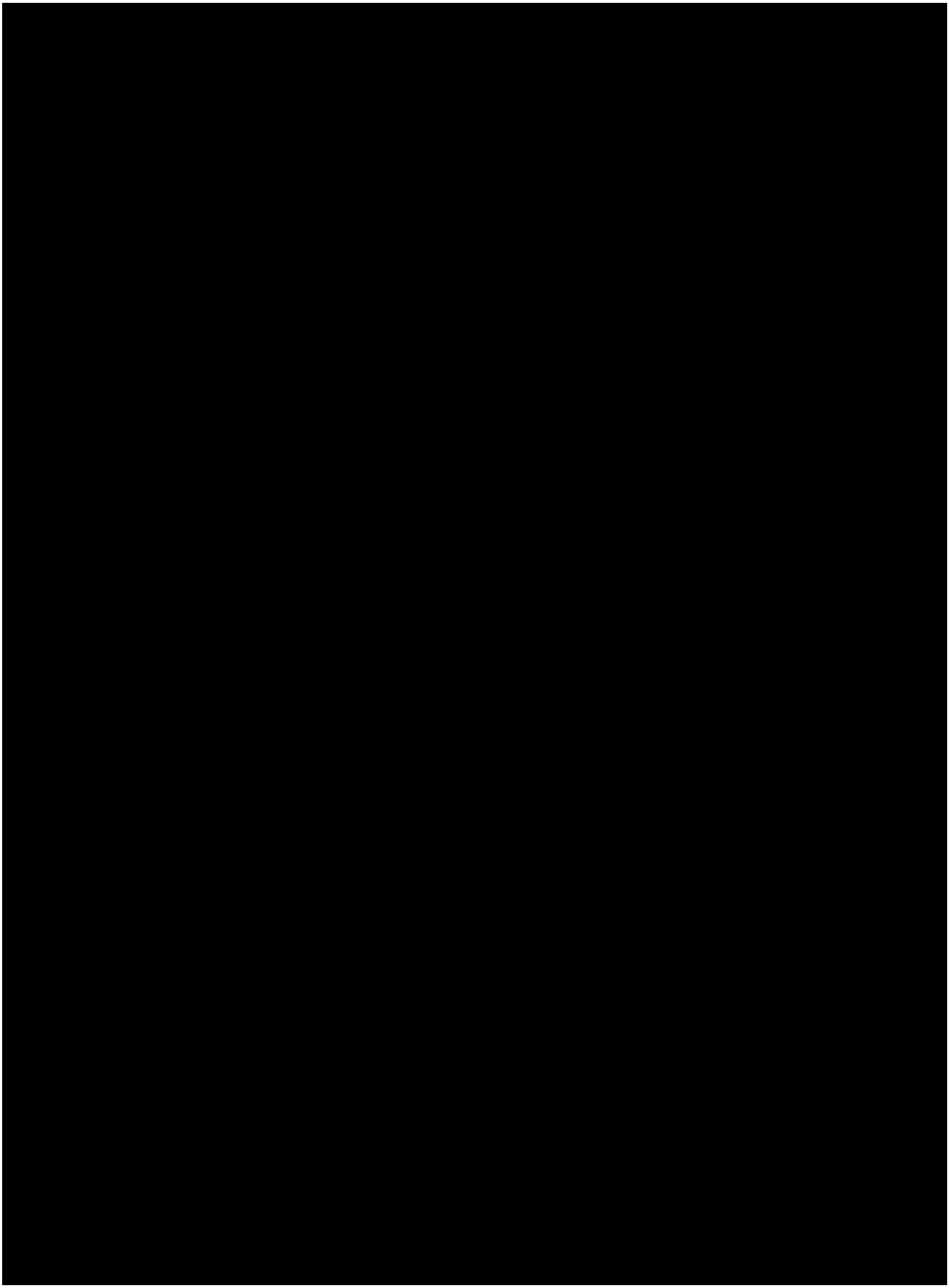


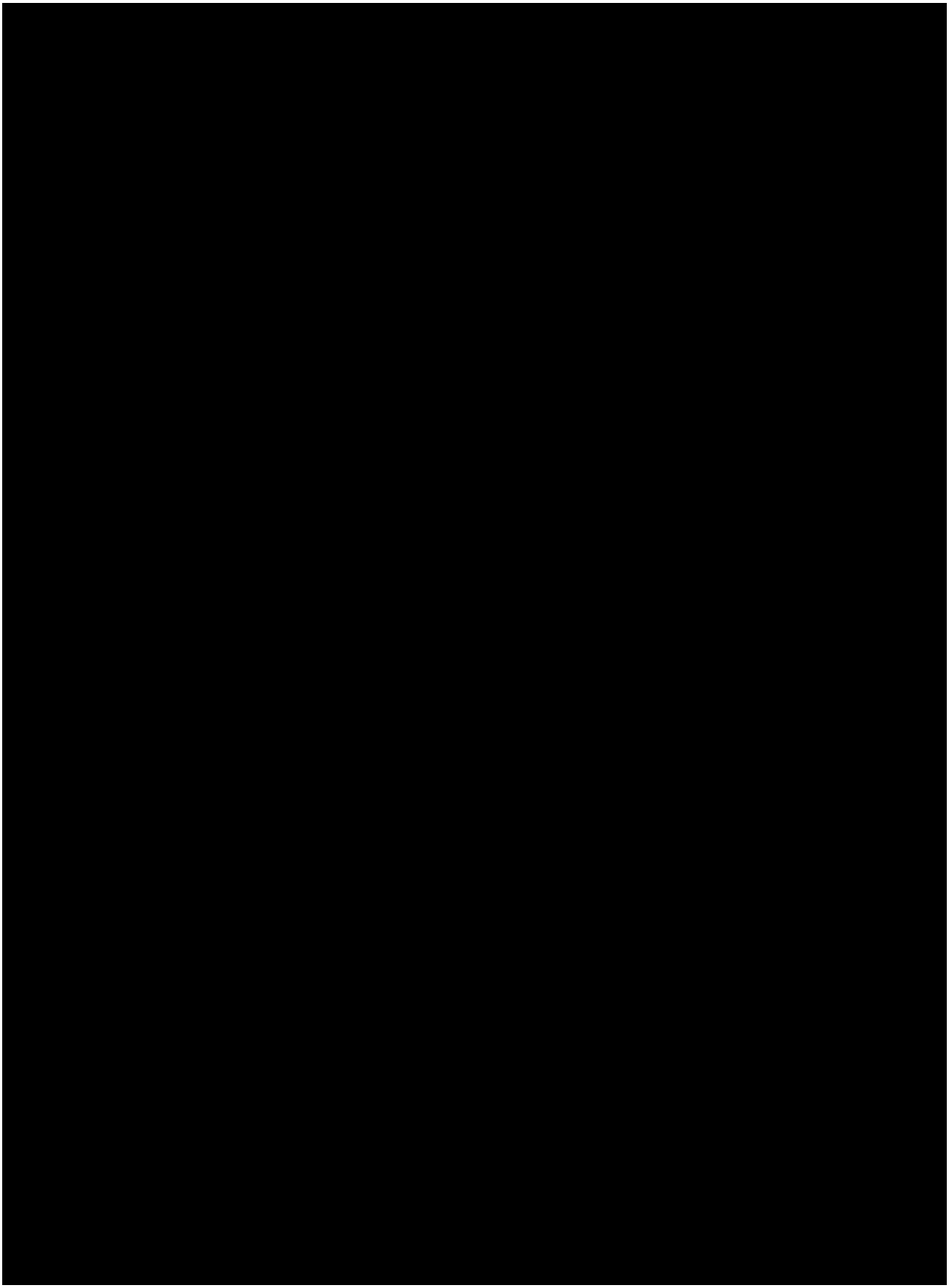


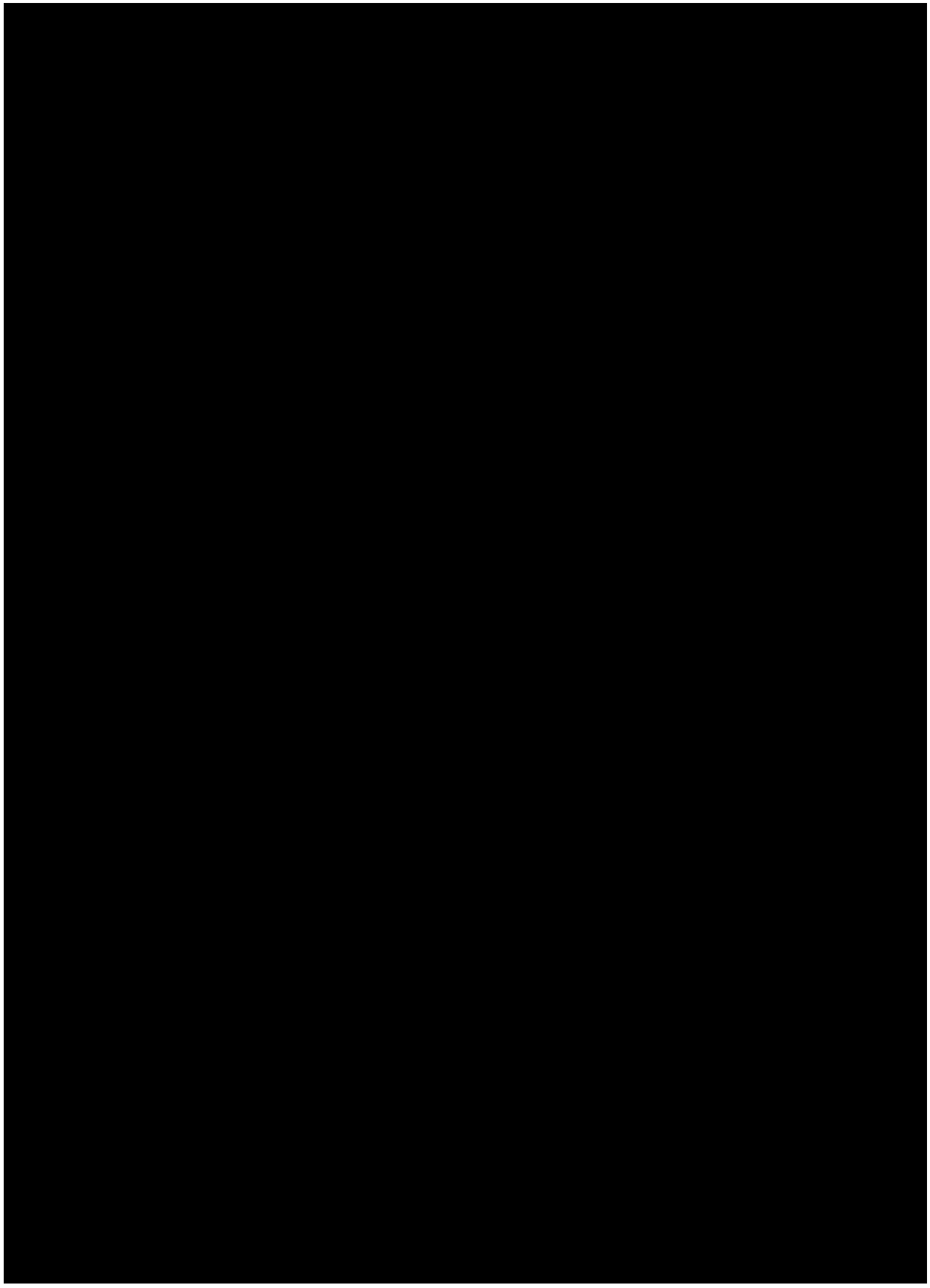










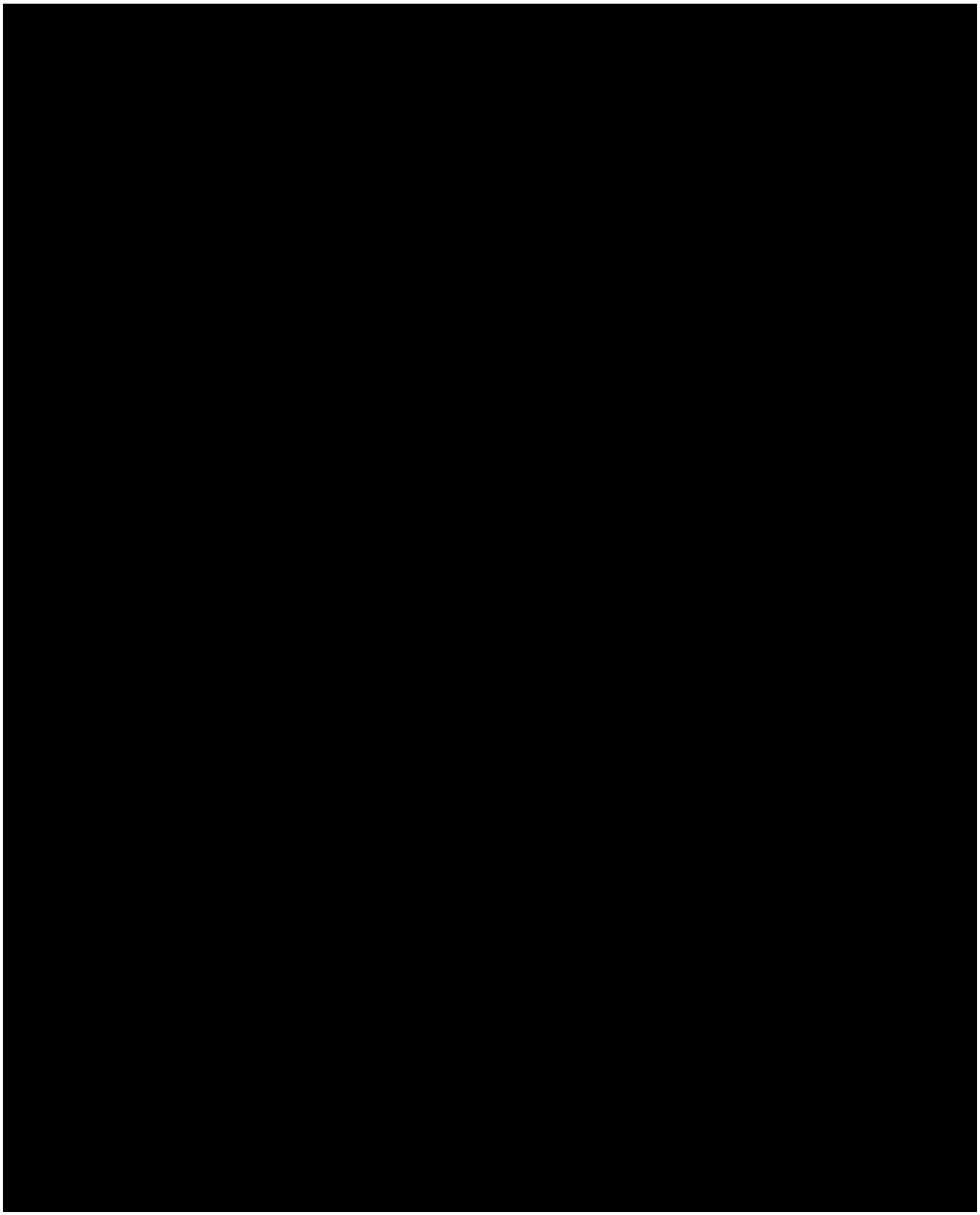


Appendix A to Schedule D Cybersecurity Controls

Vulnerability and Remediation Response

The vulnerability of the risk rating is determined by the CVSS score set forth below.



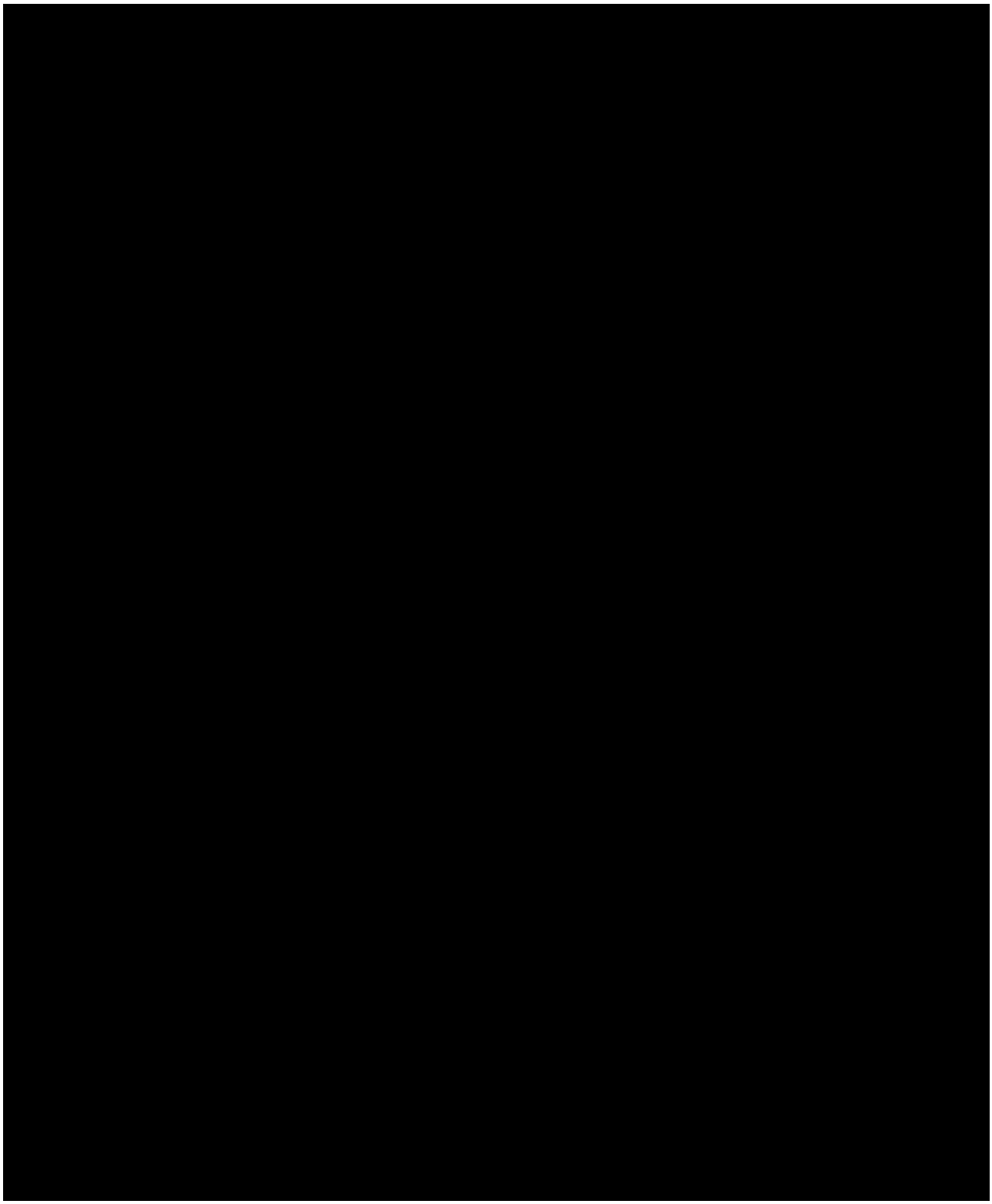


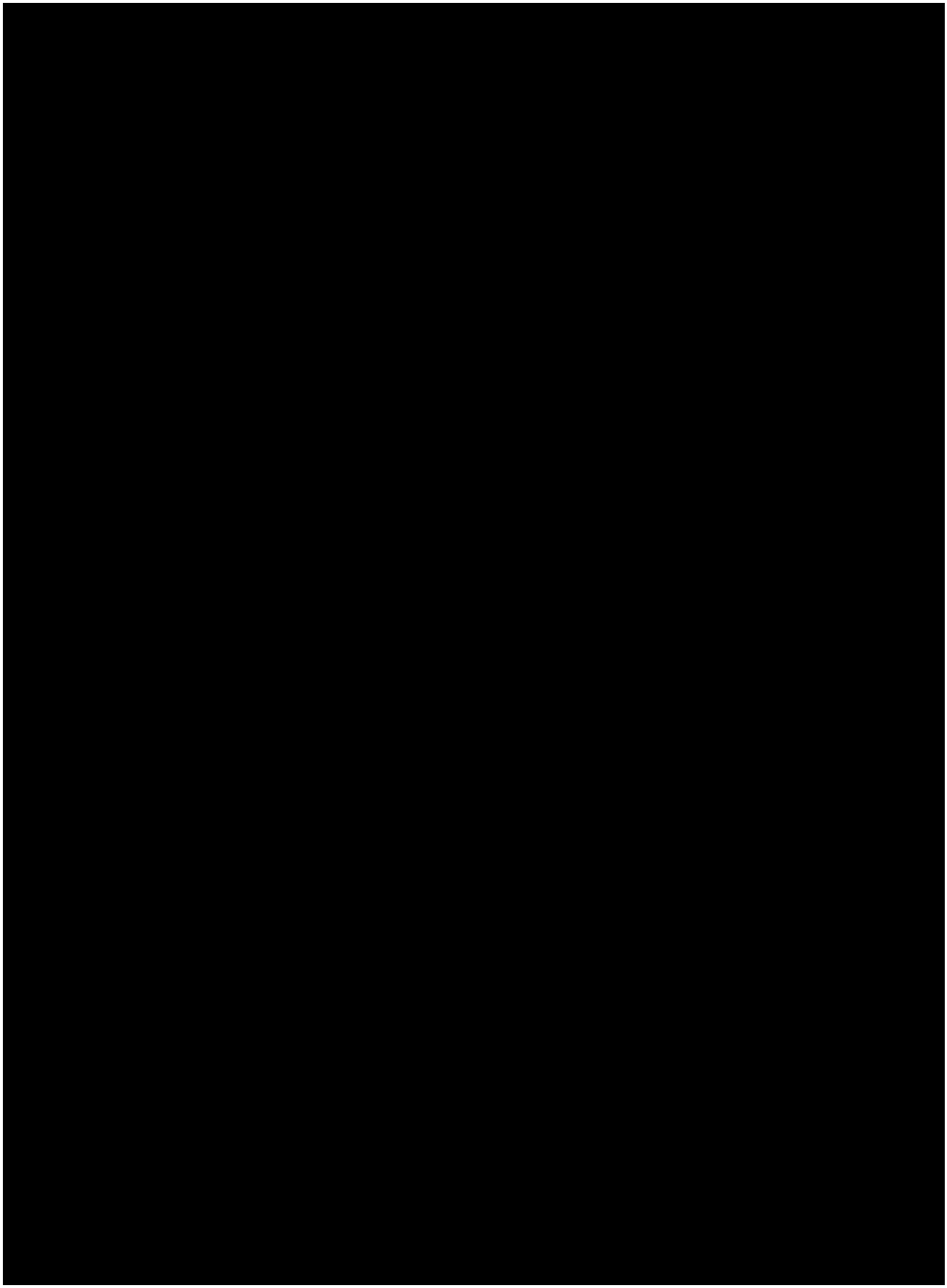


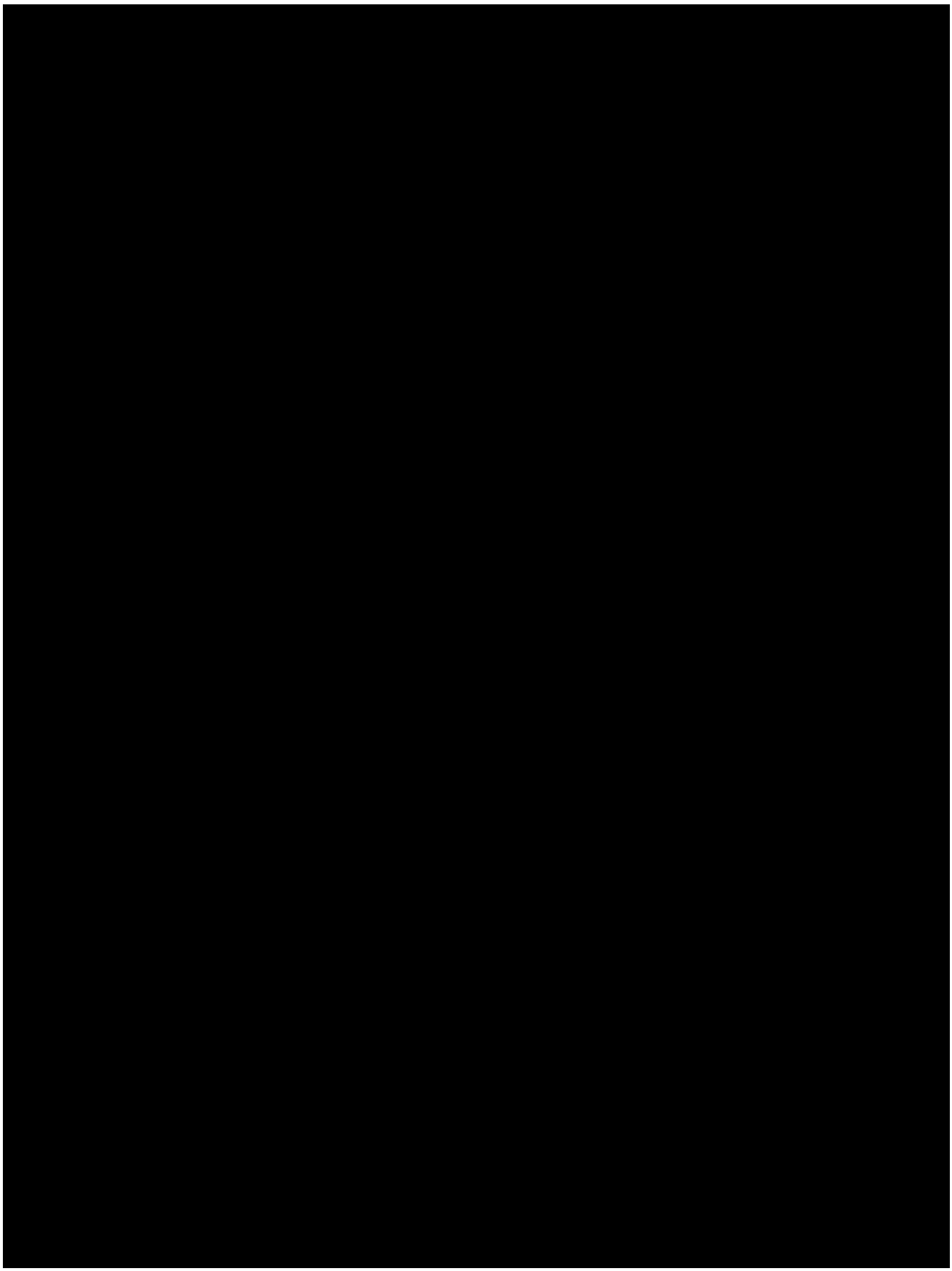


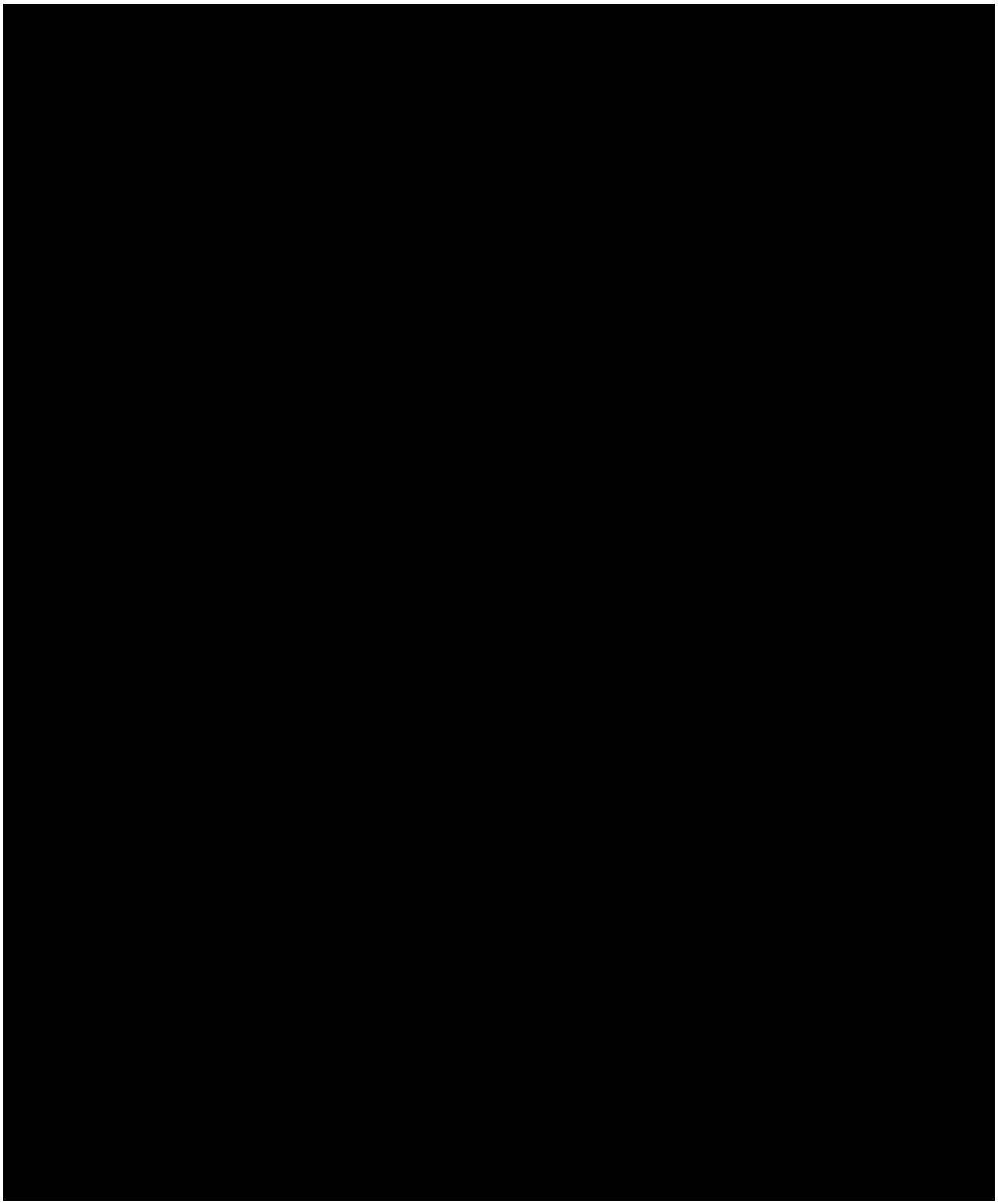
Appendix B to Schedule D Cybersecurity Controls

Cybersecurity Incident Response









Agreement for Professional Consulting Services

THIS AGREEMENT is made as of the 27th day of April, 2022 between **Toronto Hydro-Electric System Limited** ("Toronto Hydro"), a corporation incorporated under the laws of the province of Ontario and **Concentric Advisors ULC**, a corporation incorporated under the laws of the province of Alberta (the "Consultant"), pursuant to which Toronto Hydro shall retain the Consultant to provide certain Services, and the Consultant shall provide such Services, during the Term, subject to the terms and conditions hereof;

NOW THEREFORE, in consideration of the mutual covenants set forth herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. INTERPRETATION

Unless otherwise indicated, all capitalized terms in this Agreement shall be as defined in SCHEDULE B and any reference to currency in this Agreement shall refer to lawful money of Canada.

2. RELATIONSHIP OF THE PARTIES

2.1 Retainer

Toronto Hydro hereby retains the Consultant to provide the Services, and the Consultant hereby agrees to provide the Services, during the Term, in accordance with the terms and conditions of this Agreement.

2.2 Independent Contractors

(a) Notwithstanding any provision hereof, this Agreement does not constitute and shall not be construed as constituting a partnership, joint venture, principal/agency relationship, or employer/employee relationship between the parties. The Consultant and Toronto Hydro shall at all times remain independent contractors of each other, and neither party shall represent itself to be an agent or employee of the other.

(b) Without limiting the generality of paragraph 2.2(a), the Consultant hereby acknowledges and agrees that neither it nor its Representatives shall be eligible or entitled, by reason of this Agreement, to participate in any employee-related program offered by Toronto Hydro or any of its Affiliates, including, without limitation, any benefit, insurance, compensation, health plan, bonus or retirement program.

(c) The Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities or claims whatsoever against Toronto Hydro or its Representatives resulting from or relating to the Consultant or its Representatives being deemed to be an employee of Toronto Hydro or any of its Affiliates.

(d) The Consultant hereby acknowledges and agrees that Toronto Hydro shall not be responsible for and shall not have control or charge of any means, methods, techniques,

sequences or procedures used for or in respect of the Services, or for the safety precautions or programs required for the Services or otherwise prescribed hereunder.

2.3 Conflicts of Interest

The Parties acknowledge that there is potential for a conflict of interest based on services provided by the Consultant from time to time to Toronto Hydro. The Consultant agrees to take all such steps as Toronto Hydro deems necessary, acting reasonably, to remove, mitigate or minimize such conflict of interest.

3. TERM

3.1 Term

Unless otherwise terminated in accordance with the provisions hereof, this Agreement shall be for a term commencing on April 27, 2022 and terminating on April 26, 2025 (the "**Term**").

4. SERVICE REQUIREMENTS

4.1 Services

During the Term, the Consultant shall perform the Services as detailed in SCHEDULE A hereto.

4.2 Time and Availability

(a) Unless otherwise directed in writing by Toronto Hydro, the Consultant shall have discretion in selecting the dates and times it performs the Services throughout the month, giving due regard to the needs of Toronto Hydro's business requirements and provided that any access to Toronto Hydro property shall be during regular business hours.

4.3 Revision to Services

(a) The Parties acknowledge and agree that the Services to be undertaken and completed by the Consultant under this Agreement may be subject to revision or amendment from time to time during the Term: (i) as required by Toronto Hydro to comply with the Guidelines or other standards set out in section 4.4 below; (ii) as required by Toronto Hydro to comply with the Applicable Laws or any order, instruction, directive or legal requirement of a Governmental Authority; or (iii) as required by Toronto Hydro to ensure that Toronto Hydro receives the expected funding and benefits with respect to the project to which the Services relate.

(b) Toronto Hydro agrees to provide the Consultant with written notice of any revision or amendment to the Services required pursuant to this Section 4.3, and subject to the terms of Subsection 4.3(d) below, the Consultant shall comply with all such directives.

(c) In the event that the Consultant fails to comply with a directive issued by Toronto Hydro pursuant to this Section 4.3, Toronto Hydro shall have the right, in addition to any other remedies which may be available to Toronto Hydro hereunder or otherwise at law, to terminate this Agreement by giving written notice of termination to the Consultant whereupon this Agreement shall terminate as at the effective date of termination specified in the notice and the provision of Section 7 shall apply.

(d) Notwithstanding Subsection 4.3(b), where a directive from Toronto Hydro results in a material change in the scope and/or implementation of the Services, then the Consultant shall have the right to terminate this Agreement by giving notice of termination to Toronto Hydro whereupon the Agreement shall terminate as at the effective date of termination specified in the notice and the provisions of Section 7 shall apply.

4.4 Applicable Laws

(a) The Consultant shall, at its sole expense, obtain and maintain during the Term of this Agreement, all permits, licences and approvals required by all Applicable Laws to perform its obligations under this Agreement. The terms and conditions of this Agreement shall be carried out in strict compliance with all Applicable Laws and in the event of any conflict between any Applicable Laws, the Applicable Laws with the most stringent standard shall apply.

(b) Without limiting the generality of the foregoing, the Consultant shall comply with:

(i) the *Municipal Freedom of Information and Protection of Privacy Act* (Ontario) ("MFIPPA"), the *Personal Information Protection and Electronic Documents Act* (Canada) ("PIPEDA") and any other applicable privacy legislation (collectively, "Privacy Laws") with respect to any personal information collected, used or disclosed in connection with this Agreement and shall indemnify and hold harmless Toronto Hydro and its Representatives from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments (including related expenses and legal costs) they may incur related to or arising out of any non-compliance therewith;

(ii) In its performance of the Services under this Agreement, the International Financial Reporting Standards (IFRS) including International Accounting Standards (IAS) and Interpretations thereto;

(c) Where any Deliverable is subject to the approval or review of any authority, department, government or agency other than Toronto Hydro, such applications for approval or review shall, unless otherwise authorized by Toronto Hydro in writing, be prepared by the Consultant to be approved and submitted by and through the offices of Toronto Hydro, and the Consultant shall not have any direct dealings with the authority, department, government or agency in question with regards to the Deliverable.

(d) The Consultant and the Consultant's personnel shall comply with all rules and direction of Toronto Hydro, whether specified in this Agreement or otherwise, while working on Toronto Hydro's premises or when accessing or connecting to Toronto Hydro's information technology systems, including rules and directions concerning health, safety, security and environmental protection, including without limitation, Toronto Hydro's *Code of Business Conduct and Whistleblower Procedure,* Toronto Hydro's *Disclosure Policy,* Toronto Hydro's *Social Media and Digital Communication Policy,* Toronto Hydro's *Accessibility Policy,* Toronto Hydro's *Workplace Harassment Policy and Program,* Toronto Hydro's *Violence Prevention in the Workplace Policy,* Toronto Hydro's *Workplace Alcohol and Drug Policy*, Toronto Hydro's *Environmental Policy,* Toronto Hydro's *Occupational Health and Safety Policy,* Toronto Hydro's *Privacy Policy,* Toronto Hydro's *Cyber Security Policy*, Toronto Hydro's *Technology Use Guidelines*, Toronto

Hydro's *Physical Security Policy*, Toronto Hydro's *COVID-19 Vaccination Policy,* and the *Affiliate Relationships Code for Electricity Distributors and Transmitters* issued by the OEB (together, the "Guidelines"). The Consultant agrees to comply with and to direct its Representatives to comply with such Guidelines, as amended.

4.5 Performance

(a) The Services shall be performed to the satisfaction of Toronto Hydro, and Toronto Hydro shall have the right, at all reasonable times, to inspect or otherwise review the Services performed or being performed. The Consultant shall, upon the request of Toronto Hydro, acting reasonably, provide Toronto Hydro with written reports of the status of the Deliverables and the Consultant's progress in providing the Services.

(b) In the event of any dispute between Toronto Hydro and the Consultant relating to the quality or acceptability or rate of progress of any of the Services, or relating to the interpretation of any instructions or specifications concerning the Services, Toronto Hydro and the Consultant shall, both acting reasonably, attempt to mutually reach a resolution in good faith.

5. REPRESENTATIONS, WARRANTIES, INDEMNITIES AND INSURANCE

5.1 Representations and Warranties

The Consultant hereby represents, warrants and agrees that:

(i) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has/have the necessary experience and qualifications to perform the Services;

(ii) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) will perform the Services in a diligent, expeditious and workmanlike manner, consistent with standards generally observed by reputable and competent members of the same industry providing similar services;

(iii) all Services shall be the Consultant's (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) original work and none of the Services or any invention, development, use, production, distribution or exploitation relating thereto will infringe, misappropriate or violate any intellectual property or other right of any person or entity.

(iv) If, during the performance of these Services or within six months following completion of the Services, such Services shall prove to be faulty or defective by reason of a failure to meet such standards, Consultant agrees that upon prompt written notification from Toronto Hydro prior to the expiration of the six month period following the completion of the Services containing any such fault or defect, such faulty portion of the Services shall be redone at no cost to Toronto Hydro up to a maximum amount equivalent to the cost of the Services rendered under this Agreement. The foregoing shall constitute

Consultant's sole liability with respect to the accuracy or completeness of the work and the activities involved in its preparation, but shall not limit or exclude the Consultant's obligations otherwise set out under this Agreement, including, but not limited to sections 5.2 and 9.3 below.

5.2 Indemnity

a) The Consultant shall be liable for and shall indemnify and hold harmless Toronto Hydro and its Representatives from all claims, demands, actions, penalties, damages, losses, judgments and settlements, liabilities, costs, expenses, including legal fees and other related costs and expenses arising out of, related to, or incident to, the Consultant's or any of its Representatives' performance of the Services under this Agreement, including, without limitation:

i. any breach, violation or non-performance by the Consultant or any of its Representatives of any terms, conditions, warranties, obligations or covenants contained in this Agreement;
ii. any breach or violation by the Consultant or any of its Representatives of any Applicable Laws; and
iii. any actions, omissions, negligence or wilful misconduct of the Consultant or any of its Representatives

except to the extent directly caused or contributed to by the negligence or wilful misconduct of Toronto Hydro or its Representatives.

b) In no event shall either party be liable for loss of profit or use or for any indirect, special, incidental or consequential damages of any nature or kind including but not limited to delays, loss of revenue, loss of use, loss of data, loss of product, costs of capital or costs or replacement power, even if that party has been advised of the possibility of such damages.

c) Subject to section 5.2(d), the Consultant's liability for a claim for damages shall be limited to three (3) times the amounts paid or payable by Toronto Hydro to the Consultant pursuant to this Agreement.

d) Notwithstanding the foregoing, no exclusion or limitation of liability shall apply to:

i. Breach of the confidentiality or privacy obligations in this Agreement
ii. Intentional misconduct or gross negligence;
iii. Breach of Applicable Law; or
iv. Breach of intellectual property indemnity in Section 9.

5.3 Insurance

(a) The Consultant shall, during the Term, and at its own expense, maintain and keep in full force and effect (and, when requested, provide Toronto Hydro with proof thereof):

(i) commercial general liability insurance on an occurrence basis having a minimum inclusive coverage limit, including personal injury and property damage, of not less than two (2) million dollars ($2,000,000) per occurrence, which commercial general liability insurance shall be extended to cover contractual liability, products and completed operations liability, and owners/contractors protective liability;

(ii) Automobile liability insurance on all hired and non-owned vehicles used in connection with this Agreement and such insurance coverage shall have a limit of not less than one (1) million dollars ($1,000,000.00) combined single limit, in respect of bodily injury (including passenger hazard) and property damage inclusive of any one accident and mandatory accident benefits;

(iii) Errors and Omissions Insurance (Professional Liability) in the amount of not less than two million dollars ($2,000,000);

(iv) Umbrella insurance coverage limit of not less than two million dollars ($2,000,000.00).

(b) All insurance coverages and limits required to be maintained hereunder shall: (i) be primary to any insurance maintained by Toronto Hydro, which insurance shall be excess and non-contributory; (ii) contain a cross liability clause and a severability of interest clause; and (iii) contain a thirty (30) day prior written notice to Toronto Hydro for any cancellation, non-renewal or adverse material change.

(c) The Consultant agrees that the insurance required hereunder in no way limits the Consultant's liability pursuant to the Liability and Indemnity provision in Section 5.3.A waiver of subrogation shall be provided by the insurer(s) to Toronto Hydro.

6. FEES

6.1 Fees

(a) Subject to paragraphs 6.1(b) - 6.1(e), in exchange for the performance of the Services in accordance with the terms hereof, Toronto Hydro shall pay the Consultant the amounts outlined in SCHEDULE A, not including HST (the "Fee")_, plus any reasonable out-of-pocket expenses or other disbursements made on the behalf of Toronto Hydro by the Consultant while on assignment for Toronto Hydro. Consultant shall be reimbursed for reasonable and customary travel expenses incurred on Toronto Hydro's behalf, provided that the prior authorization of Toronto Hydro has been obtained with respect to such expenses.

(b) Any disbursements for additional incidentals incurred by the Consultant in relation to this Agreement ("Disbursements") exceeding $500 CAD_must be pre-approved by Toronto Hydro in writing.

(c) The Consultant shall not incur or submit invoices for any work outside the scope of the Services without prior written approval from Toronto Hydro.

(d) The Consultant shall make all payment of taxes, employment insurance premiums, pension plan contributions and any other taxes or other payment of any nature, imposed by any authority in respect of the Fee paid by Toronto Hydro to the Consultant under this Agreement (together, the "Remittances"), and the Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities and claims whatsoever against Toronto Hydro or its Representatives, in

any way arising out of or relating to any failure to deduct, withhold, or remit any Remittance.

(e) Without limiting the generality of paragraph 6.1(a), Toronto Hydro reserves the right to deduct any applicable non-resident withholding taxes from any Fee owing to the Consultant under this Agreement and remit such amounts to the applicable taxation authority.

6.2 Payment

The Consultant shall submit invoices to Toronto Hydro on a monthly basis containing:

(i) a description of the Services performed during the invoice period;

(ii) the monthly payment amount;

(iii) the total HST applicable to the Services during the invoice period, as well as the Consultant's HST registration number; and

(iv) a detailed description of the Disbursements incurred around the invoice period, supported by documentation in a form acceptable to Toronto Hydro.

Unless otherwise provided in this Agreement, the Consultant shall invoice Toronto Hydro after final inspection and acceptance by Toronto Hydro of the Services performed and subject to receipt of all documents required by this Agreement. **Invoices must be sent electronically to: AP@torontohydro.com**. Subject to approval of the invoice by Toronto Hydro, receipt of all documents required by this Agreement, and final review by Toronto Hydro, Toronto Hydro shall make payment to the Consultant via electronic funds transfer not later than thirty (30) days following receipt of an acceptable invoice and the EFT Information (as set out below). **The Consultant must provide Toronto Hydro with, in the case of the first payment only, (i) a void cheque, pre-printed deposit slip or bank confirmation letter and (ii) the email address where the Consultant wishes to receive remittance information (together, "EFT Information"). EFT Information must be sent electronically to efthelp@torontohydro.com or to 14 Carlton Street, Toronto, ON, M5B 1K5, Attention: Treasury Department.** Toronto Hydro reserves the right to pay the Consultant through other payment methods.

7. SUSPENSION OR TERMINATION

7.1 Suspension or Termination

(a) Toronto Hydro may, at any time during the Term by notice in writing, suspend all or a portion of the Services. Upon receipt of such written notice, the Consultant shall perform no further work other than as directed by Toronto Hydro, and shall be entitled to payment for time spent in performing the Services up to the date of suspension, and, if applicable, the costs of returning Consultant personnel to home base and other reasonable costs and expenses incurred in the suspension of the Services.

(b) Either party may terminate this Agreement immediately upon written notice where the other party enters into liquidation, whether compulsory or voluntarily, or where a

proceeding in receivership, bankruptcy or insolvency has been instituted by or against such party or its property.

(c) Toronto Hydro, at its sole discretion, may terminate this Agreement immediately upon written notice where the Consultant or any of its Representatives has been in material default in the performance of its duties, obligations or undertakings under this Agreement, and has not taken immediate steps to remedy such default within two (2) Business Days following written notice of the specific default by Toronto Hydro. For the purposes of this section, a material default shall include, without limitation, a breach of any of the representations or warranties contained herein or the failure or refusal to provide the Services in accordance with the terms and conditions of this Agreement.

(d) Notwithstanding any other provision in this Agreement, Toronto Hydro, at its sole discretion, shall have the right to terminate this Agreement, for any reason, upon two (2) weeks written notice to the Consultant.

(e) In the event that this Agreement is terminated by Toronto Hydro in accordance with section 7.1(d), the Consultant shall be entitled to payment for time spent in performing the Services up to the date of termination, plus the costs of returning Consultant personnel to home base and other reasonable costs and expenses incurred in effecting termination and returning documents.

7.2 Effect of Termination

Upon the termination or expiration of this Agreement, upon Toronto Hydro's request, the Consultant shall return to Toronto Hydro and delete any and all electronic copies the Consultant may have of all documents and materials in its possession relating to the Services or this Agreement, including all Confidential Information and all Deliverables, whether completed or not.

8. CONFIDENTIALITY

8.1 Non-Disclosure

In performing the Services required by this Agreement, the Consultant may be provided access to Confidential Information. The Consultant acknowledges and agrees that:

(a) the Consultant shall not disclose, permit access to, transmit, or transfer the Confidential Information to any third party without the prior written authorization of Toronto Hydro;

(b) the Consultant shall protect the confidentiality of the Confidential Information in its possession by exercising the same security measures it normally exercises with respect to its own confidential information and at minimum a reasonable standard of care;

(c) upon the request of Toronto Hydro, and in any event upon the expiration or termination of this Agreement for any reason, the Consultant shall return (or delete, in the case of electronic documents) forthwith to Toronto Hydro all Confidential Information, including all copies and other materials containing the Confidential Information, which are in the possession or under the control of the Consultant; and

(d) the Consultant shall not use any Confidential Information for any purpose other than to perform the Services required by this Agreement. Without limiting the foregoing, the

Consultant shall not, and shall not permit any of its Representatives to, use any Confidential Information in furtherance of its, or their, individual business or for its, or their, own benefit, profit or advantage, or for the benefit, profit or advantage of any other party.

Notwithstanding the foregoing, the Consultant may disclose such Confidential Information to any of the Representatives of the Consultant who agree to be bound by the obligations of confidentiality herein and who have a reasonable need to know such Confidential Information in the course of their duties for the Consultant but only for the purposes of the Consultant exercising its rights and obligations under this Agreement; and in the event that the Consultant believes it is required by law to disclose, or is requested by a governmental authority to disclose, any Confidential Information to a governmental authority; provided that the Consultant shall, to the extent permitted by law, first inform Toronto Hydro of the request or requirement for disclosure to allow an opportunity for Toronto Hydro to apply for an order to prohibit or restrict such disclosure.

8.2 Non-Solicitation

Unless Toronto Hydro's Chief Executive Officer provides prior written consent, the Consultant hereby covenants and agrees that during the term of this Agreement and for a period of two (2) years following the termination of the Agreement, however caused, the Consultant will not directly or indirectly, either individually or in partnership or jointly or in conjunction with any other Person,

a) hire or otherwise engage any Protected Employee who is currently employed by Toronto Hydro;

b) hire or otherwise engage any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause;

c) solicit or attempt to solicit any Protected Employee who is currently employed by Toronto Hydro or encourage any such person to leave his/her employment with Toronto Hydro; and

d) solicit or attempt to solicit any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause.

Given the unique expertise and intimate knowledge that the employees have of the operations of Toronto Hydro the Consultant acknowledges and agrees that the restrictions contained in this Section 8.2 are reasonable and necessary to preserve the value of Toronto Hydro's business.

9. INTELLECTUAL PROPERTY

9.1 Use

Nothing in this Agreement shall be deemed to transfer, license, assign, permit the use of, or otherwise convey an interest in whole or in part to the Consultant of any Intellectual Property belonging to Toronto Hydro or any of its Representatives or any third party whose Intellectual Property is in Toronto Hydro's custody or control, and the use by the Consultant of any such Intellectual Property shall be subject to the prior written approval of Toronto Hydro. It is understood and agreed that Consultant's use of its proprietary computer software, methodology,

procedures, or other proprietary information in connection with an assignment shall not give Toronto Hydro any rights with respect to such proprietary computer software, methodology, procedures or other proprietary information. Consultant may retain and further use the technical content of its work hereunder.

Any Deliverables prepared for Toronto Hydro by Consultant pursuant to this Agreement that are reports or other written documentation shall be for Toronto Hydro's use consistent with the Services set out under this Agreement. For greater clarity, for the purposes of this section 9.1 only, "use" shall include, but is not limited to, the leveraging of such Deliverables and disclosure of such Deliverables to third parties as may be required for Toronto Hydro's disclosure obligations including, but not limited to, annual financial filings as well as disclosures to the Ontario Energy Board (OEB) as part of Toronto Hydro's utility rate application(s).

Notwithstanding the foregoing, Toronto Hydro shall refrain from using such Deliverables in connection with a public offering of securities or in connection with any other financing not directly related to Toronto Hydro's activities as a utility without Consultant's prior written consent, which shall not be unreasonably withheld or delayed.

9.2 Ownership

Toronto Hydro shall at all times have full rights and title to the Deliverables, and may at all times take possession of or use any completed or partially completed Deliverables, notwithstanding any provision, express or implied, to the contrary. Without limiting the generality of the foregoing, Toronto Hydro shall own all Intellectual Property rights in all Deliverables, and the Consultant hereby waives and assigns to Toronto Hydro any such rights, and agrees to give Toronto Hydro and its Representatives all assistance as may be reasonably required to perfect such rights including, without limitation and where the Consultant is a corporation or partnership, obtaining waiver of moral rights from any of the Consultant's employees, partners or other Representatives.

9.3 Intellectual Property Protection

The Consultant expressly warrants that the manufacture, delivery, sale or use of the Consultant's Services will not infringe any Canadian or foreign patents, trademarks, copyrights, industrial design or other intellectual property rights and the Consultant shall indemnify and save Toronto Hydro harmless from all claims, judgments and decrees that may be entered against Toronto Hydro or its Representatives and against all damage, liability, costs and expenses (including legal fees and other attendant costs and expenses) Toronto Hydro incurs by reason of any infringement or claim thereof.

9.4 Pre-Existing Intellectual Property

Any pre-existing Intellectual Proprietary ("Pre-Existing IP") of Consultant or its licensors used to perform Services, or included in any Deliverables, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of the Consultant and its licensors (collectively, "Consultant Information"). To the extent that Consultant incorporates any Consultant Information into the Deliverable(s), Consultant hereby grants to Toronto Hydro a fully paid up, royalty free, irrevocable and non-cancellable, non-exclusive, assignable and transferable right to Use the Consultant Information without restriction, except that any such Use must be in conjunction with the Deliverables in which the Consultant Information is incorporated and not as a separate item. For the purpose of the foregoing, "Use" means one or more of the following rights to: use; modify; adapt; translate; create changes, alterations, modifications,

improvements, adoptions, enhancements and derivative works based upon or derived from the Consultant Information; reproduce; copy; display; perform; communicate in any manner; license or sublicense. Consultant shall provide Toronto Hydro with a list of any freeware, shareware or open source software used in the Deliverables. Any pre-existing intellectual property of Toronto Hydro, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of Toronto Hydro.

10. HEALTH AND SAFETY

The Consultant shall be responsible for managing the health and safety of its own personnel and other Representatives. Neither Toronto Hydro, nor its Representatives, shall be liable for any loss, damages or claims arising directly or indirectly from the Consultant's access to or work in or around Toronto Hydro's facilities, and the Consultant hereby waives any claims to which it may become entitled for loss or damage and releases Toronto Hydro and its Representatives from any and all such claims.

11. MISCELLANEOUS

11.1 Survival

In addition to the terms in this Agreement that by their nature survive the expiry or termination of the Agreement, the terms of section 5 (Representations, Warranties and Indemnities), section 8 (Confidentiality), section 9 (Intellectual Property), and subsection 11.3 (Injunctive Relief) shall survive the expiry of this Agreement for a term of five (5) years.

11.2 Subcontracting

The Consultant may not subcontract the performance of any part of the Services without Toronto Hydro's prior written approval. Where Toronto Hydro provides its prior written approval to the Consultant to subcontract all or part of the Services, then the Consultant shall enter into agreements with such permitted subcontractor(s) to require the permitted subcontractor(s) to provide Services in accordance with all of the terms of this Agreement. Notwithstanding the foregoing, the Consultant shall remain liable for any and all acts or omissions of any subcontractor(s) as if such acts or omissions were those of Consultant.

Toronto Hydro reserves the right to remove or add any subcontractors that are involved in Toronto Hydro projects at sole discretion.

11.3 Injunctive Relief

(a) The Consultant acknowledges and agrees that the terms of section 8 (Confidentiality) and section 9 (Intellectual Property) of this Agreement are reasonably necessary to protect the legitimate interests of Toronto Hydro, are reasonable in scope and duration, and are not unduly restrictive.

(b) The Consultant further acknowledges that a breach of any of the terms of section 8 (Confidentiality) or section 9 (Intellectual Property) would render irreparable harm to Toronto Hydro, and that a remedy at law for breach of these sections would be inadequate, and that Toronto Hydro shall therefore be entitled to any and all equitable relief, including,

without limitation, injunctive relief, and any other remedy that may be available at law or in equity.

11.4 Force Majeure

Either party will be relieved of liability for delays in performance of its obligations hereunder where such delay is a result of Force Majeure. The party affected by the Force Majeure shall give prompt notice thereof to the other party and, upon cessation of the Force Majeure, shall take all reasonable steps to resume the performance of its obligations hereunder. If a delay in performance by reason of Force Majeure extends beyond thirty (30) Business Days, then either party may terminate this Agreement by written notice.

11.5 Non-Exclusive Agreement

This Agreement will not be interpreted to grant to the Consultant exclusive rights to provide the Services or to bind Toronto Hydro in any way to an exclusive relationship with the Consultant with regards to the Services or any other service.

11.6 Waiver

No delay on the part of either party in exercising any of its rights hereunder or failure to exercise the same, nor the acquiescence thereto shall operate as a waiver except in the specific instance for which it is given and where such waiver is provided in writing by the party waiving its rights.

11.7 Amendments

None of the terms, conditions or provisions of this Agreement shall be varied, modified or altered except by written agreement signed by an authorized representative of each parties.

11.8 Assignment

Save and except for Toronto Hydro's right to assign this Agreement to any of its Affiliates, neither party may assign this Agreement or any of their rights or obligations hereunder, without the prior written authorization of the other party, acting reasonably.

11.9 Enurement

This Agreement shall enure to the benefit of, and be binding upon, the parties hereto and their respective successors and permitted assigns.

11.10 Severability

In the event that any provision or portion of this Agreement is determined to be invalid or unenforceable for any reason, the remaining provisions or portions of this Agreement will be unaffected and will remain in full force and effect to the fullest extent permitted by law.

11.11 Neutral Construction

The parties to this Agreement agree that this Agreement was negotiated fairly between them at arm's length, that the final terms of this Agreement are the product of the parties' negotiations, and that this Agreement shall be deemed to have been jointly and equally drafted by them, and that the

provisions thereof should not be construed against a party on the grounds that such party drafted the Agreement in whole or in part.

11.12 Entire Agreement

This Agreement constitutes the entire agreement between the parties relating to the subject matter hereof. This Agreement supersedes any and all prior correspondence, warranties, covenants, collateral undertakings, or agreements, oral or otherwise, express or implied, unless otherwise contained herein.

11.13 Notices

(a) All questions or other communications regarding this Agreement, including any notices required by this Agreement, are to be addressed to the following addresses:

to Toronto Hydro:

Name:	Leslie Armstrong
Title:	Manager, Capital Planning & Reporting
Address:	14 Carlton Street
Telephone:	647-297-9265
Email:	larmstrong@torontohydro.com

with copy to:

Title:	EVP, Public and Regulatory Affairs & Chief Legal Officer
Address:	14 Carlton, Toronto Hydro, ON M5B 1K5
Telephone:	(416) 542-3000
Email:	legal@torontohydro.com

to the Consultant:

Name:	**Larry Kennedy**
Title:	Senior Vice President
Address:	200 Rivercrest Drive SE, Ste 277, Calgary, AB T2C 2X5
Telephone:	587-997-6489
Email:	lkennedy@ceadvisors.com

(b) All notices or communications shall be deemed to be received on the date of acceptance (as evidenced by the signature of the party) if delivered by personal delivery or courier, on the fifth (5th) Business Day after mailing, if mailed by first class mail, or on the first (1st) Business Day after transmission, if sent by facsimile (provided the transmission is evidenced by documented proof of proper fax transmittal).

11.14 Governing Law

This Agreement shall be governed by and construed in accordance with the law of the Province of Ontario and the laws of Canada applicable therein.

11.15 Execution

This Agreement may be signed in counterparts and delivered by electronic means, each of which shall be deemed an original and all of which, together, shall have the same effect as if all constitute one and the same Agreement.

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the date first written above:

Concentric Advisors ULC

Per: _____

Name: Larry Kennedy

Title: Senior Vice President

I have authority to bind the Consultant.

Toronto Hydro-Electric System Limited

Per: _____

Name: Federico Zeni

Title: Interim Chief Financial Officer

I have authority to bind Toronto Hydro.

SCHEDULE A

SERVICES AND RATES

1. Services to be Performed

(a) The Consultant will complete a depreciation study based on available Toronto Hydro asset data and drawing on the knowledge and experience of relevant Toronto Hydro subject matter experts (SMEs). The study will need to be completed in accordance with International Financial Reporting Standards (IFRS), Ontario Energy Board (OEB) requirements and expectations, and any relevant industry standards. It will need to determine financial useful lives (i.e. to be used for rate making and in financial reporting) for existing asset classes, including both distribution and non-distribution (facilities, fleet, IT). The study shall assess whether current componentization is sufficient and in line with IFRS standards, and if not, recommend where to further componentize to be in line with IFRS and industry standards. The study should include support for the rationale of the proposed asset useful lives in accordance with International Accounting Standard (IAS) 16, "Property, Plant and Equipment". An important consideration is alignment, as appropriate, with any other Toronto Hydro asset analyses and its asset management practices. As per the OEB Rate Handbook, "the study must be supported by high quality evidence and a thorough analysis that can be rigorously tested."

(b) The Consultant shall review the current and past asset classification documents for non-distribution facilities assets during the analysis process. The Consultant will be responsible to determine the most appropriate asset category, threshold and useful life; based on industry knowledge and best practices and apply this new asset classification to the existing facilities asset base.

(c) Toronto Hydro requires a final report on the depreciation study with a draft report provided for review prior to issuance of the final report. The final report will need to include the following (naming conventions, ordering, and grouping are a draft proposal, can all be adjusted in accordance with consultant's best practices):

- Executive Summary
- Credentials of the Consultant
- Objective and Scope of Work
    - Scope: All asset classes which fall under the regulated entity
- Execution Process / Study Procedure
- Methodology
- For each asset or component – detailed derivations of useful lives by asset class, including:
    - Survivor Curves or Failure Curves and summary of any adjustments or special treatment of data
    - Details on Methodology used, assumptions and key considerations
    - Commentary to support the accuracy of existing componentization or provide support and rationale for any changes to componentization where applicable in accordance with IFRS standards and IAS 16Recommended Useful Life and upper/lower values
    - Clear explanations and rationale provided for any deviations of recommended useful life from the Asset Depreciation Study prepared for the Ontario Energy Board by Kinectrics Inc (Report No: K-418033-RA-011-R000)

- Clear explanations and rationale provided for any deviations of recommended useful life from the existing Toronto Hydro Electric System Useful Life of Assets Report by Kinectrics Inc (Report No: K-418021-RA-0001-R002) (e.g. changes in industry standards since initial report was issued)
- Clear explanations and rationale provided for any deviations from useful lives used for asset management decision making

- Summary of Results and Findings, including:
  - Demonstration that all asset classes covered
  - Quantification of impact of the recommended, high, and low-end changes on the existing net asset base for rate making as of December 31, 2021 (which is projected to be $4.6B) (comparison of current and recommended depreciation rates and accruals); SAP Experience will be preferred/beneficial
    - Gross Depreciation Impact on 2023 and 2024 Test Years; as well as 2025-2029 Test Years
    - Breakdown of impacts associated with 2020-2021 asset additions vs. pre-2020 asset additions (regulatory reporting requirements)
    - Other Revenue Amortization Impact (from Capital Contribution Assets) on 2023 and 2024 Test Years; as well as 2025-2029 Test Years
    - Breakdown of impacts associated with 2020-2021 asset additions vs. pre-2020 asset additions (regulatory reporting requirements)
    - Exclusion of assets that have been appropriately assessed as having a unique useful life compared to the existing standard
    - Inclusion of impact of any new componentization splitting to existing asset base

- Conclusions

(d) The Consultant shall also provide an updated report, subsequent to December 31, 2022 year end, to update any quantifications to reflect the impact of new additions in between January 1, 2022 and December 31, 2022.

(e) The Consultant shall also provide related support as needed for auditor queries and Toronto Hydro's 2025 rebasing application proceeding (details to be determined but could include for example responding to interrogatories and undertakings and providing support ahead of and during hearings). The level of application support required will depend on the degree of OEB Staff and intervenor interest in the depreciation study. The financial statement auditors may have clarifying questions as part of their quarterly and/or annual testing procedures (could include clarifications around componentization decisions, walkthroughs of process and/or quantifications, sample testing, etc). In written or oral format (i.e. acting as a witness for Toronto Hydro in a technical conference or oral hearing for the application), the Consultant must be able to answer clarifying questions regarding the study and explain and defend the methodology, assumptions, and choices made (written responses generally expected to be provided under tight timelines).

(f) The Consultant shall, prior to commencement of the Services, provide a proposed schedule and comprehensive and detailed project management plan including start date, breakdown into stages and milestones with corresponding timing and roles of respondent and Toronto Hydro resource requirements as well as required utility inputs and approximate personnel time commitments. Include any risks to meeting the timeframes that are deemed relevant, and how the respondent will mitigate them.

There are two phases of services required:

Study:

Kick-off early 2022 with biweekly updates/touchpoints until delivery of Final Report
Draft Report to be submitted no later than Aug. 1, 2022.
Final report to be submitted no later than Nov. 1, 2022.
Subsequent report update no later than March 31, 2023 (to reflect additional impact of 2022 additions).

Support:

Specific timing to be confirmed
Audit Queries: Q4 2022 to Q1 2024; turn around time of 2-3 business days
Application Support: ~Q3 2023 to Q4 2024; Interrogatory response draft turnaround time of ~ 1 week, Undertaking response draft turnaround time of 24 hours. Hearing time – as general support and/or in the hearing room as a witness – to be decided

(g) Toronto Hydro to provide asset data to the Consultant and make Toronto Hydro subject matter experts available for surveys/interviews.

2. Rates

In exchange for Consultant's provision of the Services under this Agreement, Toronto Hydro shall pay Consultant Fees at a time and materials basis at the rates indicated below, up to a maximum of [redacted] (the "Anticipated Fees"). Consultant shall not exceed the Anticipated Fees, nor commence any Services in excess of the Anticipated Fees, without the prior express written consent of Toronto Hydro.

Ad Hoc Services	Rate
All post study support (excludes update to the report in 2023) including:	As per below chart
Responding to audit queries	As per below chart
Responding to application interrogatories	As per below chart
Application hearing support including responses to undertakings and any time spent preparing for and acting as witness.	As per below chart

Title	[redacted]
Senior Vice President	
Project Manager	
Senior Consultant	
Consultant	
Senior Analyst	
Analyst	
Project Assistant	

The Anticipated Fees shall be allocated to the below Deliverables under the Agreement:

Description of Services / Resource Type	[redacted]
Compete Depreciation Study including draft and final reports (up to delivery of final report)	
Report Update ~ March 2023	
Total ceiling cost to provide the Services per the Scope of Work	
HST /Taxes as applicable	
Total	

SCHEDULE B

DEFINITIONS

In this Agreement, the following definitions shall apply:

"Affiliates"	has the meaning prescribed to it in the *Business Corporations Act* of Ontario, as amended from time to time;
"Agreement"	means this Agreement for Professional Consulting Services, including all recitals, schedules and attachments thereto;
"Applicable Laws"	means all federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to this Agreement, including without limitation all applicable OEB codes, rules or guidelines;
"Business Day"	means a day on which banks are open for business in the City of Toronto, Ontario, but does not include a Saturday, Sunday, or a civic or statutory holiday in the Province of Ontario;
"Confidential Information"	means the terms of this Agreement and any and all data or information relating to the business, management or affairs of Toronto Hydro, its customers, employees, or any of its Affiliates disclosed by Toronto Hydro to the Consultant pursuant to this Agreement, whether or not such Confidential Information is expressly identified as confidential. Notwithstanding the foregoing, Confidential Information does not include any information or data which: (a) information or data that is or becomes publicly known through no breach of the terms or conditions of this Agreement; (b) information or data that is independently developed without reference to Confidential Information and without breach of the terms and conditions of this Agreement; or (c) Confidential Information that is required by court order or other legal compulsion to be disclosed, in which case the Consultant shall give Toronto Hydro prior written notice of such disclosure, as permitted by law;
"Consultant"	means Concentric Advisors ULC;
"Deliverable"	means any and all works prepared, generated, created or designed by the Consultant pursuant to this Agreement, including without limitation all drawings, models, designs, formulae, methods, documents, reports, software, specifications, or source codes, and any related works, enhancements, modifications or additions thereto;
"Disbursements"	shall have the meaning as prescribed in paragraph 6.1(b);
"Fees"	shall have the meaning as prescribed in paragraph 6.1(a);

"Force Majeure"	means any impediments beyond the control of the applicable party due, wholly or in part, directly or indirectly, to: strikes, lockouts, riots, epidemics, war, governmental regulations, fire, explosions, acts of God, or any other impediment beyond the control of the party affected;
"Hourly Rate"	shall have the meaning prescribed in paragraph 6.1(a);
"HST"	means Harmonized Sales Tax;
"Guidelines"	has the meaning prescribed in paragraph 4.4(d);
"Intellectual Property"	includes all trademarks, copyrights, patents, business names, trade secrets, proprietary software, analysis or techniques (whether or not patented or patentable), confidential or secret designs and processes, source codes, plans or devices, or other proprietary and intellectual property rights;
"Intervenor"	means any interested group or individual who participates actively in an OEB proceeding either by submitting evidence, arguments or interrogatories (written questions) or by cross-examining a witness or witnesses at an oral hearing;
"Person"	means any individual, firm, corporation, unlimited liability company, partnership, limited liability partnership, joint venture, trust, unincorporated association, unincorporated syndicate, any governmental authority and any other legal or business entity.
"Protected Employee"	means any individual who, during the course of their employment with Toronto Hydro, was directly or indirectly involved in: i. the procurement of the Services of the Consultant on behalf of Toronto Hydro; ii. the negotiation of the Consultant's Agreement on behalf of Toronto Hydro; and/or the awarding and/or approval of the Consultant's Agreement on behalf of Toronto Hydro.
"Remittances"	has the meaning prescribed to it in paragraph 6.1(d);
"Term"	has the meaning prescribed to it in subsection 3.1; and
"Toronto Hydro"	means Toronto Hydro-Electric System Limited.

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AMENDING AGREEMENT

THIS AMENDING AGREEMENT (the "Amending Agreement") is made effective as of June 1, 2023 (the "Effective Date") between **CONCENTRIC ADVISORS ULC.** ("Consultant") and **TORONTO HYDRO-ELECTRIC SYSTEM LIMITED** ("Toronto Hydro") (collectively, the "Parties").

WHEREAS:

1. Toronto Hydro and Consultant entered into an agreement for professional consulting services dated April 27, 2022 (the "Agreement") pursuant to which the Consultant shall provide a depreciation study and related services (the "Services"); and

2. The Parties wish to amend the Agreement by attaching the Ontario Energy Board's *Rules of Practice and Procedure* Rule 13A, and make associated amendments related to the Consultant's participation in Toronto Hydro's upcoming rate application, as provided herein.

NOW THEREFORE, THIS AMENDING AGREEMENT WITNESSES that in consideration of the mutual covenants contained herein and for other valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Toronto Hydro and Consultant agree as follows:

1. Any capitalized terms used but not defined herein shall be as defined in the Agreement. The recitals above are agreed by the Parties to be true and deemed to form part of this Amending Agreement as if specifically restated herein.

2. Section 4.4 of the Agreement is amended by adding the following subsection (e) immediately following subsection 4.4(d):

   (e) Without limiting the generality of subsection 4.4(a) above, the Consultant shall comply with Rule 13A Expert Evidence of the OEB's *Rules of Practice and Procedure*, attached as SCHEDULE C hereto, in the course of providing the Services and agrees to accept the responsibilities that are or may be imposed on them by that rule.

3. The Parties agree to add a new SCHEDULE C to the Agreement, attached hereto as Appendix 1 to this Amending Agreement.

4. All other terms and conditions of the Agreement remain continuously in full force and effect, unamended, and shall be deemed to apply to this Amending Agreement.

5. This Amending Agreement, together with the Agreement, shall hereinafter constitute the entire agreement between the Parties with respect to the Services as further described in the Agreement, and supersedes any and all other agreements, understandings, discussions, negotiations, representations and correspondence which may have been made by or between the Parties respecting the same.

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IN WITNESS WHEREOF the Parties hereto have executed this Amending Agreement as of the date first written above.

CONCENTRIC ADVISORS ULC.

Per: DocuSigned by: 5DBB223B0E8F4F0...

Name:

Title:

I have the authority to bind the Consultant.

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

Per: DocuSigned by: C7C2BC2528154DA...

Name: Federico Zeni

Title: Controller

I have authority to bind Toronto Hydro.

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APPENDIX 1

SCHEDULE C

Ontario Energy Board *Rules of Practice and Procedure* Rule 13A

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the OEB impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

a. the expert's name, business name and address, and general area of expertise;
b. the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;
c. the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;
d. the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;
e. in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and
f. an acknowledgement of the expert's duty to the OEB in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the OEB may require two or more of the experts to:

a. in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and
b. at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the OEB and others as permitted by the OEB, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the OEB, including as to:

a. scope and timing;
b. the involvement of any expert engaged by the OEB;
c. the costs associated with the conduct of the activities;
d. the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of Rule **13A.04**; and
e. any issues in relation to confidentiality.

13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A.**

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AGREEMENT FOR PROFESSIONAL CONSULTING SERVICES

THIS AGREEMENT is made as of the 10th day of May, 2023 (the "Effective Date") between **Toronto Hydro-Electric System Limited** ("Toronto Hydro"), a corporation incorporated under the laws of the province of Ontario and **EA Technology LLC,** a corporation incorporated under the laws of the State of New Jersey (the "Consultant"), pursuant to which Toronto Hydro shall retain the Consultant to provide certain Services, and the Consultant shall provide such Services, during the Term, subject to the terms and conditions hereof;

NOW THEREFORE, in consideration of the mutual covenants set forth herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. INTERPRETATION

Unless otherwise indicated, all capitalized terms in this Agreement shall be as defined in SCHEDULE B and any reference to currency in this Agreement shall refer to lawful money of Canada.

2. RELATIONSHIP OF THE PARTIES

2.1 Retainer

Toronto Hydro hereby retains the Consultant to provide the Services, and the Consultant hereby agrees to provide the Services, during the Term, in accordance with the terms and conditions of this Agreement.

2.2 Independent Contractors

(a) Notwithstanding any provision hereof, this Agreement does not constitute and shall not be construed as constituting a partnership, joint venture, principal/agency relationship, or employer/employee relationship between the parties. The Consultant and Toronto Hydro shall at all times remain independent contractors of each other, and neither party shall represent itself to be an agent or employee of the other.

(b) Without limiting the generality of Subsection 2.2(a), the Consultant hereby acknowledges and agrees that neither it nor its Representatives shall be eligible or entitled, by reason of this Agreement, to participate in any employee-related program offered by Toronto Hydro or any of its Affiliates, including, without limitation, any benefit, insurance, compensation, health plan, bonus or retirement program.

(c) The Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities or claims whatsoever against Toronto Hydro or its Representatives resulting from or relating to the Consultant or its Representatives being deemed to be an employee of Toronto Hydro or any of its Affiliates.

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(d) The Consultant hereby acknowledges and agrees that Toronto Hydro shall not be responsible for and shall not have control or charge of any means, methods, techniques, sequences or procedures used for or in respect of the Services, or for the safety precautions or programs required for the Services or otherwise prescribed hereunder.

3. TERM

3.1 Term

Unless otherwise terminated in accordance with the provisions hereof, this Agreement shall be for a term commencing on the Effective Date and terminating two (2) years thereafter (the "Term").

4. SERVICE REQUIREMENTS

4.1 Services

During the Term, the Consultant shall perform the Services as detailed in SCHEDULE A hereto.

4.2 Time and Availability

Unless otherwise directed in writing by Toronto Hydro, the Consultant shall have discretion in selecting the dates and times it performs the Services throughout the month, giving due regard to the needs of Toronto Hydro's business requirements and provided that any access to Toronto Hydro property shall be during regular business hours.

4.3 Key Employee

[Intentionally deleted].

4.4 Revision to Services

(a) The Parties acknowledge and agree that the Services to be undertaken and completed by the Consultant under this Agreement may be subject to revision or amendment from time to time during the Term: (i) as required by Toronto Hydro to comply with the Guidelines; (ii) as required by Toronto Hydro to comply with the Applicable Laws or any order, instruction, directive or legal requirement of a Governmental Authority; or (iii) as required by Toronto Hydro to ensure that Toronto Hydro receives the expected funding and benefits with respect to the project to which the Services relate.

(b) Toronto Hydro agrees to provide the Consultant with written notice of any revision or amendment to the Services required pursuant to this Section 4.4, and subject to the terms of Subsection 4.4(d) below, the Consultant shall comply with all such directives.

(c) In the event that the Consultant fails to comply with a directive issued by Toronto Hydro pursuant to this Section 4.4, Toronto Hydro shall have the right, in addition to any other remedies which may be available to Toronto Hydro hereunder or otherwise at law, to terminate this Agreement by giving written notice of termination to the Consultant whereupon this Agreement shall terminate as at the effective date of termination specified in the notice and the provision of Section 7 shall apply.

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(d) Notwithstanding Subsection 4.4(b), where a directive from Toronto Hydro results in a material change in the scope and/or implementation of the Services, then the Consultant shall have the right to terminate this Agreement by giving notice of termination to Toronto Hydro whereupon the Agreement shall terminate as at the effective date of termination specified in the notice and the provisions of Section 7 shall apply.

4.5 Applicable Laws

(a) The Consultant shall, at its sole expense, obtain and maintain during the Term of this Agreement, all permits, licences and approvals required by all Applicable Laws to perform its obligations under this Agreement. The terms and conditions of this Agreement shall be carried out in strict compliance with all Applicable Laws and in the event of any conflict between any Applicable Laws, the Applicable Laws with the most stringent standard shall apply.

(b) Without limiting the generality of the foregoing, the Consultant shall comply with the *Municipal Freedom of Information Act* ("MFIPPA"), the *Personal Information Protection and Electronic Documents Act* (Canada) ("PIPEDA")and any other applicable privacy legislation (collectively, "Privacy Laws") with respect to any personal information collected, used or disclosed in connection with this Agreement and shall indemnify and hold harmless Toronto Hydro and its Representatives from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments (including related expenses and legal costs) they may incur related to or arising out of any non-compliance therewith.

(c) Without limiting the generality of subsection 13(a) above, the Vendor shall comply with Rules 13 and 13A Expert Evidence of the OEB's *Rules of Practice and Procedure*, attached as APPENDIX A.1 hereto, in the course of providing the Services and agrees to accept the responsibilities that are or may be imposed on them by that rule.

(d) Where any Development is subject to the approval or review of any authority, department, government or agency other than Toronto Hydro, such applications for approval or review shall, unless otherwise authorized by Toronto Hydro in writing, be prepared by the Consultant to be approved and submitted by and through the offices of Toronto Hydro, and the Consultant shall not have any direct dealings with the authority, department, government or agency in question with regards to the Development.

(e) The Consultant and the Consultant's personnel shall comply with all rules and direction of Toronto Hydro, whether specified in this Agreement or otherwise, while working on Toronto Hydro's facilities: Toronto Hydro's *Code of Business Conduct and Whistleblower Procedure*, Toronto Hydro's *Disclosure Policy,* Toronto Hydro's *Social Media and Digital Communication Policy,* Toronto Hydro's *Accessibility Policy*, Toronto Hydro's *Workplace Harassment Policy and Program*, Toronto Hydro's *Violence Prevention in the Workplace Policy,* Toronto Hydro's *Workplace Alcohol and Drug Policy*, Toronto Hydro's *Environmental Policy,* Toronto Hydro's *Occupational Health and Safety Policy*, Toronto Hydro's *Privacy Policy,* Toronto Hydro's *Cyber Security Policy*, Toronto Hydro's *Technology Use Guidelines*, Toronto Hydro's *External Supplier Access to Application Services Policy,* Toronto Hydro's *Physical Security Policy,* and the *Affiliate Relationships Code for Electricity Distributors and Transmitters* issued by the OEB (together, the "Guidelines"). The Consultant acknowledges that it has been provided with a copy of the Guidelines, has provided and will provide a copy of the Guidelines to each of its Representatives and that it agrees to comply with and to direct its Representatives to comply with such Guidelines, as amended.

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4.6 Performance

(a) The Services shall be performed to the satisfaction of Toronto Hydro, and Toronto Hydro shall have the right at all reasonable times, to inspect or otherwise review the Services performed or being performed. The Consultant shall, upon the request of Toronto Hydro, provide Toronto Hydro with written reports of the status of the Developments and the Consultant's progress in providing the Services.

(b) In the event of any dispute between Toronto Hydro and the Consultant relating to the quality or acceptability or rate of progress of any of the Services, or relating to the interpretation of any instructions or specifications concerning the Services, the reasonable opinion of Toronto Hydro shall govern and be binding on the parties hereto.

4.7 Health and Safety

The Consultant shall be responsible for managing the health and safety of its own personnel and other Representatives. Neither Toronto Hydro, nor its Representatives, shall be liable for any loss, damages or claims arising directly or indirectly from the Consultant's access to or work in or around Toronto Hydro's facilities, and the Consultant hereby waives any claims to which it may become entitled for loss or damage and releases Toronto Hydro and its Representatives from any and all such claims.

5. REPRESENTATIONS, WARRANTIES, INDEMNITIES AND INSURANCE

5.1 Representations and Warranties

The Consultant hereby represents, warrants and agrees that:

(i) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has/have the necessary experience and qualifications to perform the Services;

(ii) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) will perform the Services in a diligent, expeditious and workmanlike manner, consistent with standards generally observed by reputable and competent members of the same industry providing similar services;

(iii) all Services shall be the Consultant's (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) original work and none of the Services or any invention, development, use, production, distribution or exploitation relating thereto will infringe, misappropriate or violate any intellectual property or other right of any person or entity;

(iv) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has the corporate power and authority to enter into this Agreement and to perform its obligations hereunder, and that this Agreement constitutes a legal, valid, and binding obligation of the Consultant, enforceable against the Consultant in accordance with its terms.

5.2 Indemnity

The Consultant shall be liable for and shall indemnify and hold harmless Toronto Hydro and its Representatives from all claims, demands, actions, penalties, damages, losses, judgments and settlements,

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liabilities, costs, expenses, including legal fees and other related costs and expenses arising out of, related to, or incident to, the Consultant or any of its Representatives' performance of the Services under this Agreement, including, without limitation:

a) any breach, violation or non-performance by the Consultant or any of its Representatives of any terms, conditions, warranties, obligations or covenants contained in this Agreement;

b) any breach or violation by the Consultant or any of its Representatives of any Applicable Laws; and

c) any actions, omissions, negligence or wilful misconduct of the Consultant or any of its Representatives.

5.3 Insurance

(a) The Consultant shall, during the Term, and at its own expense, maintain and keep in full force and effect (and, when requested, provide Toronto Hydro with proof thereof) the following insurance:

(i) commercial general liability insurance on an occurrence basis having a minimum inclusive coverage limit, including personal injury and property damage, of not less than two million dollars ($2,000,000.00) per occurrence with property damage deductible of not more than fifty thousand dollars ($50,000.00), which commercial general liability insurance shall be extended to cover contractual liability, products and completed operations liability, contingent employer's liability, and owners/contractors protective liability;

(ii) automobile liability insurance on all owned and non-owned vehicles used in connection with this Agreement, with such automobile insurance coverage having a limit of not less than two million dollars ($2,000,000.00) per vehicle, in respect of bodily injury (including passenger hazard), property damage and mandatory accident benefits.

(b) All insurance coverages and limits required to be maintained by the Consultant shall be primary to any insurance maintained by Toronto Hydro, which shall be excess and non-contributory. Prior to the commencement of the delivery of the Services, the Consultant shall deliver to Toronto Hydro a certificate of insurance which evidences the Consultant's compliance with this section, including the provision of a thirty (30) day prior written notice of cancellation, non-renewal or adverse material change, to Toronto Hydro.

(c) The Consultant agrees that the insurance described herein does in no way limit the Consultant's liability pursuant to the indemnity provisions of this Agreement.

(d) A waiver of subrogation shall be provided by the insurer(s) to Toronto Hydro.

6. <u>FEES</u>

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6.1 Fees

(a) Subject to Subsections 6.1(d), 6.1(e) and 6.1(f), in exchange for the performance of the Services in accordance with the terms hereof, Toronto Hydro shall pay the Consultant [redacted] (plus applicable taxes), (the "Fees"), subject to invoicing as outlined in Section 6.2.

(b) The Fee noted in subsection 6.1(a) shall be the only fee payable by Toronto Hydro under this Agreement. Without limiting the generality of the foregoing, the Consultant hereby agrees and acknowledges that all out-of-pocket expenses, travelling costs, and other disbursements shall be at the sole expense of the Consultant, except with the prior written approval from Toronto Hydro.

(c) Any disbursements for additional incidentals incurred by the Consultant in relation to this Agreement ("Disbursements") must be pre-approved by Toronto Hydro in writing.

(d) The Consultant shall not incur or submit Fees for any work outside the scope of the Services, or exceed the Fees listed in Subsection 6.1(a) without prior written approval from Toronto Hydro.

(e) The Consultant shall make all payment of taxes, employment insurance premiums, pension plan contributions and any other taxes or other payment of any nature, imposed by any authority in respect of the Fees paid by Toronto Hydro to the Consultant under this Agreement (together, the "Remittances"), and the Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities and claims whatsoever against Toronto Hydro or its Representatives, in any way arising out of or relating to any failure to deduct, withhold, or remit any Remittance.

(f) The Consultant acknowledges that it is a non-resident of Canada for income tax purposes and agrees that Toronto Hydro shall withhold any applicable non-resident withholding taxes from any amount owing hereunder and remit such taxes to the applicable federal taxing authority without provision for gross-up. Services provided in Canada should be detailed and separated from Services provided outside of Canada on invoices issued for payment.

6.2 Payment

The Consultant shall submit invoices to Toronto Hydro monthly (with respect to the Services set out under subsection 4(c) of SCHEDULE A) or on acceptance of the Developments hereunder containing:

(i) a detailed description of the Services performed during the invoice period; and

(ii) the dates and the amount of time spent by the Consultant for the provision of the Services;

All Services under this Agreement shall be performed outside of Canada. The Consultant acknowledges that it is not an HST registrant and it is not required to register for HST under Canadian tax law.

Unless otherwise provided in this Agreement, the Consultant shall invoice Toronto Hydro after final inspection and acceptance by Toronto Hydro of the Services performed and subject to receipt of all documents required by this Agreement. **Invoices must be sent electronically to: AP@torontohydro.com.** Subject to approval of the invoice by Toronto Hydro, receipt of all documents required by this Agreement, and final review by Toronto Hydro, Toronto Hydro shall

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make payment to the Consultant via electronic funds transfer not later than thirty (30) days following receipt of an acceptable invoice and the EFT Information (as set out below). **The Consultant must provide Toronto Hydro with, in the case of the first payment only, (i) a void cheque, pre-printed deposit slip or bank confirmation letter and (ii) the email address where the Consultant wishes to receive remittance information (together, "EFT Information"). EFT Information must be sent electronically to efthelp@torontohydro.com or to 14 Carlton Street, Toronto, ON, M5B 1K5, Attention: Treasury Department.** Toronto Hydro reserves the right to pay the Consultant through other payment methods.

7. SUSPENSION OR TERMINATION

7.1 Suspension or Termination

(a) Toronto Hydro may, at any time during the Term by notice in writing, suspend all or a portion of the Services. Upon receipt of such written notice, the Consultant shall perform no further work other than as directed by Toronto Hydro, and shall be entitled to payment for time spent in performing the Services up to the date of suspension.

(b) Either party may terminate this Agreement immediately upon written notice where the other party enters into liquidation, whether compulsory or voluntarily, or where a proceeding in receivership, bankruptcy or insolvency has been instituted by or against such party or its property.

(c) Toronto Hydro, at its sole discretion, may terminate this Agreement immediately upon written notice where the Consultant or any of its Representatives has been in default in the performance of its duties, obligations or undertakings under this Agreement, and has not taken immediate steps to remedy such default within five (5) Business Days following written notice of the specific default by Toronto Hydro. For the purposes of this section, a material default shall include, without limitation, a breach of any of the representations or warranties contained herein or the failure or refusal to provide the Services in accordance with the terms and conditions of this Agreement.

(d) Notwithstanding any other provision in this Agreement, Toronto Hydro, at its sole discretion, shall have the right to terminate this Agreement, for any reason, upon two (2) weeks written notice to the Consultant.

7.2 Effect of Termination

Upon the termination or expiration of this Agreement, the Consultant shall return to Toronto Hydro and delete any and all electronic copies the Consultant may have of all documents and materials in its possession relating to the Services or this Agreement, including all Confidential Information and all Developments, whether completed or not.

8. CONFIDENTIALITY

(a) In performing the Services required by this Agreement, the Consultant may be provided access to Confidential Information. The Consultant acknowledges and agrees that:

(i) the Consultant shall not disclose, permit access to, transmit, or transfer the Confidential Information to any third party without the prior written authorization of Toronto Hydro;

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(ii) the Consultant shall protect the confidentiality of the Confidential Information in its possession by exercising the same security measures it normally exercises with respect to its own confidential information and at minimum a reasonable standard of care;

(iii) upon the request of Toronto Hydro, and in any event upon the expiration or termination of this Agreement for any reason, the Consultant shall return (or delete, in the case of electronic documents) forthwith to Toronto Hydro all Confidential Information, including all copies and other materials containing the Confidential Information, which are in the possession or under the control of the Consultant;

(iv) the Consultant shall not use any Confidential Information for any purpose other than to perform the Services required by this Agreement. Without limiting the foregoing, the Consultant shall not, and shall not permit any of its Representatives to, use any Confidential Information in furtherance of its, or their, individual business or for its, or their, own benefit, profit or advantage, or for the benefit, profit or advantage of any other party; and

(v) Toronto Hydro is subject to MFIPPA and is governed by Governmental Authority such as the Independent Electricity System Operator ("IESO") and the Ontario Energy Board ("OEB") and shall have the right to disclose Confidential Information in accordance with the provisions of MFIPPA or as required by the IESO or the OEB.

(b) Notwithstanding the foregoing, the Consultant may disclose such Confidential Information:

(i) to any of the Representatives of the Consultant who agree to be bound by the obligations of confidentiality herein and who have a reasonable need to know such Confidential Information in the course of their duties for the Consultant but only for the purposes of the Consultant exercising its rights and obligations under this Agreement; and

(ii) in the event that the Consultant believes it is required by law to disclose, or is requested by a Governmental Authority to disclose, any Confidential Information to a Governmental Authority; provided that the Consultant shall, to the extent permitted by law, first inform Toronto Hydro of the request or requirement for disclosure to allow an opportunity for Toronto Hydro to apply for an order to prohibit or restrict such disclosure.

9. INTELLECTUAL PROPERTY

9.1 Use

Nothing in this Agreement shall be deemed to transfer, license, assign, permit the use of, or otherwise convey an interest in whole or in part to the Consultant of any Intellectual Property belonging to Toronto Hydro or any of its Representatives or any third party whose Intellectual Property is in Toronto Hydro's custody or control, and the use by the Consultant of any such Intellectual Property shall be subject to the prior written approval of Toronto Hydro.

9.2 Ownership

Toronto Hydro shall at all times have full rights and title to the Developments, and may at all times take possession of or use any completed or partially completed Developments, notwithstanding any provision, express or implied, to the contrary. Without limiting the generality of the foregoing, Toronto Hydro shall own all Intellectual Property rights in all Developments, and the Consultant hereby waives and assigns to Toronto Hydro any such rights, and agrees to give Toronto Hydro

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and its Representatives all assistance as may be reasonably required to perfect such rights including, without limitation and where the Consultant is a corporation or partnership, obtaining waiver of moral rights from any of the Consultant's employees, partners or other Representatives.

9.3 Intellectual Property Protection

The Consultant expressly warrants that the manufacture, delivery, sale or use of the Consultant's Services will not infringe any Canadian or foreign patents, trademarks, copyrights, industrial design or other intellectual property rights and the Consultant shall indemnify and save Toronto Hydro harmless from all claims, judgments and decrees that may be entered against Toronto Hydro or its Representatives and against all damage, liability, costs and expenses (including legal fees and other attendant costs and expenses**)** Toronto Hydro incurs by reason of any infringement or claim thereof.

9.4 Pre-Existing Intellectual Property

Any pre-existing Intellectual Proprietary ("Pre-Existing IP") of Consultant or its licensors used to perform Services, or included in any Development, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of the Consultant and its licensors (collectively, "Consultant Information"). To the extent that Consultant incorporates any Consultant Information into the Development(s), Consultant hereby grants to Toronto Hydro a fully paid up, royalty free, irrevocable and non-cancellable, non-exclusive, assignable and transferable right to Use the Consultant Information without restriction, except that any such Use must be in conjunction with the Developments in which the Consultant Information is incorporated and not as a separate item. For the purpose of the foregoing, "Use" means one or more of the following rights to: use; modify; adapt; translate; create changes, alterations, modifications, improvements, adoptions, enhancements and derivative works based upon or derived from the Consultant Information; reproduce; copy; display; perform; communicate in any manner; license or sublicense. Consultant shall provide Toronto Hydro with a list of any freeware, shareware or open source software used in the Developments. Any pre-existing intellectual property of Toronto Hydro, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of Toronto Hydro.

10. <u>MISCELLANEOUS</u>

10.1 Survival

In addition to the terms in this Agreement that by their nature survive the expiry or termination of the Agreement, the terms of Section 5 (Representations, Warranties and Indemnities), Section 8 (Confidentiality), Section 9 (Intellectual Property), and Section 10.2 (Injunctive Relief) shall survive the expiry of this Agreement for a term of five (5) years.

10.2 Injunctive Relief

(a) The Consultant acknowledges and agrees that the terms of Section 8 (Confidentiality) and Section 9 (Intellectual Property) of this Agreement are reasonably necessary to protect the legitimate interests of Toronto Hydro, are reasonable in scope and duration, and are not unduly restrictive.

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(b) The Consultant further acknowledges that a breach of any of the terms of Section 8 (Confidentiality) or Section 9 (Intellectual Property) would render irreparable harm to Toronto Hydro, and that a remedy at law for breach of these sections would be inadequate, and that Toronto Hydro shall therefore be entitled to any and all equitable relief, including, without limitation, injunctive relief without proof of actual damages, and any other remedy that may be available at law or in equity.

10.3 Subcontracting

The Consultant may not subcontract the performance of any part of the Services without Toronto Hydro's prior written approval. Where Toronto Hydro provides its prior written approval to the Consultant to subcontract all or part of the Services, then the Consultant shall enter into agreements with such permitted subcontractor(s) to require the permitted subcontractor(s) to provide Services in accordance with all of the terms of this Agreement. Notwithstanding the foregoing, the Consultant shall remain liable for any and all acts or omissions of any subcontractor(s) as if such acts or omissions were those of Consultant.

10.4 Force Majeure

Either party will be relieved of liability for delays in performance of its obligations hereunder where such delay is a result of Force Majeure. The party affected by the Force Majeure shall give prompt notice thereof to the other party and, upon cessation of the Force Majeure, shall take all reasonable steps to resume the performance of its obligations hereunder. If a delay in performance by reason of Force Majeure extends beyond thirty (30) Business Days, then either party may terminate this Agreement by written notice.

10.5 Waiver

No delay on the part of either party in exercising any of its rights hereunder or failure to exercise the same, nor the acquiescence thereto shall operate as a waiver except in the specific instance for which it is given and where such waiver is provided in writing by the party waiving its rights.

10.6 Amendments

None of the terms, conditions or provisions of this Agreement shall be varied, modified or altered except by written agreement signed by an authorized representative of each parties.

10.7 Assignment

Save and except for Toronto Hydro's right to assign this Agreement to any of its Affiliates, neither party may assign this Agreement or any of their rights or obligations hereunder, without the prior written authorization of the other party.

10.8 Enurement

This Agreement shall enure to the benefit of, and be binding upon, the parties hereto and their respective successors and permitted assigns.

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10.9 Severability

In the event that any provision or portion of this Agreement is determined to be invalid or unenforceable for any reason, the remaining provisions or portions of this Agreement will be unaffected and will remain in full force and effect to the fullest extent permitted by law.

10.10 Non-Exclusive Agreement

This Agreement will not be interpreted to grant to the Consultant exclusive rights to provide the Services or to bind Toronto Hydro in any way to an exclusive relationship with the Consultant with regards to the Services or any other service.

10.11 Neutral Construction

The parties to this Agreement agree that this Agreement was negotiated fairly between them at arm's length, that the final terms of this Agreement are the product of the parties' negotiations, and that this Agreement shall be deemed to have been jointly and equally drafted by them, and that the provisions thereof should not be construed against a party on the grounds that such party drafted the Agreement in whole or in part.

10.12 Entire Agreement

This Agreement constitutes the entire agreement between the parties relating to the subject matter hereof. This Agreement supersedes any and all prior correspondence, warranties, covenants, collateral undertakings, or agreements, oral or otherwise, express or implied, unless otherwise contained herein.

10.13 Notices

(a) All questions or other communications regarding this Agreement, including any notices required by this Agreement, are to be addressed to the following addresses:

to Toronto Hydro:

Name:	Binendra Shakya
Title:	Manager, Maintenance Planning
Address:	500 Commissioners St, Toronto Hydro, ON M4M 3N7
Telephone:	416-902-6904
E-mail:	Bshakya@torontohydro.com

with copy to:

Title:	EVP, Public and Regulatory Affairs & Chief Legal Officer
Address:	14 Carlton, Toronto Hydro, ON M5B 1K5
Telephone:	(416) 542-3000
Email:	legal@torontohydro.com

to the Consultant:

Name:	William Higinbotham
Title:	President
Address:	400 Morris Ave Suite 240, Denville NJ 07853

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Telephone: (862) 261-2759
E-mail: bill.higinbotham@eatechnologyusa.com

(b) All notices or communications shall be deemed to be received on the date of acceptance (as evidenced by the signature of the party) if delivered by personal delivery or courier, on the fifth (5th) Business Day after mailing, if mailed by first class mail, or on the first (1st) Business Day after transmission, if sent by facsimile (provided the transmission is evidenced by documented proof of proper fax transmittal).

10.14 Governing Law

This Agreement shall be governed by and construed in accordance with the law of the Province of Ontario and the laws of Canada applicable therein.

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10.15 Execution

This Agreement may be signed in counterparts and delivered by electronic means, each of which shall be deemed an original and all of which, together, shall have the same effect as if all constitute one and the same Agreement.

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the day and year first written above:

EA Technology LLC

Per: DocuSigned by: William Higinbotham 5FAF02F8BA2F41E...

Name: William Higinbotham

Title: President

I have authority to bind the Consultant.

Toronto Hydro-Electric System Limited

Per: DocuSigned by: Matthew Higgins D6102E17E3B9484...

Name: Matthew Higgins

Title: Director, Integrated Planning and Modernisation

I have authority to bind Toronto Hydro.

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SCHEDULE A

SERVICES

1. Services to be Performed

Toronto Hydro requires the Consultant to perform a review of asset condition assessments and condition-based risk management (CBRM) enhancements and customisations Toronto Hydro has implemented since 2018 (collectively, the "Services"). The Services shall include consideration of the general outputs of Toronto Hydro's Asset Condition Assessment (ACA) model, alignment with the core principles of the CBRM methodology, and generally accepted industry practices for condition and risk-based asset management.

2. Specifications

The Consultant shall carry out the following tasks with respect to the Services:

a) Review changes and enhancements Toronto Hydro has made to its health score methodologies since 2018.

A high-level review of the changes that have been implemented since 2018 to determine whether the assumptions are reasonable and appropriate.

The review will cover:

- Updates to calibration values (factors and condition caps and collars).
- Inclusion of additional inputs, e.g. flood plains, distance to roads, salt usage in location factor, etc.

Toronto Hydro shall provide the following to the Consultant to enable performance of this component of the Services:

- Summary of additional inputs (if any) that have been included in the models since 2018.
- Summary of changes to factors, caps and collars that have been implemented since 2018 and rationale for the changes.

Consultant shall ensure this review will be carried out by considering groups of asset classes together, where appropriate. For example, it is anticipated that calibration values for some transformer asset classes can be considered together.

b) Review the Current and Future Health Score outputs for all applicable asset classes.

Review the outputs (health index profiles) to examine if the results are reasonable for the calibrations used for two asset classes to be selected by Toronto Hydro.

Toronto Hydro shall provide the following to the Consultant to enable performance of this component of the Services:

- Current and future health index profiles for both asset classes selected.

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- Summary of the inputs to the current health score (initial health score, observed condition factors and measured condition factors, reliability factor) on a per asset basis for both asset classes selected.

c) Review Toronto Hydro's implementation of additional CBRM components, including Probability of Failure, Consequence of Failure, asset criticality, and risk.

Review how Toronto Hydro have set the different consequence of failure, asset criticalities and probability of failure values to determine whether the implementation is reasonable and aligned with generally accepted industry practices. In addition, review Toronto Hydro's adoption of consequence of failure from their broader Value Framework to assess reasonable application and alignment with the CBRM approach.

Toronto Hydro shall provide the following to the Consultant to enable performance of this component of the Services:

- Details of how the consequence of failure values have been selected.
- Definitions of failure modes and categorisation of failures.

3. Timetable / Developments

The Consultant shall provide to Toronto Hydro the following Developments:

- Report(s) outlining its review, findings, and conclusions with respect to the Services tasks outlined in section 2 of this SCHEDULE A above.

Consultant shall provide a draft version of the above-noted Development(s) for Toronto Hydro's review prior to acceptance by Toronto Hydro and finalisation by the Consultant. Consultant may provide a portion of the Development(s) responsive to each task separately for Toronto Hydro's review.

Consultant hereby warrants that the Development(s) will meet all applicable specifications and shall correct any deficiencies discovered by Toronto Hydro for a period of thirty (30) days after final acceptance/receipt of the Development(s) by Toronto Hydro (the "**Warranty Period**").

Notwithstanding anything to the contrary in this Agreement, the Consultant shall provide the final version of the Deliverables to Toronto Hydro no later than June 30, 2023.

4. Services Conditions

The following additional conditions shall apply to the performance of the Services:

a) The Services shall be performed remotely.

b) All meetings between Toronto Hydro and the Consultant shall be facilitated via Webex or similar web-based platforms.

c) The Consultant acknowledges that the Development may be implemented by Toronto Hydro in its filings to a Governmental Authority. The Consultant shall further be available to speak to the Services in a regulatory proceeding as required by Toronto Hydro and/or the Ontario Energy Board relating to Toronto Hydro's 2025 rate application.

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The degree of Consultant's participation shall be dependent on the degree of interest in the Services by OEB staff or any intervenors. Consultant's participation in such proceeding may entail, but is not limited to, preparation of expert report(s), responding to interrogatories and undertakings, provision of support prior to and during any hearings required by the OEB, and answers to any questions regarding the form, methodology, assumptions, and choices made in the provision of the Services, in either written or oral format (the latter in acting as a witness for Toronto Hydro).

The Consultant shall further comply with the requirements and agrees to accept the responsibilities set out in Rules 13 and 13A of the OEB's Rules of Practice and Procedure, attached as APPENDIX A.1 to this Agreement, when providing any Services relating to Toronto Hydro's 2025 rate application.

5. Fees

In exchange for the Services and Developments set out under this Agreement, Toronto Hydro shall pay to the Consultant a fixed fee in the amount of [redacted] on delivery of the Developments set out in section 2 of this SCHEDULE A above. Consultant shall invoice for the Services in accordance with section 6.2 of this Agreement.

With respect to the component of the Services set out under subsection 4(c) of this SCHEDULE A above, Toronto Hydro shall pay to the Consultant on a time and materials basis according to the Consultant's then-current rates as of the Effective Date of this Agreement, or as may otherwise be agreed upon by the parties in writing via an amendment to this Agreement.

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APPENDIX A.1

EXCERPTED OEB RULES OF PRACTICE AND PROCEDURE

[please see attached]

APPENDIX A.1.pdf

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12. Affidavits

12.01 An affidavit shall be confined to the statement of facts within the personal knowledge of the person making the affidavit unless the facts are clearly stated to be based on the information and belief of the person making the affidavit.

12.02 Where a statement is made on information and belief, the source of the information and the grounds on which the belief is based shall be set out in the affidavit.

12.03 An exhibit that is referred to in an affidavit shall be marked as such by the person taking the affidavit, and the exhibit shall be attached to and filed with the affidavit.

12.04 The OEB may require the whole or any part of a document filed to be verified by affidavit.

13. Written Evidence

13.01 Other than oral evidence given at the hearing, where a party intends to submit evidence, or is required to do so by the OEB, the evidence shall be in writing and in a form approved by the OEB.

13.02 The written evidence shall include a statement of the qualifications of the person who prepared the evidence or under whose direction or control the evidence was prepared.

13.03 Where a party is unable to submit written evidence as directed by the OEB, the party shall:

(a) file such written evidence as is available at that time;

(b) identify the balance of the evidence to be filed; and

(c) state when the balance of the evidence will be filed.

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the OEB impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

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(a) the expert's name, business name and address, and general area of expertise;

(b) the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;

(c) the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;

(d) the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;

(e) in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and

(f) an acknowledgement of the expert's duty to the OEB in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the OEB may require two or more of the experts to:

(a) in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and

(b) at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the OEB and others as permitted by the OEB, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the OEB, including as to:

(a) scope and timing;

(b) the involvement of any expert engaged by the OEB;

(c) the costs associated with the conduct of the activities;

(d) the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of **Rule 13A.04**; and

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(e) any issues in relation to confidentiality.

13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A**.

14. Disclosure

14.01 A party who intends to rely on or refer to any document that has not already been filed in a proceeding shall file and serve the document 24 hours before using it in the proceeding, unless the OEB directs otherwise.

14.02 Any party who fails to comply with **Rule 14.01** shall not put the document in evidence or use it in the cross-examination of a witness, unless the OEB otherwise directs.

14.03 Where the good character, propriety of conduct or competence of a party is an issue in the proceeding, the party is entitled to be furnished with reasonable information of any allegations at least 15 calendar days prior to the hearing.

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SCHEDULE B

DEFINITIONS

In this Agreement, the following definitions shall apply:

"Affiliates"	has the meaning prescribed to it in the *Business Corporations Act* of Ontario, as amended from time to time;
"Agreement"	means this Agreement for Professional Consulting Services, including all recitals, schedules and attachments thereto;
"Anticipated Hours"	has the meaning prescribed in Section 4.2;
"Applicable Laws"	means all federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to this Agreement, including without limitation all applicable OEB codes, rules or guidelines;
"Business Day"	means a day on which banks are open for business in the City of Toronto, Ontario, but does not include a Saturday, Sunday, or a civic or statutory holiday in the Province of Ontario;
"Confidential Information"	means the terms of this Agreement and any and all data or information relating to the business, management or affairs of Toronto Hydro, its customers, employees, or any of its Affiliates disclosed by Toronto Hydro to the Consultant pursuant to this Agreement, whether or not such Confidential Information is expressly identified as confidential. Notwithstanding the foregoing, Confidential Information does not include any information or data which: (a) information or data that is or becomes publicly known through no breach of the terms or conditions of this Agreement; (b) information or data that is independently developed without reference to Confidential Information and without breach of the terms and conditions of this Agreement; or (c) Confidential Information that is required by court order or other legal compulsion to be disclosed, in which case the Consultant shall give Toronto Hydro prior written notice of such disclosure, as permitted by law;
"Consultant"	Means EA Technology LLC;
“Consultant Information”	has the meaning prescribed in Section 9.4;
"Development"	means any and all works prepared, generated, created or designed by the Consultant pursuant to this Agreement, including without limitation all drawings, models, designs, formulae, methods, documents, reports, software, specifications, or source codes, and any related works, enhancements, modifications or additions thereto;
"Fees"	shall have the meaning as prescribed in Subsection 6.1(a);

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"Force Majeure"	means any impediments beyond the control of the applicable party due, wholly or in part, directly or indirectly, to: strikes, lockouts, riots, epidemics, war, governmental regulations, fire, explosions, acts of God, or any other impediment beyond the control of the party affected;
"Governmental Authority"	means any government, legislature, municipality, regulatory authority, agency, commission, department, board or court or other law, regulation or rule-making public entity of similar authority, including, without limitation the OEB;
"Guidelines"	has the meaning prescribed in Subsection 4.5(e);
"HST"	means Harmonized Sales Tax;
"IESO"	means the Independent Electricity System Operator;
"Industry Standards"	means the then-current industry standards and best practices used or observed by leading Canadian and United States providers of services to companies similar to Toronto Hydro and which are the same or similar to the Services;
"Initial Term"	has the meaning prescribed to it in Section 3.1;
"Intellectual Property"	includes all trademarks, copyrights, patents, business names, trade secrets, proprietary software, analysis or techniques (whether or not patented or patentable), confidential or secret designs and processes, source codes, plans or devices, or other proprietary and intellectual property rights;
"MFIPPA"	means the *Municipal Freedom of Information Act;*
"OEB"	means the Ontario Energy Board;
"PIPEDA"	means the *Personal Information Protection and Electronic Documents Act* (Canada);
"Pre-Existing IP"	has the meaning prescribed to it in Section 9.4;
"Privacy Laws"	has the meaning prescribed to it in Section 4.5;
"Representative"	in respect of a party, means such party's directors, officers, employees, agents, contractors and advisors, the party's Affiliates, and all such Affiliates' respective directors, officers, employees, agents, contractors and advisors;
"Remittances"	has the meaning prescribed to it in Subsection 6.1(e);

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"Services"	means all of the Developments, services and specifications to be provided, performed and met by the Consultant under this Agreement, as more particularly described in SCHEDULE A;
"Term"	has the meaning prescribed to it in Section 3.1; and
"Toronto Hydro"	Means Toronto Hydro-Electric System Limited.

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SECOND AMENDING AGREEMENT

THIS SECOND AMENDING AGREEMENT (the "Amending Agreement") is made effective as of November 19, 2022 (the "Effective Date") between **ELEMENT ENERGY LIMITED** (the "Consultant") and **TORONTO HYDRO-ELECTRIC SYSTEM LIMITED** ("Toronto Hydro").

WHEREAS:

1. Toronto Hydro and the Consultant (each a "Party" and collectively, the "Parties") previously entered into an agreement for professional consulting services dated February 7, 2022 (the "Consulting Agreement"), pursuant to which the Consultant would develop a future energy scenarios model (the "FES Model"), as well as related services related to maintenance of the model, stakeholder engagement on behalf of Toronto Hydro, and weather correction of network data (the "Services");

2. The parties subsequently entered into a renewal and amending agreement dated June 1, 2022 to clarify scoping requirements related to the FES Model, implementing a change request process, set out changes relating to the applicable Fees, and renewing the Term of the Consulting Agreement for one (1) additional year (the "First Amending Agreement" and, together with the Consulting Agreement, the "Agreement"); and

3. The Parties hereto wish to further amend the Agreement to clarify the requirements of the Consultant's obligations as applicable to the Consultant's submissions to the Ontario Energy Board (OEB), as more particularly set out herein;

NOW THEREFORE, THIS AMENDING AGREEMENT WITNESSES that in consideration of the mutual covenants contained herein and for other valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Toronto Hydro and the Consultant agree as follows:

1. Any capitalized terms used but not defined herein shall be as defined in the Agreement, where applicable. The recitals above are agreed by the Parties to be true and deemed to form part of this Amending Agreement as if specifically restated herein.

2. Subsection 1(g) of SCHEDULE A to the Agreement is hereby deleted and replaced with the following:

(g) Participation in Toronto Hydro's Regulatory Application Process

The Consultant shall be available to provide information and documentation regarding the work carried out by the Consultant as part of the FES Report and all related Services for Toronto Hydro and the Consultant shall participate in a regulatory proceeding as required by the Ontario Energy Board as related to Toronto Hydro's 2025 rate application, provided that Toronto Hydro shall, to commercially reasonable efforts, request that the Ontario Energy Board meet the following accommodations:

i. The Consultant shall be given reasonable notice to participate in such proceeding.
ii. Any communication with the OEB shall be in English.
iii. The Consultant may attend the hearings of the OEB remotely (e.g. via Teams, Zoom or another similar teleconference facility), unless otherwise required by Toronto Hydro to attend the proceedings in person.
iv. The attendance by the Consultant shall take place, where feasible, during its working hours (between 9:00 – 18:00 UK time).

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Notwithstanding the foregoing, the Consultant acknowledges and agrees that the OEB is a Governmental Authority and a regulator of Toronto Hydro. Toronto Hydro cannot direct the OEB to comply with any requests for accommodation on the part of the Consultant nor can Toronto Hydro exercise any binding authority over its own regulator.

If the OEB does not meet the above requested accommodations, Toronto Hydro shall reimburse to the Consultant its reasonable costs required for travel and attendance.

If the Consultant is not given reasonable notice to participate in such proceeding, it shall not be liable to Toronto Hydro for failure to participate in a regulatory proceeding. Notwithstanding the foregoing, the Consultant shall, in all circumstances, make commercially reasonable efforts to participate in all proceedings where requested by Toronto Hydro or a Governmental Authority, regardless of the timing of such notice.

The degree of Consultant's participation shall be dependent on the degree of interest in the FES Report by OEB staff and any intervenors. Consultant's participation in such proceeding may entail, but is not limited to, response to interrogatories and undertakings, provision of support prior to and during any hearings required by the OEB, and answers to any questions regarding the FES Report's form, methodology, assumptions, and choices made, in either written or oral format (the latter in acting as a witness for Toronto Hydro). Where the Consultant is required to testify or otherwise provide evidence at a hearing before the OEB, the Consultant shall comply with the requirements set out in rules 13 and 13A of the OEB's Rules of Practice and Procedure, appended hereto as APPENDIX A.3 to this SCHEDULE A.

Toronto Hydro shall, in exchange for its provision of the Services under this section 1(g), pay to the Consultant fees on an hourly basis at the rates set out in section 2(c) of this SCHEDULE A

3. The document attached hereto as Appendix 1 to this Amending Agreement is hereby appended as APPENDIX A.3 – OEB Rules of Evidence to SCHEDULE A of the Agreement. For greater clarity, APPENDIX A.3 shall form part of SCHEDULE A to the Agreement and shall not constitute an independent schedule.

4. All other terms and conditions of the Agreement remain continuously in full force and effect, unamended and shall be deemed to apply to this Amending Agreement.

[remainder of this page intentionally left blank]

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5. This Amending Agreement, together with the Agreement, shall hereinafter constitute the entire agreement between the Parties with respect to the Services as further described in the Agreement, and supersedes any and all other agreements, understandings, discussions, negotiations, representations and correspondence which may have been made by or between the Parties respecting the same.

IN WITNESS WHEREOF the Parties hereto have executed this Amending Agreement as of the date first written above.

ELEMENT ENERGY LIMITED

DocuSigned by:
Per: Ian Walker
04A25D133611489...

Name: Ian Walker

Title: Partner

I have the authority to bind the Consultant.

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

DocuSigned by:
Per: Elias Lyberogiannis
D6B8ED38A44E42F...

Name: Elias Lyberogiannis

Title: Executive Vice President, Planning, Chief Engineering & Modernisation Officer

I have the authority to bind Toronto Hydro.

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Appendix 1 to this Amending Agreement

APPENDIX A.3 – OEB Rules of Evidence

[please see attached]

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12. Affidavits

12.01 An affidavit shall be confined to the statement of facts within the personal knowledge of the person making the affidavit unless the facts are clearly stated to be based on the information and belief of the person making the affidavit.

12.02 Where a statement is made on information and belief, the source of the information and the grounds on which the belief is based shall be set out in the affidavit.

12.03 An exhibit that is referred to in an affidavit shall be marked as such by the person taking the affidavit, and the exhibit shall be attached to and filed with the affidavit.

12.04 The OEB may require the whole or any part of a document filed to be verified by affidavit.

13. Written Evidence

13.01 Other than oral evidence given at the hearing, where a party intends to submit evidence, or is required to do so by the OEB, the evidence shall be in writing and in a form approved by the OEB.

13.02 The written evidence shall include a statement of the qualifications of the person who prepared the evidence or under whose direction or control the evidence was prepared.

13.03 Where a party is unable to submit written evidence as directed by the OEB, the party shall:

(a) file such written evidence as is available at that time;

(b) identify the balance of the evidence to be filed; and

(c) state when the balance of the evidence will be filed.

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the OEB impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

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(a) the expert's name, business name and address, and general area of expertise;

(b) the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;

(c) the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;

(d) the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;

(e) in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and

(f) an acknowledgement of the expert's duty to the OEB in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the OEB may require two or more of the experts to:

(a) in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and

(b) at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the OEB and others as permitted by the OEB, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the OEB, including as to:

(a) scope and timing;

(b) the involvement of any expert engaged by the OEB;

(c) the costs associated with the conduct of the activities;

(d) the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of **Rule 13A.04**; and

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(e) any issues in relation to confidentiality.

13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A**.

14. Disclosure

14.01 A party who intends to rely on or refer to any document that has not already been filed in a proceeding shall file and serve the document 24 hours before using it in the proceeding, unless the OEB directs otherwise.

14.02 Any party who fails to comply with **Rule 14.01** shall not put the document in evidence or use it in the cross-examination of a witness, unless the OEB otherwise directs.

14.03 Where the good character, propriety of conduct or competence of a party is an issue in the proceeding, the party is entitled to be furnished with reasonable information of any allegations at least 15 calendar days prior to the hearing.

Master Client Agreement – Gartner Canada Co.

This **MASTER CLIENT AGREEMENT** (the "**MCA**") for subscription-based research and related services, dated April 20, 2022 (the "Effective Date"), is between Gartner Canada Co. of 5000 Yonge Street, 14th Floor, Suite 1402, M2N 7E9, Toronto ("**Gartner**") and Toronto Hydro-Electric System Limited of 14 Carlton Street Toronto, ON ("**Client**"), and sets forth the general terms applicable to the use of Gartner products and services (the "**Services**") provided to Client or any of its Affiliates. For purposes of the MCA, "**Affiliates**" means any entity that, directly or indirectly, controls, is controlled by, or is under common control of that party. "**Control**" means direct or indirect ownership of 50% or more of the stock or other interests entitled to vote for the election of the board of directors or other governing body of the entity.

1) ***Service Agreements***. Service Agreements set forth the Service(s) to be provided by Gartner (as more fully described in one or more "**Service Descriptions**"), the term of Client's license for such Services, and the fees payable by Client. Service Agreements are non-cancellable, and may be terminated only for material breach by either party, upon 30 days prior written notice, if the breach is not cured within the notice period. In the event of an inconsistency between any provision of this MCA and a provision of a Service Agreement, the Service Agreement shall control during its term.

2) ***Ownership and Use of the Services***. Gartner owns and retains all rights to the Services not expressly granted to Client. Only the individuals named in the Service Agreement (each a "**Licensed User**") may access the Services. Each Licensed User will be issued a unique password, which may not be shared. Client agrees to review and comply with the *Gartner Usage Policy* which is accessible to all Licensed Users via the "Policies" section of gartner.com. Among other things, the *Gartner Usage Policy* describes how Client may substitute Licensed Users, excerpt from and/or share Gartner research documents within the Client organisation, and quote or excerpt from the Services externally.

3) ***Warranty and DISCLAIMER OF WARRANTIES.*** Gartner warrants that the Services, in the form provided by Gartner to Client, and Client's use of the Services in accordance with this MCA will not infringe on any intellectual property rights of a third party. THE SERVICES ARE PROVIDED ON AN "AS IS" BASIS, AND GARTNER EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES EXCEPT AS EXPLICITLY SET OUT IN THIS AGREEMENT, WHETHER SUCH WARRANTIES ARE EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND WARRANTIES AS TO ACCURACY, COMPLETENESS OR ADEQUACY OF INFORMATION. CLIENT RECOGNISES THE UNCERTAINTIES INHERENT IN ANY ANALYSIS OR INFORMATION THAT MAY BE PROVIDED AS PART OF THE SERVICES, AND ACKNOWLEDGES THAT THE SERVICES ARE NOT A SUBSTITUTE FOR ITS OWN INDEPENDENT EVALUATION AND ANALYSIS AND SHOULD NOT BE CONSIDERED A RECOMMENDATION TO PURSUE ANY COURSE OF ACTION. GARTNER SHALL NOT BE LIABLE FOR ANY ACTIONS OR DECISIONS THAT CLIENT MAY TAKE BASED ON THE SERVICES OR ANY INFORMATION OR DATA CONTAINED THEREIN. CLIENT UNDERSTANDS THAT IT ASSUMES THE ENTIRE RISK WITH RESPECT TO THE USE OF THE SERVICES.

4) ***Client Confidential Information.*** Gartner agrees to keep confidential any Client-specific information communicated by Client to Gartner in connection with this MCA that is (i) clearly marked confidential if provided in written form, or (ii) preceded by a statement that such information is confidential, if provided in oral form, and such statement is confirmed in writing within 30 days of its initial disclosure. This obligation of confidence shall not apply to any information that: (1) is in the public domain at the time of its communication; (2) is independently developed by Gartner; (3) entered the public domain through no fault of Gartner subsequent to Client's communication to Gartner; (4) is in Gartner's possession free of any obligation of confidence at the time of Client's communication to Gartner; or (5) is communicated by the Client to a third party free of any obligation of confidence. Additionally, Gartner may disclose such information to the extent required by legal process provided that Gartner shall, to the extent permitted by applicable law, notify Client prior to such disclosure to permit Client to seek remedy to prevent such disclosure.

5) ***Data Protection.*** In performing its obligations under this MCA, Gartner and Client will each comply with all applicable data protection legislation. In providing the services Gartner shall comply with its global privacy policy available at gartner.com/privacy.

6) ***Pricing.*** Notwithstanding anything to the contrary in this MCA or in any Service Agreement, the pricing quoted for the applicable Services under a Service Agreement will be consistent with the Gartner's fee categories then in-effect based on the Service(s) ordered, duration, and purchasing terms of the Service Agreement. The pricing quoted to a provincial crown corporation client will be consistent with Gartner's local government public sector fees for the services ordered.

7) ***Miscellaneous***

a) ***Assignability.*** This MCA and the rights granted to Client hereunder or under any Service Agreement may not be assigned, sublicensed or transferred, in whole or in part, by either party without the prior written consent of the other party, except to a successor to substantially all of the business or assets of a party by merger or acquisition. Where consent is required, it will not be unreasonably withheld.

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b) ***Dispute Resolution.*** Any unresolved dispute arising out of or in connection with this MCA shall be decided by a single arbitrator appointed by and under the International Arbitration Rules of ADR Chambers International or the parties may agree on a sole arbitrator or, failing such agreement, a party may apply to a competent court in the Province of Ontario for the appointment of an arbitrator in accordance with the International Commercial Arbitration Act, R.S.O. 1990, Chapter I-9. The arbitration hearing shall take place in Toronto, Ontario, Canada, unless otherwise agreed by the parties or ordered by the arbitrator. The decision of the arbitrator shall be final and binding, and the award may be entered in any court having jurisdiction over the parties. The parties consent to the jurisdiction of the courts of the Province of Ontario. If a party seeks recognition and enforcement of an arbitration award in Quebec, such an award will be homologated in accordance with the Code of Civil Procedure of Quebec. Gartner shall have the right to obtain injunctive relief in any court of competent jurisdiction in the event of a breach of Section 2. The prevailing party in any arbitration shall be entitled to its reasonable attorneys' fees and costs, in addition to any award of damages or other relief. Notwithstanding the foregoing, a breach of sections 2, 3, 4, and 5 of this MCA or a breach by either party of any applicable law shall be excluded from the dispute resolution provisions set forth in this section 6 b), and the applicable party may take all steps it deems fit at law or equity or as otherwise prescribed in this MCA in the event of either event.

c) ***Applicable Law.*** This MCA shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein.

d) ***Use of Name, Trademark, and Logo***. Absent the prior written consent of the other party, neither party shall use the name, trademarks, or logo of the other in promotional materials, publicity releases, advertising, or any other similar publications or communications.

e) ***No Third Party Beneficiaries***. Subject to any permitted assignments pursuant to Section 6(a) above, this MCA is for the benefit of the parties only.

f) ***Surviving Clauses***. Sections 3, 4, 5 and 7 (b), (c), (d), (e), (f) and (g) shall survive the expiration or termination of this MCA.

g) ***Entire Agreement.*** This MCA, together with any Service Agreements, sets forth the entire agreement between the parties with respect to the subject matter hereof. This MCA supersedes any previous agreements between the parties and shall not be effective until countersigned by Gartner. No modifications may be made except in writing signed by both parties.

h) ***Term.*** This MCA shall remain in effect for a period of five (5) years from the Effective Date and may be terminated by either party, for any reason, upon written notice to the other party provided, however, that the MCA shall continue to govern any active Service Agreement through its term that was entered into between the parties before the MCA termination.

Gartner Canada Co.

Authorised Signature: DocuSigned by: Ashley Belinda 3C6881B4DAC2436...

Date: April 27, 2022

Toronto Hydro-Electric System Limited

Authorised Signature:

Date April 28, 2022

Printed Name and Title: Anthony Haines, President & CEO

Address:

Telephone:

DS AB

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Consulting Services Supplement to the Master Client Agreement - Gartner Canada Co.

This Consulting Services Supplement ("Supplement") to the Master Client Agreement effective October 31, 2022 ("MCA") between Gartner Canada Co. located at 5000 Yonge Street, 14th Floor, Suite 1402, M2N 7E9, Toronto, ("Gartner") and TORONTO HYDRO-ELECTRIC SYSTEM LIMITED located at 14 CARLTON STREET, TORONTO, Ontario, M5B1K5 ("Client") amends the terms of the current MCA between Gartner and Client, and shall apply to all Consulting and/or Benchmarking Services ("Services") ordered by Client or its Affiliates from Gartner or its Affiliates. All other terms of the MCA shall remain in full force and effect. In the event of any conflict between the MCA and this Supplement, this Supplement shall prevail solely with respect to the subject matter hereto. The specific engagement and related fees shall be set forth in separate Statements of Work ("SOW"). For purposes of this Supplement, "Affiliates" shall mean any entity that, directly or indirectly, controls, is controlled by, or is under common control of that party. "Control" shall mean direct or indirect ownership of 50% or more of the stock or other interests entitled to vote for the election of the board of directors or other governing body of the entity. "Deliverable" means the written work product Gartner is to supply, or make available to Toronto Hydro as contemplated by this Supplement and set out and described in a SOW.

1. ***Intellectual Property.*** Client shall retain all right, title and interest in any proprietary materials supplied to Gartner ("Client Materials"), and grants Gartner all necessary rights and licenses for Gartner to fulfill its obligations under each SOW. Excluding any Client Materials, Gartner shall retain sole and exclusive ownership of the Deliverable(s), Gartner tools, methodologies, questionnaires, responses, and proprietary research and data generated in the course of performing the Services, together with all intellectual property rights therein (the "Gartner Materials"). Gartner grants Client a perpetual, non-exclusive, royalty-free license to use the Deliverables, subject to the limitations set forth in Section 3 (Use of Deliverables). Gartner shall not be restricted in its use of ideas, concepts, know-how, data and techniques acquired or learned in the course of performing the Services, provided that Gartner shall not use or disclose any of Client's confidential or proprietary information, as further defined in Section 4 (Confidentiality).

2. ***Benchmarking Services.*** With respect to any benchmarking services performed by Gartner, Gartner will only use Client's data in an aggregate and anonymous format and represents to Client that Client's data will not be capable of being de-aggregated or re-identified. Client acknowledges that the contents of the benchmarking Deliverables are based upon information which is proprietary to Gartner and contained in Gartner's database. Client's data will become part of the database. The database will be used by Gartner in future consulting and benchmarking engagements, provided that Gartner shall not, at any time, de-aggregate or re-identify Client's data or disclose such data to other existing Gartner clients, and Gartner acknowledges and agrees that Client's data shall remain the confidential property of Client.

3. ***Use of Deliverables.*** Subject to payment in full of the applicable fees, Gartner grants to Client, for internal purposes only, a worldwide, royalty-free, perpetual license to use, reproduce, display, distribute copies of, and prepare derivative works of the Deliverables. Unless the Deliverable is identified in a SOW as intended for external distribution by Client such as a Request for Proposal or similar document, Client shall not make the Deliverables available, in whole or in part, to anyone outside of Client, or quote excerpts from the Deliverables to the public. Notwithstanding the foregoing, Client may share the Deliverables with (i) its outside auditors and/or accountants, (ii) third parties who have signed appropriate confidentiality agreements with Client who are engaged by Client to review or implement suggestions or to further research the issues contained in the Deliverables, (iii) governmental or regulatory bodies as required by law, (iv) with Client's Affiliates provided that its Affiliates are made aware of the obligations under this Section and that Client remains liable for the use made of the Deliverables by its Affiliates.

4. ***Confidentiality & Data Protection***.
(a) The parties agree to keep confidential and not to use or disclose to any third parties any information of the other party learned or disclosed in connection with each SOW, including the Gartner Materials, regardless of

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whether such information is clearly marked as confidential. The obligation of the parties with respect to the confidential information shall terminate with respect to any particular portion of the confidential information if and when: (i) it is in the public domain at the time of its communication; (ii) it is developed independently by the receiving party without use of any confidential information; (iii) it enters the public domain through no fault of the receiving party subsequent to the time of the disclosing party's communication to the receiving party; (iv) it is in the receiving party's possession free of any obligation of confidence at the time of the disclosing party's communication; (v) it is communicated by the disclosing party to a third party free of any obligation of confidence; or (vi) the receiving party has the disclosing party's written permission.

(b) Each party shall provide notice to the other of any demand made upon it under lawful process to disclose or provide any of the other party's confidential information. The receiving party agrees to cooperate with the disclosing party, at the disclosing party's expense, if the disclosing party elects to seek reasonable protective arrangements or oppose such disclosure. Any confidential information disclosed pursuant to such lawful process shall continue to be confidential information.

(c) In performing its obligations under this Supplement, each of Gartner and Client will comply with all applicable data protection legislation. In the event that any personal data is exchanged under this Supplement or any SOW, the parties shall treat such personal data in accordance with their respective privacy policies and, in the case of Gartner, its global privacy policy and its obligations at section 5 of the MCA.

5. ***Limitation of Liability.*** Neither party shall be liable for any consequential, indirect, special or incidental damages, including but not limited to, lost profits, business failure or loss of use, arising out of use of the Deliverables or the Services, whether or not advised of the possibility of such damages. Except for liability for personal injury or death or for damage to property caused by the negligence or willful misconduct of a party or its employees, or a party's breach of its confidentiality, privacy, or intellectual property obligations under this Supplement, each party's total liability arising out of this Supplement and the provision of the Services shall be limited to three times (3x) the fees paid or payable by Client under the SOW under which such liability arises.

6. ***Fees and Expenses.*** The fees due to Gartner in connection with each SOW are set forth in the SOW and are exclusive of any applicable taxes. All taxes are the responsibility of the party to which those taxes apply. Client agrees to pay all reasonable travel-related expenses incurred by Gartner in connection with the consulting services. Out-of-pocket expenses related to travel and subsistence will be billed at the actual amount incurred, and are not included in the professional fee applicable to each SOW.

7. ***Acceptance of Deliverables.*** All Deliverables provided by Gartner to Client shall be deemed to be accepted within 15 days of receipt by Client unless Gartner receives written notice of non-acceptance within 15 days after delivery. Any notice of non-acceptance must state in reasonable detail how the Deliverables did not conform to the SOW and Gartner shall use its reasonable business efforts to correct any deficiencies in the Deliverables so that they conform to the SOW.

8. ***No Third-Party Beneficiaries.*** This Supplement is for the benefit of the parties only. None of the provisions of this Supplement are for the benefit of, or enforceable by, any third party. The parties agree that no third party shall have the right to (i) rely on the consulting services provided by Gartner, or (ii) seek to impose liability on Gartner as a result of the consulting services or any Deliverables furnished to Client.

9. ***Survival.*** Sections 1-5, 7, 8 10, and 11 shall survive any expiration or termination of this Supplement.

10. In addition to all other representations made in the MCA or this Supplement, Gartner further warrants that:

    a. The Services and Deliverables shall be provided in accordance with the specifications more particularly described in an applicable SOW;

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b. The Services shall be performed in a timely, professional, diligent and competent manner by personnel appropriately trained in the performance of such Services, and shall meet or exceed those standards generally observed by reputable and competent members of the same industry providing similar services;
c. in the course of performing the Services, Gartner shall comply with applicable law;
d. it has the corporate power and authority to enter into this Supplement and to perform its obligations hereunder, and that this Supplement constitutes a legal, valid, and binding obligation of Gartner, enforceable against Gartner in accordance with its terms;
e. all Deliverables are and will be free and clear of any pledges, liens, charges, security interests, restrictions, title defects, or encumbrances of any kind or character whatsoever such that title to the Deliverables and all media, materials and supplies housing the Deliverables delivered hereunder shall pass to Toronto Hydro in accordance with the terms hereof free and clear of all liens and encumbrances; and
f. it is a registrant for purposes of the Excise Tax Act and the regulations thereunder, each as amended.

11. ***Indemnification.*** Gartner warrants that the Services and/or Deliverables, in the form provided by Gartner to Client and Client's use of the Services and/or Deliverables will not infringe on any intellectual property rights of a third party, and Gartner has the full unencumbered right and entitlement to license and/or assign all intellectual property rights in the Deliverables to Toronto Hydro, where so required.

Gartner agrees to indemnify, defend and hold Client, its officers, directors, agents and employees harmless from and against any and all liabilities, damages, losses, expenses, claims, demands, suits, fines, penalties (whether civil or criminal) or judgments, including reasonable attorneys' fees, costs arising from or relating to a claim by a third party that the Services infringe upon any third party intellectual property right. Client shall: 1) promptly notify Gartner in writing of any such claim; 2) permit Gartner to control the defense or settlement of such claim, and 3) reasonably cooperate with Gartner in such defense or settlement. Gartner shall have no obligation under this section for a claim of infringement to the extent it is based on any unauthorized modification or use of the Services by Client.

This Supplement shall be subject to the terms and conditions of Gartner's Master Client Agreement, which is incorporated herein by this reference, and together with the applicable SOW for the services shall constitute the entire legal agreement for such services. This Supplement may be executed in counterparts.

The parties have caused this Supplement to be executed by their authorized representatives.

Gartner Canada Co.

DocuSigned by:
David Vixama
CCE13228C8BD44B...

David Vixama
Contracts Manager

Authorised Signatory

November 4, 2022
Date

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

Signature

October 31, 2022
Date

Anthony Haines, President and Chief Executive Officer
Name and Title

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Toronto Hydro Enterprise IT Benchmark and Capability Maturity Assessment



Statement of Work (SOW)

16th September 2022
Engagement Number: 330079917 | Version 1

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1.0 Scope, Objectives and Outcomes

Toronto Hydro-Electric System Limited ("Toronto Hydro") requires an independent and objective expert assessment of process maturity of its IT functional areas and to establish a reliable baseline of its overall IT spend and staffing positions relative to comparable peer organizations in the utility industry.

In the short-term, these maturity and cost baseline assessments will provide a fact-based action plan for the organization's regulatory filing and catalyze a roadmap of initiatives that Toronto Hydro's IT Leaders will drive to advance maturity and efficiency levels consistent with Toronto Hydro's Business and IT strategic objectives.

Longer term, these maturity and cost baseline assessments will form the basis for a transformational strategy as a result of the current state baseline and recommendations of this effort.

Gartner Canada Co. ("Gartner")'s insights and recommendations will highlight IT capabilities needed for Toronto Hydro to align to existing organizational strategies, increase the pace of value being brought to the business, and enable the possibility for future transformational aspirations.

- Gartner will combine several unique and proprietary Gartner assets and capabilities that will give Toronto Hydro a fact-based, objective starting point for its ongoing strategic direction. These capabilities include:
    - Gartner Research maturity models aligned to key capability areas that integrate Gartner Research insights and industry leading frameworks to support maturation objectives.
    - Gartner's world-leading IT Benchmark database to support a fact-based comparison, using a custom-built peer group to Toronto Hydro's environment, to anchor the current state in key IT enterprise-level cost and staffing measures.
- Outcomes of the engagement will include:
    - A current state summary of Toronto Hydro's maturity across the Utility Industry.
    - A current state summary of Toronto Hydro's IT spend and staffing levels relative to peers with a comparable environment that will identify optimization opportunities to focus future strategic efforts. The analysis will include, but not be limited to, the following metrics:
        - IT Spending as a Percentage of Revenue
        - IT Spending as a Percentage of Operating Expense
        - IT Spending per Company Employee
        - Capital vs Operational Spending
        - Run vs Grow vs Transform Spending
        - Distribution of IT Spending by Category (Hardware, Software, Personnel etc.)
        - Distribution of IT Spending by Domain (Apps Development, App Support etc)

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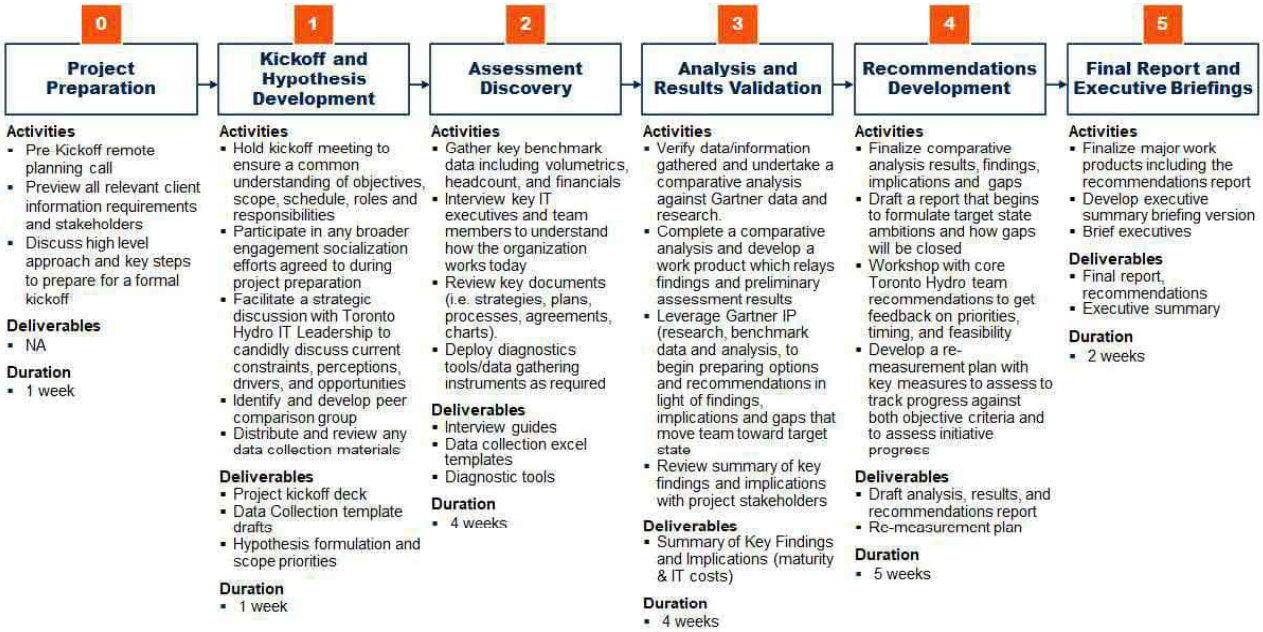
- Revenue Per Employee
- IT Staff as a Percentage of Company Employees
- IT Contractor Usage
- Distribution of IT Staff by Domain
- Other broad spending measures as mutually agreed

- A set of prioritized recommendations based on the comparative analysis that will advance Toronto Hydro in areas directly impactful to the IT and business objectives.
- Guidance on appropriate re-measurement periods and the foundation to measure progress objectively.

1.1 Overall Approach and Methodology

1.1.1 Overall Approach

Gartner will utilize its knowledge and experience in working with Utilities and Ontario Government and other public sector organizations which engage in similar enterprise IT benchmarks and maturity assessments to document the spending and capability maturity compared to peers. Gartner will use its Research, IT Optimization and Consulting IP to inform this activity, and we will also apply our best practices in conducting such benchmarks and assessments.



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1.1.2 Methodology Detail

Table 1. Gartner Task Descriptions

Step 0. Project Preparation	
Objective	• Set the foundation for a successful project that is delivered on time, within budget and meets Toronto Hydro's objectives
Activities Performed by Gartner	• Pre-Kickoff remote planning call • Preview all relevant client information requirements and stakeholders • Discuss high level approach and key steps to prepare for a formal kickoff
Toronto Hydro's Responsibilities	• Ensure attendance at (1 hour teleconference) kickoff meeting by Project Executive Sponsor, Project Core team and key stakeholders, as determined prior to kickoff • Provide relevant context and/or early documentation
Deliverable(s)	• None
Time Frame	• 1-2 Days

Step 1. Project Kickoff and Approach Refinement	
Objective	• Work closely with Toronto Hydro to refine the scope of the project, ensuring that design principles are identified for the relevant design domains /groupings
Activities Performed by Gartner	• Hold kickoff meeting to ensure a shared understanding of objectives, scope, schedule, roles and responsibilities • Participate in any broader engagement socialization efforts agreed to during project preparation • Facilitate a strategic discussion with Toronto Hydro IT Leadership to discuss current constraints, perceptions, drivers, and opportunities • Distribute and review any data collection materials • Discuss and agree on key stakeholders to participate in Step 2
Toronto Hydro's Responsibilities	• Ensure attendance at (2-3 hr) project kickoff Executive Sponsor, Project Core team and key stakeholders, as required
Deliverable(s)	• Project kickoff deck • Data Collection template drafts • Hypothesis formulation and scope priorities

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Time Frame	• 1 Week

Step 2. Assessment Discovery

Objective	• Gather sufficient information and insight to develop an understanding of the current state of IT at Toronto Hydro across in-scope areas, as well the current spend and staffing posture; model preliminary benchmark peers
Activities Performed by Gartner	• Gather key benchmark data including volumetrics, headcount, and financials • Interview key IT resources across functional areas • Review key documents (i.e. strategies, plans, processes, agreements, charts). • Deploy diagnostics tools/data gathering instruments as required
Toronto Hydro's Responsibilities	• Coordinate meetings with Toronto Hydro personnel • Attend interviews to provide input and identify opportunities & challenges • Provide relevant documentation as required • Complete data gathering templates as required
Deliverable(s)	• Interview guides; Data collection excel templates; Diagnostic tools • Ongoing Project Status Reports to convey progress
Time Frame	• 4 Weeks

Step 3. Analysis and Results Validation

Objective	• Complete an iterative comparative analysis of maturity against industry standards and best practices, as well as analysis of the benchmark data gathered vs. the custom peer group selected.
Activities Performed by Gartner	• Verify data/information gathered and undertake a comparative analysis against Gartner data and research. • Provide key observations for Toronto Hydro's performance against it's peer group. • Complete a comparative analysis and develop a work product which relays findings and preliminary assessment results. • Leverage Gartner IP (research, benchmark data and analysis) to begin preparing options and recommendations in light of findings, implications and gaps that move team toward target state. • Review summary of key findings and implications with project stakeholders to present key themes emerging from the comparative analysis, from which recommendations can be made.

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Toronto Hydro's Responsibilities	• Support ongoing questions, or requests for information • Attend workshop to review preliminary results and provide feedback on the analysis
Deliverable(s)	• Draft Findings, Analysis, and Benchmark Results
Time Frame	• 4 Weeks

Step 4. Recommendations Development

Objective	• Based on nuanced context to support Toronto Hydro's IT Strategic Objectives and the results of the assessment, develop and prioritize specific recommendations and provide a strategic roadmap to advance Toronto Hydro IT
Activities Performed by Gartner	• Finalize comparative analysis results, findings, implications and gaps. • Draft a report that begins to formulate target state ambitions and how gaps will be closed across all in scope areas, advancing both strengthening operations and supporting efficiency objectives • Workshop with core Toronto Hydro team recommendations to get feedback on priorities, timing, and feasibility • Develop a re-measurement plan with key measures to assess to track progress against both objective criteria and to assess initiative progress
Toronto Hydro's Responsibilities	• Participate in (2-3 hour) recommendations and priorities workshop
Deliverable(s)	• Draft analysis, results, and recommendations report • Re-measurement plan and measures
Time Frame	• 5 Weeks

Step 5. Final Report and Executive Briefing

Objective	• Finalize report, brief executives, and support execution momentum
Activities Performed by Gartner	• Finalize major work products including the recommendations report. • Develop executive summary briefing version. • Brief executives • Provide inputs and support in preparation for the regulatory filing, drafting responses to Interrogatory questions etc. (up to a maximum of 25 hours of effort)
Toronto Hydro's Responsibilities	• Review report and provide feedback
Deliverable(s)	• Final Report

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- Executive Summary Briefing
- Interrogatory responses (where applicable)

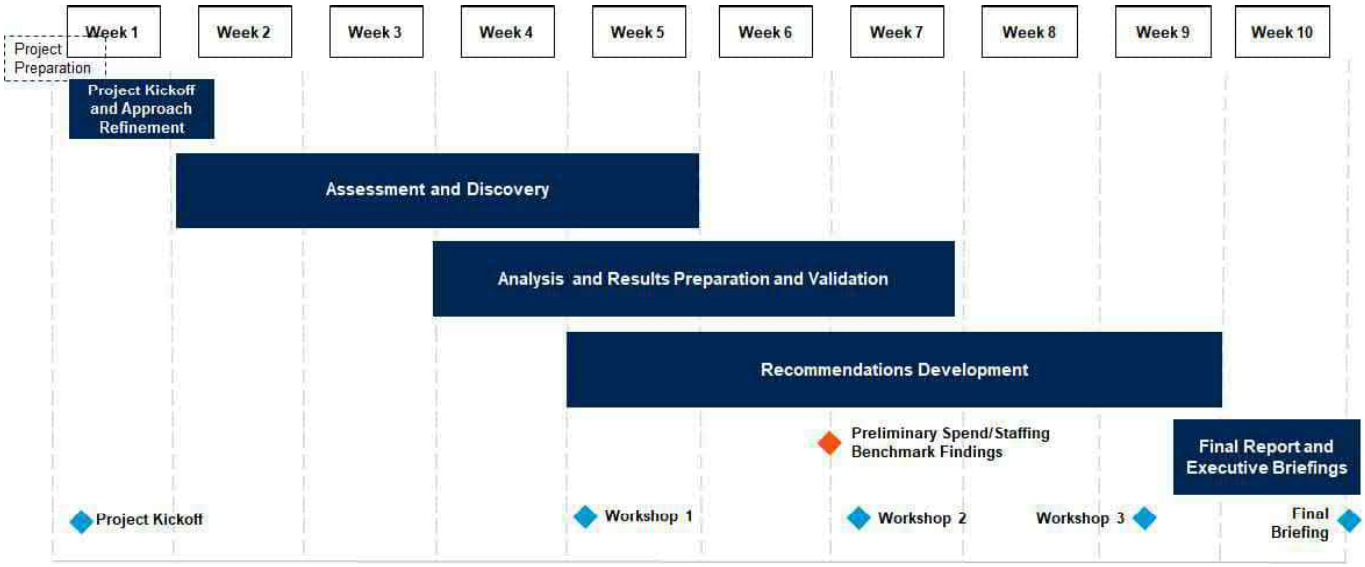
Time Frame

- 2 Weeks

1.1.3 Project Plan and Schedule

Gartner anticipates completion of each annual benchmark within 10 weeks, as detailed in the following figure. This schedule is dependent on the assumptions included in this Statement of Work (SOW). Actual start date is indicative and will be confirmed upon authorization of SOW.

Figure 1. Estimated Engagement Schedule



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2.0 Assumptions

The deliverables, schedule and pricing in this SOW are based on the following assumptions:

Toronto Hydro Participation:

- Toronto Hydro will designate a project manager to act as the primary point of contact for this project. The Toronto Hydro project manager will be expected to work closely with the Gartner employees as needed and will: (a) approve project priorities, detailed step plans and schedules; (b) facilitate the scheduling of Gartner interviews with appropriate client personnel; (c) notify Gartner in writing of any project or performance issues; and (d) assist in resolving project issues that may arise
- The work effort described in this SOW assumes Toronto Hydro IT personnel are available to assist in the manner defined in this SOW. In the event that Toronto Hydro personnel are not available, a change request may be necessary if there is an impact on scope, schedule or other key parameters.
- Toronto Hydro will review and approve documents within five business days. If no formal approval or rejection is received within that time, the deliverable is considered to be accepted by Toronto Hydro
- Toronto Hydro will schedule Toronto Hydro resources for project activities and provide meeting facilities as necessary
- Toronto Hydro personnel will be available per the final project schedule
- Gartner will formally capture feedback on your overall experience via our client survey. This allows us to quantify our performance on this project and to ensure a culture of continuous improvement of process and best practice

Data Collection:

- The due diligence (as-is) data are reasonably available via interviews and documentation review
- Toronto Hydro will provide timely access to all appropriate personnel to be interviewed. These personnel will provide data necessary to complete this project, answer questions, provide existing documentation and attend working sessions
- Project pricing assumes that Gartner will conduct 15 – 20 interviews/consultations and that Toronto Hydro will arrange all sessions with Toronto Hydro IT Personnel
- All data collection and interviews/workshops will take place via telephone or web conference

Key Personnel:

- Resumes of key personnel provided in this SOW are representative resumes of Gartner team members that deliver these types of engagements.
- Where it is indicated in this SOW, that a proposed project team member is a sub-contractor to Gartner, Toronto Hydro agrees to the inclusion of that individual as a member of the project team so long as the sub-contractor is suitably qualified to provide the services. In the event that such inclusion is not reasonably acceptable to Toronto Hydro, Gartner will be informed at the earliest opportunity and requested to find an alternative team member

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Place of Performance:

- All Gartner services will be performed at Gartner locations.

Deliverables and Change to Scope:

- Any requests for additional information or resource (beyond the details described in the steps above) that are made by Toronto Hydro will be considered a change in scope for this project and will be handled accordingly (see Changes to Scope section of this SOW)
- All deliverables will be developed using Microsoft products (e.g., Word and PowerPoint) and will be produced in English only.

Gartner Independence and Objectivity:

- Gartner Research and Consulting recommendations are produced independently by the Company's analysts and consultants, respectively, without the influence, review or approval of outside investors, shareholders or directors. For further information on the independence and integrity of Gartner Research, see "Guiding Principles on Independence and Objectivity" on our website, gartner.com or contact the Office of the Ombuds at ombuds@gartner.com or +1 203 316 3334.
- Notwithstanding anything to the contrary, Gartner shall further, with respect to the Services under this Statement of Work, comply with Rule 13A Expert Evidence of the Ontario Energy Board's Rules of Practice and Procedure, and agrees to accept the responsibilities imposed on them by that rule with respect to any testimony before the Ontario Energy Board

Timeline

- Notwithstanding anything to the contrary in this SOW, Gartner shall complete all services and deliver all Deliverables no later than ten (10) weeks from the execution of this SOW by both parties, ***provided that,*** Toronto Hydro promptly completes its duties and/or obligations set forth in this SOW.

Intellectual Property

- Notwithstanding anything to the contrary in this SOW, the Master Client Agreement, or the Consulting Services Supplement to the Master Client Agreement between the parties, the parties acknowledge and agree that Toronto Hydro shall, at all times, have full rights and title to the Deliverables generated by Gartner under this SOW, including without limitation any reports any related modifications, or additions thereto (collectively, the "SOW Work Product"), and may at all times take possession of or any use of any completed SOW Work Product, notwithstanding any provision, express or implied, to the contrary. Without limiting the generality of the foregoing, Toronto Hydro shall own all intellectual property rights in all SOW Work Product, and Gartner hereby waives and assigns to Toronto Hydro any such rights, and agrees to give Toronto Hydro and its representatives all assistance as may be reasonably required to perfect such rights including, without limitation, obtaining waiver of moral rights from any of Gartner's employees, partners, or other representatives.

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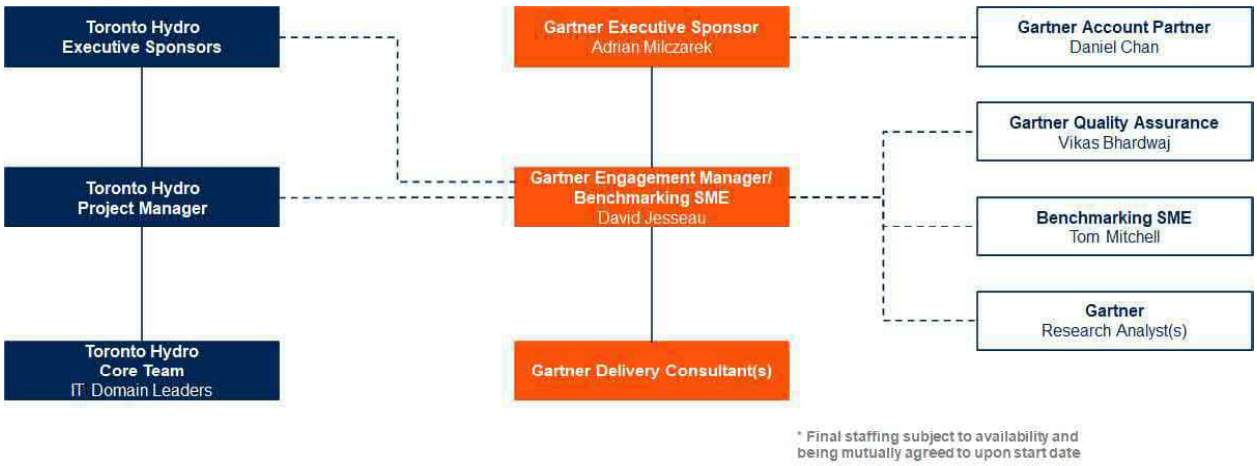
Notwithstanding the foregoing, Gartner shall retain sole and exclusive ownership of any pre-existing Gartner tools, methodologies, questionnaires, responses, and proprietary research and data, together with all intellectual property rights therein (the "Gartner Materials"). Gartner grants to Toronto Hydro a fully paid up, perpetual, non-exclusive, royalty-free, non-assignable license to the Gartner Materials contained within the SOW Work Product. For the avoidance of any doubt, Toronto Hydro may share the SOW Work Product and any embedded Gartner Materials with the Ontario Energy Board (OEB).

3.0 Gartner Project Team Overview and Experience

Gartner is proposing a team that is highly qualified in the areas of IT Benchmarks and capability maturity assessments. This section details the proposed team, brief description of their roles, responsibilities and expertise, and organizational chart.

Gartner has created an organization structure for this engagement that ensures high-level sponsorship and quality assurance, strong day-to-day project management, a focused team of project consultants, and deep subject matter expertise. The key roles and proposed individuals for the Gartner team are shown in Figure 2 below.

Figure 2. Gartner Project Team for Toronto Hydro



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Functional Role	Responsibilities
Executive Sponsor	▪ Ensure that Gartner activities support Toronto Hydro's goals. ▪ Build and maintain a long-standing relationship with Toronto Hydro. ▪ Provide high-level oversight to the engagement and become more heavily involved should any issue resolution be necessary.
Gartner Engagement Manager	▪ Be responsible for the day-to-day management of engagement initiatives. ▪ Ensure that deliverables are completed on time and meet the Gartner quality standards. ▪ Act as the primary point of contact for the Gartner team. ▪ Work closely with Toronto Hydro to ensure that Gartner is meeting its needs.
Project Consultant(s) and SME(s)	▪ Provide day-to-day consulting support for project steps. ▪ Provide support for data collection, data analysis and recommendations for activities. ▪ Participate in deliverable creation, deliverable review and client presentations as needed. ▪ Present results to Toronto Hydro as needed.
Quality Assurance	▪ Provide quality assurance review of Gartner project plan and Gartner deliverables throughout the engagement. ▪ Ensure value through use of the Gartner Project Management Life Cycle detailed in this document. ▪ Provide team with deep industry advisory and oversight ▪ Verify industry best practices and provide industry insights
Research Analyst(s)	▪ Support the core project team by providing a context-sensitive perspective to issues specific to Toronto Hydro based on Gartner industry-leading research. ▪ Participate in analysis and comparisons, and review deliverables as needed.

Role	Responsibilities
Executive Sponsor(s)	The Sponsors are responsible for the overall conduct of all phases of the project. The Sponsors: ▪ Provide executive level sponsorship. ▪ Appoint members to the Steering Committee. ▪ Approve the charter. ▪ Authorize project expenditures within the approved project budget.
Toronto Hydro Project Manager	The Project Manager works closely with the Proponent Project Manager to execute the project and is jointly accountable for project delivery and success. ▪ Manages Toronto Hydro's activities of the project within the approved plans and budget and oversees the overall project plan ▪ Plans, schedules and assigns Toronto Hydro project resources as required. ▪ Ensures all Proponent deliverables are meeting Toronto Hydro's scope, quality, timeline and budgetary requirements. ▪ Initiates corrective action for deviations from the approved plans. ▪ Drives the overall project to meet milestone & completion dates. ▪ Controls scope of the overall project to ensure on-time, on-budget delivery. ▪ Manages day-to-day tasks, issues, budgets and risks.
Toronto Hydro Extended Project Team	▪ Performs work as directed by Toronto Hydro's Project Manager.

4.0 Changes to Scope

- The scope of this engagement is defined by this SOW. All Toronto Hydro requests for changes to the SOW must be in writing and must set forth with specificity the requested changes. As soon as practicable, Gartner shall advise Toronto Hydro of the cost and schedule implications of the requested changes and any other necessary details to allow both parties to make an informed decision as to whether they will proceed with the requested changes. The parties shall agree in writing upon any requested changes prior to Gartner commencing work.
- As used herein, "changes" are defined as work activities or work products not originally planned for or specifically defined by this SOW. By way of example and not limitation, changes may include the following:
  - Any activities not specifically set forth in this SOW

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- Providing or developing any deliverables not specifically set forth in this SOW
- Any material change in the respective responsibilities of Gartner and Toronto Hydro, including any reallocation or any changes in engagement or project manager staffing
- Any rework of completed activities or Deliverables following acceptance of such Deliverables by Toronto Hydro
- Any additional work caused by a material change in the assumptions set forth in this SOW
- Any material delays in deliverable caused by modification of acceptance criteria in this SOW

i. Any changes to Research Analysts' time or resources

5.0 Investment Summary: Fees and Expenses

Gartner will conduct the steps outlined in this SOW for a firm-fixed price of $275,000 CAD, exclusive of any applicable taxes.

Billing:

- Gartner will conduct the steps as outlined in this SOW for the firm-fixed price defined above.
- Gartner will bill for 50% of the professional fees upon execution of this SOW by both parties, followed by the balance of 50% upon completion of the final report, approved by Toronto Hydro

i. This includes pre-payment of 25 hours towards Regulatory Filing support, per Step 5 in section 1.1.2

Invoicing:

- All invoices are payable net 30 days from the date of invoice. While we do not itemize billing for services, we agree and will comply with any reasonable requests for records substantiating our invoices.
- If Toronto Hydro requires a purchase order (PO) number, please specify the PO number in the Authorization section and forward a copy of the PO, with this agreement, to name/address or fax of appropriate individual. Ensure that the PO includes all labor and travel expenses quoted in this SOW. Any pre-printed terms on the PO that are in addition to or in contradiction of the terms of this agreement shall be inapplicable.

6.0 Authorization

- This SOW is submitted under the terms and conditions of the Master Client Agreement dated April 20, 2022 and the Consulting Services Supplement to the Master Client Agreement dated October 31, 2022 each between Gartner Canada Co. and Toronto Hydro-Electric System Limited.

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- When signed by Gartner Canada Co. and Toronto Hydro, this Proposal/SOW is an attachment to and governed by the above noted agreements. These documents will set forth the relationship between the parties for this engagement. This SOW may be modified at any time provided such changes (i) are agreed by the parties in writing and (ii) where applicable, are in accordance with the Change Order provision.
- IF USING A DIGITAL SIGNATURE, PLEASE CONFIRM THE FOLLOWING AS A CONDITION OF CONTRACT EXECUTION:
- [ ] By ticking this box, I agree that by affixing my digital signature hereunder I am attesting that: (i) this is my own personal legal signature; and (ii) I am a duly authorized signatory for my company. My signature verifies that the information provided to Gartner hereunder is subscribed by me, under penalty of false statement and material breach of contract.

SUBMITTED ON BEHALF OF GARTNER CANADA CO.

DocuSigned by:
Kim Blimka
9FB5551581C34B5...

SIGNATURE

Kim Blimka Contracts Specialist

PRINT NAME AND TITLE

November 4, 2022

DATE

AGREED ON BEHALF OF Toronto Hydro

SIGNATURE

Sheikh Nahyaan, Executive Vice President, Customer Care, and Chief Information Officer

PRINT NAME AND TITLE

October 31, 2022

DATE

PO NUMBER (If applicable)

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Agreement for Purchase of Services

THIS AGREEMENT is made this 1st day of October, 2020,

BETWEEN:

Toronto Hydro-Electric System Limited.,

a corporation incorporated under the laws of Ontario

(hereinafter called "Toronto Hydro")

and

Stantec Consulting Ltd.

a corporation incorporated under the laws of Canada

(hereinafter called the "Vendor")

WHEREAS:

A. Toronto Hydro requires the supply of engineering services including the design, development, and drafting of construction standards, technical support for distributed energy resources connections and protection, systems planning and market analysis, program and project management services, data science and analytics, and enterprise asset management (EAM) for ERP, as detailed in SCHEDULE A (collectively, the "Services");

B. the Vendor carries on the business of providing these engineering and related services and has indicated to Toronto Hydro that it has the skill and expertise to provide the Services on the terms and conditions set forth herein;

C. the Vendor has agreed to provide the Services to Toronto Hydro and Toronto Hydro has agreed to purchase the Services, upon the terms and conditions as set forth below; and

D. this Agreement is issued in connection with RFP 20P-0448 dated March 9, 2020 (the, including any schedules, attachments, amendments, supplements or addenda thereto and the Vendor's submission in response thereto dated April 20, 2020.

NOW THEREFORE, in consideration of the mutual covenants contained herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. Interpretation

a) All capitalized terms in this Agreement shall have the meaning as defined in SCHEDULE C;

b) The recitals hereto shall form an integral part of this Agreement as if specifically restated herein;

c) Words denoting the singular include the plural and vice versa and words denoting any gender include all genders;

d) The word "including" shall mean "including without limitation";

e) Any reference to a statute shall mean the statute in force as of the date hereof, together with all regulations promulgated thereunder as may be amended, re-enacted, consolidated and/or replaced, from time to time, and any successor statute thereto, unless otherwise provided;

f) When calculating a period of time within which or following which any act is to be done or step taken, the date which is the reference day in calculating such period shall be excluded, and if the last day of such period is a Saturday, Sunday or statutory holiday, the period shall end on the next Business Day;

g) All dollar amounts in this Agreement are expressed in Canadian dollars, unless otherwise stated;

h) The division of this Agreement into separate articles, sections, subsections and Schedules and the insertion of headings is for convenience of reference only and shall not affect the construction or interpretation of this Agreement; and

i) Save and except as otherwise expressly defined within the body of this Agreement or in SCHEDULE C hereto, words or abbreviations which have well known or trade meanings are used herein in accordance with their recognized meanings.

2. Schedules, Exhibits and Appendices

The following schedules and appendices are attached to and form part of this Agreement:

a) SCHEDULE A –Services Required
    i. Appendix 1 – Project Work Order

b) SCHEDULE B – Purchase Price

c) SCHEDULE C – Defined Terms

d) SCHEDULE D – Supplier Quality Manual

In the event of a conflict between the terms of any schedule, exhibit or appendix and the terms of this Agreement, the terms of this Agreement shall govern.

3. Purchase and Sale

Subject to the terms and conditions of this Agreement, and in reliance on the representations, warranties and conditions set forth in this Agreement, Toronto Hydro agrees to purchase the Services from the Vendor and the Vendor agrees to supply the Services to Toronto Hydro during the Term of this Agreement.

4. Term

a) Subject to any termination rights herein, this Agreement shall be for a term of 3 years, from October 1, 2020 to October 1, 2023 (the "Initial Term").

b) Toronto Hydro may, at its sole option, elect to renew this Agreement for three (3) additional 1 year terms (each a "Renewal Term") by giving written notice to the Vendor at least sixty (60) days before the end of the Initial Term or the first Renewal Term, as applicable. The same terms and conditions contained herein shall apply during the Renewal Term, save and except as amended in writing by the parties.

c) The Initial Term and the Renewal Term, if any, shall hereinafter together be referred to as the "Term".

5. Price and Payment

a) The prices for the Services shall be as specified in SCHEDULE B hereto and, except as otherwise provided, shall be in Canadian dollars DDP Toronto Hydro's location (INCOTERMS 2010), and shall represent the total cost to Toronto Hydro, excluding any value added taxes (including HST) but including without limitation all other applicable taxes, duties, packaging, handling and delivery costs. Toronto Hydro shall withhold any applicable non-resident withholding taxes from any amount owing in this Agreement and remit such taxes to the appropriate federal taxing authority. If no price is stipulated in this Agreement, the price must not exceed the last previous quotation made by the Vendor to Toronto Hydro for the same Services.

b) Unless otherwise provided in this Agreement, the Vendor shall invoice Toronto Hydro after final inspection and acceptance by Toronto Hydro of the Services performed and subject to receipt of all documents required by this Agreement. **Invoices must be sent electronically to: AP@torontohydro.com.** Subject to approval of the invoice by Toronto Hydro, receipt of all documents required by this Agreement, and final review by Toronto Hydro, Toronto Hydro shall make payment to the Vendor via electronic funds transfer not later than thirty (30) days following receipt of an acceptable invoice and the EFT Information (as set out below). **The Vendor must provide Toronto Hydro with, in the case of the first payment only, (i) a void cheque, pre-printed deposit slip or bank confirmation letter and (ii) the email address where the Vendor wishes to receive remittance information (together, "EFT Information"). EFT Information must be sent electronically to efthelp@torontohydro.com or to 14 Carlton Street, Toronto, ON, M5B 1K5, Attention: Treasury Department.** Toronto Hydro reserves the right to pay the Vendor through other payment methods.

6. Delivery of Services

a) All Services shall be performed in accordance with the terms, specifications and schedules included in SCHEDULE A. The Vendor shall immediately notify Toronto Hydro, in writing, of any circumstances known or suspected that may cause delay in performance of the Services.

b) In the event of any question, dispute, disagreement or difference of opinion between Toronto Hydro and the Vendor relating to the quality or acceptability or rate of progress of any Services or relating to the interpretation of the specifications in SCHEDULE A or the performance of this Agreement,

the opinion of Toronto Hydro or its authorized Representative shall govern and be binding on the parties hereto.

7. Invoice Requirements

The Vendor shall submit invoices to Toronto Hydro in accordance with Section 5 of this Agreement and the payment terms as set out in SCHEDULE B. Each invoice shall contain:

a) a detailed description of the Services performed during the invoice period;

b) the dates and the amount of time spent by the Vendor for the provision of the Services;

c) the hourly rates;

d) the total HST applicable to the Services during the invoice period, as well as the Vendor's HST registration number; and

e) a detailed description of any applicable disbursements incurred around the invoice period, supported by documentation in a form acceptable to Toronto Hydro.

8. Inspection

All Services performed will be subject to final inspection and approval by Toronto Hydro after performance, notwithstanding any prior payment. In the event that Services are performed which are not in conformity with the terms and conditions and specifications of this Agreement, Toronto Hydro may, at its option:

a) reject the Services and require the Vendor to immediately re-perform the Services;

b) negotiate with the Vendor an agreeable reduction in the price of the delivered, non-conforming Services;

c) rework, or cause to be reworked, the delivered, non-conforming Services, at the Vendor's expense, which expense shall constitute a proper set-off by Toronto Hydro against amounts otherwise due to the Vendor under this Agreement; or

d) reject the Services and require a repayment of applicable amounts for such deliverables.

9. Representations, Warranties and Covenants

The Vendor represents and warrants to Toronto Hydro that:

a) it has the corporate power and authority to enter into this Agreement and to perform its obligations hereunder, and that this Agreement constitutes a legal, valid, and binding obligation of the Vendor, enforceable against the Vendor in accordance with its terms;

b) the Vendor, after conducting due diligence, is not aware of any actions, suits or other legal proceedings which may affect its ability to perform this Agreement;

c) the Services shall be performed in a professional, diligent and competent manner and shall meet those standards generally observed by reputable and competent members of the same industry providing similar services;

d) it is an expert, trained, equipped and capable in providing the Services and shall only use reliable, qualified and Competent Persons to perform the Services;

e) it is in compliance with and has paid, and will continue to pay, all assessments and other amounts owing pursuant to the WSIA; and

f) it is satisfied with the conditions under which the Services will be performed, and shall assume full responsibility for understanding the conditions of supply, operations, and service.

10. Warranty

All Services shall be provided in compliance with Applicable Laws in a professional, diligent, and competent manner using fully qualified, professionally and technically, personnel entitled to legally work in the Ontario, Canada exercising the level of skill and diligence required of a qualified and reasonable contractor. The Services will conform to the descriptions as specified in SCHEDULE A hereto. This warranty is in addition to all other warranties specified in SCHEDULE A or implied by law and shall survive acceptance and payment.

11. Personnel

The Vendor shall inform Toronto Hydro of turnover of all personnel within its organization that are connected to the Services being provided by the Vendor to Toronto Hydro (whether a Required Resource or not) in a timely fashion, but in no case longer than five (5) Business Days from such effective termination, in order to allow Toronto Hydro to make arrangements for its protection.

12. Health and Safety

The Vendor shall be responsible for:

a) managing the health and safety of its own personnel and its other Representatives;

b) ensuring compliance with all Applicable Laws related to health and safety, including without limitation the OHSA; and

c) ensuring that its personnel and its other Representatives are aware of any safety hazards involved in working in or around Toronto Hydro's facilities and all Applicable Laws with respect thereto.

Neither Toronto Hydro, nor its Representatives, shall be liable for any loss, damages or claims arising directly or indirectly from the Vendor's work in or around Toronto Hydro's facilities, and the Vendor hereby waives any claims to which it may become entitled for loss or damage and releases Toronto Hydro and its Representatives from any and all such claims.

13. Permits and Applicable Laws

a) The Vendor shall, at its sole expense, obtain and maintain during the Term of this Agreement, all permits, licences and approvals required by all Applicable Laws to perform its obligations under this Agreement. The terms and conditions of this Agreement shall be carried out in strict

compliance with all Applicable Laws and in the event of any conflict between any Applicable Laws, the Applicable Laws with the most stringent standard shall apply.

b) Without limiting the generality of subsection 13(a) above, the Vendor shall comply with the *Personal Information Protection and Electronic Documents Act* (Canada), MFIPPA and any other applicable privacy legislation with respect to any personal information collected, used or disclosed in connection with this Agreement and shall indemnify and hold harmless Toronto Hydro and its Representatives from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments (including related expenses and legal costs) they may incur related to or arising out of any non-compliance therewith by the Vendor or its Representatives.

14. Compliance with Guidelines

The Vendor's personnel shall comply with all rules and direction of Toronto Hydro, whether specified in this Agreement or otherwise, while working on Toronto Hydro's premises, distribution system or when accessing or connecting to Toronto Hydro's information technology systems, including rules and directions concerning health, safety, security and environmental protection, including without limitation, Toronto Hydro's *Code of Business Conduct*, Toronto Hydro's *Disclosure Policy*, Toronto Hydro's *Social Media and Digital Communication Guidelines*, Toronto Hydro's *Accessibility Standards for Customer Service Policy*, Toronto Hydro's *Workplace Harassment Policy*, Toronto Hydro's *Violence Prevention in the Workplace Policy*, Toronto Hydro's *Environmental Policy*, Toronto Hydro's *Occupational Health & Safety Policy*, Toronto Hydro's *Privacy Policy Statement*, Toronto Hydro's *Cyber Security Policy*, Toronto Hydro's *Technology Use Guidelines*, and the *Affiliate Relationships Code for Electricity Distributors and Transmitters* issued by the OEB (together, the "Guidelines"). The Vendor acknowledges that it has been provided with a copy of the Guidelines, has provided and will provide a copy of the Guidelines to each of its Representatives and that it agrees to comply with and to direct its Representatives to comply with such Guidelines, as amended.

15. Liability and Indemnification

The Vendor shall be liable for and shall indemnify and hold harmless Toronto Hydro and its Representatives from all claims, demands, actions, penalties, damages, losses, judgments and settlements, liabilities, costs, expenses, including legal fees and other related costs and expenses arising out of, related to, or incident to, the Vendor or any of its Representatives' performance of the Services under this Agreement, including, without limitation:

a) any breach, violation or non-performance by the Vendor or any of its Representatives of any terms, conditions, warranties, obligations or covenants contained in this Agreement;

b) any breach or violation by the Vendor or any of its Representatives of any Applicable Laws; and

c) any actions, omissions, negligence or wilful misconduct of the Vendor or any of its Representatives.

Except for losses arising out of, related to or incident to: (i) breach of Applicable Laws; (ii) wilful misconduct; (iii) damage to persons or tangible property due to negligence; (iv) breach of confidentiality or privacy obligations; or (v) breach of Section 21 (Intellectual Property Protection), Vendor's total liability shall not exceed the greater of : (i) the total amount of fees paid to Vendor under the applicable purchase order; and (ii) five million dollars ($5,000,000.00) and the proceeds of insurance, as set out in Section 16 below. Subject to the foregoing, in no event shall either party be liable for any indirect or consequential damages (including lost profits or loss of revenue).

16. Insurance

a) Unless otherwise specified in this Agreement, the Vendor shall, during the Term of this Agreement, and at its own expense, maintain and keep in full force and effect:

i. commercial general liability insurance on an occurrence basis having a minimum inclusive coverage limit, including personal injury and property damage, of five million dollars ($5,000,000.00) per occurrence, which shall be extended to cover contractual liability, products and completed operations liability, contingent employer's liability, owners/contractors protective liability and must also contain a cross liability clause and a severability of interest clause, and must name Toronto Hydro and its Affiliates as additional insureds;

ii. Errors and Omissions Insurance (Professional Liability) covering actual or alleged acts, errors or omissions committed by the Vendor or its Representatives, arising out of the performance of this Agreement, which shall also extend to include personal injury, bodily injury and property damage from the performance of professional services, in the amount of two million dollars ($2,000,000.00);

iii. any and all insurance and/or financial assurance required by the Ministry of the Environment and any applicable Governmental Authority as well as environmental liability insurance and pollution liability coverage on at least a sudden and accidental basis, all on a per occurrence basis having a coverage limit of five million dollars ($5,000,000.00) per occurrence.

iv. automobile liability insurance on all owned and non-owned vehicles used in connection with this Agreement and such insurance coverage shall have a limit of two million dollars ($2,000,000.00) per accident, in respect of bodily injury (including passenger hazard) and property damage inclusive of any one accident and mandatory accident benefits.

b) All insurance coverages and limits required to be maintained by the Vendor shall be primary to any insurance maintained by Toronto Hydro, which shall be excess and non-contributory. Prior to the commencement of the delivery of the Services, the Vendor shall deliver to Toronto Hydro a certificate of insurance which evidences the Vendor's compliance with this Section, including the provision of a thirty (30) day prior written notice of cancellation to Toronto Hydro. The Vendor agrees that the insurance described herein does in no way limit the Vendor's liability pursuant to the indemnity provisions of this Agreement.

c) A waiver of subrogation shall be provided by the commercial liability insurer(s) to Toronto Hydro.

17. Subcontractors

The Vendor may only subcontract any of the Service under this Agreement with the prior written consent of Toronto Hydro. If subcontracting is permitted, the Vendor shall enter into agreements with such subcontractors to require them to perform the Services in accordance with all Applicable Laws and the terms of this Agreement and the Vendor shall be liable for any acts or omissions of such subcontractors as if such acts or omissions were those of persons directly employed by the Vendor. The Vendor agrees to incorporate the terms of this Agreement into all subcontract agreements with its subcontractors. Any subcontract shall not relieve the Vendor from any of its obligations or liabilities under this Agreement.

18. Termination

a) Toronto Hydro may, for its convenience and at its sole option, terminate this Agreement by providing at least sixty (60) days prior written notice of such termination. Upon issuance of such notice, the Vendor shall stop performance of the Services under this Agreement, except as may be necessary to carry out such termination and take any other action which Toronto Hydro may reasonably direct. Upon a termination for convenience, Toronto Hydro shall pay for such Services requested and accepted by Toronto Hydro up until the effective date of such termination. Toronto Hydro shall not be liable to the Vendor for any other costs or damages whatsoever arising from such termination, including without limitation, any indirect, consequential or special damages such as a loss of profit or loss of opportunity.

b) If the Vendor fails to fulfil any covenant or material obligation under this Agreement, including, without limitation, the failure to meet the delivery schedule or any specification contained herein, or breaches any representation or warranty contained herein, then Toronto Hydro may, without prejudice to any other right or remedy Toronto Hydro may have, notify the Vendor in writing that the Vendor is in default of its contractual obligations and instruct the Vendor to correct the default within five (5) Business Days immediately following the receipt of such notice. If the Vendor fails to correct the default in the time specified, then, without prejudice to any other right or remedy Toronto Hydro may have, Toronto Hydro may either correct such default and deduct the cost thereof from any payment then or thereafter due to the Vendor and/or terminate this Agreement.

c) If bankruptcy or insolvency proceedings are instituted by or against the Vendor or the Vendor is adjudicated a bankrupt, becomes insolvent, makes an assignment for the benefit of creditors or proposes or makes arrangements for the liquidation of its debts, or a receiver or receiver and manager is appointed with respect to all or part of the assets of the Vendor, Toronto Hydro may, without prejudice to any other rights or remedies it may have, immediately terminate this Agreement.

d) The termination of this Agreement shall not affect any rights or obligations which may have accrued prior to such termination or any other rights which the terminating party may have arising out of either the termination or the event giving rise to the termination.

19. Time of the Essence

Time is of the essence in this Agreement. The Vendor shall perform all Services in accordance with the dates and times for performance and delivery specified in SCHEDULE A hereto and Toronto Hydro shall have the right to take possession of and use any completed or partially completed portions notwithstanding any provisions expressed or implied to the contrary.

20. Force Majeure

a) As used herein, “Force Majeure” means events beyond the reasonable control of a party applying reasonable diligence and foresight given the nature of the Services being provided under the Agreement, including, as applicable, any acts of God and the public enemy, the elements; fire; accidents; vandalism; sabotage; power failure; strikes, lockouts or any other industrial, civil or public disturbances; any laws, orders, rules, regulations, acts or restraints of any government or governmental body or authority, civil or military, including the orders and judgments of courts and any other similar causes or acts.

b) If, by reason of Force Majeure, either party hereto (the "Frustrated Party") is delayed or unable, in whole or in part, to perform or comply with any obligation or condition of this Agreement, then it will be relieved of liability and will suffer no prejudice for failing to perform or comply or for delaying such performance or compliance during the continuance and to the extent of the inability so caused from and after the happening of the event of Force Majeure, provided that it gives to the other party prompt notice of such inability, reasonably full particulars of the cause thereof and the expected cessation. If notice is not promptly given, then the Frustrated Party will only be relieved from performance or compliance from and after the giving of such notice. The Frustrated Party will use its best efforts to remedy the situation and remove, so far as possible with reasonable dispatch, the cause of its inability to perform or comply, provided, however, that settlement of strikes, lockouts and other industrial disputes shall be within the discretion of the Frustrated Party. The Frustrated Party will give prompt notice of the cessation of Force Majeure. If at any time the Vendor cannot deliver the Services required to be provided pursuant to the Agreement due to Force Majeure, Toronto Hydro may engage any other party to provide such Services which the Vendor cannot provide. The benefit of this provision of Force Majeure shall only survive for thirty (30) days from the commencement of an event of Force Majeure. A requirement to disclose Confidential Information other than under Canadian law pursuant to the terms of this Agreement shall not be an event of Force Majeure. A failure by a sub-contractor to perform shall not be an event of Force Majeure for a Frustrated Party unless such sub-contractor is itself suffering from an event of Force Majeure and the provisos set forth above are followed.

21. Intellectual Property Protection

The Vendor expressly warrants that the manufacture, delivery, sale or use of the Vendor's Services will not infringe any Canadian or foreign patents, trademarks, copyrights, industrial design or other intellectual property rights and the Vendor shall indemnify and save Toronto Hydro harmless from all claims, judgments and decrees that may be entered against Toronto Hydro or its Representatives and against all damage, liability, costs and expenses (including legal fees and other attendant costs and expenses) Toronto Hydro incurs by reason of any infringement or claim thereof.

22. Confidential Information

The parties agree and acknowledge that, subject to Applicable Laws or court order,

a) each party (the "Receiving Party") shall maintain in strict confidence the terms of this Agreement and any and all proprietary and confidential information about the business, operations or customers of the other party or any of their Affiliates, which it acquires in any form from the other party (the "Disclosing Party") by virtue of this Agreement ("Confidential Information") and will not disclose to any third party or make use of such Confidential Information for itself or any third party without the prior written consent of the Disclosing Party;

b) the Receiving Party may disclose such Confidential Information to any of the Representatives of the Receiving Party or any of its Affiliates who agree to be bound by the obligations of confidentiality herein and who have a reasonable need to know such Confidential Information in the course of their duties for the Receiving party but only for the purposes of the Receiving party exercising its rights and obligations under this Agreement;

c) Toronto Hydro is subject to MFIPPA and is governed by governmental authorities such as the IESO and the OEB and shall have the right to disclose Confidential Information in accordance with the provisions of MFIPPA or as required by the IESO or the OEB;

d) a party shall be entitled to all remedies available at law or in equity to enforce, or seek relief in connection with any breach of obligations pursuant to this section;

e) the Receiving Party shall be responsible for any breach of this Agreement by it and its Representatives and by any other person to whom it discloses any Confidential Information. The Parties agree that the Disclosing Party would be irreparably injured by a breach of this Agreement by the Receiving Party, or by any person to whom it discloses any Confidential Information, and that monetary damages would not be a sufficient remedy. Therefore, in such event, the Disclosing Party shall be entitled to all available equitable relief, including injunctive relief without proof of actual damages, as well as specific performance. Such remedies shall not be deemed to be exclusive remedies for a breach of this Agreement but shall be in addition to all other remedies available at law or equity;

f) upon termination of this Agreement, or upon ten (10) days' prior written notice from the Disclosing Party requesting return of any or all Confidential Information, the Receiving Party shall forthwith return to the Disclosing Party all Confidential Information, including without limitation all copies of any form of the Confidential Information, the Receiving Party has received and, at the option of the Disclosing Party, deliver to the Disclosing Party, or destroy or have destroyed, any copies or other reproductions of the Confidential Information together with all notes, analyses, reports and other written material whatsoever prepared by, or on behalf of, the Receiving Party, from, or in respect of, the Confidential Information; provided that the Receiving Party shall be entitled to keep, subject always to all the provisions of this Agreement, one copy of such notes, analyses, reports or other written material prepared by, or on behalf, the Receiving Party for its records. The Receiving Party shall provide to the Disclosing Party, upon request, a certificate of an officer of the Receiving Party certifying such destruction; and

g) notwithstanding section 22(a), in the event that the Receiving Party believes it is required by law to disclose, or is requested by a Governmental Authority to disclose, any Confidential Information to a Governmental Authority, the Receiving Party may so disclose; provided that if legally allowed to do so, it shall, to the extent permitted by law, first inform the Disclosing Party of the request or requirement for disclosure to allow an opportunity for the Disclosing Party to apply for an order to prohibit or restrict such disclosure.

The terms of this Section 18 shall survive the expiry or termination of the Contract for a period of three (3) years.

23. Audit Rights

a) For the purpose of verifying the Vendor's compliance with this Agreement (including, without limitation, compliance with all Applicable Laws and verification of all amounts invoiced to Toronto Hydro), Toronto Hydro or its authorized Representative shall have access at all reasonable times to the Vendor's premises, financial data, personnel, files and records, correspondence, computer files, and books and accounting records relating in any manner to the Services. The Vendor shall ensure that Toronto Hydro or its authorized Representative has the same audit access with respect to subcontractors. All costs of conducting such audits shall be borne by Toronto Hydro.

b) If an audit indicates errors in any amount claimed by Vendor in respect of the Services, the Vendor shall make the appropriate adjustments to the amount claimed and promptly refund overpayments to Toronto Hydro.

c) Notwithstanding the foregoing, Toronto Hydro's right to inspect, copy and audit shall not extend to the composition of the Vendor's rates and fees, percentage mark-ups or multipliers but shall apply only to their application to the applicable units.

24. Workers' Rights

a) The Vendor shall at all times pay or cause to be paid any assessments or compensation required to be paid by the Vendor or its subcontractors pursuant to any applicable workers' compensation legislation, and upon failure to do so, Toronto Hydro may pay such assessments or compensation to the Workplace Safety and Insurance Board or other applicable authority, body or agency and may deduct such assessments or compensation from monies due to the Vendor. The Vendor shall comply with all regulations and laws relating to workers' compensation.

b) The Vendor agrees to indemnify and save harmless Toronto Hydro from and against all losses, liability, costs, charges, claims, damages, expenses or liens which may arise as a consequence of or result from any failure, including any delay in complying, of the Vendor or any of its subcontractors to comply fully with the provisions of this Section 24 or which may arise as a consequence of any illness, injury or death of any employee of the Vendor or any such subcontractor.

25. [INTENTIONALLY OMITTED]

26. Non-Solicitation

Unless Toronto Hydro's Chief Executive Officer provides prior written consent, the Vendor hereby covenants and agrees that during the term of this Agreement and for a period of two (2) years following the termination of the Agreement, however caused, the Vendor will not directly or indirectly, either individually or in partnership or jointly or in conjunction with any other Person,

a) hire or otherwise engage any Protected Employee who is currently employed by Toronto Hydro;

b) hire or otherwise engage any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause;

c) solicit or attempt to solicit any Protected Employee who is currently employed by Toronto Hydro or encourage any such person to leave his/her employment with Toronto Hydro; and

d) solicit or attempt to solicit any Protected Employee who was formerly employed by Toronto Hydro and is within the twelve (12) month period immediately following the Protected Employee's termination date provided that the Protected Employee's employment was not terminated without cause.

Given the unique expertise and intimate knowledge that the employees have of the operations of Toronto Hydro the Vendor acknowledges and agrees that the restrictions contained in this Section 23 are reasonable and necessary to preserve the value of Toronto Hydro's business.

27. Changes

a) Toronto Hydro may, without invalidating the Agreement, change or issue instructions or schedules for the Services, require the Vendor to perform extra or additional work, or require the Vendor to delete certain parts of the Services (any such change, a "Change Order"), with the purchase price and schedule for the Services being adjusted accordingly by the Change Order.

b) If the Vendor's costs or ability to meet the schedule are impacted by any failure by Toronto Hydro to perform any of Toronto Hydro's obligations under the Agreement in the manner or within the time periods required by the Agreement, the Vendor may submit a request for a Change Order pursuant to this Section for a change in the purchase price, the schedule or both, to the extent the Vendor incurs any additional costs or is delayed on account of Toronto Hydro's failure.

c) Upon receipt of notice of a required change in the Services, the Vendor shall promptly, and in any event within five (5) Business Days of receiving such written request, provide Toronto Hydro with a written estimate of the additional costs for such change or the cost savings with respect to deleted portions of the Services, as well as the impact to the schedule. In each case the estimate shall show the hours and costs to the Vendor for labour, materials, and equipment overhead, along with the impact on delivery, all with adequate supporting documentation.

d) After receipt of an estimate of costs related to a Change Order from the Vendor, Toronto Hydro will determine what amendments to the Agreement, if any, may be reasonably required by such changes. Any change to the scope of work will be agreed to by the parties prior to implementation and evidenced in a written Change Order signed by both parties provided that Toronto Hydro may direct the Vendor to proceed with a change pending dispute resolution.

e) Extra or additional work performed by the Vendor without a prior Change Order from Toronto Hydro shall be at the Vendor's sole cost and expense and Toronto Hydro shall not be liable for any claim by the Vendor.

f) The Vendor shall not suspend the unaffected portions of the Services while Toronto Hydro is in the process of making such changes and any related adjustment unless so initiated by Toronto Hydro.

28. Suspension

Toronto Hydro may, at any time during the term by notice in writing, suspend all or a portion of the Services. Upon receipt of such written notice, the Vendor shall perform no further work other than as directed by Toronto Hydro, and shall be entitled to payment for time spent in performing the Services up to the date of suspension.

29. Toronto Hydro Not Responsible

Notwithstanding any other provision in this Agreement, Toronto Hydro shall not be responsible for and shall not have control or charge of any means, methods, techniques, sequences or procedures used for or in respect of the Services, or for the safety precautions or programs required for the Services or otherwise prescribed hereunder. Toronto Hydro shall not be responsible for or have control or charge over the acts or omissions of the Vendor, subcontractors (if any) or their agents, employees or other persons performing any of the Services.

30. Preparation of the Agreement

Notwithstanding the fact that this Agreement was drafted by Toronto Hydro and its legal and other profession advisors, the parties acknowledge and agree that any doubt or ambiguity in the meaning, application or enforceability of any term or provision of this Agreement will not be construed or interpreted against Toronto Hydro or in favour of the Vendor when interpreting such term or provision, by virtue of such fact.

31. Publicity

The Vendor shall not use Toronto Hydro's (or its Affiliates') name, corporate logos or trade-marks in advertising or publicity nor the fact that any agreement between the Vendor and Toronto Hydro has been entered into without Toronto Hydro's express prior written consent, which may be withheld in the sole discretion of Toronto Hydro.

32. No Minimum Volume

The Vendor acknowledges and agrees that: (i) no portion of the Agreement shall be interpreted as imposing any minimum volume purchase commitment on Toronto Hydro; (ii) the Agreement does not obligate Toronto Hydro to award the procurement of any or all services associated with the Agreement to the Vendor, and services may be added or deleted in Toronto Hydro's absolute and sole discretion at any time; and (iii) the volume of purchase of the Services may diminish or be eliminated prior to the termination date of the Agreement without any liability on the part of Toronto Hydro, including but not limited to any claims by the Vendor for loss of anticipated profits.

33. Non-Exclusive Contract

It is expressly understood that the Agreement is non-exclusive with respect to the Vendor and Toronto Hydro. Toronto Hydro may contract with others for the procurement of the Services described herein in its sole discretion.

34. Assignment

Save and except for Toronto Hydro's right to assign this Agreement to any of its Affiliates, neither party may assign this Agreement or any of its rights or obligations hereunder, in whole or in part, without the prior written consent of the other party, which consent may not be unreasonably withheld.

35. Relationship of the Parties

Nothing contained in this Agreement shall be construed to constitute either party as the partner, employee or agent of, or joint venturer with the other party, nor shall either party have any authority to bind the other in any respect, it being intended that each party shall remain an independent contractor of the other. The Vendor is responsible for all deductions and remittances required by law in relation to its employees, including those required for Canada unemployment insurance, workers' compensation and income tax.

36. Severability

In the event that any of the covenants herein shall be held unenforceable or declared invalid for any reason whatsoever, to the extent permitted by law, such unenforceability or invalidity shall not affect the

enforceability or validity of the remaining provisions of this Agreement and such unenforceable or invalid portion shall be severable from the remainder of this Agreement.

37. No Waiver

A waiver of any provisions of this Agreement shall not constitute either a waiver of any other provisions or a continuing waiver, unless otherwise expressly indicated in writing.

38. Enurement

This Agreement and everything contained herein shall enure to the benefit of, and be binding upon, the parties hereto and their respective successors and permitted assigns.

39. Notice

All notices, requests, claims, demands and other communications hereunder shall be in writing and shall be deemed (in the absence of evidence of prior receipt) to have been validly and effectively given on the same day if personally served, the next Business Day if sent by e-mail or similar means of recorded communication or on the fifth Business Day next following if sent by registered mail. Notices shall be addressed as follows:

to Toronto Hydro:

Name:	Hani Taki
Title:	Director, Standards and Technical Studies
Address:	500 Commissioners St.
Telephone:	416 542 7853
Email:	htaki@torontohydro.com

with copy to:

Title:	Executive Vice-President, Public & Regulatory Affairs and Chief Legal Officer
Address:	14 Carlton Street, Toronto, ON M5B 1K5
Telephone:	(416) 542-3000
Email:	legal@torontohydro.com

to the Vendor:

Name:	Arielle Kadoch, P.Eng
Title:	Principal, Sector Leader
Address:	1060 Robert-Bourassa Boulevard, Suite 600
Telephone:	(514) 781-4488
Email:	Arielle.Kadoch@stantec.com

40. Compliance with Supplier Quality Manual

The Vendor shall comply with the Supplier Quality Manual which has been attached to this Agreement as SCHEDULE D.

41. ISN Compliance

The Vendor shall subscribe with ISN Software Corporation as a registrant for ISNetworld, maintain such subscription throughout the Term, provide all records and information as required by ISN Software Corporation and Toronto Hydro to allow for the maintenance of such subscription and maintain a rating of B or higher on the ISNetworld system by [insert date] and during the remainder of the Term.

42. Governing Law

This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein. The parties irrevocably attorn to the jurisdiction of the courts of Ontario with respect to any matter arising under or related to this Agreement. Either party can terminate for cause without the obligation to engage in dispute resolution, mediation or arbitration.

43. Entire Agreement

a) This Agreement, including all schedules and appendices referred to herein and subsequent amendments, constitutes the entire agreement between the Vendor and Toronto Hydro relating to the subject matter hereof. This Agreement supersedes the terms of the RFP, the Proposal, any purchase order, and all prior correspondence, representations, warranties, covenants, collateral undertakings, discussions, negotiations, understandings or agreements, oral or otherwise, express or implied, unless otherwise provided in this Agreement.

b) No modification or amendment to this Agreement shall be binding on Toronto Hydro unless agreed to in writing.

44. Further Assurances

The Vendor agrees to execute such further assurances and documents, including any bills of sale, and to do all such things and actions which shall be necessary or proper for the carrying out of the purposes and intent of this Agreement.

45. Survival

In addition to the terms of this Agreement that by their nature survive the expiry or termination of this Agreement, the terms of Sections 9 (Representations, Warranties and Covenants), 15 (Liability and Indemnification), 21 (Intellectual Property Protection), 22 (Confidential Information), 36 (Severability), 38 (Enurement), 39 (Notice) and 42 (Governing Law) shall survive the expiry or termination of this Agreement for a period of five (5) years.

46. Execution and Counterparts

This Agreement may be executed in any number of counterparts (including by way of email) and all of such counterparts taken together shall be deemed to constitute one and the same instrument.

[*signature page follows*]

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the day and year first written above:

Stantec Consulting Ltd.

Per: 

Name: Arielle Kadoch, ing.

Title: Sector Leader Power Delivery Canada and International

I have authority to bind the Vendor.

Saisissez du texte ici

Toronto Hydro-Electric System Limited

Per: 

Name: Elias Lyberogiannis, P.Eng, MBA

Title: Executive Vice-President, Planning and Chief Engineering and Modernization Officer

I have authority to bind Toronto Hydro.

SCHEDULE A

Services Required

Introduction

Toronto Hydro requires the Vendor to provide the Services for various Toronto Hydro civil and electrical engineering projects. The Vendor shall have the resources and expertise available to execute a large volume of concurrent projects spread across various locations and range in a variety of scopes.

Continued assignments for the Services shall be based, at Toronto Hydro's discretion, on the quality of previous project work, timely submission of deliverables, and the ability of the Vendor to meet project expectations, as set out on a project-by-project basis.

Project Work Orders

Requests to perform the Services shall be assigned to the Vendor by Toronto Hydro in its sole discretion on a project by project basis through a project work order. The scope of work, staffing, and total price shall be determined prior to commencement of the Services on the project and set out in writing (the **"Project Work Order"** in the form provided at Appendix 1 to this Schedule).

Toronto Hydro may, in its sole discretion, terminate a Project Work Order by providing two (2) weeks' notice to the Vendor in writing, which notice shall specify the termination date of the Project Work Order. Upon termination of a Project Work Order, Toronto Hydro shall pay for such services requested and accepted by Toronto Hydro under the Project Work Order up until the effective date of such termination. Toronto Hydro shall not be liable to the Vendor for any other costs or damages whatsoever arising from such termination, including without limitation, any indirect, consequential or special damages such as loss of profit or loss of opportunity.

Services Required

1. Design, Development and Drafting of Construction Standards

a) Development of Construction Standards, including:

i. Electrical distribution system constructions standards development based on appropriate codes and regulations that govern a utility's practices, including, but not limited to, CAN/CSA C22.3 Overhead and Underground standards, Ontario Electrical Safety Code and Ontario Regulation 22/04, as applicable to:

- Overhead distribution systems
- Underground distribution systems
- Primary and secondary network systems
- Transformer and municipal stations
- Civil components of the standards
- Street Lighting
- Grounding
- Cable and conductors

- Switchgear

ii. Assessment of design and tool implications;
iii. Developing training documentation and provide technical training to Toronto Hydro staff and contractors;
iv. Instruction of engineering applications, as per field requirements; and
v. Approval of all standards by a Professional Engineer (P.Eng.), with Civil and Electrical disciplines required.

b) Drafting

i. Electrical equipment, civil equipment, and Construction Standards (both to scale or not to scale);
ii. Title blocks and cover page;
iii. Drafting to be completed in MicroStation; and
iv. Develop a quality assurance process to validate the outgoing quality of the completed work.

c) Design Consultation

i. Assess field requirements of system design and assess the applicability of components for fit and the provision of safe and reliable power;
ii. Identify different options and provide recommendations of the best designs;
iii. Research options for new requirements (code, regulatory, etc.) and applications;
iv. Assess safety, environmental, quality, and reliability impacts of design proposals;
v. Review and assess proposals and engineering drawings and provide recommendations;
vi. Ensure compliance with Standard Design Practices, Standard Practices, Conditions of Service and other internal policy documents;
vii. Review, revise and align Standard Design Practices, Standards Practices and other internal policy documents with industry best practices;
viii. Review design proposals from external parties and provide recommendations based on compliance to standards, design practices, codes and regulations and other internal processes/documents;
ix. Integrity evaluation/loading calculations and performing review and reporting on civil infrastructure such as vaults or pole lines over railway tracks;
x. Evaluation to ensure ample structural support when transporting equipment with flatbed or haulage company to worksite for overhaul or change out;
xi. Geotech Reporting for sensitivity areas;
xii. Excavation for areas with low water table to install or rebuild vaults and ducts; and
xiii. Preparing civil designs:

(a) where no underground infrastructure information is available for foreign utilities; and
(b) within private residential or commercial properties

d) Material Approval

i. Develop equipment and material requirements specifications for procurement purposes;

ii. Identification, technical assessments, verification of components, and how they are applied within the electrical distribution system while focusing on safety, productivity, quality, reliability, cost, and environmental impact;
iii. Review test reports and test results during the material approval process to ensure compliance; and
iv. Develop training documentation and provide technical training during new material introductions.

e) Quality Assurance

i. Perform statistical analysis of given data sets to generate trends, conclusions and recommendations;
ii. Perform root cause investigations of equipment failures and generate a technical report on subsequent analysis;
iii. Perform incoming source inspection of materials; and
iv. Perform inspections on equipment and construction installations against required specifications and Construction Standards.

Appendix 1 to Schedule A

Project Work Order

PROJECT WORK ORDER	
Retainer Date: (mm/dd/yyyy)	
Between (Firm name): ("Toronto Hydro") (the "Firm") and Toronto Hydro Electric-System Limited	
Title:	Reporting To:
Target Start Date: (mm/dd/yyyy)	Target Completion Date: (mm/dd/yyyy)
Description:	
Applicable Guidelines and/or Special Requirements: (By signing this Project Work Order, the Firm acknowledges having received a copy of the Guidelines and certifies it understands and agrees to the special requirements.)	
Ancillary Goods and Costs:	
This Project Work Order is subject to and governed by that certain Master Agreement for the Provision of Retained Staffing Services dated •, 2012 between Toronto Hydro and the Firm (the "Agreement"). Defined terms, usually denoted with initial capital letters, if not otherwise defined herein, shall have the respective meanings assigned thereto in the Agreement.	

SCHEDULE B

Purchase Price

Pricing for the supply of the Services shall be as according to one of the methods set out below, the method of compensation to be determined by Toronto Hydro in its sole discretion.

All pricing set out below shall be inclusive of the costs of equipment, materials, and required vehicles necessary for performing the Services. For clarity, the timing intervals used below shall have the following meanings:

1. Quarterly: 13 standard work-weeks, 40 hours per week;
2. Semi-annual: 26 standard work-weeks, 40 hours per week; and
3. Annual: 52 standard work-weeks, 40 hours per week.
4. Standard work week: 40 hours of work, excluding statutory and civic holidays in the Province of Ontario.

Price Schedule - Design, Development and Drafting of Construction Standards		
Name, if applicable	**Title/Role**	**Rate**
Jose Ribon	Account Manager and Team leader Distribution team	[redacted]
Dan Pentahtegoose	Overhead transmission and OH and underground distribution	
Justin Lefnesky	Overhead and underground distribution	
Andrew Rees	Overhead and underground distribution	
Sean Freihaut	Overhead and underground distribution	
	Drafting resources	
Tom Tisdale	Project Manager	
Roberto Falcon	Civil and Structural Engineer	
Vinson Fan	Structural Engineer	
Randy Wedge	Civil and Structural Engineer	
John Brisbois	Geotechnical	
Jeff Dietz	Geotechnical	
Katherine Guay	Electrical Engineer	
Abdi Bahrami	Electrical Engineer	
Amir Tashakori	Electrical Engineer	
Derek Van Gaal	Switchgear Expert and Power Systems Engineer	
Peter Dyck	Switchgear Expert and Power Systems Engineer	
Idlir Mero	Electrical Engineer	
Hassan Fayaz	Power systems Lead	
	* based on 37,5 hours weekly for the duration	

Price Escalation	
Term	**% Increase/Decease**
Year 2	[redacted]
Year 3	
Year 4	
Year 5	

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SCHEDULE C

Defined Terms

In this Agreement, the following definitions shall apply:

"Affiliates"	shall have the meaning as prescribed in the *Business Corporations Act* (Ontario);
"Agreement"	means this Agreement for Purchase of Services, including all Schedules and Appendices hereto and subsequent amendments;
"Applicable Laws"	means all federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to this Agreement, including without limitation all applicable OEB codes, rules or guidelines;
"Business Day"	means a day on which banks are open for business in the City of Toronto, Ontario, but does not include a Saturday, Sunday, or a statutory holiday in the Province of Ontario;
"Change Order"	has the meaning prescribed to it in Section 27;
"Competent Persons"	shall have the meaning as prescribed in the OHSA;
"Confidential Information"	has the meaning prescribed to it in Section 22;
"DDP"	shall have the meaning prescribed to it in the Incoterms2010 rules published by the International Chamber of Commerce;
"Disclosing Party"	has the meaning prescribed to it in Section 22;
"EFT Information"	has the meaning prescribed to it in subsection 5(b);
"Force Majeure"	has the meaning prescribed to it in Section 20;
"Frustrated Party"	has the meaning prescribed to it in subsection 20(b);
"Governmental Authority"	means any government, legislature, municipality, regulatory authority, agency, commission, department, board or court or other law, regulation or rule-making public entity of similar authority, including, without limitation the OEB;
"Guidelines"	has the meaning prescribed to it in Section 14;
"HST"	means Harmonized Sales Tax;
"IESO"	means Independent Electricity System Operator;

"Initial Term"	has the meaning prescribed to it in subsection 4(a);
"MFIPPA"	means *Municipal Freedom of Information and Protection of Privacy Act* (Ontario) and the regulations thereunder, each, as amended;
"OEB"	means Ontario Energy Board;
"OHSA"	means *Occupational Health and Safety Act* (Ontario) and the regulations thereunder, each, as amended;
"Person"	means any individual, firm, corporation, unlimited liability company, partnership, limited liability partnership, joint venture, trust, unincorporated association, unincorporated syndicate, any governmental authority and any other legal or business entity;
"Project Work Order"	has the meaning prescribed to it in Schedule A and is in the form provided at Schedule E;
"Protected Employee"	means any individual who, during the course of their employment with Toronto Hydro, was directly or indirectly involved in: i. the procurement of the Services of the Vendor on behalf of Toronto Hydro; ii. the negotiation of the Vendor's Agreement on behalf of Toronto Hydro; and/or the awarding and/or approval of the Vendor's Agreement on behalf of Toronto Hydro;
"Quotation"	has the meaning prescribed to it in Recital D;
"Receiving Party"	has the meaning prescribed to it in Section 22;
"Renewal Term"	has the meaning prescribed to it in subsection 4(b);
"Representative"	in respect of a party, means such party's directors, officers, employees, agents and contractors, the party's Affiliates, and all such Affiliates' respective directors, officers, employees, agents and contractors;
"Required Resources"	has the meaning prescribed to it in subsection 11(a);
"RFQ"	has the meaning prescribed to it in Recital D;
"Services"	has the meaning prescribed to it in Recital A;
"Term"	has the meaning prescribed to it in subsection 4(c);
"Toronto Hydro"	has the meaning prescribed to in the preamble to this Agreement;
"Vendor"	has the meaning prescribed to in the preamble to this Agreement; and

"WSIA"	means *Workplace Safety and Insurance Act, 1997* (Ontario) and the regulations thereunder.

SCHEDULE D

Supplier Quality Manual

[*Please see attached*]



QSM-QA-74300 Supplier Quality Manual.pdf

Toronto Hydro-Electric System Limited
14 Carlton Street
Toronto, Ontario M5B 1K5

Toronto Hydro
Climate Change Vulnerability Assessment Update

Scope of Work

June 2022

1 Purpose

Toronto Hydro is seeking to update the climate parameters as described in the engineering analysis results in the 2015 Toronto Hydro-Electric System Limited Climate Change Vulnerability Assessment (the "2015 Study") (copy enclosed) with newly available global climate modelling (GCM) data.

1.1 Background

The 2015 Study evaluated Toronto Hydro's electrical distribution system utilizing Engineers Canada's Public Infrastructure Engineering Vulnerability Assessment Protocol (PIEVC). The 2015 Study identified infrastructure climate change vulnerabilities and suggested opportunities for adapting infrastructure to climate change impacts. It included:

- The use of a system level approach to assess the impacts of climate change on the TH's electrical distribution system.
- Climate parameters and the annual probability including high temperature, heavy rainfall, snowfall, freezing rain, lightning strike, etc.
- A risk-based framework to assess vulnerability of TH's electrical system to the climate parameters A mapping of risk ratings was completed as part of the existing study.
- High level adaptation options under the themes of engineering actions, management actions, monitoring activities and further study.

The 2015 Study was filed with the Ontario Energy Board as part of Toronto Hydro's 2020-2024 Rate Application.

1.2 Updated Global Climate Modelling Data

The climate parameters in the 2015 Study were prepared using GCM data obtained from the Intergovernmental Panel on Climate Change's 5th Assessment Report (IPPC AR5). Earlier this year, the IPPC released updated GCM data in the 6th Assessment Report (https://www.ipcc.ch/assessment-report/ar6/) (IPPC AR6).

The purpose of this new engagement is to assess whether the IPPC AR6 data materially impacts the probability assessment set out in the 2015 Study (which relied on IPPR AR5).

2 Scope of Work

The scope of this engagement is to assess the impact of the new IPPC AR6 data to the 2015 Study assessment:

A) Does the new GCM data (IPPC AR6) materially impact the probability assessment set out in the THESL Climate Change Vulnerability Assessment?

B) If yes, is any further action required to address those revised/updated climate parameters in addition to those described in the Engineering Analysis Results at page 43 of the 2015 Study? For example, if the IPPC AR6 data supports a new finding that the projected incidents of daily maximum temperatures of 35°C in 2030 and 2050 have doubled (now 6 days per year, 16 per year respectively), would that materially modify the recommendations in the 2015 Study related to the impact of high temperatures on transmission stations.[1]

2.1 Timeline

This engagement shall be completed in final form, by no later than September 30, 2022.

2.2 Meetings with Toronto Hydro

Regular meetings with Toronto Hydro staff should take place to update status of work and discuss any issues that may arise. Frequency of meetings is to be jointly agreed upon when the contract is awarded.

[1] See Appendix A for excerpt.

3 Appendix A – Excerpts from 2015 Study re impact of high temperatures on transmission stations

6.1 Municipal and Transmission Stations and Communications Systems

…

2. High temperature above 35°C / transmission stations

Further action recommended, conclusions for high temperature and power transformers also apply (see Chapter 7). Transmission station designers will need to take into account the significant increase in days with maximum temperatures above 35°C, which reduces station capacity while, on the other hand, experiences an increased load demand. At the moment, no load growth rate for the period of this study was estimated. The recommendations given in Chapter 7 for transmission stations and maximum temperature above 40°C / average temp above 30°C also apply to this interaction.[2]

…

[Chapter 7] 7.1 Vulnerabilities to a Changing Climate

…

High Ambient Temperatures – Station and Feeder Assets

High ambient temperatures create problems for the distribution system because of the compounding effect of high demand (e.g. for cooling) and high ambient temperature affecting equipment cooling and electrical transmission efficiency. Two specific climate parameters were of most significant concern, daily peak temperatures exceeding 40°C (excluding humidity) and daily average temperatures exceeding 30°C. In these cases, the climate analysis found that such extreme temperatures have occurred only rarely in the past, but are projected to occur on an almost semi-annual to annual basis by the 2030's and 2050's respectively. Through preliminary demand and supply growth projections completed for this study, these vulnerabilities were identified based on the notion that extreme heat will generate electrical demand for cooling in areas where station excess capacity is projected to be marginal. Furthermore, such temperature extremes may cause equipment, notably power transformers, to operate beyond their design specifications and increases the likelihood of failure. It is anticipated that vulnerability to high heat events will be concentrated in the Former Toronto area,

[2] 2015 Study at pg. 44.

although there are several horseshoe station service areas which would also be vulnerable.[3]

[3] 2015 Study at pg. 49.

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AMENDING AGREEMENT

THIS AMENDING AGREEMENT (the "Amending Agreement") is made effective as of June 1, 2023 (the "Effective Date") between **STANTEC CONSULTING LTD.** ("Vendor") and **TORONTO HYDRO-ELECTRIC SYSTEM LIMITED** ("Toronto Hydro") (collectively, the "Parties").

WHEREAS:

1. Toronto Hydro and the Vendor previously entered into an Agreement for Purchase of Services effective October 1, 2020 in connection with RFP #20P-0448 (the "Agreement"), pursuant to which the Vendor provides Toronto Hydro with various engineering services including the design, development, and drafting of construction standards; technical support for distributed energy resources connections and protection; systems planning and market analysis; program and project management services; data science and analytics; and enterprise asset management (EAM) for ERP (the "Services"); and

2. The Parties now wish to amend the Agreement by attaching the Ontario Energy Board's *Rules of Practice and Procedure* Rule 13A, and make associated amendments related to the Vendor's participation in Toronto Hydro's upcoming rate application, as provided herein.

NOW THEREFORE, THIS AMENDING AGREEMENT WITNESSES that in consideration of the mutual covenants contained herein and for other valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Toronto Hydro and Vendor agree as follows:

1. Any capitalized terms used but not defined herein shall be as defined in the Agreement. The recitals above are agreed by the Parties to be true and deemed to form part of this Amending Agreement as if specifically restated herein.

2. Section 2 of the Agreement is amended by adding the following subsection (e) immediately following subsection 2(d):

   (e) SCHEDULE E - Ontario Energy Board *Rules of Practice and Procedure* Rule 13A

3. Section 13 of the Agreement is amended by adding the following subsection (c) immediately following subsection 13(b):

   (d) Without limiting the generality of subsection 13(a) above, the Vendor shall comply with Rule 13A Expert Evidence of the OEB's *Rules of Practice and Procedure*, attached as SCHEDULE E hereto, in the course of providing the Services and agrees to accept the responsibilities that are or may be imposed on them by that rule.

4. SCHEDULE A is amended by adding the following heading and contents immediately following the "Services Required" section:

   Participation in Toronto Hydro's Regulatory Application Process

   The Vendor shall be available to speak to the Services in a regulatory proceeding as required by Toronto Hydro and/or the Ontario Energy Board relating to Toronto Hydro's 2025 rate application.

   The degree of Vendor's participation shall be dependent on the degree of interest in the Services by OEB staff or any intervenors. Vendor's participation in such proceeding may entail, but is not

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limited to, preparation of expert report(s), responding to interrogatories and undertakings, provision of support prior to and during any hearings required by the OEB, and answers to any questions regarding the form, methodology, assumptions, and choices made in the provision of the Services, in either written or oral format (the latter in acting as a witness for Toronto Hydro).

The Vendor shall comply with the requirements and agrees to accept the responsibilities set out in Rule 13A of the OEB's *Rules of Practice and Procedure*, attached as SCHEDULE E to this Agreement, when providing any Services relating to Toronto Hydro's 2025 rate application.

5. The Parties agree to add a new SCHEDULE E to the Agreement, attached hereto as Appendix 1 to this Amending Agreement.

6. All other terms and conditions of the Agreement remain continuously in full force and effect, unamended, and shall be deemed to apply to this Amending Agreement.

7. This Amending Agreement, together with the Agreement, shall hereinafter constitute the entire agreement between the Parties with respect to the Services as further described in the Agreement, and supersedes any and all other agreements, understandings, discussions, negotiations, representations and correspondence which may have been made by or between the Parties respecting the same.

IN WITNESS WHEREOF the Parties hereto have executed this Amending Agreement as of the date first written above.

STANTEC CONSULTING LTD.

DocuSigned by:

Per: _____
2FF535D87FC140A...

Name:

Title:

I have the authority to bind the Vendor.

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

DocuSigned by:

Per: Elias Lyberogiannis _____
D6B8ED36A44E42F...

Name: Elias Lyberogiannis

Title: Executive Vice-President, Planning & Chief Engineering & Modernization Officer

I have authority to bind Toronto Hydro.

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APPENDIX 1

SCHEDULE E

Ontario Energy Board *Rules of Practice and Procedure* Rule 13A

13A. Expert Evidence

13A.01 A party may engage, and two or more parties may jointly engage, one or more experts to give evidence in a proceeding on issues that are relevant to the expert's area of expertise.

13A.02 An expert shall assist the OEB impartially by giving evidence that is fair and objective.

13A.03 An expert's evidence shall, at a minimum, include the following:

a. the expert's name, business name and address, and general area of expertise;
b. the expert's qualifications, including the expert's relevant educational and professional experience in respect of each issue in the proceeding to which the expert's evidence relates;
c. the instructions provided to the expert in relation to the proceeding and, where applicable, to each issue in the proceeding to which the expert's evidence relates;
d. the specific information upon which the expert's evidence is based, including a description of any factual assumptions made and research conducted, and a list of the documents relied on by the expert in preparing the evidence;
e. in the case of evidence that is provided in response to another expert's evidence, a summary of the points of agreement and disagreement with the other expert's evidence; and
f. an acknowledgement of the expert's duty to the OEB in **Form A** to these Rules, signed by the expert.

13A.04 In a proceeding where two or more parties have engaged experts, the OEB may require two or more of the experts to:

a. in advance of the hearing, confer with each other for the purposes of, among others, narrowing issues, identifying the points on which their views differ and are in agreement, and preparing a joint written statement to be admissible as evidence at the hearing; and
b. at the hearing, appear together as a concurrent expert panel for the purposes of, among others, answering questions from the OEB and others as permitted by the OEB, and providing comments on the views of another expert on the same panel.

13A.05 The activities referred to in **Rule 13A.04** shall be conducted in accordance with such directions as may be given by the OEB, including as to:

a. scope and timing;
b. the involvement of any expert engaged by the OEB;
c. the costs associated with the conduct of the activities;
d. the attendance or non-attendance of counsel for the parties, or of other persons, in respect of the activities referred to in paragraph (a) of Rule **13A.04**; and
e. any issues in relation to confidentiality.

13A.06 A party that engages an expert shall ensure that the expert is made aware of, and has agreed to accept, the responsibilities that are or may be imposed on the expert as set out in this **Rule 13A** and **Form A.**

Mercer

Senior Principal
120 Bremner Boulevard, Suite 800
Toronto, Ontario M5J 0A8
+1 416 868 2867
Fax +1 416 868 7671
marvin.reyes@mercer.com
www.mercer.ca

16 August 2022

PROJECT INITIATION FORM (PIF)

The objective of this Project Initiation Form (PIF) is to confirm the scope of our work and the compensation for this project. This terms and conditions of our existing agreement (Agreement of Purchase Compensation Consulting Services – dated 1, December 2016) apply.

Project Details

1. Client Name: **Toronto Hydro Electric System Limited ("THESL")**
2. Project name: **Total Remuneration Review (Non-Executive)**
3. Description of Mercer responsibilities: **Mercer will work with THESL to complete the following:**

Step 1: Project Planning, Information Gathering, and Management

- Conduct a project planning meeting (approximately 1 hour) to:
  - Confirm project scope, timeline, and deliverables
  - Discuss current programs, challenges, and objectives going forward
  - Discuss data requirements
  - Confirm the current compensation philosophy (if available)

[redacted]

Step 2: Benchmark and Peer Group Confirmation

[redacted]

[redacted]

Step 3: Benefits and Pension Relative Value Analysis

[redacted]

Step 4: Market Research and Analysis

[redacted]

[redacted]

Step 5: Report Development

[redacted]

Step 6: Presentation to Senior Management

- Be available to attend a senior management team meeting to discuss the reports (assumes one 1-hour meeting)

4. Description of client responsibilities: **Provide requested data and information and be available to answer questions**

5. Estimated period of time over which work will be performed: We can begin this work immediately and estimate completing the above scope of work within between August 2022 to January 2023, following approval of this PIF. **For accounting purposes, this project will remain active to March 31, 2023.**

6. Estimated fees ($CDN) [redacted]

Fee Assumptions

- Applicable taxes are in addition to the above fees
- Fee estimates from any one step may be transferred to another
- If the scope of the project changes significantly, we will discuss the change with you and revise our fee estimates accordingly
- Any required travel expenses will be charged at cost (no travel is expected)
- THESL is expected to provide complete, consolidated, and up-to-date data. Any data "cleaning" will result in additional fees

[redacted]

Mercer issues detailed monthly invoices. The terms of our engagement would be covered within our standard engagement letter.

Should additional support be required beyond the scoped above, Mercer fees will be based on our hourly rates ($CDN) outlined below:

Role	Hourly Rate
Partner	[redacted]
Principal	
Sr. Associate	
Analytical Support	
Administrative Support	

Conclusion

We appreciate your business and look forward to working with you on this assignment. Please acknowledge your agreement to the assignment terms by returning a signed copy of this PIF.

MERCER (CANADA) LIMITED

By: 

Name: Marvin Reyes Date: August 16, 2022

Title: Senior Principal

AGREED AND ACCEPTED

Toronto Hydro Electric System Limited

By:

Name: Shirley Powell Digitally signed by Shirley Powell DN: cn=Shirley Powell, email=spowell@torontohydro.com Date: 2022.08.25 12:00:57 -04'00' Date:

Title: Director, HR Systems and Rewards

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-12

Reference: Exhibit 1B, Tab 2, Schedule 1, p. 26

QUESTIONS (A) – (D):

With respect to the proposal to use a custom Toronto Hourly Salary and Wages Index:

a. Toronto Hydro notes that the "index can either be derived by the Conference Board of Canada ("CBC") economic data subscription service, or can be reproduced by purchasing relevant tax data from Statistics Canada". Is the Conference Board of Canada Toronto Hourly Salary and Wages Index based on the same relevant tax data from Statistics Canada that Toronto Hydro refers to, or would there be a difference in results based on the source of the information?

b. Please provide any documents from the Conference Board of Canada that details the methodology for its Toronto Hourly Salary and Wages Index.

c. The Toronto Hourly Salary and Wages Index appears to be an hourly wage index. Please provide a revised version of Table 4 that compares the proposed Conference Board of Canada Toronto Hourly Salary & Wages, with Statistics Canada Average Hourly Earnings (AHE) Ontario, and Toronto Hydro Average Blended Hourly Salary Increase.

d. Please provide a copy of any Conference Board of Canada forecast for Toronto and/or Ontario wage and salary information that is available to Toronto Hydro.

RESPONSE (A) – (D):

Please see response to 1B-Staff-93.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-13

References: Exhibit 1B, Tab 2, Schedule 1, Page 30

QUESTION:

Toronto Hydro states: "Any combination between the empirical efficiency-factor and the performance incentive that make-up the total X-factor should be capped at 0.75 percent in order to maintain balance between the utility risk and customer reward derived from the PIM." Please explain, in detail, the basis of the view that the specific number of 0.75 percent should be a cap.

RESPONSE:

The proactive component of the X factor is a voluntary contribution by Toronto Hydro reflecting an amount that it ordinarily would be able to recover in rates as a fair return, but which Toronto Hydro has put at risk with the opportunity to earn it back upon the achievement of certain results under the Plan. This reflects the fact that the utility stands behind its plan as being the minimum amount of investment necessary to address grid needs and deliver customer outcomes. However, in setting the performance factor it needs to be recognized that the voluntary contribution and the ability to earn back its fair return must be matched with a reasonable level of risk. Otherwise, the X-factor would be placing Toronto Hydro in a position where instead of being able to have an opportunity to earn a fair return, it actually forfeits that right. This does not yield just and reasonable rates, nor does it create suitable performance incentives.

Any level of the X-factor is a reduction of revenue that the utility must fund in order to achieve its Plan and provide customer benefits. The X-factor cannot be so large that it either is inconsistent with the results of total cost benchmarking or transfers risk to such a degree that Toronto Hydro cannot fund the activities necessary to deliver the plan and its objectives and outcomes. Toronto Hydro believes that a X-factor greater than 0.75 – which is already 0.15% larger than the OEB-approved X-factor for Price Cap IR – would reflect an inordinate transfer of risk, and would not be in the best

interest of customers because it would mean that the plan and its outcomes are less likely to be achieved.

A 0.75% X-factor reflects a cap that should not be increased as it would: (i) distort a reasonble balance of risk/benefit between the utility and customers as illustrated in the scenarios below; (ii) put at risk Toronto Hydro's ability to deliver a plan which is necessary to address both foundational and emerging outcomes that being a distributor requires and customers value; and (iii) place an unacceptable level of financial risk on the utility that effectively preclude it from having a reasonable opportunity (*not guarantee*) to earn the allowed rate of return.

As shown in the response to 1B-Staff-3(b) the proposed Custom Revenue Cap Index (CRCI) reduces the revenue that the utility can collect (relative to the revenue it requires to fund the 2025-2029 Investment Plan) by approximately $81.5 million over the rate term, through the application of the 0.75% X-factor as part of the CRCI.

By constraining the utility's revenues relative to its true costs, the X-factor creates a significant upfront rate reduction benefit for customers, in addition to the benefits associated with achievement of the PIM targets as detailed in Exhibit 1B, Tab 3, Schedule 1. Table 1 below summarizes the risk that X-factor places on the utility compared to the benefits it provides to customers.

Utility Risk (Revenue Deficiency)	Utility Reward (PIM)	Net Utility Risk/Reward	Minimum Customer Benefits	Customer Cost (PIM)	Net Customer Cost/Benefit
($81.5M)	$65.1M	($16.4M)	$90.3M	($65.1M)	$25.2M

In Table 1 above, the utility risk is the $81.5 million revenue deficiency imposed by the CRCI, and the utility reward represents the proposed $65.1 million PIM incentive. The utility net risk/reward is the difference between the two previous items, which is the unmitigated revenue risk imposed by empirical efficiency factor (0.15%) to find continuous improvement in efficiency and productivity.

The customer benefits represent the direct minimum benefits associated with the achievement of the PIM targets over the 2025-2029 rate period as outlined in the evidence in Exhibit 1B, Tab 3, Schedule 1 at pages 57-58. The customer cost is the PIM incentive to be paid by customers if the utility achieves the targets. The net customer cost benefit is the difference between these items. The analysis above, shows that through the X-factor, the CRCI provides customers a net benefit of $25.2 million and places a net risk of $16.4 million on the utility. Toronto Hydro considers this to be a balanced outcome between the utility and its customers with a net favorable impact for customers. In addition to striking this balance, the 0.75% X-factor imposes a financial risk on the utility that is within an acceptable range, and that provides the utility a reasonable opportunity (*not guarantee*) to earn the allowed regulated rate of return. The table below shows the annual ROE risk imposed by the CRCI through the X-factor.

2025-2029 Financial Performance (ROE) under the proposed CRCI

	2025	2026	2027	2028	2029
CRCI Revenue Deficiency	n/a	7.3	14.9	22.9	31.5
ROE Impact (basis points)	n/a	27	55	85	117

Toronto Hydro's believes that the 0.75% X-factor reflects a cap that should not be increased for the reasons discussed above. For illustrative purposes, please see the hypothetical scenarios below where a higher X-factor imposes an additional $10M revenue deficiency on the utility.

Balanace of Risk and Benefits between the Utility and Customers – Scenarios

Scenario A – higher PIM

	A	B	C	D	E	F
	Utility Risk (Revenue Deficiency)	Utility Reward (PIM)	Net Utility Risk/Reward	Minimum Customer Benefits	Customer Cost (PIM)	Net Customer Cost/Benefit
Base	**($81.5M)**	**$65.1M**	**($16.4M)**	**$90.3M**	**($65.1M)**	**$25.2M**
1	**($91.5M)**	**$75.1M**	**($16.4M)**	**$90.3M**	**($75.1M)**	**$15.2M**

In Scenario 1, the balance is distorted relative to the base case, because the spread between utility net risk (column C) and customer net benefits (column F) gets narrower to the detriment of customers (i.e. net customer benefit decreases by $10M relative to the base case).

Scenario B – higher Efficiency-Factor

	A	B	C	D	E	F
	Utility Risk (Revenue Deficiency)	Utility Reward (PIM)	Net Utility Risk/Reward	Minimum Customer Benefits	Customer Cost (PIM)	Net Customer Cost/Benefit
Base	**($81.5M)**	**$65.1M**	**($16.4M)**	**$90.3M**	**($65.1M)**	**$25.2M**
2	**($91.5M)**	**$65.1M**	**($26.4M)**	**$100.3M**	**($65.1M)**	**$35.2M**

In Scenario 2, where the efficiency factor is higher, the balance is distorted relative to the base case, because the spread between utility net risk (C) and customer net benefits (F) gets wider to the detriment of the utility. In this scenario, Toronto Hydro assumes that the revenue reduction imposed on the utility through a higher efficiency-factor would depart from total cost benchmarking that *appropriately* takes into consideration the unique and distinct asset needs and operational challenges of serving Canada's largest and one of North America's fastest growing city. In that case, the level of financial risk placed on the utility becomes unacceptable. The is because efficiency expectations that are not supported by empirical evidence are unachievable, and thus preclude the utility from having a reasonable opportunity (*not guarantee*) to earn the allowed rate of return.

Scenario C – both factors are higher (i.e. allocate $10M additional risk equally to each factor)

	A	B	C	D	E	F
	Utility Risk (Revenue Deficiency)	Utility Reward (PIM)	Net Utility Risk/Reward	Minimum Customer Benefits	Customer Cost (PIM)	Net Customer Cost/Benefit
Base	**($81.5M)**	**$65.1M**	**($16.4M)**	**$90.3M**	**($65.1M)**	**$25.2M**
3	**($91.5M)**	**$70.1M**	**($21.4M)**	**$95.3M**	**($70.1M)**	**$25.2M**

In Scenario 3, where both the PIM and the efficiency factor are increased, the balance is also distorted because additional revenue risk is placed on the utility without any corresponding net benefit to customers (i.e. column F comparison).

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-14

Reference: Exhibit 1B, Tab 2, Schedule 1, p. 32

QUESTION:

Toronto Hydro proposes that the PIM-DA be "brought forward for review and disposition in the utility's next rebasing application, based on known (or forecasted) performance results for the 2025-2029 rate period." As that application will be filed and considered before the end of the rate term, for performance targets that have not been achieved (or can properly be assessed at that time), when does Toronto Hydro propose for them to be reviewed and relevant PIM-DA balances to be recovered from customers?

RESPONSE:

Toronto Hydro envisions that by the final year of the 2025-2029 rate period, the utility can either confirm that the target was achieved, or can forecast with confidence that the target will be achieved. This forecast can either be provided at the pre-filed evidence stage or during the bridge year update process that typically occurs during the discovery phase. In the event that a target is forecasted to be achieved, but is not in fact achieved at year-end 2029, the utility would withdraw its request to recover the associated balances in the PIM-DA at the Draft Rate Order stage which normally occurs in the first quarter of the new rate period (i.e. Q1 of 2030).

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-15

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 36

With respect to the proposed Demand-Related Variance Account - Expenditure Variance sub-account:

QUESTION (A):

a) Please provide a table that shows for each year of the rate term (2025-2029),
   i. the total proposed revenue requirement,
   ii. the total proposed revenue requirement that would be subject to the proposed sub-account,
   iii. total in-service additions,
   iv. total in-service additions subject to the proposed sub-account,
   v. total OM&A costs, and
   vi. total OM&A costs subject to the proposed account.

RESPONSE (A):

The Total Revenue Requirement presented below is based on pre-filed evidence (November 17, 2023) whereas the DRVA revenue requirement below is based on an estimate of the updated 2025-2029 Total Revenue Requirement, which includes impact from: (i) the 2023 actuals and updated 2024 forecast (presented in 2A-Staff-104), and (ii) the January 29, 2024 evidence update. The final PILS models for the updated 2025-2029 total Revenue Requirement (Exhibit 6) are not yet available because it was not possible to complete this work within the timelines for responding to interrogatories. This information will be provided in advance of the Technical Conference as indicated in 1A-Staff-01 and noted in the Application Evidence Update cover letter.[1]

[1] EB-2023-0195, Evidence Update Letter (January 29,2024)

With respect to parts (i) and (ii), Table 1 shows total revenue requirement and total revenue requirement subject to the proposed sub-account.

Table 1: 2025-29 Revenue Requirement ($ Millions)

	2025	2026	2027	2028	2029
Total Revenue Requirement (i)	972.4	1,027.0	1,074.4	1,175.7	1,219.2
DRVA Revenue Requirement (ii)	22.0	34.8	48.5	64.1	77.1
DRVA % of Total Revenue Requirement	2.26%	3.39%	4.51%	5.45%	6.32%

With respect to parts (iii) and (iv), Table 2 show total In-Service Additions and total in-service additions subject to the proposed sub-account.

Table 2: 2025-29 In-Service Additions ($ Millions)

	2025	2026	2027	2028	2029
Total In-Service Additions (iii)	653.8	699.9	795.1	770.1	860.1
DRVA In-Service Additions (iv)	144.0	167.1	158.5	157.8	198.6
DRVA % of Total In-Service Additions	22.03%	23.87%	19.93%	20.49%	23.09%

With respect to (v) and (vi) of this question, Table 3 shows total OM&A costs, and total OM&A costs subject to the proposed sub-account.

Table 3: 2025-29 OM&A ($ Millions)

	2025	2026	2027	2028	2029
Total OM&A (v)	343.0	358.0	370.2	385.5	399.6
DRVA OM&A (vi)	4.9	5.7	6.3	7.0	7.6
DRVA % of Total OM&A	1.43%	1.59%	1.70%	1.82%	1.90%

QUESTION (B):

b) Please provide a table that for each year between 2016 and 2024 shows,

i. the approved revenue requirement,

ii. the total approved revenue requirement that was subject to a similar symmetrical variance account treatment as the proposed sub-account,
iii. total approved in-service additions,
iv. total approved in-service additions that was subject to a similar symmetrical variance account treatment as the proposed sub-account,
v. total approved OM&A costs, and
vi. total approved OM&A costs that was subject to a similar symmetrical variance account treatment as the proposed sub-account.

RESPONSE (B):

With respect to subparts (i) and (ii) of this question, Table 4 shows 2016-2024 total approved revenue requirement and total approved revenue requirement that was subject to similar symmetrical variance account treatment – i.e. Externally Driven Capital (2016-2024) and Derecognition (2015-2019).

Table 4: 2016-2024 Revenue Requirement ($ Millions)

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total Revenue Requirement (i)	659.2	709.0	749.7	781.5	750.2	786.2	799.4	852.2	892.9
Revenue Requirement subject to Symmetrical Treatment (ii)	33.1	33.3	33.4	35.7	1.6	3.7	4.2	4.3	4.5
Similar Symmetrical Variance Treatment % of Total Revenue Requirement	5.02%	4.70%	4.46%	4.57%	0.21%	0.47%	0.53%	0.50%	0.50%

With respect to subparts (iii) and (iv) of this question, Table 5 shows total in-service additions ("ISA") and total approved in-service additions that were subject to similar symmetrical variance account treatment as proposed by the sub-account.

Table 5: In-Service Additions ($ Millions)

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total ISA (iii)	621.1	459.5	397.7	477.2	527.4	456.2	565.1	565.8	559.1

	2016	2017	2018	2019	2020	2021	2022	2023	2024
ISA Subject to Symmetrical Variance Treatment (iv)	4.0	4.0	4.0	4.0	11.4	20.8	4.6	4.7	4.5
Similar Symmetrical Variance Treatment % of Total ISA	0.64%	0.87%	1.01%	0.84%	2.16%	4.56%	0.81%	0.83%	0.80%

With respect to subparts (v) and (vi) of this question, Table 6 shows total OEB-approved OM&A cost for 2020, the USoA 4380 adjustment,[2] and the reclassified Total OEB-Approved OM&A for 2020. To determine the approved-OM&A over the period, Toronto Hydro escalated the 2020 Test Year by the OEB inflation factor (I) and the approved 0.6% X factor for the current rate period.

For 2023-24, OM&A costs subject to similar symmetrical variance account treatment reflects costs that are eligible for variance treatment under the *Getting Ontario Connected Act* Variance Account (see 4-Staff-296 for more information).

Table 6: OM&A Costs Subject Symmetrical Variance Treatment ($ Millions)

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total Approved OM&A	247.6	250.8	252.3	254.6	272.2	276.6	284.0	292.8	305.1
USoA 4380 adjustment	(3.5)	(3.5)	(3.5)	(3.5)	(5.5)	(5.6)	(5.7)	(5.9)	(6.2)
Reclassified Total Approved OM&A (v)	244.1	247.3	248.8	251.1	266.7	271.0	278.3	286.9	298.9
OM&A Subject to Symmetrical Variance Treatment (vi)	-	-	-	-	-	-	-	4.8[3]	5.0

In addition to the OM&A costs subject to symmetrical variance treatment listed above, Toronto Hydro also notes that distributors (including Custom IR filers) are eligible to apply for deferral accounts for (1) cloud-related implementation costs,[4] and (2) operations, maintenance, and

[2] See 1B-SEC-8 for more information about the shared services reclassification.
[3] Please see the response to interrogatory 4-Staff-296 related to locates.
[4] Ontario Energy Board, *Accounting Order (003-2023) for the Establishment of a Deferral Account to Record Incremental Cloud Computing Arrangement Implementation Costs* (November 2, 2023)

administration (OM&A) costs related to DER integration and use, pending their rebasing applications.[5]

QUESTION (C):

c) Please explain how Toronto Hydro plans to incorporate any approved X-Factor into the calculation of any sub-account balance.

RESPONSE (C):

Toronto Hydro proposes to set the base amount against which actuals are tracked based on the revenue requirement (i.e., before the application of the X-factor) and to track symmetrical variances against this amount. This approach ensures that the X-Factor (which places earnings risk on the utility that can only be mitigated through productivity and performance achievements) cannot be mitigated (i.e. earned-back) through recoveries under the variance account.

QUESTION (D):

d) Toronto Hydro lists the programs for which both capital and operations variances from actuals will be recorded in the Expenditure Variance Sub-Account: Customer Connections, Customer Operations, Stations Expansion, Load Demand, Non-Wires Solutions, Generation Protection Monitoring and Control and Externally-Initiated Plant Relocations and Expansions. Only one of the Programs listed above is a specific OM&A Program (Ex. 4-2-8) however other listed programs impact a wide number of OM&A Programs, e.g. Non-Wires Solutions affects Asset and Program Management and Control Centre Operations. For each of the OM&A Programs and segments in which the cost variance will be included in the sub-account, please provide information on the forecasted costs for 2025-2029.

[5] Ontario Energy Board, *Framework for Energy Innovation: Setting a Path Forward for DER Integration (January 2023)* at page 4

RESPONSE (D):

Table 6 below shows the OM&A segments for which cost variance would have been included in the DRVA expenditure sub-account. Although the Control Center program will support the delivery of the Flexibility Services segment, Toronto Hydro has not proposed variance account treatment for the Control Center program because the costs in this program are driven by many factors other than demand.

Table 6: OM&A Costs Subject to the Proposed DRVA Expenditure Sub-Account ($ Millions)

Program	Segment	2025	2026	2027	2028	2029
Customer Operations (Exhibit 4, Tab 2, Schedule 8)	Customer Connections	3.2	3.3	3.5	3.6	3.8
	Key Accounts	1.5	1.5	1.7	1.8	1.9
Asset & Program Management (Exhibit 4, Tab 2, Schedule 9)	Flexibility Services (see the Non-Wires Solutions program in Exhibit 2B, E7.2)	0.2	0.9	1.1	1.6	1.9
Total		**4.9**	**5.7**	**6.3**	**7.0**	**7.6**

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-16

Reference: Exhibit 1B-2-1, Page.46

QUESTION (A-C):

With respect to the proposed Demand-Related Variance Account - Revenue Variance sub-account:

a. Please provide a table that shows for each year of the rate term (2025-2029), a) total forecast revenue, and b) total forecast revenue subject to the proposed sub-account.
b. Please provide a table that shows for each year of the rate term (2016-2024), a) total approved revenue, and b) total approved revenue subject to a similar symmetrical variance account treatment as the proposed sub-account.
c. Please provide a table that shows for each year of the rate term (2016-2024), a) total revenue, and b) total weather normalized revenue.

RESPONSE (A-C):

Table 1 below provides the information requested in part (a). Since the 2025-2029 load forecast in Exhibit 3 is weather-normalized, the total forecasted revenue in the application is subject to the proposed sub-account, as summarized in the table 1 below.

Table 1

2025	2026	2027	2028	2029
$972 M	$1,020 M	$1,059 M	$1,151 M	$1,185 M

Historically, there were no revenues subject to similar symmetrical variance account treatment as the proposed sub-account. Table 2 below provides the 2016-2023 total revenue before and after weather normalization, and the weather normalized revenue for 2024 forecasted in Exhibit 3.

Table 2

Year	Actual Revenues ($M)	Weather-normalized Actual Revenues ($M)	Board-Approved Revenues ($M)	Variance ($M)
2016*	$657.7	$651.5	$659.2	-$7.7
2017	$692.0	$694.8	$709.0	-$14.2
2018	$746.1	$737.4	$749.7	-$12.3
2019	$763.1	$761.0	$781.6	-$20.0
2020*	$721.6	$720.9	$750.2	-$29.3
2021	$756.1	$756.8	$786.2	-$29.4
2022	$782.5	$780.7	$799.4	-$18.7
2023	$834.4	$839.5	$852.2	-$12.6

**The revenues for 2016 and 2020 have been normalized due to delay in the approval of rates for respective years.*

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-17

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 48

In addition to the revenue requirement and DVA accounts that may be approved in this application, please detail all other distribution ratepayer funding mechanisms Toronto Hydro believes would be available to it during the rate term.

RESPONSE:

Toronto Hydro would continue to have access to the Z-factor mechanism in accordance with the OEB's standard criteria, as well as any generic DVA accounts that distributors may be granted, or have the opportunity to apply for, under applicable existing or future OEB policy instruments.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-18

Reference: Exhibit 1B, Tab 2, Schedule 1, Appendix A

QUESTION (A):

With respect to Scott Madden, Review of Rate Framework Report:

a) [p. 4-5] The Report provides examples of jurisdictions that have approved Attrition Relief Mechanisms, Alternative Cost Recovery Mechanism, Performance Incentive Mechanisms, and separate funding for innovation projects. For each of the jurisdictions referred to, please provide a summary of all the components of their respective rate and regulatory framework and how each compare to what is being proposed by Toronto Hydro.

RESPONSE (A) - PREPARED BY SCOTTMADDEN:

Please refer to the response to 1B-SEC-19.

QUESTION (B):

b) [p.14] Please provide more details on the difference between building blocks vs the stair-step approach.

RESPONSE (B) - PREPARED BY SCOTTMADDEN:

The stair-step approach sets rates annually based on pre-determined rate levels. By comparison, the building blocks approach sets rates annually based on pre-determined formula that reflects forecasted capital, OM&A expenditures, and adjustments to account for performance incentives, tax impacts, inflation, and other supplementary funding mechanisms.

QUESTION (C):

c) [p.14-15] Is the trend in distribution rate framework towards building block rate mechanisms, the stair-step approach, or forms of incentive regulation? Please discuss your answer.

RESPONSE (C) - PREPARED BY SCOTTMADDEN:

ScottMadden did not evaluate trends in distribution rate frameworks. ScottMadden evaluated Toronto Hydro's proposed custom IR plan for its relative consistency with other electric utility ratemaking frameworks and practices that support a clean energy transition. Please refer to the response to 1B-EP-23, part (a).

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-19

Reference: Exhibit 1B, Tab2, Schedule 1, Appendix B

Preamble:

With respect to Scott Madden, Jurisdictional Review of Modernized Performance-Based Regulation Report:

QUESTION (A):

a) [p. 20-41] The Report provides examples of jurisdictions that have approved Modified Attrition Relief Mechanisms, Alternative Cost Recovery Mechanism, Performance Incentives, and separate funding for innovative/demonstration projects. For each of the jurisdictions referred to in the Report, please provide a summary of all the components of the respective rate and regulatory framework and how each compare to what is being proposed by Toronto Hydro.

RESPONSE (A) - PREPARED BY SCOTTMADDEN:

Please refer to the table below.

Utility (Jurisdiction)	Framework Overview
ATCO Electric (Alberta)	**ARM:** Formulaic approach linked to average historical capex; indexed O&M **Cost Recovery**: Capital trackers for costs related to extraordinary events or net-zero laws **PIM:** None **Innovation Funding:** None
SDG&E (CA)	**ARM:** Uses utility-specific cost index for O&M rather than general inflation; capital investments based on an escalated seven-year historic and forecast average of capital additions **Cost Recovery**: Various two-way balancing accounts and riders, such as AMI balancing account **PIM:** IDER Pilot **Innovation Funding:** Rate Rider (Public Purpose Programs)

Utility (Jurisdiction)	Framework Overview
PG&E (CA)	**ARM:** Uses utility-specific cost index for O&M rather than general inflation; most capital costs escalated using utility specific cost index ; certain capital costs (that are "unique and not appropriately projected with any available index mechanism") forecasted in post-test years **Cost Recovery**: Various two-way balancing accounts and riders **PIM:** IDER Pilot **Innovation Funding:** Rate Rider (Public Purpose Programs)
Hawaiian Electric (HI)	**ARM:** Annual revenues adjusted using indexed formula **Cost Recovery**: EPRM and various riders **PIM:** 3 reward only performance incentives; 2 symmetrical performance incentives **Innovation Funding:** "Pilot Process" recovers innovative pilot costs through annual target revenues
Ameren (IL)	**ARM:** To be determined (MYRP rate case decision pending) **Cost Recovery**: To be determined (MYRP rate case decision pending) **PIM:** 8 symmetrical performance incentives **Innovation Funding:** "Pilot Process" recovers innovative pilot costs through annual target revenues
Central Maine Power (ME)	**ARM:** Forecast O&M and capital **Cost Recovery**: No alternative cost recovery mechanisms **PIM:** 6 penalty-only service quality metrics **Innovation Funding:** None
Eversource (MA)	**ARM:** O&M adjusted annually by I-X ; K-bar for supplement capital funding based on average historical capex **Cost Recovery**: 10% variance allowed for forecasted capital budget; Forecast excludes certain capital projects, such as solar investments, meter-related capital, and grid mod, eligible for recovery through other rate mechanisms outside of base rates **PIM:** 7 penalty-only service quality metrics; reward-only energy efficiency metric **Innovation Funding:** None
Xcel (MN)	**ARM:** Forecast O&M and capital **Cost Recovery**: Various riders/trackers to recover various pass-through costs, related to energy efficiency, services for specific customer classes, and environmental improvement, among other areas. **PIM:** None (tracking-only metrics) **Innovation Funding:** None
PSE&G (NJ)	**ARM:** N/A – no MYRP **Cost Recovery**: Multiple trackers, including Energy Strong **PIM:** None **Innovation Funding:** None

Utility (Jurisdiction)	Framework Overview
Con Edison (NY)	**ARM:** Forecast O&M and capital (used in settlements) **Cost Recovery**: Multiple riders, such as the Systems Beneift Charge **PIM:** 7 reward-only incentives (based on 2020 rate case) **Innovation Funding:** Rate Rider for REV demonstration projects
National Grid (NY)	**ARM:** Forecast O&M and capital (used in settlements) **Cost Recovery**: Multiple riders, such as the Systems Beneift Charge **PIM:** 9 reward-only incentives **Innovation Funding:** Rate Rider for REV demonstration projects
Duke Energy (NC)	**ARM:** Commission-authorized "step-ups" in revenue requirements for incremental capital spending projects and associated O&M for each year of the MYRP **Cost Recovery**: Multiple riders, such as the Systems Beneift Charge **PIM:** 1 penalty-only metric; 2 reward-only metric **Innovation Funding:** Rate Rider for REV demonstration projects
Nova Scotia Power (NS)	**ARM:** Forecast O&M and capital **Cost Recovery**: Various riders **PIM:** None **Innovation Funding:** Rate Rider
AEP (OH)	**ARM:** N/A – no MYRP **Cost Recovery**: Various riders, such as the Enhanced Service Reliability Rider **PIM:** None **Innovation Funding:** None
PECO (PA)	**ARM:** N/A – no MYRP **Cost Recovery**: Various riders, such as the Distribution System Improvement Charge **PIM:** None **Innovation Funding:** None
Rhode Island Energy (RI)	**ARM:** Forecast O&M and capital **Cost Recovery**: Various adjustment provisions, such as the Infrastructure, Safety, and Reliability Provision **PIM:** 4 service quality penalty-only metrics; 1 demand reduction reward-only metric **Innovation Funding:** None
UK RIIO	**ARM:** Forecast O&M and capital (building blocks method) **Cost Recovery**: Uncertainty mechanisms **PIM:** 10 symmetrical performance incentives **Innovation Funding:** Multiple funding mechanisms, including the Strategic Innovation Fund and the Network Innovation Allowance

Utility (Jurisdiction)	Framework Overview
Green Mountain Power (VT)	**ARM:** Hybrid ARM approach with forecasted CAPEX capped over the plan period and OPEX treated in one of three ways: forecasted and capped, capped and tied to an external inflation index, or reforecast annually **Cost Recovery**: Various riders **PIM:** None (tracking-only metrics) **Innovation Funding:** Recovers innovative pilot costs through annual target revenues

The table shows Toronto Hydro's proposed Custom IR Framework is comparable with the other electric utility ratemaking frameworks and practices referenced in the report, as summarized in Exhibit 1B, Tab 2, Schedule 1, pp. 5-8, Appendix B.

QUESTION (B):

b) Please identify which jurisdictions are the referenced regulatory mechanism/approach applied to vertically integrated utilities vs. distribution only utilities.

RESPONSE (B) - PREPARED BY SCOTTMADDEN:

Utilities in Alberta, UK, Illinois, Maine, Massachusetts, New Jersey, New York, Ohio, Pennsylvania, and Rhode Island are distribution-only.

Utilities in Nova Scotia, California, Hawaii, Minnesota, North Carolina, and Vermont are vertically integrated.

QUESTION (C):

c) [p.40-41] For jurisdictions that have separate funding mechanisms for innovation projects, please provide information regarding the parameters and any conditions related to the projects and funding. Please provide a comparison with what Toronto Hydro has proposed in its application.

RESPONSE (C) - PREPARED BY SCOTTMADDEN:

Please see the response to 1B-PP-19 (b). Toronto Hydro's proposed Innovation Fund is similar to the other electric utilities referenced in the report, including program objectives, characteristics, and funding mechanisms.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-20

Reference: Exhibit 1B, Tab 3, Schedule 1, Pages 6-68

With respect to the proposed 2025-2029 Performance Incentives Scorecard Measures:

QUESTION (A):

a) Please detail all Performance Incentive Measures that Toronto Hydro considered, but ultimately rejected.

UPDATED RESPONSE (A):

Toronto Hydro's proposed scorecard measures for the 2025-2029 rate period were the result of consideration and internal discussions that evolved over a period of many months leading to the finalization of the measures. It is the actual measures that have been put forward on the application which will be assessed by the OEB on their merits. It would be impractical, and Toronto Hydro's position is that it would be of no probative value, to try to provide details of the evolution of the various internal discussions or considerations and ideas on this topic that led to the final measures. Further, Toronto Hydro's internal discussions and consideration on this topic would be subject to litigation privilege in the process of the development of the rate application, and to some extent would also involve information subject to solicitor-client privilege in light of the participants in the discussions. For the above reasons, Toronto Hydro has objected to this request.

/C

QUESTION (B)

b) Please explain the basis for the relative weights for each measure.

RESPONSE (B):

Toronto Hydro applied a balanced scorecard approach to determine the relative weight for each measure on the Custom Scorecard. This approach entailed two steps: (1) an assessment of the weight

to be attributed to each area of performance, and (2) a determination of the weight for each measure within that area of performance based on a consideration of value to customers.

In the first step, the utility was guided by the customer needs and priorities ascertained through the Phase 1 engagement study:

- **Price and reliability are the top customer priorities**: Relative to price, reliability has become increasingly important to residential customers. When it comes to reliability, customers prioritize reducing the length of outages.
- **New Technology**: Almost as equally important to price and reliability, customers expect the utility to invest in new technologies that will reduce costs and make the system better, even if the benefits aren't immediate, as long as the costs and benefits are clear.
- **System Capacity**: Customers expect Toronto Hydro to invest proactively in system capacity to ensure that high growth areas do not experience a decrease in service levels.

With these key considerations in mind, Toronto Hydro attributed:

- 30% weight to Reliability and Resilience;
- 30% weight to Efficiency and Financial Performance,
- 20% weight to Customer Service & Experience,
- 20% weight to Environment Safety and Governance.

In step 2, once the performance measures were finalized, Toronto Hydro's subject matter experts worked cross-functionally to allocate weight to each measure, applying their judgement and expertise to determine a leading measure for each category and to place the greatest weights on the measures that (i) best align customer and utility priorities, and (ii) provide high value to customers as quantified by the Benefits Analysis in section 3 of the evidence (Exhibit 1B, Tab 3, Schedule 1 starting on page 56) and summarized at Table 21. For example, within the Reliability and Resilience category Toronto Hydro placed greater weight on Outage Duration (SAIDI) over Outage Frequency (SAIFI) because when it comes to reliability, customers prioritize reducing the length of outages over

the total number of outages. In the Efficiency and Financial Performance category, Toronto Hydro prioritized Efficiency Achievements to recognize the importance of cost-effectiveness in (i) providing value for money to customers, and (ii) achieving the utility's financial performance objectives with respect to being able to earn the allowed rate of return.

QUESTION (C):

c) If the application is approved as filed, does Toronto Hydro expect to achieve each Performance Incentive Measure?

RESPONSE (C):

Yes.

QUESTION (D) :

d) [p.16] Please explain why a 2 standard deviation range is an appropriate target for SAIFI defective requirements measure.

RESPONSE (D):

Standard deviation measures the amount of variation or dispersion in SAIFI Defective Equipment historical values and quantifies how much the metric's performance varies from the average. Two standard deviations encompass approximately 95% of the data points. This means that setting SAIFI Defective Equipment PIM within this range can account for the variability of outcomes expected based on the past performance, making the target realistic and achievable in the face of typical volatility. The target range set too close to the average might be unachievable/demotivating due to inherent volatility leading to the performance being outside of the range despite the utility's efforts. A target of two standard deviations strikes a balance, challenging the organization to be proactive in managing SAIFI Defective Equipment while still being within a statistically reasonable range of outcomes.

See response to 2B-SEC-42 for a detailed explanation of Toronto Hydro reliability projection methodology.

QUESTION (E):

e) [p.37] Please explain in detail Toronto Hydro's methodology for calculating its scope 1 emissions.

RESPONSE (E):

Scope 1 emissions are calculated by multiplying the activity data for Toronto Hydro's sources of direct emissions by the appropriate emissions factor. The activity data includes cubic meters of natural gas, litres of fuel, and kilograms of sulfur hexafluoride (SF_6) emissions. Toronto Hydro uses the emission factors published in the National Inventory Report ("NIR"), which is prepared by Environment and Climate Change Canada and submitted annually to the United Nations.

QUESTION (F):

f) [p.41-42] Toronto Hydro proposes an Efficiency Achievement measure which "tracks this commitment over the next rate period by holding the utility accountable for delivering sustained (and quantifiable) efficiency benefits to customers in the next rebasing application."
   i. Please explain the methodology for calculating efficiency achievements.
   ii. Please provide how the methodology ensures that the savings or cost avoidance are sustainable.

RESPONSE (F):

The proposed custom measure tracks efficiency benefits realized through cost reduction and cost avoidance strategies that Toronto Hydro would deploy in the next rate term in order to manage the revenue deficiency and meet the efficiency expectation imposed by the 0.15% efficiency factor proposed as part of the custom revenue cap index.

Toronto Hydro would ensure that benefits are sustained into future rate periods by excluding any savings related to expenditures that are simply deferred into future periods. For example, the deferral of the S4 Hana upgrade in the current 2020-2024 rate period would not have met the criteria for this measure, because the costs associated with this project were deferred into the 2025-2029 rate period.

Efficiency achievements would be tracked and measured in accordance with the following methodologies:

- **Cost Reduction:** Projects with cost reduction efficiency benefits yield an absolute reduction in an overall expenditures. Cost reduction benefits are measured by comparing actual costs in a defined area of scope (e.g. an expense category) against an annual (or justified pro-rated amount) baseline cost based on previously funded expenses in rates. For example, if the utility introduces process automation to reduce OM&A expenses associated with completing a manual work process, the OM&A savings would be tracked as a cost reduction benefit.
- **Cost Avoidance:** Projects with cost avoidance efficiency benefits yield an avoidance of future cost increases which were not included in the forecasts used to set base rates for 2025-2029. Cost avoidance benefits are measured by determining a forecast annual (or justified pro-rated amount) incremental cost that the utility must manage. For example, if the utility faces an incremental business requirement that was not included in the 2025-2029 Investment Plan, such as the need to lease additional office space to house its growing workforce, and is able to reconfigure its existing workspaces to avoid the incremental costs associated with obtaining additional office space, the annual savings would be tracked as a cost avoidance benefit.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-21

Reference: [Exhibit 1B-3-1, p.46-68]

QUESTION:

SEC seeks to understand how changes in the capital budget as may be ordered by the OEB would impact the PIM targets. For each of the following scenarios, please provide the revised PIM targets, and a detailed explanation of the basis of any change, including any underlying calculations.

a. Scenario 1: The OEB reduced the proposed capital expenditure budget by 10% (envelope reduction).
b. Scenario 2: The OEB reduced the proposed capital expenditure budget by 20% (envelope reduction).
c. Scenario 3: The OEB reduced the proposed capital expenditure budget by 30% (envelope reduction).

RESPONSE:

Toronto Hydro is unable to forecast PIM targets on the basis of the scenarios outlined above. To determine targets, the utility would need to undertake a bottom-up planning exercise to assess and evaluate the implications of the proposed reductions on its capital expenditure plan. It is not possible to complete such an exercise within the context of IRs. Furthermore, Toronto Hydro notes that the scenarios are "incomplete" in that they do not contemplate any consideration of operational funding requirements. Nonetheless, to be helpful and responsive to this question, in Table 1 below Toronto Hydro gauges the impact of not investing in programs that have a direct link to specific targets. The total cumulative impact of these programs is approximately $1,121 million, which is close to the 30% scenario above. For the reasons noted above, Toronto Hydro underscores that the information provided below does not reflect an investment plan and that the noted impacts on specific metrics cannot be treated as targets. The only way to set meaningful PIM targets is to undertake a holistic

evaluation of total expenditures levels along with consideration of other key approvals outlined in this application (e.g. the proposed Deferral and Variance Accounts).

Capital Investment	Program Cost ($ Millions)	Impacts to Performance Outcomes					
		SAIDI (2025-2029 Avg.)[1]	SAIFI (2025-2029 Avg.)[2]	System Security	Grid Automation	GHG Reductions	Efficiency Achievements
Horseshoe Renewal: Underground and Overhead	~$784[3]	6% Decline	15% Decline				
Downtown Renewal: Underground and Network	~$164[4]	0.1% Decline	1.2% Decline				
System Enhancements	~$151[5]	1.7% Decline	1.4% Decline		Cannot be achieved		
ADMS	~$34[6]						
Cyber and Physical Security	~$50[7]			Cannot be achieved			
Fleet and Building Electrification	$52[8]					Cannot be achieved	
Process Automation	$50[9]						Cannot be achieved

1

[1] Toronto Hydro calculated deterioration in SAIDI (Excluding Loss of Supply, Major Events and Scheduled Outages) based on the five-year rolling projection for each scenario compared to the 2025-2029 Investment Plan. Note, the underlying rate of deterioration is different when comparing 2029 annual performance instead of a rolling average. 10%, 0.2%, and 2.9%, respectively, for Horseshoe Renewal, Downtown Renewal, and System Enhancements. See 2B-SEC-42.
[2] Toronto Hydro calculated deterioration in SAIFI (Defective Equipment) based on the five-year rolling projection for each scenario compared to the 2025-2029 Investment Plan. Note, the underlying rate of deterioration is different when comparing 2029 annual performance instead of a rolling average. 26%, 0%, and 2.3%, respectively, for Horseshoe Renewal, Downtown Renewal, and System Enhancements. See 2B-SEC-42 for more information.
[3] Exhibit 2B, Section E6.2 and E6.5
[4] Exhibit 2B, Section E6.3 and E6.4
[5] Exhibit 2B, Section E7.1
[6] Exhibit 2B, Section E8.4 at Appendix A
[7] Exhibit 2B, Section E8.4 at page 20 and Exhibit 2B, Section E8.2 at page 26.
[8] See 2B-AMPCO-66 and 2B-Staff-265.
[9] See 1B-CCC-42.

Horseshoe Renewal: Overhead, Underground

In addition to the originally filed scenarios (Toronto Hydro's 2025-2029 Proposed Investment Plan, and IRM filed under Exhibit 1B, Tab 3, Schedule 1, Pg. 10 & 17), Toronto Hydro has made its best effort to produce additional Reliability Projections that reflect hypothetical budgetary reduction scenarios. These scenarios should be used for comparative purposes only. Please see the response to interrogatory 2B-SEC-42 for more information on Toronto Hydro's reliability projection methodology.

This Reliability Projection (SAIDI and SAIFI Forecast) scenario reflects a reduction to renewal spending in the Horseshoe region over the 2025-2029 period, with some investment in 2025 to continue the removal of PCB transformers from Toronto Hydro's distribution system. These reductions would almost entirely eliminate the Underground System Renewal – Horseshoe (Exhibit 2B, Section E6.2) and Overhead System Renewal (Exhibit 2B, Section E6.5) programs, going from a combined cost of approximately $834 million down to approximately $50 million over the 2025-2029 period.

Downtown Renewal: Underground and Network

This Reliability Projection (SAIDI and SAIFI Forecast) scenario reflects a reduction to Downtown Renewal spending over the 2025-2029 period, with some investment in 2025 to continue the removal of PCB transformers from Toronto Hydro's distribution system. These reductions would eliminate almost all of the 2025-2029 funding for Underground System Renewal - Downtown (Exhibit 2B, Section E6.3), from a cost of approximately $165 million to less than $1 million over the 2025-2029 period.

System Enhancements

This Reliability Projection (SAIDI and SAIFI Forecast) scenario reflects the elimination of System Enhancements spending over the 2025-2029 period (primarily the elimination of additional SCADA switches and mid-line reclosers). The entire funding proposed for the System Enhancements

Program (Exhibit 2B, Section E7.1) for 2025-2029 would be cut to zero from a cost of roughly $151 million.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-22

Reference: Exhibit 1B, Tab 3, Schedule 1, Pages 46-68

With respect to the proposed System Capacity (Non-Wires) Performance Incentive Measure:

QUESTION (A):

a) [p.49] Please explain why the target is based on capacity procured (30 MW) and not financial benefit ($10M).

RESPONSE (B):

Toronto Hydro's proposal is consistent with the reference measures outlined in the fixed incentive option outlined at page 8 of the OEB's *Filing Guidelines for Incentives for Electricity Distributors to Use Third-Party DERs as Non-Wires Alternatives*. Specifically, the target will be based on actual versus forecast "*amount of system capacity provided by third-party owned DER solutions that would otherwise have to be provided by a wires solution.*" Furthermore, the utility notes that the amount of capacity procured is trackable and measurable, whereas the financial benefit associated with that capacity could be different because of (i) an updated BCA methodology as the OEB framework evolves and takes shape, and (ii) the actual load demand projects that are deferred or avoided in the next rate period, which could change as noted the response to 1B-Staff-89(a).

QUESTION (B):

b) [p.51] Toronto Hydro has provided a benefit-cost analysis ("BCA") of the proposed non-wire investment in its Horseshoe north area.

   i. Please provide a copy of the full BCA calculation, including any live Excel spreadsheet used.

ii. Please undertake a similar BCA analysis for the same investment, using the proposed OEB BCA Draft Framework. Please provide all calculations and any live Excel spreadsheet used.

iii. Based on Toronto Hydro's BCA, the total NPV benefits of the investment is $3.32M which is equal to the benefit it would receive if it met the System Capacity (Non-Wires) Performance Incentives Measure. Please explain why it is appropriate for Toronto Hydro to receive 100% of the NPV benefit of undertaking the investment.

RESPONSE (B):

i) Please see 1B-Staff-49 Appendix A for the live Excel spreadsheet.

ii) Please see 1B-Staff-89 part (c).

iii) Refer to pages 54-55 of Exhibit 1B, Tab 3, Schedule 1 under *Concluding Remarks* re Toronto Hydro's Non-Wires Incentive Proposal.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-23

Reference: Exhibit 1B, Tab 3, Schedule 2

With respect to Toronto Hydro's scorecard:

QUESTION (A) AND (B):

a) [p.22] Please update Table 3 Custom Measure Performance to include 2023 results, as well as include the measure targets as set out in EB-2018-0165.

b) For each of the measures on Toronto Hydro's OEB scorecard, please provide the 2023 results.

RESPONSE (A):

Below is an updated table for Toronto Hydro's 2020-2024 Custom Measures which includes 2023 results as well as the targets set out in EB-2018-0165.[1]

2020-2023 Toronto Hydro Custom Measure Performance Results and Targets[2]

Toronto Hydro Outcome	OEB Reporting Category	Toronto Hydro's Custom Measures	2020 Results	2021 Results	2022 Results	2023 Results	Target
Customer Service	**Customer Satisfaction**	Customers on eBills	317,341	350,993	381,490	405,505	Improve
Safety	**Safety**	Total Recordable Injury Frequency	0.58	0.56	0.47	0.30	Maintain
		Network Units Modernization	61%	63%	65%	68%	Improve
Reliability	**System Reliability**	SAIDI - Defective Equipment	0.36	0.36	0.34	0.25	Maintain
		SAIFI - Defective Equipment	0.40	0.46	0.46	0.33	Maintain

/C

[1] EB-2018-0165, Decision and Order (December 1, 2019) at page 49.
[2] Updated Table 3 from Exhibit 1B, Tab 3, Schedule 2 at page 22.

Toronto Hydro Outcome	OEB Reporting Category	Toronto Hydro's Custom Measures	2020 Results	2021 Results	2022 Results	2023 Results	Target
		FESI-7 System (# of feeders)	9	10	27	27[3]	Improve
		FESI-6 Large Customers (# of feeders)	10	5	12	21	Maintain
		MAIFI	3.18	3.39	3.36	3.34	Monitor
	Asset Management	System Capacity (# of Stations)	11	11	12	12	Maintain
		System Health (Asset Condition) – Wood Poles[4]	11%	14%	9%	8%	Monitor
		Direct Buried Cable Replacement	729 km	697 km	679 km[5]	653 km	Improve
		In-Service Additions (Cumulative)	17%	35%	56%	78%	Monitor
Financial	**Cost Control**	Average Wood Pole Replacement Cost	$7,779	$7,847	$7,973	8,179	Improve
		Vegetation Management Cost per Km	$2,158	$2,213	$2,175	2,355	Improve
Environment	**Environment**	Oil Spills Containing PCBs (# of spills)	0	0	1	1	Improve
		Waste Diversion Rate	90.3%	91.5%	92.4%	91.4%	Monitor

/C

RESPONSE (B):

Below Toronto Hydro provides updated results including 2023 actuals for: (1) the OEB Scorecard and (2) the Electricity Service Quality Requirements (ESQR). Please note that for some measures the 2023 actuals are not available (n/a) until the end of Q2.

[3] As described in Exhibit 1B, Tab 3, Schedule 2, the increase in reported outages is attributed to the implementation of the OUA system, which tracks outages at a more granular level (i.e. previously not visible due to their size and location). The increased number of interruptions are outages with less than 100 Customers Interrupted, with the number of interruptions impacting more than 100 customers is consistent with prior years.

[4] As explained in Section 2.10 of this Schedule and Exhibit 2B, Section D3, Appendix A, Toronto Hydro refined its asset condition assessment methodology for wood poles. With this approach, the System Health (Asset Condition) for Wood Poles decreases to 6% in 2020 and decreases to 8% in 2021.

[5] In preparing this evidence, Toronto Hydro identified a data error in the number of km of direct buried cable remaining on the system reported for 2022 actuals. As of the end of 2022, Toronto Hydro has 666 kilometers of cable remaining rather than 679 kilometers. Please refer to Section 2.11 of this Schedule.

1 **Toronto Hydro Electricity Distributor Scorecard (EDS) 2023 Results and 2019-2023 Average**

Performance Measures		2023 Results	2019-2023 (5-yr avg)
New Residential/Small Business Services Connected on Time		99.91%	99.83%
Scheduled Appointments Met on Time		99.90%	99.73%
Telephone Calls Answered on Time		77.80%	75.68%
First Contact Resolution		92%	91.4%
Billing Accuracy		99.20%	99.14%
Customer Satisfaction Survey Results		94%	94%
Level of Public Awareness		64%	68%
Compliance with O. Reg 22/04		n/a	C
Serious Electrical Incidents	Number of General Public Incidents	n/a	n/a
	Rate per 10, 100, 1000 km of line	n/a	0.71
SAIDI		0.79	0.84
SAIFI		1.24	1.32
DSP Implementation		n/a	n/a
Efficiency Assessment		n/a	5
Total Cost per Customer		n/a	n/a
Total Cost per km of Line		n/a	n/a
New Micro-embedded Generation Facilities Connected on Time		98.40%	96.39%
Liquidity: Current Ratio		1.07	0.87
Leverage: Total Debt to Equity Ratio		1.19	1.17
Profitability: Regulatory ROE	Deemed	8.52%	8.68%
	Achieved	6.80%	7.13%

/C

1 **2018-2022 ESQR Performance Results (i.e. Updated Table 2 from Exhibit 1B, Tab 3, Schedule 2)**

ESQR	OEB Standard	2018	2019	2020	2021	2022	2023	2018-22 (5-yr avg)	2019-23 (5-yr avg)
Connection of New Services – Low Voltage ("LV") (EDS)	90	99.8	99.7	99.7	99.9	99.9	99.9	99.8	99.8
Connection of New Service – High Voltage ("HV")	90	100	99.3	99.7	99.3	99.2	100%	99.5	99.5
Connection of Micro-Embedded Generation Facilities (EDS)	90	100	100	100	92.3	91.3	98.4	96.7	96.4
Appointment Scheduling	90	81.6	91.8	94.1	90.7	81.2	95.3	87.9	91.4
Scheduled Appointments Met on Time (EDS)	90	99.7	99.0	99.9	99.9	99.9	99.9	99.7	99.7
Rescheduling a Missed Appointment	100	100	100	100	100	100	100	100	100
Telephone Accessibility (EDS)	65	80.2	74.8	69.9	76.9	79.1	77.8	76.2	75.7
Telephone Call Abandon Rate	10	1.4	3.5	2.7	1.1	1.1	0.7	1.96	1.8
Written Response to Enquires	80	98.4	99.4	96.3	98.3	99.7	99.8	98.4	98.5
Billing Accuracy (EDS)	98	99.3	99.2	99.2	99.0	99.1	99.2	99.2	99.1
Emergency Response (Urban)	80	86.6	92.4	88.3	88.5	86.5	88.5	88.5	88.8
Reconnection Performance Standard	85	97.7	99.9	99.5	NA	99.5	98	99.7	99.2

/C

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-24

Reference: Exhibit 1B, Tab 3, Schedule 3, Pages 21-22

For each listed divisional and departmental productivity initiative, please detail how the cost reduction/avoidance were calculated, including all assumptions.

RESPONSE:

Please see Toronto Hydro's response to 1B-AMPCO-07.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-25

Reference: Exhibit 1B, Tab 3, Schedule 3

For each year between 2025-2029, please detail all productivity and efficiency initiatives that Toronto Hydro plans to undertake. For each please provide a quantitative estimate of forecast savings, and include the full methodology and assumptions used in the calculation.

RESPONSE:

Consistent with the expectations of the X-factor, the 2025-2029 Custom Scorecard includes an Efficiency Achievements metric with a target to achieve approximately $6.9 million in sustained and quantified efficiency benefits per year by the end of the rate period (i.e. 2029). Table 16 in the referenced evidence details the types of investments that will enable Toronto Hydro to achieve the $6.9 million target on this custom metric. Please refer to the utility's response to 1B-SEC-20(f) for an explanation of how these Efficiency Achievements will be tracked in the next rate period.

In the next rate period, the utility intends to continue to focus on process automation (e.g. digitization, robotics and predictive analytics) to drive continuous improvement in efficiency and productivity. A detailed list of specific initiatives will be determined as part of Toronto Hydro's IT Investment Planning process and Enterprise Technology Portfolio (ETP) framework as described in Exhibit 2B, Section D8, pages 7-10. As initiatives are prioritized and approved for execution, expected savings and benefits will be tracked and evaluated. Please see the evidence in Exhibit 1B, Tab 3, Schedule 3 for a detailed list and explanation of over 30 productivity initiatives undertaken in the current rate period, and the response to 1B-AMPCO-07 for more information about these initiatives.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-26

Reference: Exhibit 1B, Tab 3, Schedule 3

Please revise Tables 10 to 19, to include a comparison against the industry average.

RESPONSE:

Please see Tables 1-10 below for comparisons against the industry average.[1] Toronto Hydro stands behind the evidence in Exhibit 1B, Tab 3, Schedule 3 and the submissions in its March 18, 2022 letter[2] regarding the limitations of the APB econometric model, which does not account for recognized differences that set Toronto Hydro apart from other Ontario utilities. For a further discussion of these considerations please see also the response to interrogatory 2B-Staff-121.

Table 1: 2018-2022 Billing O&M Cost per Customer

	2018	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [5315]	9,626	16,633	22,200	21,444	24,401	18,861
Scale (1,000 Customers)	772.6	777.9	779.2	785.7	790.5	781.2
Unit Cost ($/Customer)	12.46	21.38	28.49	27.29	30.87	24.10
Industry Average ($/Customer)	35.57	34.89	35.69	35.52	36.13	36.88

Table 2: 2018-2022 Metering O&M Cost per Customer

	2018	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [5065 + 5175 + 5310]	5,193	5,556	5,656	4,656	4,853	5,183
Scale (1,000 Customers)	772.6	777.9	779.2	785.7	790.5	781.2
Unit Cost ($/Customer)	6.72	7.14	7.26	5.93	6.14	6.64
Industry Average ($/Customer)	20.23	19.76	19.21	19.58	18.68	19.43

[1] Toronto Hydro calculated the industry average by taking the average of all distributor unit costs (excluding any zero values) in each year.
[2] EB-2018-0278, Toronto Hydro Letter, Activities and Program-based Benchmarking: Enhancements Inititative (March 18, 2022)

Table 3: 2018-2022 Vegetation Management O&M Cost per Pole

	2018	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [5135]	3,309	2,826	3,230	2,083	3,431	2,976
Scale (1,000 Poles)	179.4	180.3	181.8	182.6	183.6	181.6
Unit Cost ($/Pole)	18.44	15.67	17.76	11.40	18.69	16.39
Industry Average ($/Pole)	35.29	35.26	34.22	36.02	43.93	36.62

Table 4: 2019-2022 Lines O&M Cost per Circuit km

	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [5020:5030 + 5040:5050 + 5090:5095 + 5125:5130 + 5145:5155]	21,869	23,264	25,850	29,596	23,661
Scale (Circuit km of Primary Line)	10,528	10,597	10,625	10,663	10,583
Unit Cost ($/Circuit km of Primary Line)	2,077	2,195	2,433	2,776	2,235
Industry Average ($/Circuit km of Primary Line)	1,800	1,811	1,779	1,926	1,797

Table 5: 2018-2022 Stations O&M Cost per Total MVA

	2018	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [5016 + 5017 + 5114]	12,779	8,051	6,488	9,187	8,602	9,021
Scale (Total MVA)	7,583	7,617	7,774	7,891	7,853	7,744
Unit Cost ($/MVA)	1,685	1,057	835	1,164	1,095	1,167
Industry Average ($/MVA)	1,374	1,503	1,477	1,790	1,680	1,554

Table 6: 2018-2022 Poles, Towers, and Fixtures O&M Cost per Pole

	2018	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [5120]	581	1,161	2,123	2,102	1,751	1,296
Scale (1,000 Poles)	179.4	180.3	181.8	182.6	183.6	180.6
Unit Cost ($/Pole)	3.24	6.44	11.68	11.51	9.54	7.15
Industry Average ($/Pole)	11.29	11.16	10.53	10.66	14.11	11.03

Table 7: 2018-2022 Stations Capital Additions per Total MVA

	2018	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [1820] Capital Additions	30,320	16,655	21,541	25,606	26,295	24,083
Scale (Total MVA)	7,583	7,617	7,774	7,891	7,853	7,744
Unit Cost ($/MVA)	3,998	2,186	2,771	3,245	3,348	3,110
Industry Average ($/MVA)	2,605	4,444	4,013	3,002	7,413	5,211

Table 8: 2018-2022 Poles, Towers, and Fixtures Capital Addition Costs per Pole

	2018	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [1830] Capital Additions	21,288	32,866	33,134	33,663	29,573	30,105
Scale (Pole Additions)	3,254	3,525	3,367	3,677	3,312	3,427
Unit Cost ($/Pole Addition)	6,542	9,324	9,841	9,155	8,929	8,758
Industry Average ($/Pole Addition)	6,480	8,202	8,832	10,856	11,202	9,472

Table 9: 2018-2022 Line Transformer Capital Addition Costs per Transformer

	2018	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [1850] Capital Additions	62,026	79,731	84,980	87,980	78,613	78,666
Scale (Lines Transformer Additions)	2,900	2,746	2,716	3,086	2,470	2,784
Unit Cost ($/Line Transformer Addition)	21,388	29,035	31,289	28,510	31,827	28,410
Industry Average ($/Line Transformer Addition)	8,468	9,185	10,180	10,672	13,771	10,455

Table 10: 2018-2022 Meter Capital Addition Costs per Customer

	2018	2019	2020	2021	2022	Avg.
Cost ($1,000) - USoA [1860] Capital Additions	24,359	14,491	19,983	15,476	17,882	18,438
Scale (1,000 Customers)	773	778	779	786	791	781
Unit Cost ($/Customer)	32	19	26	20	23	24
Industry Average ($/Customer)	13	13	12	11	11	12

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-27

Reference: Exhibit 1B-3-3, Appendix A

With respect to the Clearspring Energy Advisors, Econometric Benchmarking Study of Toronto Hydro's Total Cost and Reliability Metrics Report:

QUESTIONS (A)

a. Please detail all changes to Clearspring's methodology since its report in Toronto Hydro's last custom IR application EB-2018-0165. Please explain the reason for the change.

RESPONSE (A) – PREPARED BY CLEASPRING::

There have been a series of methodological refinements since the study in the previous Toronto Hydro application. The best and detailed description of them is contained in [i] Clearspring's Hydro One JRAP benchmark report in EB-2021-0110 titled, "Benchmarking and Productivity Research for Hydro One Networks' Joint Rate Application", [ii] the Joint Clearspring/PEG Report in that application as we adopted PEG's suggestion on the new scope variable, and [iii] the Clearspring Report in this application that carries forward all of the Joint Report methodology and variables but then discusses the three new variables that have been added since then (distribution substations, substation capacity, and the time variant percent urban). Section 2 in the Clearspring benchmarking report for Hydro One provides a series of research items, Clearspring's approach to them, and the rationale for them. These items include the sample period where we have determined a consistent start year of 2000 is appropriate, model specification, peak demand variable definition, capital asset price levels, Canadian input price inflation, capital benchmark year, customized labour and non-labour OM&A weights, and pensions and benefits treatment.

QUESTIONS (B)

b. [p.11] Please explain the reason for excluding pension and benefit costs. Directionally, what impact would it likely have on the results if it was included?

RESPONSE (B) – PREPARED BY CLEASPRING::

Excluding pensions and benefits is the approach taken by both Clearspring and PEG in the Hydro One Joint Report. Pensions and benefits can be sensitive to external shocks and conditions such as stock prices and the differing regulatory environments of Ontario and the U.S. can impact those expense categories. Clearspring states on page 17 of the Clearspring benchmarking report for Hydro One, "Including or excluding pensions and benefits has been a topic of discussion in several CIR proceedings. Driving the issue is that Ontario distributors do not consistently report OM&A pensions and benefits expenses. Further, the different health care and other regulatory differences between the U.S. and Ontario can cause pensions and benefits to be higher in the U.S. than in Ontario, creating a small bias in favor of Ontario utilities when they are included. We believe it is fair to say that both consultants would prefer to exclude these expenses when it is possible to consistently do so."

QUESTIONS (C)

c. [p.20] Please explain why Clearspring did not include any Ontario utilities in its benchmarking sample.

RESPONSE (C)– PREPARED BY CLEASPRING:

Using a U.S. only dataset is the approach that both Clearspring and PEG agreed upon as being appropriate in the Hydro One Joint Clearspring/PEG Report, and PEG had also taken that approach in the previous Toronto Hydro application. One of the reasons is the pensions and benefits issue discussed in part (b). Using a U.S. only dataset allows pensions and benefits to be excluded and avoids issues related to their inclusion. Clearspring has continued the methodology established in the Hydro One Joint Report. That research did not include Ontario utilities. Only using a U.S. sample assists in assuring consistent cost definitions. For these reasons, we have settled on a U.S. only sample when benchmarking the large, outlier utilities within Ontario.

QUESTIONS (D)

d. [p.21] Based on the model, please provide both forecast incremental capital and OM&A benchmark costs for each additional customer and MW of peak demand.

RESPONSE (D) – PREPARED BY CLEASPRING:

Clearspring did not estimate a capital or OM&A model, only a total cost model. The stretch factor has been and should continue to be based upon total cost benchmarking results. Disaggregated models will suffer from both accounting differences between comparators and substitution differences between capital, labour, and non-labour inputs within the sample.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-28

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix C

Preamble:

With respect to UMS Group, Unit Cost Benchmarking Study:

QUESTION (A):

a) Please detail all methodological differences in this study as compared to similar studies filed in Toronto Hydro's EB-2018-0165 application.

RESPONSE (A) PROVIDED BY UMS GROUP:

The only methodical differences involved the absence of what we would consider a fully normalized comparison, not addressing the effect of regional cost differences and difficulty factors. This difference is described in the report. Referring to our report in the EB-2018-0165 filing, the Board provided THESL and UMS Group constructive feedback regarding certain aspects of the normalization formula. In response to that feedback, we simplified our normalization efforts to focus on those criteria accepted by the Board in 2018. Thus, we truncated the normalization effort to only include the USD to CAD dollar and metric conversions, and differences in accounting practices. Please also see our response to 1B-AMPCO-12, part (f).

RESPONSE (A) PROVIDED BY TORONTO HYDRO:

Toronto Hydro updated the methodology of the unit costs that served as an input into the UMS Unit Cost Benchmarking Study. Please see Toronto Hydro's response to interrogatory 1B-AMPCO-9 for the methodology differences that were applied to the capital assets in this study.

QUESTION (B):

b) [p.2] Please explain how the various asset categories and OM&A programs/practices were selected. Please provide a list of others that were considered, and reasons for why they were not selected.

RESPONSE (B) PROVIDED BY UMS GROUP:

We started with the list of asset classes from the previous application (EB-2018-0165) as a starting point for discussion and considering our experience with a similar study for Hydro Ottawa, reviewed the viability of gaining consistency across utilities for each Asset Class and Maintenance Program. Citing significant variability in the selection, installation, and accounting for overhead switches, we opted to remove that category from the study, and two asset classes were added:

- Substation maintenance in consideration of the significant attention being paid to this area across the industry, and
- Cable Chambers / Manholes (please refer to our response to 1B-AMPCO-12, part (d)).

The validity of these asset classes and maintenance programs as indicative of THESL's overall unit cost performance was verified when it was determined that the seven asset categories represented approximately half of the planned capital budget over the 2020 through 2022 period; and the five maintenance programs represented almost 60% of all preventative and predictive maintenance costs in each year over the same timeframe.

QUESTION (C):

c) Please confirm the Study benchmarks average unit cost over the 2020-2022 period.

RESPONSE (C) PROVIDED BY UMS GROUP:

Confirmed. The weighted average unit costs over the 2020-2022 period are reflective of the input received from THESL and each member of the Peer Group Panel.

QUESTION (D):

d) [Appendix F] Please provide Toronto Hydro's completed Appendix F.

RESPONSE (D) PROVIDED BY UMS GROUP

Toronto Hydro's completed Appendix F is included as an attachment (Unit Cost Survey_THESL.xls).

QUESTION (E):

e) [Appendix F] Using the same methodology used to complete Appendix F, for each unit of measure, please provide Toronto Hydro's actual unit cost for each year between 2020 and 2023, and forecast for 2024 to 2029.

RESPONSE (E) PROVIDED BY TORONTO HYDRO:

Appendix F for the UMS Unit Cost Benchmarking Study consisted of years 2020-2022. Please see 1B-SEC-28 App B for the requested yearly breakdown.

Toronto Hydro is unable to forecast the unit cost for 2024-2029 as the unit cost methodology utilizes ISA data from completed projects.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-29

References: Exhibit 1B, Tab 4, Schedule 2

With respect to the Innovation Fund Proposal:

QUESTION (A) :

a) Please provide details regarding Toronto Hydro's proposed public reporting on projects costs, benefits, evaluations and lessons learned.

RESPONSE (A):

The Governance Framework for the proposed Innovation Fund (Exhibit 1B-4-2, pp. 8-16) refers to three types of reports that will be produced, for different purposes, including the pilot selection report, milestone reports, and the pilot evaluation and learnings report. Of these, only the pilot evaluation and learning report is intended for public circulation. The pilot evaluation and learnings report will contain information on the costs, benefits, evaluations and lessons learned. The specific requirements of the report will be determined during the 2025-2029 rate period. For more information on all other (e.g. not public) Innovation Fund reporting, please see Toronto Hydro's response to interrogatory 1B-CCC-46 part e).

QUESTION (B) :

b) Please explain how potential projects and proposals will be identified and selected.

RESPONSE (B):

The potential pilot projects will be selected from the four areas of innovation identified in the referenced evidence. For more information about pilot project identification and selection, please see Toronto Hydro's response to interrogatory 1B-CCC-46 part (c).

QUESTION (C) :

c) [p.16] Toronto Hydro is proposes the Innovation Fund Variance Account to record the difference in amounts collected and the actuals to deploy the selected pilot projects. Does this mean that customers may end up paying more than $16M for innovating pilot projects, if final costs are greater than $16M?

RESPONSE:

Yes, it is possible that customers may end up paying more than $16M for pilot projects under the Innovation Fund, as follows.

First, for clarity, Toronto Hydro is proposing to recover through a rate rider an amount equal to 0.3% of the total revenue requirement that gets approved by the OEB. The $16 million amount that is forecast to be recovered currently through the rate rider is based on 0.3% of the total revenue requirement presented in Exhibit 6 of the evidence. The total dollar amount that would need to be recovered through the rate rider will be recalculated during the Draft Rate Orders stage on the basis of the approved revenue requirement.

Second, as part of the Innovation Fund proposal, Toronto Hydro is requesting a symmetrical variance account (IFVA) to track actual expenditures, whether capital or OM&A, on a revenue requirement basis against the forecasted amount that will be recovered through the rate rider. Toronto Hydro will propose an approach to clearing the balance in the variance account in its next rebasing application. Please see Toronto Hydro's response to 9-Staff-342 part (a) for more information.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1B-VECC-1

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 13

"Under a standard IRM scenario, Toronto Hydro's 2025-2029 capital investment plan would be underfunded by approximately 35 percent or $1.5 billion."

QUESTION (A):

Please provide the model, calculations and assumptions which support this statement. Specifically show which capital categories are assumed to be reduced under a lower capital spending plan.

RESPONSE (A):

The table below provides a breakdown the utility's capital-related revenue (CRR) under IRM used to inform the statement referenced above.

Table 1: 2025-2029 Capital Related Revenue (CRR) under IRM

	2025	2026	2027	2028	2029
Amortization/Depreciation	285.3	289.3	293.4	297.5	301.7
Deemed Interest Expense	143.1	145.1	147.1	149.2	151.3
Return on Equity	220.9	224.0	227.2	230.4	233.6
PILs	27.9	28.3	28.7	29.1	29.5
Capital Related Revenue (CRR)	**677.2**	**686.7**	**696.3**	**706.1**	**716.0**

For this IRM scenario, Toronto Hydro determined the 2026-2029 CRR by escalating the 2025 capital CRR (detailed in Exhibit 6 and summarized in 1B-Staff-03 at Table 1) with standard Price Cap IR parameters, namely: an inflation factor (based on a 2% forecast) minus a 0.6% X-factor.

To determine the approximate total capital expenditures (CAPEX) that could be funded by the CRR available under this IRM scenario, Toronto Hydro applied CRR to CAPEX ratio of 1:10. Applying this ratio to the CRR in Table 1 above, yields an approximate 2025-2029 CAPEX envelope of $2.4 billion, which is $1.6 billion less than the CAPEX requirements described in Toronto Hydro's plan as-filed.

Table 2 below shows the CAPEX reductions that were assumed in the IRM scenario compared to the 2025-2029 Investment Plan, for the purpose of modelling the reliability impacts under an IRM scenario (i.e. Outage Duration and Outage Frequency as shown in Exhibit 1B, Tab 03, Schedule 1 at pages 7 and 10, respectively).

Table 2: Comparison of 2025-2029 Final Plan vs. IRM Scenario

Category	Final Plan 2025-2029 ($M)	Final Plan[1] % of Total	Total IRM 2025-2029 ($M)	IRM % of Total	$ Reduction	% Reduction
System Access	1,071.7	27%	1,071.1	45%	0.6	0%
System Renewal	1,970.3	49%	747.0	31%	1,223.3	62%
System Service	352.9	9%	179.3	7%	173.6	49%
General Plant	562.6	14%	375.8	16%	186.8	33%
Other	44.3	1%	26.7	1%	17.6	40%
Total CapEx	4,001.7	100%	2,400.0	100%	1601.7	40%

[1] As filed on November 17, 2023.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1B-VECC-02

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 13

"Adoption of a plan constrained by this funding envelope would force the utility into a sustainment plan that would be almost entirely reactive in nature, resulting in roughly an 8 percent deterioration in system reliability by the end of the rate period,."

QUESTION (A):

a) Please provide the model, calculations and assumptions which derive an 8% system reliability deterioration noted in this reference.

RESPONSE (A):

Please see Toronto Hydro's responses to interrogatories: (i) 1B-EP-15 for an explanation of how the 8% was derived; (ii) 1B-VECC-1 for a breakdown of the capital expenditure assumptions that underpin this IRM funding scenario; and (iii) 2B-SEC-42 for a description of the reliability forecasting model that Toronto Hydro used to estimate the result.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1B-VECC-3

Reference: Exhibit 1B, Tab 3, Schedule 1, Page 2

QUESTION (A):

a) How was the 0.6 ($65 million) value for PIM amount chosen?

RESPONSE (A):

Toronto Hydro applied the following key considerations in the decision to include a 0.6% incentive-factor attributed to the PIM in the proposed custom rate framework:

- The OEB's expectation in the Rate Handbook that the X-Factor included in a custom index should be higher than X-Factor that would otherwise be assigned under Price Cap IR. Together the efficiency-factor of 0.15% and the PIM of 0.6%, Toronto Hydro's proposed X-Factor is 0.75%, which is 0.15% greater than the X-factor under Price Cap IR;
- The principle and objective of balancing the utility risk/reward under the PIM with the customer cost and benefits that can be reasonably quantified from the achievement of PIM scorecard targets. As shown in the cost benefit analysis in Exhibit 1B, Tab 3, Schedule 1 at pages 57-58, in addition to the efficiency-factor, the achievement of PIM targets provide customers a minimum direct benefit of approximately $74 million over the 2025 to 2029 period (plus indirect benefits), relative to a utility incentive of $65 million.
- The utility's assessment of an appropriate level of financial risk (i.e. *revenue reduction*) that can be assigned to the combined X-factor (*i.e. the empirically-derived efficiency factor and the proactive PIM*). Please see the response to interrogatory 1B-Staff-03(b) for a summary of the revenue deficiency (i.e. *financial risk*) imposed by combined X-factor over the rate period. See also 1B-SEC-13.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1B-VECC-4

Reference: Exhibit 1B, Tab 2, Schedule 1, Page 32

"Only if the set performance targets are achieved (or forecasted be achieved with a high degree of confidence) by the end of the rate term would the incentive be recovered from customers in the next decade. As such, Toronto Hydro confirms that that there would be no rate recovery associated with the PIM in the 2025-2029 period."

QUESTION (A):

a) The PIM mechanism may create issues with respect to intergeneration inequities in that the cost (incentive) is recovered in the period after which the efficiencies are achieved. Is this correct? If so how is/could this issue be addressed or mitigated?

RESPONSE (A):

Toronto Hydro does not believe the proposed recovery of any PIM-DA entries in the 2030+ period creates material intergenerational inequities. While measurement of performance is assessed on the basis of 2025 to 2029 results, many of the metrics reflect the output/results of multi-year investments or initiatives which will continue to provide value to customers beyond the next rate term. This is evidenced by the analysis on pages 57-58 of Exhibit 1B, Tab 3, Schedule 1 which shows that quantifiable benefits associated with target achievement entail significant minimum lifetime benefits of $892 million on a nominal basis, or $266 million on a present value basis.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1.0-VECC-5

Reference: Exhibit 1B, Tab3, Schedule 1, Page 8

"Toronto Hydro proposes to remove the Scheduled Outages cause code from its 2025-2029 custom SAIDI performance measure for two reasons: (1) major forecasting uncertainty caused by the ongoing implementation of Oracle's Utility Analytics ("OUA"), and (2) the utility expects Scheduled Outages to increase in the 2025-2029 period as the result of a larger work program."

QUESTION (A):

a) Please confirm (or correct) that the proposal for the PIM measurement includes scheduled outages (as per Table 1 at 1B/T3/S1/pg.7).

RESPONSE (A):

The proposal for the PIM measure as indicated in Table 1 in Exhibit 1B, Tab 03, Schedule 1 for Outage duration does not include Major Event Days, Loss of Supply or Scheduled Outages.

QUESTION (B):

b) Given THESL's aggressive capital plan for the rate period could lead to more customer interruptions, what mechanisms are being employed to ensure that customers do not endure more and scheduled outages than during the last rate plan?

RESPONSE (B):

Scheduled outages (as detailed in Exhibit 2B, Section C2.4) are necessary in order for work to be safely performed on the distribution system. While an increased volume of electrical work will require an increased volume of scheduled outages, Toronto Hydro plans and reviews all outage requests such that the customer impact is as small as possible while still enabling work to be

undertaken safely. Prior to any scheduled outage, Toronto Hydro's Customer Operations Communication Office (COCO) provides advanced notice to customers of the impending project work to be performed in their area to allow customers to plan for the scheduled outage and thereby minimize its impact. Toronto Hydro intends to track customer satisfaction with respect to scheduled outage communications as part of the 2025-2029 Custom Scorecard (please see Exhibit 1B, Tab 3, Schedule 3 at page 27).

QUESTION (C):

c) In its customer engagement did THESL explain that more or longer scheduled outages might occur as a result of implementing the plan? If so, please provide the references which show customers' acceptance of that in order to support the more aggressive capital plan.

RESPONSE (C):

Scheduled Outages were not discussed during the Customer Engagement.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1.0-VECC-6

Reference: Exhibit 1B, Tab 3, Schedule 1, Page 7, Table 1

QUESTION (A):

a) THESL' proposed PIM Scorecard differs from the Board specified Electricity Distributor Scorecard (EDS). Why? Specifically what advantages does THESL see in using its customized scorecard as opposed to adopting the EDS for the PIM?

RESPONSE (A):

As noted in the evidence in Exhibit 1B, Tab 3, Schedule 2 on page 1 Toronto Hydro intends to continue delivering performance on the Electricity Distributor Scorecard ("EDS") and the Electricity Service Quality Requirements ("ESQR") consistent with the historical results presented in Exhibit 1B, Tab 3, Schedule 2. In addition to fulfilling the OEB's general expectations of distributor performance, as part of this custom incentive rate application, Toronto Hydro has put forward a Custom Scorecard and a Performance Incentive Mechanism. Together these components of the custom rate framework shift notable incremental risk to the utility for achieving performance objectives that: (i) represent expanded priorities of the utility's 2025-2029 Investment Plan which are not captured by the EDS (i.e. system security, post-transactional customer satisfaction, customer escalations resolution, grid automation readiness, non-wires system capacity, efficiency achievements, GHG reductions and alignment with international standards in key management system); and (ii) are aligned with the areas of performance explored in the Phase 2 Customer Engagement study whereby over 33,000 customers completed a detailed survey reviewing Toronto Hydro's draft plan and its key outcomes, and an average of 84% of customers surveyed supported the draft plan or one that does even more to advance key outcomes.

QUESTION (B):

b) None of the PIM measures provide performance comparability with other electricity distributors in Ontario. For example, with respect to service reliability there are no metrics which would compare THESL performance with, for example adjoining utilities like Alectra, or similar aging utilities like London Hydro or Hydro Ottawa. Did THESL undertake any studies which compare its performance to other utilities? Specifically, has THESL performed any analysis which compares THESL productivity or service quality performance over the past five years with any other individual or group of Ontario utilities?

RESPONSE (B):

As noted above, the custom measures reflect specific investment objectives of Toronto Hydro's 2025-2029 Investment Plan, which were informed by customers' needs and preferences. While Toronto Hydro did not undertake a specific study to compare its custom measures to other utilities on these metrics, it did where possible consider industry benchmarks or standards in the development of the PIM and associated targets. Please see the table below for a summary:

Table 1: Alignment with Industry Benchmarking or Standards

Performance Measures	Alignment with Industry Benchmarking or Standards
Reliability (SAIDI)	Clearspring Study at Exhibit 1B, Tab 3, Schedule 3, Appendix A, which shows that Toronto Hydro is above benchmark in SAIFI, and below benchmark in CAIDI performance relative to the established peer group.[1]
New Services Connected on Time	See the Tables 27 and 28 in Exhibit 1B, Tab 3, Schedule 1 which indicate average Ontario LDC performance for HV and LV connections at 97% compared to Toronto Hydro's target of 99%.

[1] Exhibit 1B, Tab 3, Schedule 3, Appendix A, p. 5

Performance Measures	Alignment with Industry Benchmarking or Standards
Grid Automation Readiness	***2021 Utility Grid Modernization Survey*, Accenture, July 30, 2021**: General grid modernization benchmarking survey including 21 North American utilities covering 23 jurisdictions. Study finds that "automated sectionalizing devices have been well integrated in many utilities with a majority stating over 50% of their feeders had such operational technology. Many utilities, 52% of respondents, have recognized the potential of sectionalizers beyond reclosing activities and have devices provide telemetry and integrate data into operational models (e.g., ADMS)." ***Smart Energy Benchmarking: Utility Scorecard Results*, SGIN, June 2023**: Modernization benchmarking study covering 12 Canadian utilities. Example of relevant findings: "Three quarters of utilities had deployed an Advanced Distribution Management System (ADMS) as of 2021 or were about to do so. Only three utilities had no ADMS or short-term plans to deploy one, ranging across different provinces and size categories. Moreover, several utilities of various sizes have recently deployed Fault Location Isolation and Service Restoration (FLISR) technology."
Non-Wires System Capacity	Toronto Hydro continues to be a leader in the development and integration of non-wires solutions into distribution system planning. Toronto Hydro's target of 30 MW for demand response capacity triples with volume of capacity targeted in the 2020-2024 rate period. This demonstrates an ambitious and, to date, unprecedented commitment to NWSs by any other local distribution company in Ontario. Other utility leaders in this space, such as Alectra, have procured capacity in the range of 10-15 MW.
System Security	Aligned with NIST Cybersecurity Framework standards.

Performance Measures	Alignment with Industry Benchmarking or Standards
Total Recordable Injury Frequency Rate (TRIF)	Toronto Hydro's TRIF target of 0.85 is below the Electricity Canada industry average of 1.35.
ISO Standards	By definition this measure reflects alignment of the utility's performance in its key management systems with international standards. Toronto Hydro notes that, to its knowledge, the following utilities have achieved or are pursing ISO55001 certification in the U.S. and Canada: Hydro Ottawa, Lansing Board of Water and Light – REO Cogeneration, New York Power Authority, Palm Beach County Water Utilities Department, PG&E Electrical, PG&E Gas, and PG&E Power Generation.[2]
Efficiency Achievements	This target is informed by the Clearspring Total Cost Benchnmarking (Exhibit 1B, Tab 3, Schedule 3, Appendix A) which concludes that Toronto Hydro is below (i.e. less costly) than benchmark expectations, with a 2020 to 2022 score relative to benchmark of -28.0%.[3]

[2] Please note that the list only includes organizations who have 'self-declared' their certification. There may be others that Toronto Hydro is not aware of.
[3] Exhibit 1B, Tab 3, Schedule 3, Appendix A, page 2

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1B-VECC-7

Reference: Exhibit 1B, Tab 3, Schedule 2, pg. 13 /Schedule 3, page 31

Preamble:

"As the sub-metering market has become more mature in Toronto over the last decade, a greater share of new multi-unit buildings is opting for bulk-metering service connections. The practical effect of operating in this urban environment with a deregulated sub-metering market is a slower rate of formally reported customer growth from 2013 to 2022, which is putting artificial upward pressure on cost performance metrics like Total Cost Per Customer and Total Cost per km of Line."

QUESTION (A) AND (B) :

a) Does THESL provide sub-metering services in competition with other service providers in Ontario?

b) If yes, are any sub-metering costs included in this application for recovery from ratepayers?

RESPONSE (A) AND (B):

No. In accordance with Part III of the *Energy Consumer Protection Act, 2010*, Toronto Hydro provides services as a unit smart meter provider, meaning a distributor licensed by the Board to engage in unit smart metering. The utility does not engage in *competitive unit sub-metering* activities related to multi-unit complexes that are connected to a bulk meter. The evidence referenced above notes that as the unit *sub-metering market* has become more mature, a greater share of the multi-unit buildings being constructed are opting for a Toronto Hydro bulk meter service (with competitive unit sub-metering), rather than a Toronto Hydro unit smart metering service.

QUESTION (C):

It is unclear to us why sub-metering would result in higher costs per customers. For example, presumably THESL avoids the cost of individual metering, meter reading, line connection and other high-cost activities associated with individual metered customers. Conversely bulk metered customers are a lower cost to serve. The result would be that while the number of residential units is increasing in the average costs to THESL of serving those customers is also decreasing. In any event, what evidence/studies does THESL have to demonstrate that sub-metering (all other things being equal) results in a higher, rather than lower, or unchanged cost per customer?

RESPONSE (C):

The referenced evidence is not an assertion about the relative cost of serving bulk metered vs. individually metered customers. Rather, it is about the prevalence of unit sub-metering in Toronto Hydro's service territory skewing comparative metrics that use customer count as the denominator. Unit sub-metering results in the aggregation of dozens or hundreds of end-consumers behind a single bulk-meter, and subsequently counts each multi-unit building with a bulk-meter as a single customer. As noted in the OM&A Overview evidence at Exhibit 4, Tab 1, Schedule 1 at page 11, Toronto Hydro estimates that it serves approximately 340,000 end-consumers or more behind bulk meters.

QUESTION (D):

A similar insinuation of costs per customer is made at Schedule 3 which notes that Toronto Hydro provides an average of 31.8 MWh per customer, more load per customer relative to the peer group of utilities who have a multi-year average of 23.6 MWh. The evidence ascribes this relative difference to the proliferation of high rises. However, it is not clear why this is a relevant consideration if one assumes that there is a lower cost of delivered power for utilities with a greater proportion of bulk metered units. Please provide the studies that THESL relies upon to support its contention that higher density of customers is a more costly delivery model than lower density service.

RESPONSE (D):

Operating in a dense urban environment drives unique challenges which have an impact on costs as evidenced in Exhibit 1B, Tab 3, Schedule 3 at pages 2-8 and in the Total Cost Benchmarking Study found at Appendix A of the same reference.

The referenced analysis illustrates a key operational difference between the utility and its Ontario peers that should be considered when evaluating cost per customer benchmarks. Because Toronto Hydro has substantially more high-rise buildings than comparator utilities in Ontario, its customer count denominator is lower than it otherwise would be if that number included sub-metered residential customers in buildings serviced by a bulk-metered. As a result it is not unreasonable to see in the cost per customer benchmarking analyses that Toronto Hydro has more demand, more consumption, more net fixed assets, and more OM&A cost per customer compared to its peers.

For a specific discussion of how serving a dense service territory relates to asset utilization and costs, please see Toronto Hydro's response to 2B-Staff-121.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1B-VECC-8

References: Exhibit 1B, Tab 3, Schedule 2, Page 19

Decision EB-2023-0143

"In this regard, the OEB notes that the incremental costs of locates activity anticipated to be triggered by Bill 93 will not be limited to a 12-month period as is typically associated with a Z-factor event and as set out in the OEB's Chapter 3 Filing Guidelines. The account will be in place for each utility until their next rebasing application, to be reviewed for disposition as part of that application, unless large balances have accrued that may require disposition in an IRM year."

QUESTION (A):

a) Does this application incorporate an estimate for the costs of Bill 93 as contemplated by the Board's Decision for utilities in a rebasing application?

RESPONSE (A):

Yes, please refer to Toronto Hydro's response to 4-Staff-296(e) for an update to the balance of the *Getting Ontario Connected Act* variance account for the period of April 1, 2023 to December 31, 2024.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1B-VECC-09

Reference: Exhibit 1B, Tab 3, Schedule 3

QUESTION (A):

a) Does THESL's customer call/contact operations produce a monthly or annual report. If yes, please provide the reports for 2022 and 2023. If not, please explain what reporting is provided to senior and executive management with respect to customer contacts.

RESPONSE (A):

Please refer to the appendices to this response.

QUESTION (B):

b) What proportion (annually) of customer contacts come from sub-metered electricity users. Are these calls generally referred back to the sub-meter entity?

RESPONSE (B):

Toronto Hydro does not track customer contacts from sub-metered electricity users. Where appropriate, such contacts would be referred to unit sub-metering providers.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1B-VECC-10

Reference: Exhibit 1B, Tab 3, Schedule 3, Section 4.7

QUESTION:

a) For each of the AFB benchmarks shown at section 4.7 in tables 10 through 18 please provide a summary table showing the 2018-2022 THEL average and for the same period the associated Ontario distributor average.

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 1B-SEC-26.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 1-VECC-11

Reference: Exhibit 1B, Tab 3, Schedule 3, Appendix A Clearspring

"To make this congested urban variable time variant, Clearspring gathered the number of high-rise skyscrapers at or above 100 metres for each year and for each city served within the U.S. sample and Toronto."

QUESTIONS (A)

a) Is the "urban" variable composed entirely of 100 metre (30 story) buildings? If not please provide a description of the other data used as part of the urban variable.

RESPONSE (A)– PREPARED BY CLEASPRING:

The prior congested urban variable, which was gathered by examining the proportion of each service territory that contained buildings with seven stories or more, continues to be the foundation of the urban variable. The refinement that has now been made is to address the fact that the original variable was not escalated by the change in skyscraper buildings from year to year. So in 2017, when the prior variable was calculated, the value of the variable is exactly the same as in the prior benchmarking models conducted by Clearspring. But that 2017 congested urban variable has now been escalated for years subsequent to 2017 (or reduced for years prior to 2017) based on an adjusted rate of change in the number of skyscrapers present.

QUESTIONS (B)

b) Does this variable include data from Canadian cities other than Toronto?

RESPONSE (B)– PREPARED BY CLEASPRING:

No, only Toronto data was gathered because the dataset is a U.S. only one other than Toronto Hydro.

QUESTIONS (C)

c) What adjustment is made to capture potential differences between high rise buildings which are themselves congested and isolated high-rise buildings. That is, how is the difference between isolated building distinguished between multi-complex developments?

RESPONSE (C)– PREPARED BY CLEASPRING:

This distinction was made in the construction of the percent congested urban variable. The area designated as congested urban required 7-story or higher buildings to be clustered together. In using the skyscraper data to escalate the percent congested urban variable there was no distinction made between isolated and multi-complex developments. We do not see this as a significant concern, as it is likely that most buildings 100 meters or above would be surrounded by area designated as congested urban service territory.

QUESTIONS (D)

d) High rise developments are also often associated with transportation infrastructure improvements, for example in Toronto along the new Eglington LRT. Such developments can allow an opportunity for utilities to replace infrastructure at lower costs due to multi-party sharing of costs. How is this phenomenon captured in the "urban" variable.

RESPONSE (D)– PREPARED BY CLEASPRING:

To the extent that utilities can reduce costs due to possible savings opportunities and sharing this will tend to reduce the coefficient on the urban variable.

QUESTIONS (E)

e) The 'urban" variable captures the correlation as between the change in high-rise buildings and what specific costs?

RESPONSE (E)– PREPARED BY CLEASPRING:

From a modeling perspective, the variable is capturing the correlation between serving a highly urban area and the total costs incurred by the utility. The model does not disaggregate to specific costs below that total cost level.

QUESTIONS (F)

f) Ontario allows for third party suite metering in high rise developments. Do all or any of the other jurisdictions which are in the data set do the same? Does Clearspring's model/data capture the relative proportion of suite metered high rises?

RESPONSE (F)– PREPARED BY CLEASPRING:

We are not aware if other jurisdictions have similar arrangements. The model is not adjusting for this situation. This is likely to the disadvantage of Toronto Hydro who is serving more customers than the model is crediting to the Company.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-104

Reference: Appendix 2-AA and Appendix 2-AB

QUESTION:

a) Please update actual capital expenditures for 2023 bridge year in Appendix 2-AA format and Appendix 2-AB format (and update other related tabs in Chapter 2 Appendices accordingly). Please specify for which months actual data has been used versus forecast.

RESPONSE:

Please refer to Appendix A and Appendix B for updated OEB Appendices 2-AA and 2-AB for 2023 Actuals (as of December 31, 2023), and updated 2024 Bridge.

Additionally, the following appendixes have been updated for 2023 actuals and updated 2024 bridge through interrogatory responses:

- OEB Appendix 2-BA can be found in the response to 1B-SEC-01 (e).
- OEB Appendix 2-FA-FB can be found in the response to 2A-Staff-109 (a)
- In-Service Additions by Investment Category can be found in the response to 1B-SEC-01 (d)

As noted in the Application Update Cover Letter[1], the remaining tabs in Chapter 2 Appendixes will be provided in advance of the Technical Conference.

[1] EB-2023-0195, Toronto Hydro 2025-2029 Custom Rate Application For Electricity Distribution Rates and Charges – Evidence Update, January 29,2024, page 1.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-105

References: Exhibit 2A, Tab 1, Schedule 2 - OEB Appendix 2-BA

Exhibit 2B, Exhibit E4, Appendix A - OEB Appendix 2-AB

Exhibit 2B, Section E4, Table 3

Preamble:

OEB staff have compiled information from the references above to compare yearly expenditures to yearly in service additions in the table below. The "difference" row in the table below also aligns with the difference in closing CWIP in Table 3 in reference 3.

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Net Capital Expenditures	448.1	533.2	597.9	582.9	625.3	734.6	767.3	836.2	837.9	825.7
Additions	447.9	485.2	554.4	607.9	606.3	645.9	699.4	795.6	769.2	875.4
Difference	0.2	48.0	43.4	(24.9)	19.0	88.8	67.9	40.6	68.7	(49.6)

QUESTION (A):

a) Please outline the reasons for the year over year variances in the difference between net capital expenditures and in service additions.

RESPONSE (A):

Year-over-year variances are attributed to the nature of capital projects resulting in a timing lag between the completion of the project, the close-out process and any validation required to complete a project and bring it into service. Additionally, large projects may incur ongoing expenditure over multiple years before they are put in-service. This difference between capital expenditures and in-service additions remains in Construction Work-in-Progress ("CWIP") until the expenditures are in service, on project completion.

Additionally, Toronto Hydro notes that the yearly expenditures included in the question include Renewable Generation Facility Assets and Other Non-Rate-Regulated Utility Assets[1] whereas the in-service additions do not. Table 1 below provides Capital Expenditures normalized for these expenditures, In-Service Additions as well as Opening and Closing CWIP for the 2020-2029 period.

Table 1: Forecasted CWIP ($Millions)

	Actuals			**Bridge**		**Forecast**				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Opening CWIP	381.2	380.6	427.8	471.2	442.4	456.4	536.3	595.1	622.7	681.7
Additions (CAPEX)	447.4	532.4	597.8	579.1	620.3	725.8	758.1	823.2	828.2	812.3
Deductions (In Service Additions)	(447.9)	(485.2)	(554.4)	(607.9)	(606.3)	(645.9)	(699.4)	(795.6)	(769.2)	(875.4)
Closing CWIP	380.6	427.8	471.2	442.4	456.4	536.3	595.1	622.7	681.7	618.6
Difference	**(0.5)**	**47.2**	**43.3**	**(28.8)**	**14.0**	**79.9**	**58.7**	**27.6**	**59.0**	**(63.1)**

[1] Exhibit 2B, Section E4, Appendix B - OEB Appendix 2-AA

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-106

Reference: **Exhibit 2A, Tab 2, Schedule 1, Appendix D**

Preamble**:**

In its depreciation report for Toronto Hydro, Concentric noted that "Through the completion of the depreciation study, Concentric was made aware that the currently utilized account structure for facilities was leading to non-homogeneous assets being grouped together. Concentric recommends Toronto Hydro examine the facilities accounts and create a set of accounts that better aligns with the actual use of facilities assets." Concentric then provided a recommended account structure with proposed useful lives.

QUESTION (A) AND (B):

a) Using Concentric's proposed account structure, please provide a comparison of the depreciation expense included in Toronto Hydro's forecast rates for 2025-2029 and the depreciation expense using the account structure recommended by Concentric.
b) Please discuss if Toronto Hydro has addressed this recommendation in the current application. If not, why not and how Toronto Hydro plans to address Concentric's recommendation.

RESPONSE (A) AND (B):

The depreciation expense included in Toronto Hydro's forecast rates for 2025-2029 is using Concentric's proposed account structure.

Concentric's recommendations have been addressed in the current application.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-107

Reference: Exhibit 2A, Tab 3, Schedule 1, Page.1

Question(s):

a) Please file the Lead-Lag study done by Guidehouse based on 2023 actuals. If the study is not yet completed, please advise when it will be.

RESPONSE:

Please see Appendix A to this response. /C

Working Capital Requirements of Toronto Hydro-Electric System Limited

2025-2029

Prepared for:

Toronto Hydro-Electric System Limited

Submitted by:
Guidehouse Inc.
100 King St. W
Suite 4950
Toronto, ON M5X 1B1

416.777.2440
guidehouse.com

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Executive Summary

Guidehouse was retained by Toronto Hydro-Electric System Limited ("THESL") to calculate the working capital requirements of THESL using a lead-lag study.

Working capital is the amount of funds that are required to finance the day-to-day operations, and which are included as part of a rate base for ratemaking purposes. A lead-lag study is the most accurate basis for the determination of working capital and was used by Guidehouse for this purpose. The results of this study are provided in this report.

This report is an update to Guidehouse's original report dated June 9, 2023. This study and accompanying report are based on THESL's more recent revenue and expense data from 2023. See section 5 of this report for analysis of how the results of this updated study compares to the original study.

The updated working capital requirement of THESL's distribution business is shown below.

Table 1: THESL Summary of Working Capital Requirement

	Test Year 2023
Percentage of OM&A and Cost of Power	7.08%
Working Capital Requirement ($M)	$200.97

The working capital requirements shown in Table 1 above are based upon the revenue lag and expense lead days shown in Table 2.

Table 2: THESL Working Capital Requirements (2023)

Description	Revenue Lag Days	Expense Lead Days	Net Lag Days
Cost of Power	53.24	32.63	20.61
OM&A Expenses	53.24	36.74	16.50
PILS	53.24	-14.00	67.24
Interest Expense	53.24	22.92	30.32

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1. Introduction and Methodology

Guidehouse Inc. was retained by Toronto Hydro-Electric System Limited ("THESL") to calculate its working capital requirements. This report provides the results of the assessment and the resulting working capital requirements.

Working capital is the amount of funds that are required to finance the day-to-day operations, and which are included as part of a rate base for ratemaking purposes. A lead-lag study is the most accurate basis for the determination of working capital and was used by Guidehouse for this purpose.

A lead-lag study analyzes the time between the date customers receive service and the date that customers' payments are available to THESL (or "lag") together with the time between the date THESL receives goods and services from its vendors and the date that THESL pays for them (or "lead").

"Leads" and "Lags" are both measured in days and are dollar-weighted where appropriate. The dollar-weighted net lag (lag minus lead) days is then divided by 365 (or 366 for leap years) and then multiplied by the annual test year expenses to determine the amount of working capital required. The resulting amount of working capital is then included in THESL's rate base for the purpose of determining revenue requirement.

THESL provided revenue and expense data to support the lead-lag study for the 2021, 2022 and 2023 calendar years. Generally, for this updated report, Guidehouse utilized the revenue and expense data for the 2023 calendar year as it was the most recent source of data provided.

1.1 Key Concepts

The following section outlines the key concepts used throughout this report to assess the working capital requirements of THESL's business. This includes the mid-point method, statutory approach, revenue lag components, expense lead components and dollar weighting.

1.1.1 Mid-Point Method

When a service is provided to (or by) THESL over a period of time, the service is deemed to have been provided (or received) evenly over the period, unless specific information regarding the provision (or receipt) of that service indicates otherwise. If both the service end date ("Y") and the service start date ("X") are known, the mid-point of a service period can be calculated using Equation 1-1.

Equation 1-1

$$Mid - Point = \frac{(Y - X) + 1}{2}$$

When specific start and end dates are unknown, but it is known that a service is evenly distributed over the mid-point of a period, an alternative formula that is generally used is shown below. Equation 1-2 uses the number of days in a year ("A") and the number of periods in a year ("B"):

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Equation 1-2

$$Mid - Point = \frac{A/B}{2}$$

1.1.2 Statutory Approach

In conjunction with the mid-point method, it is important to note that not all areas of this study may utilize dates on which actual payments were made to (or by) THESL. In some instances, the due dates for payments are established by statute or by regulation. In these instances, the due date established by statute has been used in lieu of when payments were made.

1.1.3 Revenue Lag Components

As used in this study, revenue lags are comprised of Retail Revenue, Independent Electricity System Operator ("IESO") Credits and Other Revenues. The lag associated with Retail Revenue consist of four components:

- Service Lag component (the average time from the provision of electricity to a customer until the meter is read)
- Billing Lag component (the average time from when the meter is read to when the bill is generated and provided to customers)
- Collections Lag component (the average time from when a bill is provided to the customer until the customer initiates payment to the utility
- Payment Processing Lag component (the average time from when the customer provides payment to the utility until when the payment is made liquid and available to the utility)

1.1.4 Expense Lead Components

As used in this study, expense leads are defined to consist of two components:

- Service Lead component (services are assumed to be provided to THESL evenly around the mid-point of the service period)
- Payment Lead component (the time period from the end of the service period to the time payment was made and when funds have left THESL's possession)

1.1.5 Dollar Weighting

Both leads and lags should be dollar-weighted where appropriate and where data is available to accurately reflect the flow of dollars. For example, suppose that a particular transaction has a lead time of 100 days and has a dollar value of $100. Further, suppose that another transaction has a lead time of 30 days with a dollar value of $1 million. A simple un-weighted average of the two transactions would give us a lead time of 65 days ([100+30]/2). However, when these two transactions are dollar weighted, the resulting lead time would be closer to 30 days which is more representative of how the dollars flow.

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1.2 Methodology

Performing a lead-lag study requires two key undertakings:

1. Developing an understanding of how the regulated distribution business operates in terms of products and services sold to customers/purchased from vendors, and the policies and procedures that govern such transactions.
2. Modeling such operations using data from a relevant period of time and a representative data set. It is important to ascertain and factor into the study whether (or not) there are known changes to existing business policies and procedures going forward. Where such changes are known and material, they should be factored into the study.

To develop an understanding of THESL's operations, interviews with personnel within THESL's Accounts Receivable, Customer Service, Wholesale Market Operations, Payroll, Treasury, and Tax Departments were conducted. Key questions that were addressed during the course of the interviews included:

1. What is being sold (or purchased)? If a service is being provided to (or by) THESL, over what time period was this service provided?
2. Who are the buyers (or sellers)?
3. What are the terms for payment? Are the terms for payment driven by industry norms or by company policy? Is there flexibility in the terms for payment?
4. Are any changes to the terms for payment expected? Are these terms driven by industry or internally? What is the basis for any such changes?
5. Are there any new rules or regulations governing transactions relating to transmission operations that are expected to materialize over the time frame considered in this report?
6. How are payments made (or received)? Payment types have different payment lead times (i.e., internet payments have shorter deposit times than cheque deposit times).

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2. Revenue Lags

This section of the report provides the revenue lag days for THESL. A revenue lag represents the number of days from the date that is service is rendered by THESL until the date payments are received and funds are available to THESL.

THESL receives revenue from the following funding streams:

- **Retail Revenue:** a distribution utility providing service to its customers typically derives its revenues from bills paid for service by its customers.
- **IESO Credits:** THESL also receives revenue in the form of IESO reimbursement credits for Ontario Electricity Support Program ("OESP"), Ontario Electricity Rebate ("OER"), Renewable Energy Standard Offer Program ("RESOP"), Feed-in Tariff ("FIT"), and Micro Feed-in Tariff ("MFIT").
- **Other Revenue:** THESL staff indicated that it receives additional external revenue.

A summary of the revenue lags for THESL's distribution business is shown below.

Table 3: Summary of Retail Revenue Lag (2023)

Description	Amounts ($M)	Lag Days	Weighting (%)	Weighted Lag Days
Retail Revenue	$3,486.40	53.18	87.03%	46.28
IESO Credits	$354.07	63.22	8.84%	5.59
Other Revenue	$165.46	33.22	4.13%	1.37
Total	**$4,005.93**		**100.00%**	**53.24**

2.1 Retail Revenue Lag

Retail revenue lag consists of the following components:

- Service Lag
- Billing Lag
- Collections Lag
- Payment Processing Lag

Service Lag
The service lag is defined as the midpoint of the service period; the halfway point between the beginning of the service period and the end of the service period. The service period end is typically defined as the date the meter is read. All THESL customers are billed monthly. The Service Lag is calculated to be 15.21 days.

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Billing Lag
The billing lag is defined as the time period from period end (meter read) to the time that the customer's bill is generated in the customer information system. An analysis of THESL meter billing data indicated that THESL customers have an average billing lag of 12.35 days.

Collections Lag
The collections lag is defined as the time period from when the bill is generated in the customer information system to the time when the customer provides payment to THESL and when that payment is recorded in THESL's billing system. The collections lag is measured by analyzing the receivables aging data provided by THESL. THESL's collection lag was calculated to be 24.32 days, carried forward from the most recent study performed.[1]

Payment Processing Lag
The payment processing lag represents the average time from when the customer provides payment to the utility until when the payment is made liquid and available to the utility. THESL's payment processing lag was calculated to be 1.30 days.

2.2 IESO Credits

Table 4 below summarizes the amounts and revenue lag times associated with the components that make up IESO credits revenue.

Table 4: Summary of IESO Credits (2023)

Description	Amounts ($M)	Lag Days	Weighting (%)	Weighted Lag Days
OER	$272.28	63.19	76.90%	48.59
FIT	$55.93	63.38	15.80%	10.01
OESP	$21.62	63.18	6.11%	3.86
MFIT	$3.98	63.38	1.13%	0.71
RESOP	$0.26	62.94	0.07%	0.05
Total	**$354.07**		**100.00%**	**63.22**

2.3 Other External Revenue

THESL Distribution collects revenues from a variety of other sources, in addition to the retail revenue and IESO credits discussed above. THESL staff provided monthly data and payment

[1] Lead-lag studies use the most recent and accurate historical data available for calculating results. For this study revenue and expense data from 2023 was generally used. However, for purposes of calculation of collection lag days Guidehouse used the days calculated in the 2020 Addendum ("2020 Update") to the filed 2017 Lead Lag Study ("2017 Study"). Due to significant balances outstanding more than 120 days arising from the Covid-19 pandemic and resulting policy response by the Ontario Electric Board, calculating the collection lag days using receivables aging as of the end of 2023 would have inflated that calculation and the resulting Cash Working Capital percentage. It is Guidehouse' opinion that collection data from the 2020 Update is more reflective of normal business operations going forward over the period 2025 to 2029. This approach is unchanged from the original report dated June 9, 2023.

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information for the other external revenue. The table below summarizes revenue lag time associated this other external revenue.

Table 5: Summary of Other External Revenue (2023)

Description	Amounts ($M)	Lag Days	Weighting (%)	Weighted Lag Days
Other External Revenue	$165.46	33.22	100.00%	33.22
Total	**$165.46**		**100.00%**	**33.22**

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3. Expense Leads

The determination of working capital requires both a measurement of the lag in the collection of revenues for services provided by THESL, and the lead times associated with payments for services provided to THESL. Expense Leads are defined as the time period between when a service is provided to THESL and when payment is required for that service.

The following expense leads were calculated in this study:

- Cost of Power
- Operations, Maintenance and Administration ("OM&A") expenses
- Payments in Lieu of Taxes ("PILs")
- Interest on THESL'S debt
- Harmonized Sales Tax ("HST")

3.1 Cost of Power

For the purpose of the lead-lag study, cost of power expenses were considered to consist of payments made by THESL to the following providers:

1. IESO cost of power expenses (includes the purchasing of power supply requirements on a monthly basis from the IESO on a schedule defined by the IESO's billing and settlement procedures)
2. Hydro One Low Voltage Charges
3. Payments to Non-Utility Generators
4. Distributed Generation

Expense lead times were calculated individually for each of the items listed above and dollar-weighted to derive the expense lead time of 32.63 days, as seen in Table 6 below.

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Table 6: Cost of Power Expenses* (2023)

Delivery Month	Amounts ($M)	Lead Days	Weighting (%)	Weighted Lead Days
Jan-23	$199.10	31.50	8.32%	2.62
Feb-23	$200.81	30.00	8.39%	2.52
Mar-23	$220.82	35.50	9.23%	3.28
Apr-23	$167.40	31.00	7.00%	2.17
May-23	$192.38	31.50	8.04%	2.53
Jun-23	$206.35	34.00	8.62%	2.93
Jul-23	$223.52	32.50	9.34%	3.04
Aug-23	$230.28	34.50	9.62%	3.32
Sep-23	$158.25	34.00	6.61%	2.25
Oct-23	$215.68	32.50	9.01%	2.93
Nov-23	$175.81	33.00	7.35%	2.42
Dec-23	$202.37	32.50	8.46%	2.75
Total	**$2,392.76**		100.00%	**32.76**

**This table does not include Distributed Generation charges of $60.18, Hydro One Low Voltage Charges of $.42 and payments to Non-Utility Generators of $.27. These lower the weighted-average cost of power slightly to 32.63.*

3.2 Operations, Maintenance and Administration ("OM&A")

The following expenses are included in the calculation of lead days for OM&A expenses:

- **Payroll and Benefits**: this line item includes basic payroll, payroll withholdings, and benefit expenses related to the regulated utility. THESL staff provided the breakdown of payroll, payroll withholding and benefits expenses.
- **Consulting and Contracting Services:** this line item includes the provision of outside services to THESL.
- **Miscellaneous OM&A:** this line item includes miscellaneous OM&A expenses non-related to the procurement of Outside Services.
- **Property Tax:** this line item includes property tax payments to municipalities or taxing authorities in the Province of Ontario. These payments are typically made in installments.
- **Corporate Procurement Card**: this line item includes credit card expenses related to OM&A.
- **Lease Payments:** this line item includes payments made on the properties THESL uses for their operations.

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Expense lead times were calculated individually for each of the items listed above and then dollar-weighted to derive a composite expense lead time of 36.74 days for OM&A expenses.

Table 7: Summary of OM&A Expenses (2023)

Description	Amounts ($M)	Lead Days	Weighting (%)	Weighted Lead Days
Payroll & Benefits	$223.40	32.55	58.15%	18.93
Consulting and Contract Staff	$111.68	43.88	29.07%	12.76
Miscellaneous OM&A	$43.28	47.70	11.26%	5.37
Property Tax	$5.13	-27.41	1.34%	-0.37
Corporate Procurement Card	$0.55	32.17	0.14%	0.05
Lease Payments	$0.15	2.39	0.04%	0.00
Total	**$384.19**		**100.00%**	**36.74**
Total Excluding Payroll & Benefits	$160.79			
Percent OM&A that attracts HST	**41.85%**			

3.2.1 Payroll and Benefits

In addition to basic and management payroll the following benefits were considered as expenses THESL's business:

1. Three types of payroll withholdings including the Canada Pension Plan, Employment Insurance, and Income Tax withholdings
2. Contributions made to the THESL Pension Plan
3. Payments made to the Worker Safety Improvement Board ("WSIB")
4. Payments made for the Employer Health Tax ("EHT")
5. Group Health, Dental, and Life Insurance related administrative fees and claims

When all payroll, withholdings and benefits were dollar-weighted using actual payment data, the weighted average expense lead time associated with payroll and benefits was determined to be 32.55 days as shown in the table below.

Table 8: Summary of Payroll & Benefits Expenses (2023)

Description	Amounts ($M)	Lead Days	Weighting (%)	Weighted Lead Days
Payroll	$108.84	23.67	48.72%	11.53
Payroll Withholdings	$53.75	45.65	24.06%	10.98
Pensions	$35.67	56.31	15.97%	8.99
Benefits	$20.81	7.78	9.31%	0.72
Other Benefits	$4.33	16.53	1.94%	0.32
Total	**$223.40**		**100.00%**	**32.55**

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3.2.2 Consulting and Contract Staff

THESL engages consulting and contract staff to provide assistance in the areas of engineering, environmental services, receivables management, accounting, and general consulting. A dollar-weighted expense lead time of 43.88 days was determined based on a review of invoices rendered and payments made by THESL in 2023.

3.2.3 Miscellaneous OM&A

This category of expense includes items such as product purchases, equipment rentals, and provision of general services to THESL. Based on transactions in THESL's accounts payable system under this category, a dollar-weighted expense lead time of 47.70 days was derived.

3.2.4 Property Taxes

THESL makes property tax payments to the City of Toronto in installments. Using actual payment dates and amounts associated with THESL's distribution business for calendar year 2023, a dollar-weighted expense lead (lag) time of (27.41) days was determined.

3.2.5 Corporate Procurement Card

Procurement (or charge) cards are used by THESL's employees primarily for purchases of vehicle fuel. Based on actual invoices from THESL's charge card provider and payments made by THESL, a dollar-weighted expense lead time of 32.17 days was determined.

3.2.6 Lease Payments

THESL leases office space to support its ongoing operations. Using actual invoices and payments for 2023, a dollar-weighted expense lead time of 2.39 days was determined.

3.3 Payments in Lieu of Taxes ("PILs")

THESL makes payments in lieu of taxes in installments to the relevant taxing authorities. Table 7 below summarizes the components of the PILS expense lead calculation.

Table 9: Summary of Payments in Lieu of Taxes Expenses (Average 2019-2023)[2]

Description	Amounts ($M)	Lead Days	Weighting (%)	Weighted Lead Days
PILS	$11.36	(14.00)	100.00%	(14.00)
Total	**$11.36**		**100.00%**	**(14.00)**

[2] Guidehouse used an average as 2023 did not represent normal PILs activity. The approach of using an average is unchanged from the original report dated June 9, 2023.

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3.4 Interest on Debt

THESL makes interest payments on its long and short-term debt. Such payments are generally made twice a year. Considering the various bonds and other long-term debt instruments, a dollar-weighted expense lead time of 22.92 days was determined for the 2023 calendar year.

Table 10: Interest Expense (2023)

Description	Amounts ($M)	Lead Days	Weighting (%)	Weighted Lead Days
Interest Expense	$128.00	22.92	100.00%	22.92
Total	**$128.00**		**100.00%**	**22.92**

3.5 Harmonized Sales Tax

The expense lead times associated with the following items that attract HST were considered in THESL's distribution lead-lag study.

1. Revenues
2. Cost of Power
3. OM&A

A summary of the expense lead times and working capital amounts associated with each of the above items is provided in the table below. Note that the statutory approach described at the outset was used to determine the expense lead times associated with THESL's remittances and disbursements of HST (*i.e.,* both remittances and collections are generally on the last day of the month following the date of the applicable invoice).

Table 11: Summary of HST Working Capital Amounts

Description	HST Lead Time	Working Capital Factor	Amounts Eligible	HST Amount	Test Year ($M)
Revenues	-6.96	-1.91%	$3,651.85	$474.74	-$9.05
Cost of Power	44.49	12.19%	$2,453.63	$318.97	$38.88
OM&A Expenses[3]	42.85	11.74%	$160.79	$20.90	$2.45
Total					**$32.28**

[3] Costs within OM&A that attract HST include Corporate Procurement Card, Lease Payments, Consulting and Contract Staff and Miscellaneous OM&A. These represent 41.57% of OM&A Expenses included in the study. See Table 7 for a breakdown.

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4. Working Capital Requirements

The table below summarizes THESL's working capital requirements for the test year.

Table 12: THESL Working Capital Requirements (Test Year 2023)

Description	Revenue Lag Days	Expense Lead Days	Net Lag Days	Working Capital Factor	Expenses ($M)	Working Capital ($M)
Cost of Power	53.24	32.63	20.61	5.65%	$2,453.63	$138.60
OM&A Expenses	53.24	36.74	16.50	4.52%	$384.19	$17.37
PILS	53.24	-14.00	67.24	18.42%	$11.36	$2.09
Interest Expense	53.24	22.92	30.32	8.31%	$128.00	$10.63
Total					**$2,977.18**	**$168.69**
HST						$32.28
Total - Including HST						**$200.97**
Working Capital as a Percentage of OM&A incl. Cost of Power						**7.08%**

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5. Findings and Conclusions

The purpose of this section is to compare the results from this study to THESL's original working capital study as completed by Guidehouse and dated June 9, 2023.

5.1 Comparison with Original Study

Table 13: THESL Working Capital Requirements (Test Year 2022)

Description	Revenue Lag Days	Expense Lead Days	Net Lag Days	Working Capital Factor	Expenses ($M)	Working Capital ($M)
Cost of Power	53.15	32.72	20.43	5.60%	$2,461.42	$137.80
OM&A Expenses	53.15	36.84	16.31	4.47%	$358.48	$16.02
PILS	53.15	7.88	45.27	12.40%	$13.39	$1.66
Interest Expense	53.15	12.45	40.70	11.15%	$91.13	$10.16
Total					**$2,924.42**	**$165.64**
HST						$32.23
Total - Including HST						**$197.87**
Working Capital as a Percentage of OM&A incl. Cost of Power						**7.02%**

Table 14: THESL Working Capital Requirements (Test Year 2023)

Description	Revenue Lag Days	Expense Lead Days	Net Lag Days	Working Capital Factor	Expenses ($M)	Working Capital ($M)
Cost of Power	53.24	32.63	20.61	5.65%	$2,453.63	$138.60
OM&A Expenses	53.24	36.74	16.50	4.52%	$384.19	$17.37
PILS	53.24	-14.00	67.24	18.42%	$11.36	$2.09
Interest Expense	53.24	22.92	30.32	8.31%	$128.00	$10.63
Total					**$2,977.18**	**$168.69**
HST						$32.28
Total - Including HST						**$200.97**
Working Capital as a Percentage of OM&A incl. Cost of Power						**7.08%**

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Table 15: THESL Working Capital Requirements (Updated versus Original)

Description	Revenue Lag Days	Expense Lead Days	Net Lag Days	Working Capital Factor	Expenses ($M)	Working Capital ($M)
Cost of Power	.09	-.09	0.18	0.05%	- $7.79	$0.80
OM&A Expenses	.09	-.10	0.19	0.05%	$25.71	$1.35
PILS	.09	-21.88	21.97	6.02%	- $2.03	$0.43
Interest Expense	.09	10.47	-10.38	-2.84%	$36.87	$0.47
Total					**$52.76**	**$3.05**
HST						$0.05
Total - Including HST						**$3.10**
Working Capital as a Percentage of OM&A incl. Cost of Power						**0.06%**

Overall, the difference between the original study and the updated one using data through 2023 is an increase of 0.06%.

The principal driver of this minor increase is a slight increase in revenue lag days in the update (53.24 vs 53.15). Revenue lag has a large impact on the overall result of working capital studies, as it is considered in the working capital factor for all expense items. Minor variations in revenue lag can have large impacts on directional results. The other principal driver is a minor decrease in lead days associated with the cost of power (32.63 vs 32.72). COP payments were paid approximately 0.10 days earlier in 2023 vs 2022.

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RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-108

Reference: Exhibit 2A, Tab 5
Exhibit 2B, Section E5.5, pp. 8, 18, 19
Exhibit 2B, Section E7.2, p

Preamble:

In reference 1 Toronto Hydro presents Table 1 which includes investments over the 2025-2029 rate period, with footnote 8 that states "Toronto Hydro is not proposing any specific Renewable Expansion investments during 2025-2029."

In Reference 2, Toronto Hydro outlines the specific locations where bus-tie reactors will be installed in Table 9.

QUESTION (A):

a) Please explain if the plan to install Bus Tie Reactors as outline in reference 2, Table 9 and the related exhibit, are Toronto Hydro's plans for installation over the 2025-2029 period.

RESPONSE (A):

Confirmed. Exhibit 2B, Section 5.5, Table 9 provides the proposed schedule for the bus-tie reactor project.

QUESTION (B):

b) In reference 2, page 8 Toronto Hydro states it has engaged Hydro One to coordinate bus-tie reactor installations. In reference 2 page 18, Toronto Hydro states the "bus-tie reactor installations will occur in accordance with Hydro One feasibility studies."

   i. What is the status of the approvals required by Hydro One to install this equipment?

ii. If the locations identified are not approved for reactor installation by Hydro One, what actions will Toronto Hydro take to both alleviate the restrictions and handle the excess funds?

RESPONSE (B):

Toronto Hydro has submitted applications to Hydro One for the assessment and implementation of a bus-tie reactor for Richview TS. Project timeline discussions are underway.

Should the proposed locations not be suitable for bus-tie reactor installation following the study, Toronto Hydro would look to leverage other mitigation strategies such as station upgrades and technical policy agreements to improve short circuit capacity in coordination with Hydro One.

Excess funds, if any, will be recorded in Account 1533[1] and returned to the IESO at the end of the 2025-2029 rate period, similar to how excess funds associated with RGCRP in the 2015-2019 period were returned.

QUESTION (C):

c) Will the reactors be installed in advance of committed generation connection request to allow for future connections, or will the reactors be installed when and where required for committed generation connection requests?

RESPONSE (C):

Bus-tie reactors address the existing and forecasted short circuit constraints at the station buses, based on the DER forecast outlined in Exhibit 2B Section E3. Toronto Hydro intends to install bus-tie reactors at 8 stations as outlined in Section E5.5 in order to accommodate future connections.

QUESTION (D):

[1] Refer to Toronto Hydro's response to 9-Staff-348 (b) for excess funds associated with RGCRP in 2020-2024 that were recorded in the 2020-2024 period.

d) Is Toronto Hydro's plans for the Energy Storage System (ESS) to install the equipment on the 9 feeders in advance of committed generation connection requests to allow future generation, or in response to committed generation connection requests?

RESPONSE (D):

As described in Exhibit 2B, Section E7.2, Toronto Hydro intends to install energy storage systems on the nine feeders to enable forecasted generation, not in response to committed generation connection requests.

QUESTION (E):

e) For c) and d) above, if the approach is other than in response to a committed generation connection request,
   i. Please explain why these expenditures prior to committed generation are prudent enhancements to the distribution system.
   ii. Please outline how this meets the requirements of the renewable enabling funding program.

RESPONSE (E):

The proposed investments to accommodate the connection of renewable energy generation facilities are aligned with section 3.3.2 of the Distribution System Code (DSC) and the definition of "*renewable enabling improvement*". It can take one to two years to complete a bus tie reactor or and at least one year to complete an ESS project (depending on the size). If these investments were to be made in response to a committed generation request, rather than proactively, it would result in undue delays and barriers to connecting renewables.

QUESTION (F):

f) Please provide the number of applications from renewable generators over 10 kW for connection on each of the locations where ESS and reactors are planned to be installed.

RESPONSE (F):

There were a total of 40 pre-assessments performed between 2020 to 2023 for project applications on station buses identified on the list of station's proposed for bus-tie reactor installation and feeder candidates for the renewable enabling battery storage system program. For detailed descriptions of the needs at these stations and feeders please refer to the Generation Protection, Monitoring and Control (Exhibit 2B, Section E5.5) and Non-Wires Solutions (Exhibit 2B, Section E7.2) programs, respectively.

QUESTION (G):

g) If the forecast demand for Generation Protection - Monitoring Control expenditures does not materialize, how will Toronto Hydro handle the excess funds?

RESPONSE (G):

Account 1533- Renewable Generation Connection Funding Adder Deferral Account, as described in Exhibit 9, Tab 1, Schedule 1 at page 17 tracks track variances between 2020-2024 revenue requirement associated with Renewable Enabling Improvements ("REI") investments funded through Provincial Rate Protection and collected through payments from the IESO. Toronto Hydro has requested the continuation of the account in the 2025-2029 rate period. If the forecast demand does not materialize, and thereby, the costs are not incurred, similar to the 2020-2024 rate period, the variance between actual and forecasted revenue requirement will be recorded in the variance account as a payable (credit) balance to the IESO.

Please refer to Toronto Hydro's response to 9-Staff-348 (b) for the payable (credit) balance recorded for the 2020-2024 period.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-109

References: **Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S02-3 - OEBAppendices 2-FA-FB - Energy Storage_20231117**
Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S04-5 - OEBAppendices 2-FA-FB - GPMC_20231117
Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S05-6 - OEB Appendices 2-FA-FB- Stations Expansion_20240129
Exhibit 9, Tab 2, Schedule 1, THESL_9_T02_S01Continuity_Schedule_20231117, Tab 2b Continuity Schedule

Preamble:

OEB staff has identified some issues which may require updates to the Excel models in references 1, 2 and 3 as well as Account 1533 recorded in the continuity schedules in reference 4.

OEB staff notes that the Excel models in references 1 and 2 are hard coded and do not contain any formulas used to derive revenue requirement calculations.

QUESTION (A):

a) Please provide the Excel models with formulas after Toronto Hydro incorporates all the changes to the Excels models as part of its responses to interrogatories for renewable generation connection rate protection (RGCRP).

RESPONSE (A):

Please see Appendix A through C to the response for excel models with formulas reflecting all the additional information and modifications to the model requested within interrogatories for renewable generation connection rate protection (RGCP).

QUESTION (B):

b) Based on updated evidence in (a), please provide:

i. A spreadsheet detailing all the changes made.

ii. A summary table comparing the following information from the historic period (including 2023 actuals if available) to the forecast period up to 2029:

- Approved revenue requirement amounts from the OEB's previously approved decisions
- Actual/forecast revenue requirement amounts for provincial rate protection
- Variance account balances

RESPONSE (B):

i. Please see Appendix D summarizing the changes made between the Appendices as filed and the revised Appendices. The provided spreadsheet notes changes made, which are also summarized below.

The spreadsheets include specific calculations based on the mix of assets, timing of in-service additions, and different Capital Cost Allowance ("CCA") assumptions for PILs.

Toronto Hydro notes that the amounts included in Account 1533 are aligned with the detailed calculations of revenue requirement presented in these appendices, no changes were made to actual revenue requirement presented in account 1533[1] besides updates for 2023 actuals and 2024 updated forecast impacts.

Custom changes were made to Appendix 2-FB in order to facilitate the calculations with formulas and integrate the changes above. Specifically, in OEB Appendices 2-FB for GPMC (Appendix B to the response):

[1] Exhibit 9, Tab 1, Schedule 1, Table 11

- a new column was added for the 2015 to 2019 years to facilitate different capital inputs for the tabs "App.2-FB Calc of Reg A", "App.2-FB Calc of Reg B" and "App.2-FB Calc of Reg C".
- In the tab "App.2-FB Calc of REG D":
    - an additional row was added to accommodate a catch-up amortization for the 2020 In Service Amounts related to 2019 projects.
    - an accelerated CCA formula was added for Bill C-97.
    - there were changes to the formulas of the Current Year Amortization (before additions) line to accommodate assets that are fully depreciated and reach a Net Book Value of zero.
- Tab "App.2-FB Calc of REG Consol" is a consolidation of all the separate formula-based calculations from the various tabs described above.

ii. Please see Table 1 with the 2020-2024 approved and actual/forecast revenue requirement for all the investments.

Table 1: Approved versus Actual/Forecast Revenue Requirement for provincial rate protection

	2020	**2021**	**2022**	**2023**	**2024**
Approved Revenue Requirement	1.4	2.3	2.7	3.0	3.2
GPMC	0.9	1.5	1.7	1.9	2.1
Energy Storage	0.5	0.8	1.0	1.1	1.2
Actual/Forecast Revenue Requirement	**0.8**	**1.3**	**1.3**	**1.3**	**0.9**
GPMC	0.8	1.3	1.3	1.3	0.9
Energy Storage	0.0	0.0	0.0	0.0	0.0
Variance Account Balance	**(0.7)**	**(1.0)**	**(1.4)**	**(1.7)**	**(2.4)**

Note: Variances due to rounding may exist

Please see Table 2 with 2025-2029 forecast revenue requirement for all the investments.

Table 2: Forecast Revenue Requirement for provincial rate protection

	2025	2026	2027	2028	2029
GPMC	1.0	1.2	1.6	2.3	3.4
Energy Storage	0.0	0.1	0.4	1.0	1.5
Stations Expansion	0.0	0.0	0.0	0.0	0.8
Total Forecast Revenue Requirement	1.0	1.3	2.1	3.3	5.8

Note: Variances due to rounding may exist

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-110

References: **Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_X04-5 - OEBAppendices 2-FA-FB - GPMC_20231117**
Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S02-3 - OEBAppendices 2-FA-FB - Energy Storage_20231117
Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S05-6 - OEB Appendices 2-FA-FB-Stations Expansion_20240129

Preamble:

In references 1, 2 and 3, OEB staff notes that the cost of capital calculations are derived using the same working capital allowance, ROE, short term interest rate, and long term interest rate for each of the entire five year custom IR terms (from 2020-2024 and from 2025-2029).

QUESTION (A):

a) Please confirm that the working capital allowance, ROE, short term interest and long-term interest rates are fixed for each of the custom IR terms.
    i. If not, please recalculate the cost of capital calculations in references 1 and 2 using approved cost of capital parameters (or proposed numbers if the approved numbers are not available) for each of the years and comment whether the changes in short term and long-term debt values produce revenue requirement amounts that are materially different from those calculated in the original models.
    ii. If the changes in revenue requirement amounts in (i) are material, please revise Excel models in references 1 and 2 as needed.

RESPONSE (A):

Toronto Hydro confirms that the Working Capital Allowance, ROE, Short Term Interest and Long-Term Interest rates are fixed for each of the 2015-2019[1], 2020-2024[2] and 2025-2029[3] Custom IR Terms. Toronto Hydro notes that the Working Capital Allowance rate is not used as there are no OM&A costs related to these investments.

i. There were no changes to the capital parameters.

ii. There were no changes required based on question i)

[1] EB-2014-0116, Reply Submission to Draft Rate Order Comments, January 22, 2016, Schedule 1-1, page 3
[2] EB-2018-0165, Draft Rate Order, February 12, 2020, Schedule 1-1, page 3
[3] EB-2023-0195, Exhibit 5, Tab 1, Schedule 2, Appendix 2-OA

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-111

References: Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S04-5 – OEB Appendices 2-FA-FB - GPMC_20231117
Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S02-3 – OEB Appendices 2-FA-FB - Energy Storage_20231117
Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S05-6 - OEB Appendices 2-FA-FB - Stations Expansion_20240129

Preamble:

In references 1 and 2, Tab App.2-FA shows the total capital cost per year in line 62 and Tab App.2-FB shows capital additions per year in line 73. In each model, OEB staff notes that the value in line 62 does not reconcile with line 73 for each of the years.

In reference 3, Tab App.2-FA Proposed REG Inves Cx and Tab App. 2-FA Proposed REG ISA show the total capital cost per year in line 62 and Tab App.2-FB shows capital additions per year in line 73. In the model, OEB staff notes that the sum of the values in line 62 in App.2-FA Proposed REG Inves Cx and in Tab App.2-FA Proposed REG ISA for each year does not reconcile with the value in line 73 for each of the years.

QUESTION (A):

a) Please explain why the total capital costs in Tab App. 2-FA are different from the capital additions for each of the years and revise the evidence as needed.

RESPONSE (A):

The primary reason for the difference between amounts presented in 2-FA and 2-FB is that 2-FA presents capital expenditures incurred by year, whereas 2-FB presents in-service additions. There is a difference in timing between expenditure incurred and when the assets are put in-service (in-

service additions). The difference between capital expenditures and in-service additions remains in CWIP. Appendix A and B in the response to 2A-Staff-109 include a presentation of expenditures by year, as well as in-service additions by year.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-112

Reference: Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_X04-5 - OEBAppendices 2-FA-FB - GPMC_20231117, tab App.2-FB

Preamble:

From the Excel models in the reference, cells E72, E76 and E88 in tab App.2-FB show the opening gross fixed assets of $5,856,601, opening accumulated amortization of $576,913, and opening UCC of $3,760,802 respectively.

QUESTION (A):

a) Please explain in detail how Toronto Hydro derives these numbers and include references to support the derivation (e.g., EB#, exhibit, tab, schedule, date, and page number, etc).

RESPONSE (A):

Toronto Hydro is providing this response on the basis of the revised OEB Appendix 2-FB for GPMC filed as Appendix B to 2A-Staff-109.

The opening balances in the references are derived from tabs “App.2-FB Calc of REG A”, “App.2-FB Calc of REG B”, “App.2-FB Calc of REG C. Please see Tables 1-3 below. These amounts are derived based on pre-2020 in-service additions, depreciation and CCA.

Table 1: Opening Gross Fixed Assets

Opening Gross Fixed Assets	**2020**
App.2-FB Calc of REG A tab	2,129,811
App.2-FB Calc of REG B tab	751,453
App.2-FB Calc of REG C tab	2,975,337
Total	**5,856,601**

Table 2: Opening Accumulated Amortization

Opening Accumulated Amortization	2020
App.2-FB Calc of REG A tab	193,619
App.2-FB Calc of REG B tab	77,286
App.2-FB Calc of REG C tab	306,009
Total	**576,913**

Table 3: Opening UCC

Opening UCC	2020
App.2-FB Calc of REG A tab	1,730,565
App.2-FB Calc of REG B tab	544,204
App.2-FB Calc of REG C tab	1,486,032
Total	**3,760,802**

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-113

References: **Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_X04-5 - OEBAppendices 2-FA-FB - GPMC_20231117**
Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S02-3 - OEBAppendices 2-FA-FB - Energy Storage_20231117
Exhibit 2A, Tab 5, Excel Model - THESL_2A_T05_S05-6 - OEB Appendices 2-FA-FB- Stations Expansion_20240129

Preamble:

In tab App.2-FB in the references, Toronto Hydro provides values for amortization period, CCA Rate Class and CCA Rate in cells B71, B93 and B94.

QUESTION:

Please explain the rationale for using these values in the models and provide references to support the use of these numbers (e.g. EB#, exhibit, tab, schedule, date, and page number, etc).

RESPONSE:

Please see below comments for each reference.

Reference 1: Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_X04-5 - OEBAppendices 2-FA-FB - GPMC_20231117

The average useful life of assets in-service is 27.5 years and aligns with the useful lives used in both the 2020-2024[1] and the 2015-2019 CIR Applications.[2] It assumes a mix of various distribution assets from these potential investments with useful lives ranging from 15 to 40 years, resulting in an

[1] EB-2018-0165, Exhibit 2A, Tab 6, Schedule 5
[2] EB-2014-0116, Exhibit 2A, Tab 8, Schedule 1

average of 27.5 years. The exception is the Energy Monitoring and Control software,[3] which includes IT related assets put in-service in 2019-2020 with an approximate useful life of 5-years. This is reflected in the updated appendices to Toronto Hydro's response to interrogatory 2A-Staff-109.

With regard to the CCA Classes, for the distribution related assets, CCA Class 47 was used with a CCA Rate of 8%; for IT software related assets, CCA 12 with a CCA rate of 100%; and for IT hardware related assets, CCA Class 50 with a CCA rate of 55%. Please refer to Toronto Hydro's response to 2A-Staff-109 for the updated templates.

Please refer to Exhibit 2B, Section E5.5 for further details about this program.

Reference 2: Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_S02-3 - OEBAppendices 2-FA-FB - Energy Storage_20231117

The expected assets from the energy storage investments have an expected useful life of 15 years and a CCA Class of 43.1 with a CCA Rate of 30% based on the expected specifications of the investments. Please refer to Exhibit 2B, Section E7.2 for investments related to Energy Storage Systems for the nature of these investments.

Reference 3: Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_S05-6 - OEBAppendices 2-FA-FB-Stations Expansion_20240129

The Stations Expansion investments referenced are capital contributions paid to Hydro One for the Sheppard TS Bus Expansion, where a useful life of 25 years was used. These investments are subject to CCA Class 14.1 which has a CCA Rate of 5%. Please refer to Exhibit 2B, Section E7.4.4.3 for additional information.

[3] 2A-Staff-114 (a)

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-114

Reference: **Filing Requirements For Electricity Distribution Rate Applications - 2023 Edition for 2024 Rate Applications - Chapter 2, Appendix A**
Decision and Order, Green Energy Plan Electricity Rate Protection Benefit and Charge, EB-2016-0170, May 19, 2016
Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_X04-5 - OEBAppendices 2-FA-FB - GPMC_20231117
Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_S02-3 - OEBAppendices 2-FA-FB - Energy Storage_20231117
Exhibit 9, Tab 1, Schedule 1, December 19, 2023, p. 19, Table 11

Preamble:

Reference 1 states that: "For distributors that are already receiving rate protection as a result of a previous application and approval (in many cases, based on a forecast of capital expenditures on qualifying connection assets), the new (current) cost of service application should include an update to include the actual costs incurred for the investments as well as a depreciation adjustment to calculate a new capital amount for input into Appendices 2-FA through 2-FC. This would generate a new up-to-date rate protection amount for the test year and beyond, which will be subject to the materiality threshold in section 2.0.8."

OEB staff notes that Toronto Hydro received funding for renewable generation connection prior to 2020. For example, in Reference 2, the OEB approved renewable generation connection funding for Toronto Hydro in the amount of $1,173,258 for May 1 to December 31, 2016.

In references 3 and 4, OEB staff notes that the Excel models contain revenue requirement calculations for provincial rate protection starting from 2020 (there are no previous calculations prior to 2020).

OEB staff also notes that the revenue requirement amounts for provincial rate protection for the 2020-2022 period in the Excel model (reference 3) do not reconcile with actual revenue requirement amounts in Table 11 (reference 5) for the period 2020 - 2022.

QUESTION (A):

a) Please provide a list of all the renewable generation connection investments that Toronto Hydro made and received funding from the IESO prior to 2020 as well as a short description of each investment.

RESPONSE (A):

The investments made prior to 2020 as part of the Generation Protection Monitoring and Control program over the 2015-2019 period include:[1]

- **Monitoring and Control Buyback**: purchase of customer-installed monitoring equipment for SCADA communication; and
- **Energy Monitoring and Control:** installation of a Distributed Energy Resource (DER) Management System platform (DER SCADA Management)

QUESTION (B) AND (C):

b) In references 3 and 4, please confirm whether revenue requirement amounts in tab App.2-FB in both Excel models are derived based on previously approved investment projects prior to 2020 (if any), plus the revenue requirement derived from capital expenditures from the approved projects from 2020 to 2024 and the proposed projects from 2025-2029 or not.

c) If not in (b), based on the Excel models in references 3 and 4 and all the past approved investments in (a), please provide the following:

   i. Extend the historic period in the Excel models to reflect the actual capital and start-up OM&A costs incurred starting from the first year that Toronto Hydro made renewable generation connection investments which were approved by the OEB.

[1] EB-2018-0165, Exhibit 2B, Section E5.5 at pages 17-18.

ii. If the investments made prior to 2020 are substantially different from the investments made during 2020-2024 and from 2025-2029 which require different assumptions for WCA percentage, debt percentages, interest rates, kWh, tax rates, amortization period, and CCA, please create and provide a new Excel model instead of extending the historic period as described in (i). In the new Excel model, please include the revenue requirement calculations starting from the first year that Toronto Hydro made renewable generation connection investments until 2029.

iii. For the Excel models in (i) and (ii), please calculate actual revenue requirement amounts for provincial protection resulting from actual capital costs, start-up OM&A costs (if any), and depreciation adjustments. Please include 2023 actual results if available at the time of preparing interrogatories.

RESPONSE (B) AND (C):

Toronto Hydro confirms that the revenue requirement amounts are composed of investment projects from 2016 to 2029. Please see 2A-Staff-109 for the revenue requirement calculations.

QUESTION (D) AND (E):

d) From the revised excel models in (c), please provide a summary table showing the revised actual and forecast revenue requirement amounts for provincial rate protection per year for each of the Excel models for the historic period (starting from the first year the investments were made) up to the forecast period ending 2029.

e) From the summary table in (d), please comment whether the revised actual revenue requirement amounts for provincial rate protection for 2020-2022 reconcile with Table 11 in reference 5 or not.

i. If not, please revise all the evidence affected by the changes in actual revenue requirement amounts (e.g. revise amounts recorded in Account 1533 in the Continuity Schedule) as needed.

RESPONSE (D) AND (E):

Please see Table 1 based on the revised calculations in 2A-Staff-109. This table reconciles to Exhibit 9, Tab 1, Schedule 1, December 19, 2023, at page 19, Table 11 for the 2020 to 2022 actuals and has been updated to reflect 2023 actuals and an updated 2024 forecast.

Table 1: Revenue Requirement Under Provincial Rate Protection ($ Millions)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
GPMC Revenue Requirement	0.1	0.2	0.2	0.8	1.3	1.3	1.3	0.9	1.0	1.2	1.6	2.3	3.4
Energy Storage Revenue Requirement	-	-	-	-	-	-	-	0.0	0.0	0.1	0.4	1.0	1.5
Stations Expansion Revenue Requirement	-	-	-	-	-	-	-	-	-	-	-	-	0.8
Variance	**0.1**	**0.2**	**0.2**	**0.8**	**1.3**	**1.3**	**1.3**	**0.9**	**1.0**	**1.3**	**2.1**	**3.3**	**5.8**

Note: Variances due to rounding may exist

QUESTION (F):

f) From the revised models in (b), for the historical actual capital/start-up OM&A spendings, please provide details of the work related to renewable generation connection projects that required these spendings and include the following:

   i. Please provide a list of generation connected, the type of connection, and the actual amount of spending for each type.

   ii. Please describe the work involved.

   iii. Please explain drivers for any material increases in capital costs and start-up OM&A costs (if applicable).

RESPONSE (F):

i) Toronto Hydro notes that OEB Staff's question assumes these investments were made in response to committed generation connection requests. As described in the response to 2A-Staff-108 (e), actual renewable enabling improvement investments were made prior to

committed generation connections as to do otherwise would result in undue delays and barriers to connecting renewables. As such, Toronto Hydro does not have a list of generation connected, type of connections and amounts spent per type associated with these investments. Table 2 below provides the cost per unit for monitoring and control equipment and antenna installations.

Table 2: Generation Protection Monitoring and Control Investments

Program	Typical Amount (Per Unit)
Monitoring and Control Equipment	$10,000
Antenna Installation	$25,000

For a breakdown of generations connected to Toronto Hydro's system, please refer to Exhibit 2B, Section E3 and E5.1, and for actual and forecast expenditures over the 2020-2029 period, please refer to Exhibit 2B, Section E5.5.4.

ii) For descriptions of the monitoring and control equipment and antenna installations, please refer to Exhibit 2B, Section E5.5.3.3, Section 3 at pages 12-15.

iii) The increases are attributed to the system needs identified by Toronto Hydro's DER forecast. The forecast considers a combination of historical trends, project pipeline, economic environment and the current energy policies at the time of the forecast. See Exhibit 2B, Section E5.1.3.2 for further details of Toronto Hydro's DER connection forecast methodology

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-STAFF-115

References: Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_X04-5 - OEBAppendices 2-FA-FB - GPMC_20231117
Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_S02-3 - OEBAppendices 2-FA-FB - Energy Storage_20231117
Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_S05-6 - OEB Appendices 2-FA-FB- Stations Expansion_20240129

Preamble:

Toronto Hydro provides the forecast revenue requirement amounts for provincial rate protection derived from forecast capital additions in the references.

QUESTION (A):

a) For the forecast period, please provide the following for each of the models referenced:
   i) Please describe the information that has led to the forecast of capital additions and start-up OM&A costs (if applicable) for each of the forecast years.
   ii) Please provide a list of forecast renewable generation connection and type of connection if available.
   iii) Please explain drivers for any material increases in capital additions and start-up OM&A costs (if applicable).

RESPONSE (A):

Re – Reference: Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_X04-5 - OEBAppendices 2-FA-FB - GPMC_20231117

i) The evidence in Exhibit 2B, Section E5.1 notes that the DER forecast is separated into renewable, energy storage and non-renewable segments. For each segment, forecast DER capacity was approximated using a mathematical model that best represented recent and

anticipated growth patterns, considering a combination of historical trends, project pipeline, economic environment and the current energy policies at the time of forecast.

ii) Tables 6 and 7 in Exhibit 2B, Section E5.1.

iii) The increase is driven by the projected system constraints due to the forecasted growth in DER applications and the investments required to address them. Please refer to Exhibit 2B Section E3 for a detailed description of the forecast and the system constraints.

Re – Reference: Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_S02-3 - OEBAppendices 2-FA-FB - Energy Storage_20231117

i) The Energy Storage (ESS) segment reference refers to Toronto Hydro's plans to own and operate renewable-enbabling energy storage system (REBESS). The forecasted costs for this segment, as well as an explanation of how these costs were derived, are detailed in Exhibit 2B, Section E7.2 at page 3.

ii) N/A to this segment

iii) N/A to this segment

Re – Reference: Exhibit 2A / Tab 5 / Excel Model - THESL_2A_T05_S05-6 - OEB Appendices 2-FA-FB- Stations Expansion_20240129

i) As per Exhibit 2B E7.4.3 page 4, Toronto Hydro has considered multiple inputs to develop a plan that will satisfy its capacity needs. These inputs are: Toronto Hydro's 10-Year peak demand forecast, City of Toronto Development plans, and the Future Energy Scenarios (FES).

ii) N/A to this segment

iii) As described in Exhibit 2B E7.4.3, the increased expenditures in stations expansion are driven by the City of Toronto Development Plans, acceleration of electrification, and a lack of short circuit capacity (required to connect new DERs to Toronto Hydro's system).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2A-Staff-116

REFERENCE: THESL_2A_T03_S01_AppA - Cost of Power_20231117.xls

Preamble:

In the sheet titled "App.2-ZB_2028 Cost of Power" at cell D69, the kW value for Streetlighting class is the exact same as Large User class, of 3,390,747 kW. It appears that this may be a data entry error.

Question(s):

a) Please confirm that this is a data entry error.

i. If this is a data entry error, please verify that no other errors exist in the sheets of this file.

ii. If any other errors are noted, please identify them.

b) Please provide a corrected excel file.

RESPONSE

a) Toronto Hydro confirms the data entry error noted above.

i) Toronto Hydro verifies this is the only error.

ii) Not applicable.

b) Toronto Hydro submits the excel file for 2A-Staff-116, Appendix A.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2A-AMPCO-13

Reference: Exhibit 2A, Tab 1, Schedule 1, Page 2

Please provide the OEB-approved depreciation amounts for the years 2020 to 2024.

RESPONSE:

Please see Table 1 for 2020-2024 OEB-approved depreciation amounts.

Table 1: 2020-2024 OEB-Approved Depreciation ($ Millions)[1]

	2020	2021	2022	2023	2024
Depreciation Expense[2]	265.4	280.8	291.0	311.9	324.3

[1] These amounts align with Schedule 3 of the Draft Rate Order in EB-2018-0165 updated on February 12, 2020.
[2] Excluding allocated transportation depreciation.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2A-AMPCO-14

Reference: Exhibit 2A, Tab 2, Schedule 1, Page 3

Please confirm the number of asset types included in Concentric Advisor's Depreciation Study (Appendix D) and the total asset count covered by the study.

RESPONSE PREPARED BY CONCENTRIC:

As shown on pages 4-2 through 4-6 of the depreciation study, the total number of asset classes considered was 150, which includes all asset classes that existed at the time of the study, with the exception of the seven asset classes identified at page 4-6 of the depreciation study under the heading "Plant Not Studied". Depreciation calculations, including the retirement rate analysis conducted for Toronto Hydro, are conducted based on the surviving original cost of all assets installed within a given account. As such, none of the calculations rely upon an asset count; therefore, an asset count was not conducted as part of the depreciation study. Concentric does not know the number of assets considered within any given account nor within the Toronto Hydro system.

RESPONSE PREPARED BY TORONTO HYDRO:

Furthermore, Toronto Hydro notes that in addition to the asset count not being relevant to the quantification of depreciation expense impacts as a result of the study, the data on total number of assets studied will not be meaningful as it would consist of various incomparable units of measure such as units based on length (e.g. cables, ducts, etc.) as opposed to number of poles or meters, for example. Certain other assets, such as software initiatives or facilities investments in buildings, do not necessarily have a relevant unit of measure.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 2A-CCC-51

Reference: Exhibit 2A, Tab 1, Schedule 1, p. 3 - Table 3 2020-2024 In-Service Additions Variances

Please recast Table 3 2020-2024 In Service Additions Variance to include 2023 actuals.

RESPONSE:

Please see Table 1 with 2023 actuals and updated 2024 forecast.

Table 1: 2020-2024 In-Service Additions Variances ($ Millions)

	2020-2024 DRO	2020-2024 Actual/Bridge	Var. ($)	Var. (%)
System Access	469.1	632.7	163.6	34.9%
System Renewal	1,535.8	1,396.2	(139.6)	-9.1%
System Service	259.8	271.6	11.8	4.5%
General Plant	403.7	396.9	(6.8)	-1.7%
Other	5.1	4.9	(0.2)	-3.5%
Net In-Service Additions	**2,673.4**	**2,702.3**	**28.9**	**1.1%**

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 2A-CCC-52

Reference: Exhibit 2A, Tab 1, Schedule 1, Pages 5-6 - Table 4 2020-2024 Gross and Net PP&E/Table 5 2025-2029 Gross and Net PP&E

Please explain if Toronto Hydro forecasts Contributions and Grants for each year during the rate plan period. If so, what are the implications if Contributions and Grants are greater or lesser than forecast during the rate plan period. In the years 2020-2024 Contributions and Grants went from $334.7 million to $898.8 million. For each of those years what level of Contributions and Grants were forecast? Has Toronto Hydro ever considered DVA treatment for Contributions and Grants? If not, why not?

RESPONSE:

Toronto Hydro confirms that contributions and grants are forecasted in the 2025-2029 period. These are primarily associated with the Customer Connections (Exhibit 2B, Section E5.1) and Externally Initiated Plant Relocations and Expansion (Exhibit 2B, Section E5.2) programs.

Contributions and Grants are recoveries to offset costs that would otherwise increase rate base and depreciation. Therefore, if Contributions and Grants are greater than forecast, then rate base and depreciation would be lower than forecast. If Contributions and Grants are lower than forecast, the result would be that rate base and depreciation would be higher than forecast.

Please see Table 1 for forecasted Contributions and Grants during the 2020-2024 rate period.

Table 1: Forecasted Contributions and Grants ($ Millions)

	2020	2021	2022	2023	2024
Capital Contributions & Grants[1]	(378.0)	(448.4)	(504.6)	(556.8)	(789.8)

[1] EB-2018-0165, Draft Rate Order Update (February 12, 2020), Schedule 2 – OEB Appendix 2-BA

Toronto Hydro has proposed the Demand Related Variance Account[2] ("DRVA") as part of the 2025-2029 application, which includes capital-related revenue requirement associated with both programs (Customer Connections and Externally Initiated Plant Relocations and Expansion) that are expected to generate Contributions and Grants. For more information on the DRVA, please see Exhibit 9, Tab 1, Schedule 1, Appendix B and Exhibit 1B, Tab 2, Schedule 1.

[2] Exhibit 9, Tab 1, Schedule 1, Section 9.2

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 2A-CCC-53

Reference: Exhibit 2A, Tab 2, Schedule 1, Page 3

In accordance with the OEB's Decision in the 2020-2024 Rate Application (EB-2018-0165) Toronto Hydro retained Concentric Advisors ULC to complete a depreciation study which resulted in changes to depreciation rates effective January 1, 2023. Please provide the annual depreciation expense for Toronto Hydro for each year 2024-2029 under the previous and proposed methodologies.

RESPONSE:

Please see Table 1 for the annual depreciation expense for the 2024-2029 period with and without the asset useful life changes.

Table 1: Depreciation based on asset useful life with and without changes ($ Millions)

	2024 Bridge	2025 Forecast	2026 Forecast	2027 Forecast	2028 Forecast	2029 Forecast
Depreciation and Amortization Expense (without UL changes)	291.6	305.0	321.7	344.4	368.6	381.9
Depreciation and Amortization Expense (with UL change)	237.2	247.4	260.1	278.5	300.1	311.2
Difference	**(54.4)**	**(57.6)**	**(61.5)**	**(65.9)**	**(68.5)**	**(70.6)**

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2A-PP-24

References: Capitalization Policy dated 2023-10-18

Exhibit 2A, Tab 4, Schedule 1, App A

QUESTION (A):

a) Is THESL requesting OEB approval of the updated Capitalization Policy? If not, what is the process to have a new Capitalization Policy approved for use?

RESPONSE (A):

No. This policy was filed in accordance with section 2.2.9 Capitalization of the OEB's Chapter 2 Filing Requirements for Electricity Distributors (December 15, 2022). Toronto Hydro follows the International Financial Reporting Standards ("IFRS") in updating its Capitalization Policy. This is in line with the expectations set out in the Accounting Procedures Handbook.[1] The process for approving changes to the Capitalization Policy is described in Section 11.2 of the Capitalization Policy which can be found in Exhibit 2A, Tab 4, Schedule 1, Appendix A, and was last approved on October 24, 2023.

QUESTION (B):

b) Please provide a summary of the major changes compared to the previous version of the Capitalization Policy, or if easier simply provide a copy in track changes of the 2023 version against the previous version.

RESPONSE (B):

Please refer to Exhibit 2A, Tab 4, Schedule 1, page 1-5 for a list of changes to the previous version of the Capitalization Policy.

[1] OEB Accounting Procedures Handbook (issued December 2011) at page 7

QUESTION (C):

c) Cloud computing is typically an O&M expense since there are no physical assets owned by the utility. How does THESL current treat cloud computing (Capital or OM&A) and please explain why these costs should be capitalized in the 2025-2029 rate term.

RESPONSE (C):

While typically cloud computing is treated as an O&M expense, the accounting treatment is unique to each contract as described in section 8.1.4 of the Capitalization Policy filed in Exhibit 2A, Tab 4, Schedule 1, Appendix A. Additionally, accounting treatment of cloud implementation costs are also assessed based on the nature of the cost and accounting for under IFRS requirements. Please refer to Appendix C of the Capitalization Policy for the decision tree for this assessment.

Regarding the treatment of cloud computing costs in the 2025-2029 rate period, please refer to Toronto Hydro's responses to 2B-Staff-263, subparts (a) and (b).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2A-PP-25

Reference: Exhibit 2A, Tab 2, Schedule 1, Page 3

"Concentric Report, plus as summarized in Appendix D at Tables 1 - 3, the financial average service lives of six asset classes were shortened by the Study, and the financial average service lives of 73 asset were lengthened by Study, resulting in a significant overall reduction in depreciation expenses."

QUESTION (A):

a) Please explain how the significant increase in service life proposed by Concentric would impact the definition and percent of THESL assets that are at or beyond their useful life. Please also provide a recalculation of the THESL statistics on assets at or beyond useful life if the Concentric recommendations are applied.

RESPONSE (A):

Toronto Hydro has already reviewed and made adjustments informed by Concentric's recommended service lives within the Assets Past Useful Life ("APUL") metric presented in Exhibit 2B, Section A3.1, Page 7. For additional details on Toronto Hydro's useful life values and their use within the asset management system, please see response to 2B-Staff-131, part (a).

QUESTION (B):

b) Please provide a list of the pros and cons (including impacts on rate payer Energy Transition, temporal risk, etc.) of increasing the average accounting life of THESL assets.

RESPONSE (B):

The impacts of increasing the average accounting life of Toronto Hydro's assets include:

- Depreciation Expense: decreased annual depreciation expense, resulting in a significantly lower revenue requirement in the near future.
- Rate Base: Lower annual depreciation expense resulting in higher asset book values, thus increasing rate base, the ROE and deemed interest components of revenue requirement gradually, albeit at a lesser magnitude than depreciation.
- Derecognition: Assets that may be derecognized prior to end of accounting life would have a higher book value at the time of derecognition resulting in an increase to rates.

QUESTION (C):

c) Is the proposed service life change only for new assets or retroactive?

RESPONSE (C):

The proposed service life change was applied prospectively to the depreciation on all assets, both existing assets as of 2022 and new additions from 2023 onwards.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2A-PP-26

References: Concentric Report and Table 8: Depreciation and Amortization Expense 2025 to 2029 ($ Millions) [Exhibit 2A, Tab 2, Schedule 1, Page 6]

Please provide a copy of Table 8 including the impact of the Concentric service life changes. If those were already applied, please provide a copy of Table 8 based on current asset life (i.e. without changes).

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2A-CCC-53.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2A-SEC-30

References: Exhibit 2A, Tab 1

SEC seeks to understand the revenue requirement impact of the proposal capital expenditures. Please provide a table that shows for each year between 2025 and 2029, the revenue requirements, broken down by component, related only to the proposed 2025 to 2029 capital expenditures.

RESPONSE:

Table 1 below presents an estimate of 2025-2029 revenue requirement associated with 2025-2029 capital expenditures broken down by component. The revenue requirement provided below is based on an estimate of the updated 2025-2029 total Revenue Requirement, which includes impact from: (i) the 2023 actuals and updated 2024 forecast (presented in 2A-Staff-104), and (ii) the January 29, 2024 evidence update. The final PILS models for the updated 2025-2029 total Revenue Requirement (Exhibit 6) are not yet available because it was not possible to complete this work within the timelines for responding to interrogatories. This information will be provided in advance of the Technical Conference as indicated in 1A-Staff-01 and noted in the Application Evidence Update cover letter.[1]

Table 1: 2025-2029 Estimated Capital-Related Revenue Requirement

	2025	2026	2027	2028	2029	2025-2029
ROE	4.3	19.7	42.1	66.8	90.6	223.5
Deemed Interest	2.8	12.8	27.3	43.3	58.7	144.7
Depreciation	39.6	55.4	83.9	115.9	146.2	441.0
PILS	(0.3)	(12.0)	(29.5)	4.0	(2.9)	(40.7)

[1] EB-2023-0195, Toronto Hydro 2025-2029 Custom Rate Application For Electricity Distribution Rates and Charges – Evidence Update, January 29,2024, page 1.

Revenue Requirement	**46.3**	**75.9**	**123.8**	**230.0**	**292.5**	**768.5**

Rounding variances may exist

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-117

Reference: Exhibit 2A, Tab 1, Schedule 2, OEB Appendix 2-BA

a) Please provide appendix 2-BA for 2019 actuals. Please ensure to reconcile any differences between closing 2019 balances and opening 2020 balances, as provided in reference 2.

RESPONSE:

Please refer to Appendix A to this response for 2019 actuals. The difference between closing 2019 balances and opening 2020 balances is related to the disallowance from rate base of $4 million associated with the Enterprise Resource Planning ("ERP") Phase 1 project.[1]

[1] EB-2018-0165, OEB Decision and Order (December 19, 2019) at page 69.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-118

References: Exhibit 2A, Tab 4, Schedule 2, Appendix A - OEB Appendix 2-D Overhead Costs_Redacted
Exhibit 2A, Tab 4, Schedule 2

a) Please provide a variance analysis of OEB-approved overhead costs in Toronto Hydro's last CIR and actuals as provided in reference 1 for the years 2018-2023. If any of the variances result in a +10% difference, please explain in detail.

RESPONSE:

In preparing its response, Toronto Hydro identified a data entry error in populating data in OEB Appendix 2-D (Exhibit 2A, Tab 4, Schedule 2). The corrected OEB Appendix 2-D is appended to this interrogatory response, and has been updated to include: 2023 actuals, and an updated 2024 bridge year forecast reflecting the impact of the Cloud and Locates DVAs as set out in the DVA Continuity appended to interrogatory 9-Staff-349. Toronto Hydro confirms that this error was isolated to OEB Appendix 2-D.

In its Decision, the OEB approved the 2020 Test Year for Overhead Costs.[1] The 2021-2023 forecast in Table 1 was determined by escalating the test year by I-X, where "I" is the OEB approved inflation for the respective years and "X" is the 0.6 percent stretch factor. Table 1 compares this forecast with the actual capitalized OM&A for 2018-2023.

Table 1: Total Capitalized OM&A Funded/Actuals ($ Millions)

	2018	2019	2020	2021	2022	2023
Total Capitalized OM&A Funded	(115.2)	(124.7)	(122.3)	(124.2)	(127.6)	(131.5)
Total Capitalized OM&A Actuals	(115.2)	(125.2)	(122.3)	(112.7)	(124.9)	(137.8)
Variance (%)	**0%**	**0%**	**0%**	**-9%**	**-2%**	**5%**

[1] EB-2018-0165, Exhibit U, Tab 2, Schedule 3, Appendix A – OEB Appendix 2-D (April 30, 2019).

Toronto Hydro did not experience any material variance greater than +/- 10% for total capitalized OM&A between OEB-approved overhead costs in Toronto Hydro's last CIR and actuals. However, variance analysis of the three subcomponents of the OM&A is summarized below:

1. Labour Capitalization

Table 2: Labour Capitalization Funded/Actuals ($ Millions)

	2018	2019	2020	2021	2022	2023
Labour Capitalization Funded	(101.4)	(109.8)	(106.1)	(107.7)	(110.7)	(114.1)
Labour Capitalization Actuals	(101.4)	(109.4)	(106.1)	(95.2)	(105.3)	(115.2)
Variance	**0%**	**0%**	**0%**	**-12%**	**-5%**	**1%**

In 2021, capitalized labour was 12 percent lower than funded. This is attributed to the lower number of internal resources allocating their time to capital projects as a result of lower staffing levels due to challenges beyond Toronto Hydro's control such as COVID-19 and other external factors; as well as resources balancing for capital work execution.

2. Vehicle Capitalization

Table 3: Vehicle Capitalization Funded/Actuals ($ Millions)

	2018	2019	2020	2021	2022	2023
Vehicle Capitalization Funded	(4.2)	(3.9)	(3.8)	(3.9)	(4.0)	(4.1)
Vehicle Capitalization Actuals	(4.2)	(3.6)	(3.8)	(5.5)	(5.5)	(4.7)
Variance (%)	**0%**	**-7%**	**0%**	**42%**	**39%**	**15%**

As described in Exhibit 2A, Tab 4, Schedule 2 in Section 1.3 at page 3, Toronto Hydro updated its approach for the calculation of available hours to deduct leaves and time not spent working on specific operating or capital jobs from total working hours. This resulted in the variances observed in 2021-2023.

3. Material Handling On-cost

Table 4: Material Handing On-Cost Funded/Actuals ($ Millions)

	2018	2019	2020	2021	2022	2023
Material Handling On-cost Funded	(9.6)	(11.0)	(12.4)	(12.6)	(12.9)	(13.3)
Material Handling On-cost Actuals	(9.6)	(12.3)	(12.4)	(12.0)	(14.1)	(17.9)
Variance (%)	**0%**	**12%**	**0%**	**-5%**	**9%**	**34%**

In 2019 and 2023, capitalized material on-costs increases are attributed to higher material throughput and material handling costs. These increases were 12 percent ($1.2 million) and 34 percent ($4.6 million), respectively to support the material requirement for the capital program.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-119

References: Exhibit 2A, Tab 2, Schedule 1, Appendix C - OEB Appendix 2-BB - Useful Life Comparison
Exhibit 9, Tab 1, Schedule 1, Appendix A - Calculation of Useful Life Change Impacts

QUESTION (A):

a) Please provide the $ amount change in depreciation expense for 2023 and 2024 associated with the asset useful lives that changed when Toronto Hydro applied Concentric's depreciation methodology.

RESPONSE (A):

Please see Table 1 below.

Table 1: Depreciation and Amortization Expense ($ Millions)

	2023 Bridge	**2024 Bridge**
Depreciation and Amortization Expense (without UL changes)	276.1	291.6
Depreciation and Amortization Expense (with UL change)	229.0	237.2
Difference	**(47.1)**	**(54.4)**

QUESTION (B)

b) Please provide a variance analysis of historical depreciation expense to approved depreciation expense for 2018-2023 by asset class. If any variances are greater than +10%, please provide a detailed explanation.

RESPONSE (B):

Please refer to Appendix A to this response for a comparison of historical depreciation expense[1] to approved depreciation expense.[2]

[1] Exhibit 2A, Tab 1, Schedule 2, OEB Appendix 2-BA
[2] EB-2018-0165, Draft Rate Order (February 12, 2020), Schedule 2, pages 1-5; and Exhibit U, Tab 2, Schedule 1, Appendix B, (April 30, 2019)

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-120

Reference: Exhibit 2B, Section E4, Appendix B – OEB Appendix 2-AA – Program Summary

$	2025	2026	2027	2028	2029
AFUDC	6.3	7.0	8.7	10.3	12.0

a) Please confirm the interest rate applied to the eligible capital amounts.

RESPONSE:

The interest rate applied to eligible capital amounts is 4.02 percent.

Toronto Hydro notes that the interest rate in Exhibit 5, Tab 1, Schedule 2, Appendix 2-OA is 4.04 percent. The misalignment of the rates is attributed to the timing of when the capital plan was finalized, which used a preliminary forecast of the interest rate at the time. Upon finalization of the interest rate, owing to the immaterial impact to the 2025-2029 capital expenditures and revenue requirement, no further changes were made. The impact is approximately $0.2 million less in AFUDC costs over the 2025-2029 period ($0.04 million per year), which has an immaterial impact to revenue requirement.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-121

References: **Exhibit 2B, Section A, PDF Page 2 of 356**

Alectra Utilities 2020-24 Distribution System Plan, Exhibit 4, Tab 1, Schedule 1, Pages 17, 186, 211, PDF Pages 37, 205, 231 of 1007

Hydro Ottawa Distribution Revenue Requirement & Rate Application, Exhibit 4, Tab 1, Schedule 8, Page 4, PDF Page 88

Hydro Ottawa Distribution Revenue Requirement & Rate Application, Exhibit 1, Tab 3, Schedule 3, Attachment A, Page 22, PDF Page 1408

Preamble:

Please see the table below that shows a subset of utility parameters per 1,000 customer basis for Toronto Hydro and several of its peers.

Utility	# of Customers	Service Area sq. km	# of Employees	# of Terminal Stations	# of Municipal Substations	# of Poles	Circuit kms Overhead Wires	Circuit kms Underground Wires	# of Distribution Transformers
Toronto Hydro	790,000	631.1	1,245	37	139	183,620	15,393	13,765	61,300
# per 1,000 customers		0.80	1.58	0.047	0.18	232	19.5	17.4	77.6
Alectra	950,000	1924	1600	14	155	130,000	16400	22,000	125,000
# per 1,000 customers		2.03	1.68	0.015	0.16	137	17.3	23.2	131.6
Ottawa	340,000	1,116	720	18	88	49,247	5609		45414
# per 1,000 customers		3.28	2.12	0.053	0.26	145	16.5	-	133.6
Enwin	88,000	120	198	11	50	20,293	2,703	1965	6713
# per 1,000 customers		1.36	2.25	0.125	0.57	231	30.7	22.3	76.3
Brantford	39,300	74	60	3		10,021	254	229	5,063
# per 1,000 customers		1.88	1.53	0.076	-	255	6.5	5.8	128.8
Synergy	56,000	441	129	3	7	23,391	993	277	7673
# per 1,000 customers		7.88	2.30	0.054	0.13	418	17.7	4.9	137.0
Hydro One (Distribution)	1,400,000	961,142	9,300		1000	1,600,000	113,000	10000	522,000
# per 1,000 customers		686.53	6.64	-	0.71	1,143	80.7	7.1	372.9

QUESTION (A):

a) Please review and update this table with corrected Toronto Hydro information if necessary.

RESPONSE (A):

Please see Tables 1 to 3 below.

Table 1: Utility Parameters for Toronto Hydro and its Peers

	# of Customers	Peak Load *(MW)*	Service Area *(sqkm)*	# of FTE	OH Primary *(km)*	UG Primary *(km)*	Poles	Distribution Transformers
Alectra Utilities Corporation	1,076,537	5,407	1,924	1,466	7,192	14,492	130,909	124,955
Brantford Utilities	111,044	519	636	183	1,275	853	31,721	13,595
ENWIN Utilities Ltd.	91,128	465	121	169	682	480	20,299	7,723
Hydro One Networks Inc.	1,440,085	6,821	961,143	4,927	114,165	10,576	1,600,000	522,000
Hydro Ottawa Limited	358,901	1,280	1,116	616	2,763	3,463	50,000	47,400
Synergy North Corporation	57,088	172	441	128	993	277	22,362	7,670
Toronto Hydro-Electric System Limited	790,699	4,276	630	1,245	4,052	6,611	183,620	61,300

Table 2: Utility Parameters for Toronto Hydro and its Peers per 1000 Customers

	# of Customers	Service Area *(sqkm)*	# of FTE	OH Primary *(km)*	UG Primary *(km)*	Poles	Distribution Transformers
Alectra Utilities Corporation	1,076,537	1.79	1.36	6.68	13.46	121.60	116.07
Brantford Utilities	111,044	5.73	1.65	11.48	7.68	285.66	122.43
ENWIN Utilities Ltd.	91,128	1.33	1.85	7.48	5.27	222.75	84.75
Hydro One Networks Inc.	1,440,085	667.42	3.42	79.28	7.34	1,111.05	362.48
Hydro Ottawa Limited	358,901	3.11	1.72	7.70	9.65	139.31	132.07
Synergy North Corporation	57,088	7.72	2.24	17.39	4.85	391.71	134.35
Toronto Hydro-Electric System Limited	790,699	0.80	1.57	5.12	8.36	232.22	77.53

Table 3: Utility Parameters for Toronto Hydro and its Peers per MW

	Peak Load *(MW)*	Service Area *(sqkm)*	# of FTE	OH Primary *(km)*	UG Primary *(km)*	Poles	Distribution Transformers
Alectra Utilities Corporation	5,407	0.36	0.27	1.33	2.68	24.21	23.11
Brantford Utilities	519	1.23	0.35	2.46	1.64	61.16	26.21
ENWIN Utilities Ltd.	465	0.26	0.36	1.47	1.03	43.66	16.61
Hydro One Networks Inc.	6,821	140.90	0.72	16.74	1.55	234.56	76.52
Hydro Ottawa Limited	1,280	0.87	0.48	2.16	2.71	39.07	37.04
Synergy North Corporation	172	2.57	0.75	5.78	1.61	130.24	44.67
Toronto Hydro-Electric System Limited	4,276	0.15	0.29	0.95	1.55	42.94	14.33

QUESTION (B)

b) Please discuss the ability of utilities serving more densely populated service areas to achieve more optimal utilization of assets relative to utilities serving less densely populated service areas.

RESPONSE (B):

The discussion on the relative costs of serving more densely versus less densely populated service areas, specifically within the context of the City of Toronto, is thoroughly examined in the Econometric Benchmarking Study of Toronto Hydro's Total Cost and Reliability Metrics, Exhibit 1B, Tab 3, Schedule 3, Appendix A. Further insights into urban-specific challenges are outlined in the Productivity section, Exhibit 1B, Tab 3, Schedule 3 at pages 2-9.

When evaluating asset utilization across utilities serving areas of varying population densities, it's crucial to consider factors that influence operational efficiency and asset deployment. Utilities in densely populated areas, such as Toronto Hydro, encounter unique challenges in optimizing asset utilization. These challenges include serving a diverse mix of customer classes, accommodating higher customer loads, meeting elevated reliability standards, and managing the complexities of urban infrastructure demands.

Toronto's downtown core serves many unique customers that require elevated reliability and service continuity, e.g., buildings that house major economic and governmental institutions, hospitals and emergency rooms, universities and research facilities, etc. To meet these reliability requirements Toronto Hydro operates one of the largest secondary networks in North America. Secondary networks, due to their complexity and redundancy, require more infrastructure per unit of load, but they significantly improve reliability and quality of service in highly dense areas where outages have serious consequences.

Customers in densely populated areas typically exhibit higher peak loads and consumption compared to those in less densely populated areas. Toronto Hydro, for instance, records the highest peak load and consumption per customer among the utilities identified in the preamble, with the load being 17% higher than average. Urban customer density areas also require higher reliability, power quality and flexibility to support the critical nature of loads and more rigorous maintenance practices. Urban and densely populated areas benefit from redundant system designs, allowing load to be served by multiple feeders and enhancing service levels, which is achieved at the expense of increased

infrastructure per customer and load. Higher reliability requirements lead to lower asset utilization factors.

In addition, the expectation of higher growth rates in urban areas also necessitates addressing future space constraints within utility planning. Toronto's downtown core, for example, saw a significant population increase of about 16% over five years, from 2016 to 2021, as noted in Exhibit 1B, Tab 3, Schedule 3, pp. 2-3. Increased population density heightens challenges related to rights of way and congestion with other utility providers, influencing the required size and scale of assets and built-in additional capacity.

The following bullets provide additional thoughts on the nuances required in comparing utilization rates ranging from rural zones to metro downtown core areas:

- In rural areas, service is typically provided through overhead lines with a radial design and smaller-sized distribution transformers feeding individual farms or residences. Consequently, utilities encounter longer lines and a higher number of distribution transformers per customer.
- Suburban areas are served by 3-phase overhead and underground feeders, likely featuring larger conductors and higher capacity distribution transformers to accommodate increased loads. On average, each transformer serves a greater number of homes and small business customers. Enhanced reliability requirements necessitate additional circuits and switches within the system. Although utilities may install a higher asset count per customer, these assets are of higher capacity, facilitating load accommodation and enabling switching capabilities.
- Urban settings predominantly utilize underground 3-phase lines with large conductors, encased in concrete ducts and run through cable chambers. Transformation equipment, often situated in underground vaults, is sized for higher customer loads. Utilities will ensure that there is enough spare capacity available on the feeders to reroute power in case of a failure in one part of the network. In urban environments, utilities might observe a lower transformer count per customer or per unit of load, although circuit length and pole counts

may increase due to larger loads and heightened reliability demands. Many transformers must have a higher capacity compared to suburban and rural settings to manage larger loads. The grid also incorporates additional civil infrastructure, including vaults, chambers, and ducts, alongside a high number of protection and load transfer equipment. It's notable that customers may own equipment at supply points, resulting in fewer distribution transformers per customer and per unit of load.

- The downtown core is almost exclusively served by underground infrastructure, with many customers connected to a secondary network. Transformers are of a significantly larger size to serve residential and commercial towers and high-rise buildings. The high loads, interconnected feeders, and the use of dual and secondary networks lead to lengthier primary and secondary underground circuits. Feeders and equipment are housed in multi-duct banks, vaults, and chambers. The system extensively employs network protectors and switches to ensure resilient and highly reliable service delivery to critical loads. Utilities typically install more expensive, high-capacity, and complex underground equipment, along with additional lines, to ensure sufficient redundancy in the system for load switching within a sophisticated network design. However, this typically results in a lower asset count per customer or per unit of load compared to other customer density settings.

In conclusion, utilities serving more densely populated areas need to account for factors negatively impacting asset utilization: higher customer loads, increased reliability standards, and needs to accommodate potential demand growth within scarce land.

QUESTION (C):

c) Please compare and contrast Toronto Hydro's customer density and asset utilization relative to its Ontario peers.

RESPONSE (C):

The econometric study, detailed in Exhibit 1B, Tab 3, Schedule 3, Appendix A, investigates the impact of serving a densely populated service territory using the urban core variable. The study found that

Toronto Hydro's costs, when accounted for the urban core variable, were 28% below the expected benchmark for the period from 2020 to 2022. In general, the lower costs reflect a better utilization of available resources and infrastructure by Toronto Hydro when compared to its peers.

Part b) of the question discussed the challenges related to direct comparison of the asset utilization in the highly densely populated area, such as Toronto Hydro service territory with urban and downtown core settings, to its less densely populated Ontario peers.

Generally, within the service territory of Toronto Hydro, when compared to its peers in Ontario, the utility would anticipate:

- A lower count of distribution transformers per service, albeit with higher capacity;
- Longer underground circuits per customer and per unit of load when including secondary circuits (secondary network area);
- A number of poles and length of overhead infrastructure similar to that of other urban-based utilities, with the exception of those serving rural areas;
- Significantly more extensive and complex underground infrastructure, featuring multi-duct banks, vaults, and cable chambers;
- Higher counts of switching and protection equipment;
- Unique infrastructure, such as underground stations and vaults situated well below the surface.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-122

Reference(s): Exhibit 2B, Section A, Page 6

RRR Data, 2022

Preamble:

Figure 1 in Reference 1 indicates unknown causes of outage make ups 7% of outage causes from 2018 - 2022.

From the RRR data filed by Toronto Hydro, the contribution of unknown outage cause is increasing with time.

	2015	2016	2017	2018	2019	2020	2021	2022
SAIFI - Unknown	0.21	0.32	0.30	0.29	0.31	0.54	0.39	0.49

QUESTION (A):

a) How did Toronto Hydro restore the outages where the cause was unknown?

RESPONSE (A):

Please refer to Toronto Hydro's response to interrogatory 2B-EP-27.

QUESTION (B):

b) Please explain the increase in unknown outages and what Toronto Hydro is doing to improve this measure.

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 2B-EP-27.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-123

Reference: Exhibit 2B, Section A, Page 15

Preamble:

Toronto Hydro states: "Toronto Hydro now incorporates climate data projections into its equipment specifications and station load forecasting."

QUESTION (A):

a) Does Toronto Hydro update the depreciation rates of assets to reflect climate hardening activities it has undertaken? If yes, please provide examples. If no, please explain why not.

RESPONSE (A):

Response from Concentric:

Concentric considered all factors when selecting average service life and Iowa curve recommendations, including forces of retirement such as weather-related events and third-party contacts/strikes, as estimated based on peer utilities, the professional judgement of Concentric personnel, and discussions with operations and management staff from Toronto Hydro. In discussions with Toronto Hydro staff, Concentric was informed of the types of assets currently being retired and the materials and types of assets being installed. Attention was paid to circumstances where assets being removed are being replaced with significantly different assets, and the rationale for the change. While the depreciation study did not consider system hardening as a separate factor in the selection of average service lives, the changes in asset types and expected lives of assets installed in more recent years was considered. It should be noted that system hardening is occurring throughout the North American electric industry. As such, in addition to system hardening being part of discussions with operations and maintenance staff, it is reflected in the asset lives selected by peer utilities, which form the basis of the peer review.

Response from Toronto Hydro:

As described in Exhibit 2A, Tab 2, Schedule 1, Section 3.1, Toronto Hydro has incorporated the recommendations of Concentric Advisors, ULC ("Concentric") in its depreciation rates effective January 1, 2023.

QUESTION (B):

b) Does Toronto Hydro update the useful lives of assets to reflect climate hardening activities it has undertaken? If yes, please provide examples. If no, please explain why not.

RESPONSE (B):

Toronto Hydro did not specifically consider climate hardening activities to update useful lives; however, Toronto Hydro routinely considers updates to its useful lives as new information becomes available, including the information produced by Concentric as part of the Depreciation Study, which includes peer utility and operation experience that integrates climate hardening considerations as per response to part (a).

QUESTION (C):

c) Please explain how Toronto Hydro determined asset hardening needed to be done to preserve asset life and provide examples of analyses.

RESPONSE (C):

In June 2015, Toronto Hydro completed a vulnerability assessment following Engineers Canada's Public Infrastructure Engineering Vulnerability Committee ("PIEVC") protocol. The assessment identified areas of vulnerability to Toronto Hydro's infrastructure as a result of climate change. Toronto Hydro utilized climate data projections for temperature, rainfall, and freezing rain in its equipment specifications. For example, revision to submersible transformer specification to require stainless steel construction, revision to network transformer specification to require thicker walls and increased paint specifications for corrosion mitigation, and revision to padmount,

poletop, and vault transformers specification to handle overload conditions. In 2022, this study was updated, please refer to Exhibit 2B, Section D2, Appendix A.

Further to this study, Toronto Hydro monitors changes to industry codes, standards, and regulations for alignment on asset hardening requirements. For example, in February 2023 the Canadian Standards Association (or CSA Group) updated CSA C22.3 No. 1:20, Overhead Systems and CSA C22.3 No. 7:20, Underground systems, with new requirements for Climate Change Adaptation. Toronto Hydro strives to meet and surpass these new requirements. For more information see Exhibit 2B, Section D2.1.2 Climate and Weather at page 10.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-124

References: Exhibit 2B, Section A, Page 2
Exhibit 2B, Section E6.1, Page 6
Exhibit 1B, Tab 5, Schedule 1, Appendix A

Preamble:

Toronto Hydro's recent customer engagement demonstrated that residential customers' first priority is controlling rates, their second priority is maintaining reliability, and their third priority is investing in new technologies that reduce rates or reduce their exposure to long duration outages due to extreme weather. Toronto Hydro's capital expenditures are targeting improved SAIDI, which excludes the MEDs that residential customers consider a priority.

QUESTION (A):

a) Please describe how Toronto Hydro planned to achieve the first priority of lowest possible rates and the second priority of maintaining reliability in light of its targeted SAIDI improvement.

RESPONSE (A):

To clarify, customers' first priority was found to be the delivery of electricity at reasonable distribution rates, not the "lowest possible" rates. See Exhibit 1B, Tab 5, Schedule 1, page 5.

As mentioned in Exhibit 1B, Tab 5, Schedule 1, Customer Engagement at page 8, "Phase 2 solicited detailed customer feedback on the $5.9 billion draft plan and the associated price impacts, providing the utility additional insight about customers' preferences relative to the investment plan priorities, options and outcomes. This feedback: (i) confirmed that Toronto Hydro found a suitable balance between price and other key outcomes of its 2025-2029 investment plan, (ii) supported the refinement and finalization of the plan, and (iii) informed the development of the 2025-2029

custom scorecard presented in Exhibit 1B, Tab 3, Schedule 1."

Toronto Hydro's 2025-2029 Distribution System Plan ("DSP") was tailored to meet customers' needs and preferences, including prioritizing investments for reliability. As mentioned in Exhibit 1B, Tab 3, Schedule 1 at page 9, "Toronto Hydro intends to improve Outage Duration performance as measured by the custom SAIDI metric compared to historical performance. This objective aligns with customer needs and priorities based on the Phase 1 Customer Engagement survey results which revealed that when it comes to reliability performance all customers (except Key Accounts) prioritize reducing the overall length of outages."

As mentioned in Exhibit 1B, Tab 3, Schedule 1 at page 16, "Toronto Hydro's projection indicates that the investment plan is roughly sufficient to maintain Outage Frequency as measured by the custom SAIFI Defective Equipment metric over the 2025-2029 period, with some risk of deterioration relative to the five-year historical baseline (2018-2022). The target to maintain (rather than improve) Outage Frequency recognizes that customers in all classes (except Key Accounts) prioritize outage duration over frequency, and expect the utility to balance reliability performance with price and other key outcomes."

Regarding the exclusion of MEDs from the SAIDI performance metric, please see response 1B-Staff-90, part (b).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-125

Reference: Exhibit 2B, Section B, page. 2

Preamble:

Toronto Hydro indicates that as part of proactive customer engagement, large customers and developers with upcoming projects are engaged to understand their needs and timelines and these engagements enable Toronto Hydro to incorporate anticipated connections into its Peak Demand Forecast with a higher degree of confidence.

QUESTION:

a) Given the emergence of new electrification trends such as commercial electric vehicle charging, building electrification etc., please confirm if Toronto Hydro has evolved its proactive customer engagement processes to engage a broader range of customers.
    i. If yes, please explain how Toronto Hydro has evolved its proactive customer engagement processes to engage prospective customers that are interested in connecting loads for electrification trends such as commercial electric vehicle chargers, building electrification etc.

RESPONSE:

Yes, Toronto Hydro continually evolves its proactive customer engagement practices as customer needs and new environmental factors such as electrification emerge. Through the Key Accounts segment's operational and senior leader customer engagements, Toronto Hydro ascertains future electrification and decarbonization plans from Key Account customers and supports customers to develop strategies to achieve their future decarbonization goals. This information is shared with internal stakeholders such as System Planning. Please also refer to the evidence on ongoing customer

engagement,[1] the Key Accounts segment of the Customer Operations program,[2] and the Customer Relationship Management segment of the Customer Care program.[3]

[1] Exhibit 1B, Tab 5, Schedule 1, p. 13-23.
[2] Exhibit 4, Tab 2, Schedule 8, p. 22-25.
[3] Exhibit 4, Tab 2, Schedule 14, p. 34-43.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-126

Reference: Exhibit 2B, Section C, Pages 5-6

QUESTION (A):

a) Please confirm that the existing outage management system underreported scheduled outages.
   i. If not confirmed, please reconcile with the stated text "Increased number of scheduled outages reported".
   ii. Would the same underreporting issues apply to unscheduled outages?

RESPONSE (A):

Confirmed.

In addition to the impact on scheduled outages, the new Oracle Utility Analytics solution captures an increased number of unscheduled outages affecting a smaller number of customers. However, these additional outages have an insignificant impact on overall SAIDI and SAIFI performance.

QUESTION (B):

b) Please explain how Toronto Hydro is ensuring that historical underreporting of outages does not drive increased reliability spending that is unnecessary to maintain actual reliability.

RESPONSE (B):

Historical underreporting of outages has had no bearing on the 2025-2029 expenditure plan. The reporting issue is primarily a factor for Scheduled Outages.

QUESTION (C):

c) Has the historic increase in sectionalization enabled Toronto Hydro to reduce the impact (customer minutes out) of scheduled outages? Please explain.

RESPONSE (C):

In general, increased ability to sectionalize provides more options to minimize the customer impact of scheduled outages. Scheduled outages are confined to as narrow an area as possible to allow crews to work safely. This is achieved by utilizing permanent switches where available, and by installing temporary switches where permanent switches are not available. Because temporary switches are installed when permanent switches are not present, the impact of increased sectionalization on customer minutes out due to scheduled outages is marginal.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-127

Reference: Exhibit 2B, Section C, p. 5, 12

Preamble:

Toronto Hydro notes that the "recent rise in reliability impacts was caused by a range of factors. The predominant cause for the increase in SAIFI was unknown impacts, which consist of outages that have no apparent cause."

QUESTION (A):

a) Will Toronto Hydro's upgrade from the existing Outage Management System to Oracle's Network Management System facilitate improved identification of these "unknown impacts"?

RESPONSE (A):

Unknown outages, typically brief due to temporary faults, are hard to diagnose precisely. Despite enhanced identification, tracking, and reporting from Oracle's Network Management System ("NMS") and Utility Analytics ("OUA'), these tools cannot identify the root causes of such outages. For more details, please refer to Toronto Hydro's responses to 2B-EP-27.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-128

Reference: Exhibit 2B, Section C, Page 22

Preamble:

With respect to Figure 22 in Reference 1.

QUESTION (A):

a) Do Toronto Hydro's overhead conductor system failures primarily comprise splice and termination failures?
    i. If yes, please quantify the percentage of conductor failures that are due to conductor splice and termination failures.
    ii. If no, please explain where conductor splice and termination failures are tracked,
    iii. If no, please explain what typical overhead conductor failures are.

RESPONSE (A):

In general, interruptions stemming from 'overhead conductors' (shown in Figure 22) are a mix of both conductor and connection failures (including line clamps, splices, and terminations). Conductor failures could be related to issues like metal fatigue, or physical damage, while connection failures may be associated with problems in splices, terminations, or other points where the conductor is connected.

i. The majority of these failures can be attributed to connection failures rather than conductor failures. Toronto Hydro does not track overhead conductor failures with sufficient granularity to determine the percentage of failures that are due to termination or splices.

QUESTION (B):

b) What percentage of conductor system failures represent actual conductors failing between conductor splices and/or terminations. If Toronto Hydro does not have accurate numbers, please provide an estimate.

RESPONSE (B):

Due to limited data granularity, along with inherent difficulty in ascertaining the exact location of mid-span conductor failure from an interruption reporting perspective, Toronto Hydro is unable to provide an accurate percentage breakdown of actual conductors failing between splices and/or terminations. Toronto Hydro estimates that the majority of interruptions related to overhead conductors are driven by connection failures (line clamps, splices, and terminations). Please refer to the response to part (c) for more information on how Toronto Hydro is mitigating conductor, cable, and accessory failures.

QUESTION (C):

c) What is Toronto Hydro's standard practice to mitigate conductor splice and termination failures?

iv. Please provide the average cost of replacing only a conductor splice, the average cost of replacing only a termination, and the average cost of following Toronto Hydro's standard practice.

RESPONSE (C):

Toronto Hydro employs robust asset lifecycle optimization policies and practices to minimize failures and maximize the value derived from individual assets throughout their lifecycles, as outlined in Exhibit 2B, Section D3.1. By conducting overhead line patrols and infrared scans of overhead primary lines as described in Exhibit 4, Tab 2, Schedule 1, Toronto Hydro can proactively detect evident signs of conductor splice and termination defects before they result in failures. These signs may include cracked or deteriorated connections, damaged or exposed insulation, or

thermal anomalies. Toronto Hydro also mitigates failures by adhering to the latest construction standards, complying with *Ontario Regulation 22/04*,[1] conducting field audits, and implementing asset management investment plans to replace overhead infrastructure that is at higher risk of failure.

iv. Toronto Hydro replaces terminations and conductor splices reactively following a failure, or as part of a larger capital project. Due to limited data granularity and the bundling of this type of work with other work, Toronto Hydro is unable to provide the average cost of replacing only a conductor splice or termination. In general, replacing assets reactively is more expensive than replacing them as part of a planned project.

[1] O. Reg. 22/04: Electrical Distribution Safety, under Electricity Act, 1998, S.O. 1998, c. 15, Schedule. A.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-129

References: Exhibit 2B, Section D1, Page 12
Exhibit 2A, Tab 2, Schedule 1, Appendix D, Rate Base
Exhibit 2B, Section D3, Appendix A, Page 2
Exhibit 2B, Section E6.6, Page 22

Preamble:

With regards to the above references, please answer the following questions:

QUESTION (A):

a) Please define useful life in terms of the causes of retirement that useful life includes and does not include.

RESPONSE (A):

As discussed in Toronto Hydro's response to interrogatory 2B-Staff-131, Toronto Hydro's useful lives for asset management purposes were originally adopted on the basis of the mean useful life from a study conducted by Kinectrics for Toronto Hydro on asset useful lives. These were reviewed as part of the Depreciation Study completed by Concentric Inc. Toronto Hydro made adjustments to align its useful lives to Concentric's findings, where appropriate, resulting in changes to useful lives for a subset of asset types. Please see part (b) below for Concentric's response regarding causes of retirement. For a more detailed discussion regarding the determination of depreciation life versus useful life (i.e. failure curves), please see Toronto Hydro's response to interrogatory 2B-Staff-131.

QUESTION (B):

b) Please compare and contrast the causes of asset retirement as they pertain to useful life and depreciation life.

RESPONSE (B):

Response provided by Concentric:

The depreciable life of assets is based upon a detailed retirement rate analysis which includes all historical retirements through the period available to Concentric, an analysis of Canadian peer electric utilities, discussions with Toronto Hydro operations and management personnel, and the professional experience of Concentric. The depreciable life is inclusive of factors such as retirements due to the age of assets, economic forces of retirement, changes in legislation, and other retirements beyond the control of Toronto Hydro.

Response provided by Toronto Hydro:

For a detailed discussion regarding depreciation life versus failure curves, please see Toronto Hydro's response to interrogatory 2B-Staff-131.

QUESTION (C):

c) Please explain why depreciation life is always (except in exceptional circumstances) less than useful life.

RESPONSE (C):

Please see Toronto Hydro's response to interrogatory 2B-Staff-131.

QUESTION (D):

d) For asset classes with useful life estimates, please provide a table showing the useful life and depreciation life of those asset classes, and for those with equal depreciation life and useful life, please explain why they are equal.

i. Please explain how Toronto Hydro updates its useful life expectations when actual failure rates deviate from expected failure rates (e.g., power transformers Reference 4).

RESPONSE (D):

Please see Table 1 below identifying major asset classes with useful life estimates and the depreciation life of those asset classes.

Table 1: Comparison of asset useful life and depreciation life expectations.

Major Asset Classes	Asset Useful Life	Dep. Life	Reason if Equal
Overhead Primary Conductor	60	60	Minor adjustment to Useful life in review of Concentric Study
Overhead Secondary Conductor	60	60	Minor adjustment to Useful life in review of Concentric Study
Overhead Switch	30	30	Change driven by input from Concentric Study based on the impact of increasing technologies impacting useful life of asset class and input from operational and management staff.
Overhead Transformer	35	35	Toronto Hydro's useful life was originally set at 35 years based on 2009 Kinectrics Study[1]
Poles (Wood Poles)	45	45	Toronto Hydro's useful life is based on 2009 Kinectrics Study
UG Primary Cable - Concrete, Conduit	50	50	Toronto Hydro's useful life is based on 2009 Kinectrics Study
UG Primary Cable - DB Jacketed	40	20	
UG Primary Cable - DB Unjacketed	20	20	Minor adjustment to useful life in review of Concentric Study
UG Primary Cable - PILC	65	65	Change driven by input from Concentric Study, peer Canadian utilities generally had service life in the range of 30-60 years, and historical retirement data also indicated shorter life expectation.

[1] Toronto Hydro Electric System Useful Life of Assets, Kinectrics (August 28, 2009)

Major Asset Classes	Asset Useful Life	Dep. Life	Reason if Equal
UG Secondary Cable - DB	23	23	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study
UG Secondary Cable - Conduit	60	60	Change driven by input from Concentric Study based on discussions with operational staff and a comparison with peer utilities.
Underground Switch	40	40	Change driven by input from Concentric Study, impacting only air-insulated pad-mounted switches (resulting in an increase in useful life).
Underground Transformers	30	30	Change driven by input from Concentric Study based on discussions with operational and management staff.
Underground Network Units	35	35	Change driven by input from Concentric Study, increase in useful life based on operational and management experience.
Stations - Switchgear Enclosures	50	50	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study
Stations - DC Batteries	10	10	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study
Stations - Power Transformers	45	45	Toronto Hydro's useful life is based on 2009 Kinectrics Study, minor change (1 year) based on input from Concentric Study.
Circuit Breakers	45	45	Minor changes driven by input from Concentric Study impacting two subtypes (Airblast and Air Magnetic) only. Aligns useful life estimates with remaining breaker types.
Civil - Network Vaults	60	60	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study

Major Asset Classes	Asset Useful Life	Dep. Life	Reason if Equal
Civil - Network Vaults - Roof	25	25	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study
Civil - Cable Chambers	65	65	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study
Civil - Cable Chambers - Roof	25	25	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study
Civil- Underground Vaults	60	60	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study
Meters	15	15	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study
Automatic Transfer Switch (ATS) & Reverse Power Breaker (RPB)	40	40	Toronto Hydro's useful life is based on 2009 Kinectrics Study, no change due to Concentric Study

i. Please see Toronto Hydro's response to interrogatory 2B-Staff-131, part (a).

QUESTION (E):

e) For each of the assets listed in Table 1: Material Refinements to ACA Asset Models, please explain why updates to the Depreciation Study by Concentric triggered revisions to the useful life values used by the asset managers at Toronto Hydro.

ii. For each of the assets listed in Table 1, what information did Concentric have about Toronto Hydro's assets that Toronto Hydro did not have?

iii. Did Toronto Hydro hire Concentric for its expertise in determining asset depreciation lives, or its expertise in assessing asset condition and the resulting

useful life?

RESPONSE (E):

Please see Toronto Hydro's response to interrogatory 2B-Staff-131 part (a), for details regarding Toronto Hydro's updates to useful lives and the broader use of this information in asset management.

ii. Concentric leveraged their extensive professional experience in conducting service life studies along with information from peer utilities in North America in addition to asset and financial data that was available from Toronto Hydro.

iii. Toronto Hydro hired Concentric for its expertise in estimating the service life of assets for the purpose of depreciation. Toronto Hydro's engineers have sufficient expertise and first-hand knowledge of the system to determine the appropriate timing for asset replacements. As discussed in Toronto Hydro's response to interrogatory 2B-Staff-131 part (a), service life estimates and useful life of assets are inter-related and as such the results of the Depreciation Study are an important consideration in reviewing useful life estimates.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-130

References: Exhibit 2B, Section D1, Page 12

Exhibit 2B, Section D5, Page 15-16

QUESTION (A):

a) When leveraging risk-based decision making to ensure System Renewal investments are sufficient to maintain historical reliability, please explain how SCADA operated switch investments in self-healing grids changes the consequence of asset failures and the resulting risk calculations?

RESPONSE (A):

SCADA operated switch investments and related investments in self-healing grid capabilities are expected to reduce the consequence of asset failure in specific circumstances due to increased operational flexibility and automated switching operations for faster restoration of customers in unaffected parts of a feeder during an outage event.

While the reduction in consequence of failure through the implementation of self-healing grids will result in an overall reduction of risk, Toronto Hydro does not expect to have self-healing functionality implemented and operational until 2030. Therefore, the change in risk profile due to self-healing capabilities in the horseshoe system is not expected within this rate period.

Toronto Hydro recognizes that the installation of SCADA switches on horseshoe feeders does provide an immediate reliability benefit due to remote switching capabilities and increased operational flexibility (although not the more significant improvement expected through automated self-healing capabilities). These benefits are considered in Toronto Hydro's plans to maintain reliability and are integrated into the projections that underpin its performance incentives for SAIFI and SAIDI as detailed in Exhibit 1B, Tab 3, Schedule 1.

QUESTION (B):

b) When leveraging risk-based decision making please confirm that when 2100 or 1400 customer group line segments are sectionalized into 700 customer group segments the consequence of individual asset failure decreases relative to the pre-sectionalized configuration.

   i. If confirmed, please explain what change would need to occur to the probability of asset failure to maintain a constant overall risk profile when consequence of failure is reduced?

   ii. If not confirmed, please explain what happens to the consequence of asset failure post-sectionalization?

   iii. In either case, please explain the process Toronto Hydro uses to adjust the acceptable probability of failure (or useful life or acceptable asset condition) to maintain a constant overall risk profile when consequence of asset failure changes.

RESPONSE (B):

Confirmed, when group line segments are sectionalized into 700 customer group segments, the consequence of individual asset failure decreases relative to the pre-sectionalized configuration.

i. If the consequence of failure is reduced through enhancement, the probability of failure would need to increase (i.e. the asset would need to be older, in worse condition, or otherwise more likely to fail) for the risk value to remain the same.

ii. Please see response to (i) above.

iii. Probability and consequence are assessed independently and combined to assess risk within Toronto Hydro's planning processes. A reduction in the consequence of failure on a particular feeder may cause Toronto Hydro to opt to maintain assets longer and accept a higher probability of failure in favour of making investments on a part of the system that carries greater risks.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-131

References: Exhibit 2B, Section D1, Page 17
Exhibit 2B, Section D2, Pages 20, 43
Exhibit 2B, Section D3, Page 29

Preamble:

Given the large percentage of Toronto Hydro assets that are beyond their useful lives and given Toronto Hydro's historically improving SAIDI and SAIFI metrics, it is possible that Toronto Hydro has incorrectly estimated the useful lives of some of its asset classes.

QUESTION (A):

a) Please describe the process that Toronto Hydro uses to update its useful life expectations based on actual asset performance.

RESPONSE (A):

Toronto Hydro does not agree with the premise outlined in the preamble of this question with respect to the relationship between the referenced useful life metrics and SAIDI and SAIFI performance. Regardless of where the useful life values are set, the application of prudent asset management principles would dictate that a utility should always be operating a substantial percentage of assets beyond useful life. Toronto Hydro does not replace individual assets simply because the age of the asset has exceeded the useful life value. As discussed in detail in Toronto Hydro's response to interrogatory 2B-SEC-44, the utility makes replacement decisions on the basis of probability of failure, consequence of failure, and various system design considerations, as part of a programmatic asset management approach tailored to the specific realities of Toronto Hydro's dense urban environment. The specific drivers of historical reliability improvements are discussed in Exhibit 2B, Section E2.2.1.

To update its useful life expectations, Toronto Hydro relies on the judgement and expertise of its own engineering and operational experts, with support from industry-standard studies completed by leading experts. The utility's asset useful lives for asset management purposes were originally adopted on the basis of the mean useful life from a study conducted by Kinectrics for Toronto Hydro on asset useful lives, to which Toronto Hydro subject matter experts contributed. These were reviewed as part of the Depreciation Study completed by Concentric Inc., filed in Exhibit 2A, Tab 2, Schedule 1, Appendix D. Toronto Hydro made adjustments to its useful lives where appropriate, based on Concentric's results, which themselves were informed by Toronto Hydro subject matter experts.

Depreciation Life vs. Failure Curves

In 2B-Staff-129, OEB Staff requests a discussion regarding the differences between useful life values determined for depreciation purposes versus those developed for asset management purposes, and postulates that depreciation life values are almost always less than useful life values used in asset management. Toronto Hydro assumes that OEB Staff is referring to the difference between average service lives determined on the basis of a broader set of retirement causes (for depreciation purposes) as compared to average service lives calculated on the basis of what Toronto Hydro would call "failure curves," i.e. probability of failure curves created on the basis of the utility's failure data (as opposed to retirement data).

Toronto Hydro agrees with the view that, in theory, a useful life value based purely on failure data would, in many (but not all) cases, be equal to or greater than the depreciation useful life. However, the extent to which this would in fact be the case across all asset classes, and the magnitude by which the depreciation and useful life values would actually vary from one another in each instance, would be dependent on the specific asset type and the utility's asset management practices.

Assessing the actual differences between depreciation life and useful life on an objective basis requires developing asset failure curves. The development of failure curves using a utility's own

failure data continues to be an area of development and exploration for many distribution utilities like Toronto Hydro. While the statistical approaches to developing the useful life of an asset class are fairly established (and not dissimilar from developing the survival curves used for depreciation), the volume of data and quality of data required to produce a failure curve remains a barrier. Specifically, this requires many years of appropriately structured and labeled failure data that can be tied directly to underlying assets and their attributes at the time of failure. For most utilities, blended asset failure datasets of this nature are, at best, limited to around 10 years of history (as compared to useful life of distribution assets themselves, which are typically around the 30-50-year range). Furthermore, the quality of this data over the available period varies significantly, especially as utilities have progressed from early implementations of data and work management systems to more mature and advanced digital tools in recent years. The reality is that the systems which capture outage data and corrective action data were historically designed with the primary goal of optimizing the efficiency of field operations and were not intended to provide the very high level of data quality and granularity necessary to develop predictive failure curves with ease. As Toronto Hydro gains experience with the more advanced Oracle Utility Analytics ("OUA") interruption tracking system, the utility expects the level of data quality regarding asset failures to improve.

Application of Useful Lives in Asset Management at Toronto Hydro

Toronto Hydro's existing useful life values are appropriate for use in asset management. By leveraging the Kinectrics and Concentric studies, Toronto Hydro ensures alignment of useful life assumptions with broader industry knowledge for major asset classes for the purpose of driving asset management decisions. On this point, it is important to underscore exactly how useful life values factor into the utility's asset management decisions.

- **Assets Past Useful Life:** As noted earlier in this response, Toronto Hydro does not replace assets simply because they have exceeded their useful life values. While the utility does make reference to the percentage of Assets Past Useful Life ("APUL") throughout the Distribution System Plan, this measure is offered as a simplified, directional indicator of changes in asset demographics over long periods of time, and does not directly inform the

selection of assets by system planners. To the limited extent that APUL has been used to frame investment pacing decisions for 2025-2029, it is with regard to particular spikes in asset need that are expected over the longer-term (e.g., network units in 2030-2034).

Note that age and APUL are distinct measures. In some cases, Toronto Hydro's evidence highlights issues with the age demographics of certain asset classes (for example, stations power transformers and direct-buried cables). In these examples, the population of concern is not the general population of assets past useful life, but a subset of assets operating well beyond useful life (for example, stations power transformers operating beyond a target maximum age of 65 years).

- **Asset Condition Assessment ("ACA"):** Asset useful life is an input into the ACA methodology, along with inspection information and other asset characteristics to determine the overall condition of the asset. In this context, the useful life is used as a calibration factor within the model to represent a central point in time where the utility can expect to begin to see increased deterioration. When assets with ACA models are being targeted for replacement as part of discrete capital projects, these decisions are made on the basis of the health score. Importantly, the asset useful life on its own will not increase the asset health score of an asset beyond the HI3 band. There must be a verifiable condition present to push the asset into HI4 and HI5.

Toronto Hydro encourages all parties to review the detailed program-level evidence regarding asset needs and investment pacing decisions in Exhibit 2B, Section E6. Additional information regarding expected changes in asset demographics over the 2025-2029 period with investment is provided in Toronto Hydro's response to interrogatory 2B-SEC-44.

QUESTION (B):

b) For all asset classes with ACA data provide the following data in an MS Excel worksheet:

i. Useful life used in this filing.

ii. Useful life used in the previous distribution system plan.

i. For any useful lives that were updated, please explain the primary driver of the update.

iii. Assets Past Useful Life (APUL) percentage for this filing

iv. APUL percentage in 2017

v. Forecast APUL percentage in 2029

vi. Presence or absence of a probability of failure curve, and the year in which Toronto Hydro plans to either update the curve or create it for the first time.

i. For all the probability of failure curves, please indicate if the curves are based on Toronto Hydro specific data or 3rd party data.

RESPONSE (B):

Please see Toronto Hydro's response attached, 2B-Staff-131 App A ACA Demographics and Corresponding Useful Lives.

QUESTION (C):

c) Please explain why Toronto Hydro has selected asset age as its "comprehensive indicator of failure risk across the system" rather than performing an actual risk assessment based on actual asset condition (currently Toronto Hydro's proxy for probability of failure) and consequence of failure.

RESPONSE (C):

"Comprehensive" in this context refers to the fact that Toronto Hydro does not have a condition model for all of its major asset classes, and therefore the APUL metric is more inclusive of the utility's broader asset base.

"[…] indicator of failure risk" is meant to convey the simple fact that, in the broadest sense, age is correlated with probability of failure, and to the extent that the probability of failure is changing

over time across the utility's asset base, this a directional indicator of potential changes in the level of investment required to manage asset risk.

Please refer to Toronto Hydro's response to interrogatory 2B-AMPCO-18 for details regarding the current status of Toronto Hydro's implementation of the Probability of Failure and Consequence of Failure components of the Condition Based Risk Management framework.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-132

References: Exhibit 2B, Section D2, Page 10

Exhibit 2B, Section E6.5, Page 37

QUESTION (A):

a) Please confirm that the historically achieved reduction in risk and the recommendation by the consultant to not relax Toronto Hydro's existing adaptation measures means that those adaptation measures meet or exceed Toronto Hydro's requirements.

   i. If confirmed, please explain why a new budget line item of $85.9 for "Overhead Infrastructure Resiliency" is being introduced in this test period.

   ii. If not confirmed, please explain what adaptation measures are in excess of the recommended adaptation measures and why.

RESPONSE (A):

Toronto Hydro confirms that the adaptation measures described in Exhibit 2B, Section D2, page 10 meet Toronto Hydro's requirements in respect of equipment specifications and design practices. Where equipment has been replaced or installed since the adaptation measures were established, it is to the new requirements.

The Overhead Infrastructure Resilience segment is an example of where these adaptation measures are being deployed. This segment is a reintroduction and expansion of work done through the Overhead Infrastructure Relocation Program in Toronto Hydro's 2015-2019 DSP to improve the resiliency of the overhead system through targeted relocations and undergrounding of overhead assets that are at risk of adverse weather, as well as, tree contacts, animal contact, foreign interference and/or in areas that are difficult to access. Targeted assets also include obsolete designs, which are no longer aligned with Toronto Hydro's current planning and work

practices, but which are not currently addressed through other capital programs. For details of the needs driving this segment, please see Exhibit 2B, Section E6.5, page 26-33 and 37-38.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-133

Reference: Exhibit 2B, Section D2, Page 25

Preamble:

Regarding "Obsolete and deteriorating overhead accessories" and example of catastrophic failure of a porcelain insulator.

QUESTION (A):

a) Please explain how the risk of failure is high when the reason given relates solely to the typical probability of failure (i.e. the probability of electric tracking) and not typical consequence of failure.
   i. What is the typical failure mode of an insulator.
   ii. What is the typical consequence of an insulator failure.

RESPONSE (A):

i) Typical failure modes of an insulator include:
   a. Electrical tracking due to contamination build up - porcelain insulators are more susceptible to contamination build up than polymeric type insulators due to the material properties;
   b. Cracking and shattering of the insulator due to age, contamination, and even sudden temperature changes – this only applies to porcelain insulators.

ii) Typical consequence of an insulator failure include:
   a. Electrical tracking, leading to flashovers, pole fires, and outages;
   b. Cracking and shattering (for porcelain insulators only), releasing porcelain shards which can cause damage to nearby equipment, public property, and put the general public at risk.

It is the combination of the higher probability of failure with the potential to fail in a catastrophic manner as described in Exhibit 2B, Section D2 at page 25, that leads to the high risk of failure for porcelain insulators.

QUESTION (B):

b) Of all the failures in the past 5 years, what percentage resulted in a catastrophic failure that caused property damage or human injury, and what percentage did not?
   i. Please explain why a single incident of property damage is the consequence used to justify the insulator replacement program.
   ii. Please provide the risk comparison between the typical insulator failure risk (i.e. typical failure probability and typical consequence of failure) versus the risk of property damage failure (i.e. single/exceptional occurrence and property damage consequence) as measured on Toronto Hydro's risk matrix.

RESPONSE (B):

Toronto Hydro does not have detailed records specifically related to porcelain insulator failure. The information collected within Toronto Hydro's interruption tracking system does not have sufficient granularity to distinguish catastrophic and normal failure modes for this asset type.

i) Please note that Toronto Hydro is not proposing a dedicated insulator replacement program for the 2025-2029 period. Toronto Hydro will typically replace these obsolete insulators upon failure, during overhead rebuilds, or in tandem with reactive or corrective work performed on related assets such as poles or overhead conductors. As discussed in Exhibit 4, Tab 2, Schedule 1, Toronto Hydro maintains porcelain insulators by regularly washing high priority locations to reduce contamination and minimize failure risk due to tracking.

ii) As per response above, Toronto Hydro does not have the granularity within its information systems to perform a comparative risk analysis. For a broader discussion on how Toronto Hydro assesses the risk of asset failures, please see Toronto Hydro's response to interrogatory 2B-SEC-44.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-134

References: Exhibit 2B, Section D2, Table 2, Page 27
Exhibit 2B, Section D2, Table 3, Page 33
Exhibit 2B, Section D2, Table 4, Pages 40, 41
Exhibit 2B, Section D2, Table 5, Pages 46, 47
Exhibit 2B, Section D2, Table 6, Page 49
Exhibit 2B, Section D3, Appendix B, Page 19

QUESTION (A):

a) Please update Table 2 through Table 6 indicated in the references above to show the following columns with equivalencies determined by Toronto Hydro's risk matrix:
   i. Typical Failure Mode(s)
   ii. Probability of the Typical Failure Mode
   iii. Consequence of the Typical Failure Mode
   iv. Exceptional Failure Mode(s) (or Catastrophic Failure Mode(s))
   v. Probability of the Exceptional Failure Mode (or Catastrophic Failure Mode)
   vi. Consequence of the Exceptional Failure Mode
   vii. Locations of the Typical and Exceptional Failure Modes on Toronto Hydro's risk matrix.

Please note if Toronto Hydro does not have the probabilities of the typical and exceptional failure modes, then please provide an estimate of those values or an estimate of the relative probabilities of those values (e.g., the typical mode is 100 times more likely than the exceptional).

RESPONSE (A):

The tables referenced by the question provide common root causes of failure by asset class. Toronto Hydro does not compute average probabilities or average consequences for the various

root causes of failure. The utility's approach for calculating Probability of Failure ("PoF") for risk quantification purposes is largely grounded in its application of the Condition Based Risk Management ("CBRM") framework. As discussed in Exhibit 2B, Section D3, Appendix C, at page 14:

> *THESL have defined three failure modes depending on the asset deterioration stage and corresponding remedial action as listed in Table 6. These failure modes have been applied in the ACA methodology for the derivation of probability of failure and consequence of failure values. The three failure modes align with both THESL's established practices and the principles of the CNAIM methodology and are considered to be appropriate for the evaluation of asset PoF and CoF.*

The three failure modes are Incipient, Degraded, and Outage (Catastrophic). These failure modes are differentiated by the type of action that they trigger. For example, significant corrosion on a padmount transformer will trigger reactive replacement, which by definition is a "Degraded" failure mode. Incipient and Degraded failure data is assembled primarily by leveraging corrective work order data (i.e., asset repairs and reactive replacements), where as Outage failure data is assembled primarily from outage event and emergency response records. Toronto Hydro determined the PoF for these failure modes by leveraging its records of historic failure in the manner described in Exhibit 2B, Section D3, Appendix B, page 15. Ultimately, Toronto Hydro will apply the composite probability of failure for these failure modes, which tracks with the specific health score for an asset, in its risk-based value framework. For reference, Table 1 below provides the range of PoF values for each Health Index band for each asset class where existing data is currently sufficient to calculate PoF.

1 **Table 1: PoF Ranges by Health Index Band**

Assets	PoF Ranges				
	HI1	HI2	HI3	HI4	HI5
SCADAMATE Switches	0.9%	0.9% to 1.82%	1.9% to 2.78%	2.89% to 4.79%	4.95% to 8.97%
Wood Poles	0.03%	0.03% to 0.07%	0.07% to 0.1%	0.11% to 0.17%	0.18% to 0.33%
Network Transformers	1.06%	1.06% to 2.16%	2.26% to 3.29%	3.43% to 5.67%	5.86% to 10.64%
Submersible Transformers	1.5%	1.5% to 3.05%	3.19% to 4.65%	4.84% to 8.01%	8.28% to 15.03%
Vault Transformers	0.34%	0.34% to 0.69%	0.72% to 1.05%	1.09% to 1.81%	1.87% to 3.4%
Padmount Transformers	0.63%	0.63% to 1.27%	1.33% to 1.94%	2.01% to 3.33%	3.45% to 6.25%
SF6 Insulated Padmount Switch	2.26%	2.26% to 4.58%	4.79% to 6.99%	7.27% to 12.04%	12.45% to 22.58%
Air Insulated Padmount Switch	3.56%	3.56% to 7.22%	7.55% to 11.02%	11.46% to 18.98%	19.62% to 35.59%
SF6 Insulated Submersible Switch	0.88%	0.88% to 1.79%	1.87% to 2.73%	2.84% to 4.71%	4.87% to 8.83%
Air Insulated Submersible Switch	0.44%	0.44% to 0.89%	0.93% to 1.36%	1.42% to 2.34%	2.42% to 4.39%
Station Power Transformers	2.73%	2.73% to 5.53%	5.79% to 8.45%	8.79% to 14.55%	15.04% to 27.28%
AirBlast Circuit Breaker	0.5%	0.5% to 1.01%	1.05% to 1.54%	1.6% to 2.65%	2.74% to 4.96%
Air Magnetic Circuit Breaker	0.24%	0.24% to 0.48%	0.51% to 0.74%	0.77% to 1.27%	1.32% to 2.39%
Oil Circuit Breaker	0.99%	0.99% to 2.02%	2.11% to 3.08%	3.2% to 5.31%	5.48% to 9.95%
Oil KSO Circuit Breaker	1.45%	1.45% to 2.94%	3.08% to 4.49%	4.67% to 7.74%	8.% to 14.5%
SF6 Circuit Breaker	1.89%	1.89% to 3.84%	4.01% to 5.86%	6.1% to 10.09%	10.43% to 18.92%
Vacuum Circuit Breaker	0.71%	0.71% to 1.44%	1.5% to 2.19%	2.28% to 3.78%	3.91% to 7.09%

Please see response to 2B-AMPCO-18 part (a) regarding the current status of Toronto Hydro's ongoing work to develop the Consequence of Failure component of the CBRM framework.

Please see Exhibit 2B, Section D3.2.1.3 regarding how Toronto Hydro intends to combine Probability of Failure and Consequence of Failure into a quantified risk value within the Engineering Asset Investment Planning ("EAIP") tool.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-135

Reference: Exhibit 2B, Section D2, Page 42

QUESTION (A):

a) Toronto Hydro notes that it owns "approximately 139 MSs". What is the exact number of MSs owned by Toronto Hydro?

   i. If an actual number is not available, please explain why not.

RESPONSE (A):

At the time of filing, the actual number of MSs owned was 139. The term "approximately" was used as Toronto Hydro was in the process of decommissioning one MS.

QUESTION (B):

b) If there is a decommissioning plan, please provide the number of stations operational at the time of responding to IRs, and the plan for decommissioning over the forecast period.

RESPONSE (B):

Yes, Toronto Hydro has a decommissioning plan. At this time, there are 138 MSs in-service. Please see the table below summarizing the utility's decommissioning plan for the 2025-2029.

Table 1: Number of Municipal Stations to be Decommissioned over 2025-2029

	2025	2026	2027	2028	2029
Municipal Stations	**3**	**5**	**1**	**2**	**6**

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-136

Reference: Exhibit 2B, Section D2, Page 11

QUESTION (A):

a) Does Toronto Hydro routinely compare the costs of rehabilitation and replacement to extend the operating life of assets found to be in poor condition?
If so, please provide some representative costs for asset classes conducive to rehabilitation.

RESPONSE (A):

No. Toronto Hydro does not routinely compare the costs of rehabilitation and replacement for assets operating in poor condition during its capital planning process. In general, many assets that are in poor condition will be:

- older assets which are built to an older standard and it would not be prudent to be refurbishing non-standard equipment, and/or
- not repairable to a state that is safe to crews and the public, and/or
- costly to repair.

Some examples include:

- Transformers and switches which will often have corrosion that requires the full replacement of the enclosure/tank (Costly Repair)
- Civil structures like vaults which have major structural deficiencies that cannot be safely patched/repaired (Unsafe Repair) (See Exhibit 2B Section E6.4 Page 12)
- Rotting wood poles which cannot be repaired (Unsafe repair)

Furthermore, Toronto Hydro's Corrective Maintenance Program (Exhibit 4 Tab 2 Schedule 4) will undertake actions to address deficiencies that will extend the operating life of the assets.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-137

Reference: Exhibit 2B, Section D2, Page 18

QUESTION (A):

a) Are priority deficiencies only evaluated for assets found to be in HI5 condition, or are they evaluated for a broader range of asset conditions? Please explain.

RESPONSE (A):

The assigned priorities (P1-P4) are dependent on various factors such as the severity of the issue (e.g. leaking transformer), location (e.g. main trunk versus lateral/sub-lateral), number of customers potentially affected, etc. Toronto Hydro also takes into consideration environmental, safety, and reliability impacts. The priorities are assigned based on inspection results and deficiencies identified by our crews or others on any of our assets and are not limited to assets found to be in HI5 condition.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-138

References: Exhibit 2B, Section D2, Page 23

QUESTION (A):

a) Please indicate the assessed health index ratings that would trigger pole replacement.

RESPONSE (A):

There is no health score that automatically triggers asset replacement. Please see response to part (b) for more information.

QUESTION (B):

b) How does Toronto Hydro prioritize pole replacements given that it replaces poles that have different health indices?

RESPONSE (B):

As discussed in Exhibit 2B, Section E6.5 at pages 16 to 21, Toronto Hydro prioritizes replacing poles that are in HI4 and HI5 condition, with a focus on parts of the system where the consequence of failure is high and where historical performance has been poor. Other factors that drive pole replacement within the System Renewal programs include the application of construction and design standards at the project planning and design stage, voltage conversion requirements, efficiencies that can be achieved by grouping assets into area rebuilds, the presence of obsolete equipment (e.g., box construction), and on-the-ground field conditions and design factors.

QUESTION (C):

c) How does Toronto Hydro determine the appropriate economic trade-off between the value to customers of the foregone lost service life due to replacing poles and pole top

transformers before they fail against the risks associated with running these assets to failure?

RESPONSE (C):

The goal of minimizing an asset's total lifecycle cost while ensuring safe and reliable asset performance is embedded in Toronto Hydro's Reliability Centered Maintenance practices, its risk-based asset replacement and project planning approaches, and its iterative, outcomes-oriented Investment Planning & Portfolio Reporting process, all of which are described in Exhibit 2B, Section D3. Generally, when it comes to system renewal work, planners are expected to justify their proposed capital projects on the basis of value-for-money, i.e., whether the project is scoped to address sufficient failure risk and contribute meaningfully to system performance objectives. These principles are applied during a planner's desktop analysis when, for example, deciding which assets to address, and whether to address those assets through a spot replacement approach versus a broader area rebuild approach. Engineering managers are tasked with reviewing planner scopes and challenging assumptions to ensure asset lifecycle planning principles are applied consistently and that, ultimately, assets which are serviceable are not being replaced prematurely.

During the lead-up to its 2020 CIR, the utility moved toward its current approach of emphasizing measurable customer-focused outcomes and targets (as opposed to opaque cost-benefit metrics). This approach is built upon (i) industry-leading customer engagement, (ii) an iterative capital planning process that produced verifiable trade-offs within top-down financial constraints, and (iii) parametric five-year program estimates built upon a combination of historical unit and project costs, leading indicators such as asset condition demographics, and historical and forecast performance trends.

Beginning in 2021, Toronto Hydro – with encouragement from the OEB's Decision in the utility's 2020 CIR[1] – began the process of implementing an industry-leading Engineering Asset Investment Planning ("EAIP") tool (ultimately, Copperleaf C55). As part of this project, the utility has set-out to

[1] EB-2018-0165, Decision and Order (December 19, 2019) at pages 90-94.

develop an industry-leading Value Framework that leverages the asset-by-asset outputs of its Condition-Based Risk Management framework to assign a consistent, objective measure of value to individual projects developed by system planners. These value measures will be leveraged within the EAIP tool to run value-maximizing optimizations on the utility's execution work program, and will provide planners with an additional tool for assessing and demonstrating the economic value of their projects, consistent with the principles of asset lifecycle management. (Toronto Hydro expects this tool to be fully implemented and embedded in planning processes in time for its next major capital planning cycle in 2025.)

With respect to the overhead assets referenced in this question, note that Toronto Hydro generally does not prioritize pole top transformers for proactive replacement, except where the units are at risk of containing PCBs and as part of larger proactive area rebuild projects when there are economies of scale. For a general discussion of overhead asset replacement prioritization practices, please refer to Exhibit 2B, Section D3, Table 2.

QUESTION (D):

d) Please provide the benefit-cost analysis that Toronto Hydro used to evaluate its proposed proactive wood pole and pole top transformer replacement programs.

RESPONSE (D):

Per the discussion provided in response to part (c), Toronto Hydro does not reduce its five-year System Renewal investment programs down to a single benefit-cost analysis metric. The utility's 2025-2029 expenditure plan for the Overhead System Renewal program was developed based on various considerations including asset condition demographics, reliability performance trends, voltage conversion needs, and environmental and safety risks. The forecast benefits of this program with respect to reliability outcomes are captured within the SAIDI/SAIFI forecasts found in Exhibit 1B, Tab 3, Schedule 1, along with an overall benefit-cost analysis of Toronto Hydro's proposed reliability investments as a whole.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-139

Reference: Exhibit 2B, Section D3 p.6

QUESTION (A):

a) What has changed such that Toronto Hydro is adding concrete and steel poles to its dedicated pole inspection program in 2025?

RESPONSE (A):

Please refer to Toronto Hydro's response to 2B-PWU-10.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-140

Reference: Exhibit 2B, Section D3, Appendix B

Preamble:

Appendix B provides the ACA Summary for 2017, 2022 and the Forecast for 2029 year end if no investments are made.

QUESTION (A):

a) For both tabs in Appendix B, please provide Forecasts for 2029 YE under the following scenarios.
   i. If the proposed capital and maintenance plans are implemented
   ii. If Toronto Hydro's capital program was reduced by 25%
   iii. If Toronto Hydro's capital program amounts for 2025 was approved, and Toronto Hydro was to operate under a Price Cap IR regulatory framework for the forecast period.

RESPONSE (A):

For part (i), please refer to Toronto Hydro's response to interrogatory 2B-SEC-44. For (ii) and (iii), please refer to interrogatory 1B-SEC-21.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-141

References: Exhibit 2B, Section D3, Appendix A, Pages 4, 6

QUESTION (A):

a) How many SF6 switches broken down by category (e.g., insulated padmount) are planned to be replaced in the planning period?

RESPONSE (A):

Toronto Hydro has forecasted to replace 116 padmount switches based on the preliminary selection of areas targeted as per the drivers mentioned in Section E6.2.3.3. For these Horseshoe system assets, Toronto Hydro does not yet have the discrete project details for projects in later years of the plan, which would be necessary to break these switches down further into sub-categories. The utility will be prioritizing higher-risk air-insulated switches. With respect to the Downtown underground system, Toronto Hydro plans to replace four URD submersible SF6 switches in the 2025-2029 period.

QUESTION (B):

b) Please explain why it was prudent to have 1 Hi4 and 16 Hi5 SF6 insulated padmount switches in 2022.

   i. Please explain why it is now necessary to replace switches that have effectively the same health rating in 2029 as they did in 2022?

RESPONSE (B):

The 17 SF6 insulated padmount switch units in HI4/5 in 2022 were addressed for repair or replacement through corrective maintenance and reactive capital programs in 2023. The next inspection cycle of these units in 2024 will result in updates to their Health Scores as per the action taken. Please see Exhibit 2B, Section E6.2.3 for a detailed discussion regarding the need for

investment in padmount switches and the focus on air-insulated switches. Please refer to 2B-SEC-44 for a comprehensive discussion regarding expected changes in asset demographics over the 2025-2029 period.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-142

References: Exhibit 2B, Section D3, Page 6

Exhibit 2B, Section D3, Pages 12, 13

Preamble:

With regards to Toronto Hydro's asset replacement programs for poles.

QUESTION (A) AND (B):

a) Similar to submersible transformers, please explain why Toronto Hydro chose to inspect all poles on an 8-year cycle, rather than only inspecting those poles approaching or past their useful lives (or previously identified as being in poor condition) more frequently?

b) Why does Toronto Hydro not inspect poles on a cycle time that is tied to actual asset condition (or age if condition is not known)?

RESPONSE (A) AND (B):

Please refer to Toronto Hydro's response to interrogatory 2B-PWU-10.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-143

References: Exhibit 2B, Section D3, Pages 15, 16

QUESTION (A):

a) Please provide the list of asset classes that are considered critical spares.

RESPONSE (A):

The following asset classes have equipment listed as critical spares:

- Overhead transformers
- Overhead distribution poles
- Overhead primary conductors
- Overhead secondary conductors
- Overhead switches
- Overhead insulators
- Padmounted transformers
- Submersible transformers
- CRD transformers
- Building vault transformers
- Padmounted switches
- Underground cables
- Network transformers
- Stations bus disconnect switches
- Stations DC batteries and chargers

QUESTION (B):

b) For each of the critical spares asset classes please describe the long-term asset retirement strategies in terms of the expected natural failure rate, planned retirement rate, risk profile over time, and role that critical spares play in achieving that strategy.

RESPONSE (B):

Toronto Hydro is unable to provide the information requested. In the utility's experience, the multi-decade, asset-class-specific plans requested by OEB Staff are of limited value (and unnecessary) in determining effective and actionable asset investment strategies and business plans for Toronto Hydro's service territory and system. Over the last 20 years, the utility has developed an asset management and program delivery approach that is performance-based, programmatic, integrated and flexible. Toronto Hydro's programmatic System Renewal evidence found in Section E6 provides detailed justifications for the level of investment required to achieve the outcome objectives associated with the Distribution System Plan. Please see Toronto Hydro's response to 2B-SEC-44 for further discussion regarding the key considerations driving the asset management strategies for a majority of asset classes.

Toronto Hydro maintains critical spares for a large set of key assets across its system. The utility uses critical spares to allow the utility to repair or replace an asset under outage or emergency conditions in a timely manner, ultimately impacting Toronto Hydro's ability to minimize the duration of outages to its customers. The availability of critical spares is reflected in Toronto Hydro's historical interruption statistics and thus informs Toronto Hydro's risk analysis via the reliability projection methodology.

QUESTION (C):

c) Please explain why a "wall" or "wave" within a 10 to 15-year period is the optimal window within which to manage asset demographics for long lived assets.

RESPONSE (C):

As stewards of the system, Toronto Hydro must take into account rate impacts, supply chain risks, and execution limitations when dealing with asset "walls" or "waves". To clarify, Toronto Hydro does not aim to manage an asset class within a 10 to 15-year window for long-lived assets. Rather, if it becomes aware of a large proportion of assets within an asset class reaching end-of-life (i.e. a "wall" or "wave" of assets reaching end of life) within the next 10 to 15 years, it will attempt to smooth out the renewal over a longer time period to minimize inefficiencies of having to replace a large amount of assets in a short period of time. This approach allows the utility to manage execution challenges and reduce rate volatility for its customers.

QUESTION (D):

d) Please explain why asset management strategies such as Critical Spares cannot also extend the replacement lifespan over which a subset of assets can be replaced.

RESPONSE (D):

Critical spares serve as vital lifelines for Toronto Hydro, ensuring a consistent level of service continuity when faced with asset failures. The availability of critical spares is already reflected in Toronto Hydro's historical outage statistics and by extension its assumptions regarding the future consequence of failure for key assets. A greater reliance on critical spares to extend replacement lifespans would in effect mean running a greater share of assets to failure, which would result in reliability performance deterioration and greater inefficiencies related to reactive (as opposed to planned) replacement.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-144

References: Exhibit 2B, Section D3, Page 24
Exhibit 2B, Section D5, Page 20
Exhibit 2B, Section D5, Page 38
Exhibit 2B / Section D5 / p. 69

Question (A):

a) Please explain from a risk perspective why Advance Metering Infrastructure (AMI) meters cannot be run to fail (i.e. replaced reactively) and provide the business case justifying asset retirement before failure.

RESPONSE (A):

Toronto Hydro anticipates that replacing AMI meters reactively by employing a run to fail approach would pose significant operational, customer and regulatory compliance risks and forestall the achievement of expected benefits from the installation of newer meters compared to mass meter replacement, as discussed below and in program evidence.[1]

Reactive meter replacement involves replacing individual meters after they have become defective (e.g. due to loss of communication or a blown fuse). Reactive replacement always involves a degree of billing accuracy risk, due to the lag between meter failure and the execution of replacement in the field. When meters fail, customer consumption data is lost on the failed meter, and depending on the number of failed meters at any one time requiring reactive replacement, customer consumption data may not be captured for extended periods of time. Where replacement is not or cannot be completed in a timely manner, it can result in delayed billing and/or the need to estimate

[1] Exhibit 2B, Section E5.4, subsection E5.4.3.3 "Failure Risk", at p. 9-10.

customer consumption and demand, which in turn may adversely affect billing accuracy.[2]

The age of Toronto Hydro's metering assets exacerbates the risks discussed above, and the extensive number of first-generation meters in the system results in a high exposure risk should mass failure of a component begin to occur. As a larger subset of the meter population ages and approaches end of life ("EOL"), the probability of meter failures increases,[3] which further drives the need for reactive meter replacement. By 2025, approximately 70 percent of Toronto Hydro's residential and small commercial meters will have surpassed their EOL, increasing the likelihood of meter failures and hindering Toronto Hydro's ability to meet the OEB-prescribed billing accuracy target of 98%.[4] In this context, relying on reactive replacements to achieve AMI 2.0 would place significant constraints on Toronto Hydro's resources and reduce efficiencies compared to mitigating these risks through a large-scale deployment.

Toronto Hydro's AMI 2.0 initiative is also driven by metering technology obsolescence. As noted in the Metering program evidence, a significant portion of Toronto Hydro's residential and small commercial meters were installed between 2006 and 2008.[5] Due to rapid advancements in technology, these first-generation smart meters have become outdated and obsolete.[6] Meter manufacturers continuously update their product with new features, abilities, communication upgrades, and storage capacity improvements. In the past 18 years, Toronto Hydro has utilized Honeywell Elster as its AMI provider. During that period, meters have gone through five generations and two communication network upgrades. The key functionalities that Toronto Hydro plans to adopt through the AMI 2.0 initiative, as part of its Grid Modernization strategy, can only be realized with the installation of fifth generation meters in the utility's system. Obsolete meters will become

[2] Exhibit 2B, Section E6.7, subsection E6.7.3.2 "Reactive Capital", at p. 13.
[3] Exhibit 2B, Section E5.4. subsection E5.4.3.3 "Failure Risk", at p. 9-10.
[4] Exhibit 2B, Section E5.4, Table 2, at p. 2.
[5] *Supra* footnote 3.
[6] Exhibit 2B, Section E5.4, subsection E5.4.3.4 "Business Operations Efficiency & Reliability" at p. 10-13.

inhibitors to fully utilizing new features and capabilities, the benefits of which are listed in 2B-Staff-194. Therefore, replacing the entire fleet of meters is the optimal solution that leads to operational improvements and facilitates the integration of key Grid Modernization initiatives, including voltage monitoring, distributed energy resource integration, electric vehicle load forecasting, and more efficient outage detection and response.

QUESTION (B):

b) Please provide the asset age demographics (by age, asset count and asset condition) for residential and small commercial AMI meters currently in service.

RESPONSE (B):

Table 1: Residential & Small Commercial AMI Meter Asset Age Demographics

Meter Age *	Number of Residential and Small Commercial AMI meters
19	38
18	5,566
17	177,604
16	176,685
15	125,208
14	37,001
13	30,404
12	11,281
11	3,580
10	3,118
9	17,538
8	16,147
7	25,410
6	39,649
5	31,177
4	16,967
3	38,033
2	12,119
1	23,463
0	6,651

Table 1 - Note: * Data used from 2023 Year End

Toronto Hydro operates its meters on a pass or fail basis and does not use an asset health index band for this type of asset. Meters that are suitable for service have a working display, are able to accurately measure consumption, and have a working communication module. None of these functions can be partially working or have any other intermediate health status that can be measured.

QUESTION (C):

c) Based on useful life and actual failure data to date, what is the expected natural failure rate for AMI meters in each year of the planning period?

RESPONSE (C):

Please refer Table 7 on page 13 of Exhibit 2B, Section E6.7, subsection E6.7.3.2, which indicates the natural failure rate for all meters, including AMI meters.

QUESTION (D):

d) Please provide the planned retirement pacing (in dollars and number of units) by year for AMI meters as per the above plan to replace $248.1M worth of AMI meters during the planning period.

RESPONSE (D):

Toronto Hydro notes that the AMI 2.0 initiative will only cover residential and small commercial and industrial meter replacements, for which the 2025-2029 cost is estimated at $201.6 million of the $248.1 million Program cost, as indicated in Table 6 in Exhibit 2B, Section E5.4, at page 17.

For the number of meters to be replaced under the AMI 2.0 initiative, please refer to the below table:

Table 2: Number of Meters to be Replaced under AMI 2.0 Initiative

	2025	2026	2027	2028	2029	Total
Residential and Small C&I Meter Replacement	157,893	173,710	179,708	68,985	0	**580,296**

QUESTION (E):

e) What is the value of AMI 2.0 meters that are planned to be replaced in advance of their natural failure rate in each year of the planning period.

RESPONSE (E):

The table below shows the derecognition value of AMI meters that Toronto Hydro plans to replace in advance of their natural failure rate (before end of life) in each year of the 2025-2029 rate period over the course of the AMI 2.0 program.

Table 3: Derecognition Value of AMI Meters Planned for Replacement

$ (Millions)	2025	2026	2027	2028	2029
AMI Meter Derecognition Values	$3.33	$3.09	$2.89	$0.98	$0.00

QUESTION (F):

f) Please explain why AMI 2.0 needs to be done in advance of DER penetration increases rather than selectively around areas where DER penetration may cause voltage concerns.

RESPONSE (F):

To successfully enable key AMI 2.0 functionalities such as feeder voltage monitoring due to increasing DER penetration, Toronto Hydro must make wholesale changes to an area and convert the area onto the AMI 2.0 communication network. While newer AMI 2.0 meters are capable of communication on the existing network, older obsolete meters cannot communicate on the new network. If Toronto Hydro were to perform spot replacements of meters to enable a single use case, the utility would lose communication with all other meters in the area, resulting in significant impacts to customer billing and utility operations. In order to successfully transition to AMI 2.0 technology and associated functionalities, a critical mass of meters at a system level must be implemented to ensure successful billing. For further details on penetration requirements at a system level to achieve the benefits of AMI 2.0, please refer to Toronto Hydro's response to 2B-Staff-194.

QUESTION (G):

g) What level of AMI 2.0 penetration is required on a feeder to provide adequate voltage violation and overloading monitoring?

   i. Why cannot a comparatively few AMI 2.0 meters scattered amongst existing AMI meters provide adequate feeder monitoring?

RESPONSE (G):

Please refer to the response to subpart (f).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-145

Reference: Exhibit 2B, Section D3, Page 40

Preamble:

In section D3, Toronto Hydro notes that it "considers a broad range of risks that the corporation faces through the Enterprise Risk Management ("ERM") process. Toronto Hydro's ERM framework has been designed to manage risks at the corporate level and considers the risks facing individual asset classes and risks relevant to investment programs."

QUESTION (A):

a) Please provide the ERM risk results in tabular format for each of the past 5 years and yearly projections for the test period.

RESPONSE (A):

To clarify, the ERM process is a corporate risk framework, not an asset risk framework. It does not comprehensively deal with granular asset risks in a manner that lends itself to the tabulation of results. Rather, as discussed further in Exhibit 2B, Section D3 at page 41, lines 10-18, the ERM helps to identify and manage corporate risks that emerge from the asset base, such as non-energy mitigating cable chamber lids.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-146

Reference: Exhibit 2B, Section D3, Appendix B, Page 8

Preamble:

Regarding the asset health methodology of Toronto Hydro's wood pole assets.

QUESTION (A):

a) Please provide the basis for selecting a useful life of 45 years.

RESPONSE (A):

The useful life of 45 years was adopted on the basis of the mean useful life from a study conducted by Kinectrics for Toronto Hydro on asset useful lives. This was reviewed as part of the Depreciation Study completed by Concentric Inc., filed in Exhibit 2A, Tab 2, Schedule 1, Appendix D, and was maintained at 45 years. The value recommended from Concentric Inc. has been informed by review of Toronto Hydro's data, consultations with Toronto Hydro operational, engineering, and management staff and assessment of service lives utilized by peer Canadian electric distribution utilities.

QUESTION (B):

b) Please confirm that Normal Expected Lives as used in the Reference is the same as "useful life" as used by Toronto Hydro in this filing.

   i. If not confirmed, please explain the differences between Normal Expected Lives and useful life.

RESPONSE (B):

Confirmed.

QUESTION (C):

c) Please explain why Toronto Hydro has not re-calibrated the useful life (or Normal Expected Life) of wood poles despite evidence that the useful life (or Normal Expected Life) is too low, thus resulting in elevated health scores.

RESPONSE (C):

Toronto Hydro's useful life for wood poles was set on the basis described in response to part (a), and the utility believes this useful life is reasonable based on current information. The utility does not, at present, have a valid statistical basis on which to set the useful life differently, and from a governance and consistency perspective, is unwilling to make arbitrary changes to core modelling assumptions. Potential changes of this nature require thorough study, exploration and iteration by data analysts and engineers. Toronto Hydro, recognizing early-on the unique issues with the wood pole model, has implemented a number of changes to improve and temper the behaviour of the model. This is explained in detail in the referenced report. For further discussion regarding the behaviour of the wood pole model, please refer to 2B-Staff-226, part (b). For a discussion regarding the application of wood pole condition results in Toronto Hydro's 2025-2029 investment plan, refer to 2B-SEC-44. Finally, for a broader discussion regarding useful lives, please see response to 2B-Staff-131, part (a).

QUESTION (D):

d) What percentage of Wood Poles have health score collars applied to the final health score determination?
   i. Does this percentage imply a problem with the underlying health score formulation?
   ii. If no, at what percentage would a problem with the underlying health score formulation likely exist, and why?

RESPONSE (D):

As explained by EA Technology on page 9 of the referenced report:

"Just over 2% of the asset population have health score values set through condition collars, mainly due to moderate pole separation (cracks and pole top feathering). This shows a considered approach to the setting of condition collars to identify assets with issues requiring intervention.

The CNAIM methodology includes an additional (reliability) modifier to reflect any issues or observations that are not reflected in the observed and measured condition modifiers. THESL have used this methodology feature in the wood pole model and applied a collar of 7.25 to assets that have been confirmed to be in a poor condition by inspectors in the field. This is considered to be an appropriate use of the reliability modifier mechanism to directly impact asset health where information is available."

The purpose of collars in the methodology is to ensure that an asset's health score represents the correct level to reflect the condition when the Condition Input Factors are not strong enough to achieve the correct anticipated level of health score. While a high rate of collar applications would warrant further examination, there is no specific value at which the application rate would inherently represent a problem with the underlying health score formulation.[1]

[1] To illustrate this point: if 100 wood poles were condemned by a field inspector, but the condition methodology without a collar was assigning a score of less than 7.25 to 90 of those poles, then 90% of the 100 poles would require application of a collar to ensure a minimum health score of 7.25. This would be an appropriate result.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-147

Reference: Exhibit 2B, Section D3, Page 15

Preamble:

Toronto Hydro states, "Where appropriate, Toronto Hydro undertakes targeted refurbishments in the field to maximize the serviceable life of existing assets. For example, as mentioned above, the utility will rebuild a deteriorated vault roof, extending the useful life of the entire vault."

Has Toronto Hydro considered utilizing pole stubs to extend the life of wood poles that have ground line rot but are otherwise in good condition? If not, please explain why not. If yes, what were the results?

RESPONSE:

Toronto Hydro does not utilize pole stubs to extend the life of wood poles as the additional costs or risks associated with this approach outweigh any possible benefits from cost savings. These include:

1. Due to the nature of the environmental loading (as per CSA C22.3 No1-20: Overhead Systems) acting on overhead pole lines, and the physical properties of hydro poles, the maximum stress on the pole occurs close to the groundline of the pole. A location-specific customized structural design would be required for each location depending on the type of pole stubbing method selected, and the overhead framing configuration on the pole.
2. Primary, secondary, and communication risers would not be able to be maintained on these poles due to the mechanical means by which pole stubbing is installed.
3. Climbing access needs to be maintained on poles and access would be limited by pole stubbing installations.
4. Industry standard pole loading software is not capable of modelling these kinds of reinforcement methods.

5. Poles are considered a piece of major distribution equipment as defined by Electrical Safety Authority ("ESA") in their "Technical Guideline for Section 6. Approval of electrical equipment". A pole with rot identified near the ground line of the pole may indicate that there is also deterioration of the pole beneath the ground line resulting in a poorly performing pole foundation.
6. Pole stubbing may not be compatible with foundation requirements for the type of existing pole foundation: direct buried, direct buried with concrete reinforcing, poor soil, sloped terrain, proximity to foundations or retaining walls, reinforced sidewalk bays, or legacy foundation installations.
7. In relation to hydro poles, the *Accessibility for Ontarians with Disabilities Act, 2005*[1] ("AODA") requires minimum distances to be maintained around poles in areas accessible by members of the public. Pole stubbing activities would require additional footprint around existing pole locations, and this may not be possible for existing pole locations due to space restrictions.

[1] *Accessibility for Ontarians with Disabilities Act*, 2005, S.O. 2005, c. 11.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-148

Reference: Exhibit 2B, Section D3, page. 45

Preamble:

Toronto Hydro uses peak demand forecasting to identify capacity constraints at substations and undertake planning to accommodate the forecasted growth.

QUESTION (A):

a) Please provide a table listing all Toronto Hydro's stations and show the forecast capacity constraints in each station for each of the next 20 years for the summer and winter peaks.

RESPONSE (A):

Please see the Excel file attached as an appendix to this IR showing the stations with forecasted capacity constraints in the next 20 years in Summer and Winter.

QUESTION (B):

b) Please provide a table of the restricted feeders and the substations they are located within, and the capacity deficit for each restricted feeder for each of the next 20 years.

RESPONSE (B):

Compared to stations buses, feeder loading is much more dynamic in nature, as load can swing from feeder to feeder frequently due to various capital and customer work, customer supply schemes and contingency situations from both planned and unplanned work. To ensure that customers can connect to the grid in a timely and efficient manner, Toronto Hydro proactively manages feeder capacity constraints through the Load Demand program. As defined in Exhibit 2B, Section E5.3, feeders that are identified as highly loaded based on standard planning practices are considered for relief. Feeders are not considered restricted from accepting load, as required

expansion or enhancement work will be conducted to accommodate any customer load. Due to the dynamic nature of managing capacity constraints at the feeder level, the process of identifying feeder load level transfers and other investments to address restricted feeder capacity is a continuous one and Toronto Hydro does not forecast capacity deficits for feeders in the manner requested (i.e. over a 20-year period). With this context in mind, Exhibit 2B Section E5.3 pages 14-15 identifies the current plan for relief of highly loaded feeders in both the Horseshoe and Downtown systems.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-149

Reference: Exhibit 2B, Section D3, Page 45

Preamble:

Toronto Hydro considered three new specific drivers in the development of the System Peak Demand Forecast: (i) hyperscale data centres, (ii) electrification of transportation, and (iii) Municipal Energy Plans.

QUESTION (A):

a) Please provide an overview and justification for why these three specific drivers were considered.

RESPONSE (A):

The noted drivers were selected as the most impactful and discrete near and medium-term growth drivers that the utility must consider in identifying the minimum investments necessary in the 2025-2029 rate period to ensure that the system is ready and able to serve customers in the next decade. These needs are specifically:

i. Data Centers are large point loads that frequently can result station overloading.
ii. Electrification of Transportation is expected significant to impact system-wide load growth, especially transit corridors.
iii. Municipal Energy Plans: Toronto Hydro must prepare the distribution system for the City's plans. Large loads reported by City or City Consultants, require capacity planning.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-150

References: Exhibit 2B, Section D3, Page. 53

Preamble:

Toronto Hydro indicated that "The various risk analyses presented in Section D3.2 and Section D3.3 drive the overall investment required to manage the distribution system."

QUESTION:

a) Please provide a table showing the pre-investment and post-investment risks and the costs of mitigation for each of the risk analyses presented in section D3.2 and D3.3.

RESPONSE:

- **Quantified Risk-based Analysis:** As detailed in D3.2.1.3, Toronto Hydro is currently in the process of developing and implementing a custom value framework as part of its Engineering Asset Investment Planning ("EAIP") system, which will allow the utility to establish quantified value (inclusive of risk mitigation benefits) associated with asset failure. For details regarding the progress and completion expectations for the EAIP tool, please see 2B-AMPCO-20.
- **Reliability Projections:** Exhibit 1B, Tab 3, Schedule 1, Pages 8 to 21 provide both the current and forecasted reliability performance for Outage Duration and Outage Frequency (with comparisons to an "IRM"-level of funding), along with key programs within the expenditure plan that contribute to these measures.[1] For long-term planning, reliability projections are useful in understanding the risk that reliability performance could deteriorate under different investment scenarios.

[1] Note that these reliability projections have been updated in response to 2B-SEC-42, part (c).

- **Worst Performing Feeder:** Worst Performing Feeder measures (e.g., FESI) are highly volatile measures of granular, feeder-level performance and cannot be forecasted with current modelling capabilities. Worst Performing Feeder measures are leveraged to monitor the ongoing performance of the system and identify problem areas at risk of especially poor reliability performance.
- **Enterprise Risk Management:** Enterprise Risk Management is an embedded, qualitative aspect of business planning and the Investment Planning & Portfolio Reporting process. Please see response to 2B-Staff-145 regarding the interplay between the corporate ERM and the Asset Management System. Where applicable, for each asset management-related risk monitored within the ERM system (e.g., PCBs, box construction), Toronto Hydro has developed a 2025-2029 investment plan that is calibrated to prevent risk from escalating beyond acceptable tolerances.
- **Priority Deficiencies:** As discussed in Exhibit 2B, Section E3.2, Toronto Hydro applies a prioritization framework to identify urgent repairs and corrective actions. The utility does not forecast priority deficiencies by risk category as part of long-term investment planning. Underlying trends in priority deficiencies are considered when developing long-term expenditure plan levels in programs, including Reactive Capital (Exhibit 2B, Section 6.7) and Corrective Maintenance (Exhibit 4, Tab 2, Schedule 4).
- **Legacy Assets:** Please see Toronto Hydro's response of 2B-AMPCO-26 for a comparison of forecasted 2024 and 2029 results for key legacy assets. The reduction of legacy assets is driven by capital program investments within the System Renewal category.
- **Generation and Load Capacity Risk Assessments:** Please refer to Toronto Hydro's detailed evidence provided in Exhibit 2B, Sections D4, E3, E5.3, E5.5, and E7.4 for detailed discussions regarding the utility's peak demand and distributed generation forecasts, the risks associated with these increases in demand, and the expected impact that the planned investments will have on mitigating these risks.

Please see Toronto Hydro's response to 2B-SEC-44 for a comprehensive discussion on how asset health, performance, criticality, executability, and other asset management considerations together

inform the pacing of Toronto Hydro's renewal investments in the 2025-2029 Distribution System Plan.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-151

References: Exhibit 2B, Section D3, Appendix A

QUESTION (A):

a) Why is a minimum H of 4 the appropriate choice for calculating Probability of Failure (PoF).

RESPONSE (A):

Toronto Hydro referred to Ofgem's CNAIM framework in implementing its own Condition Based Risk Management framework ("CBRM") in 2017. Inherent to the methodology, assets with a health score of 0.5 are in new or like new condition, while a health score of 5.5 represents the point at which the first significant signs of deterioration would be expected. By setting a minimum asset health score ("H") of 4 in the calculation of probability of failure ("PoF"), the same PoF is given to all assets before reaching the point where significant signs of deterioration are expected.

QUESTION (B):

b) Does setting a minimum H score constrain PoF so that it is not suitably close to 0 for assets in the best condition?

RESPONSE (B):

Setting a minimum H score in the PoF calculation is a provision for constant PoF for the lowest health scores. The PoF associated with H scores less than this limit relate to installation issues or random events instead of condition and are calibrated using asset failure data (i.e., through constants k, c in the formular). The minimum H score is a transition from constant PoF to a controlled exponential relationship.

QUESTION (C):

c) For wood poles and power transformers asset classes, please provide a table showing the range of PoF for each health score and health index.

RESPONSE (C):

Please see Table 1 below.

Table 1: Wood Pole and Power Transformer PoF Ranges

HI Band	Lower Limit of Health Score	Upper Limit of Health Score	PoF Range – Wood Poles	PoF Range – Station Power Transformers
HI1	≥ 0.5	< 4	0.03%	2.73%
HI2	≥ 4	< 5.5	0.03% to 0.07%	2.73% to 5.53%
HI3	≥ 5.5	< 6.5	0.07% to 0.10%	5.79% to 8.45%
HI4	≥ 6.5	< 8	0.11% to 0.17%	8.79% to 14.55%
HI5	≥ 8	≤ 10	0.18% to 0.33%	15.04% to 27.28%

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-152

Reference: Exhibit 2B, Section D3, Appendix A

Preamble:

In Table 2, Health Index bands and definitions, Toronto Hydro sets ranges for each HI band.

QUESTION (A):

a) Please explain how the health score ranges are mapped onto the different health indices.

RESPONSE (A):

Health Score ranges are mapped onto the different health indices as a way of representing the key stages of an asset's lifecycle. Toronto Hydro adapted Ofgem's Common Network Asset Indices Methodology ("CNAIM") approach in implementing its Condition Based Risk Management framework ("CBRM") in 2017. The following mapping is inherent to the methodology:

- An asset with a health score of 0.5 has new or like new condition. A health score that is less than 4.0 has the same Probability of Failure ("PoF") as an asset that is new.
- Assets with a health score of 4.0 will begin to have a PoF related to its health score. A health score of 5.5 represents the point at which first significant signs of deterioration would be expected. This is where the PoF of the asset is approximately double that of a new asset.
- A health score of 10 represents the worst current condition of an asset, where the PoF is 10 times that of a new asset. A health score of 15 represents the worst future condition of an asset.

Figure 1 below, taken from CNAIM, illustrates where the health index bands lie on a typical asset health / PoF curve.

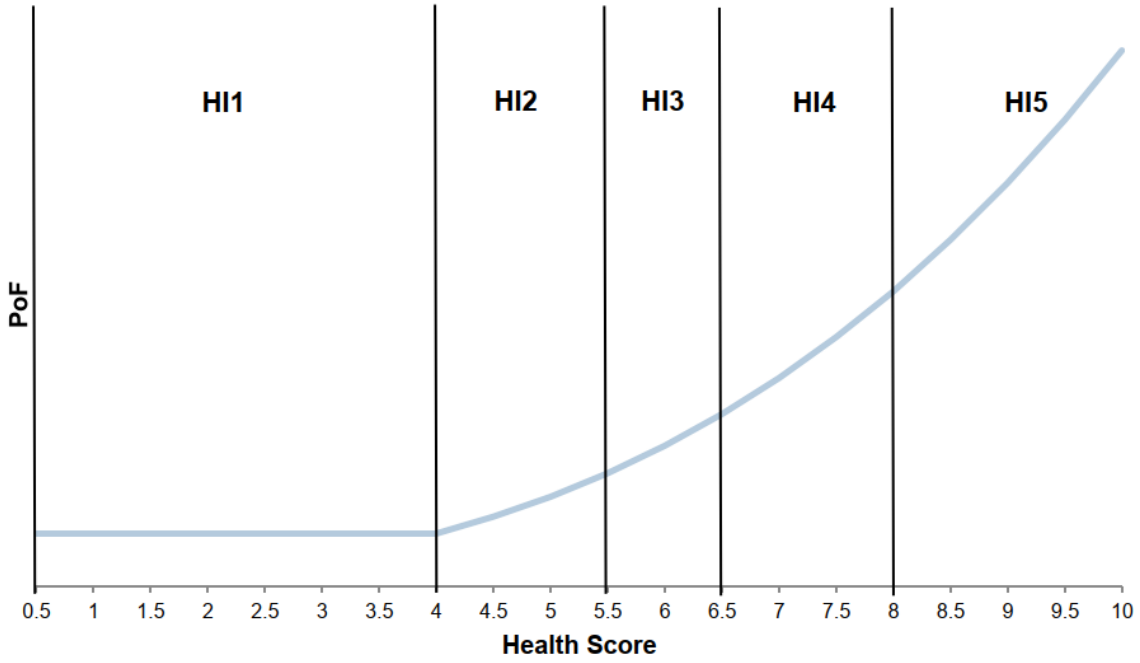

FIGURE 3: HI BANDING

Figure 1: Mapping of Health Index Bands to Probability of Failure/Health Score[1]

QUESTION (B):

b) Please explain why the future forecast range of health scores is different (upper limit of 15) than the current range for those assets (upper limit of 10).

RESPONSE (B):

The cap on the future health score is extended to 15 in order to provide room for assets that are currently in poor condition to continue deteriorating in the future health score model. If this extension was not provided, assets would cluster around the maximum score of 10, which would

[1] https://www.ofgem.gov.uk/sites/default/files/docs/2021/04/dno_common_network_asset_indices_methodology_v2.1_final_01-04-2021.pdf, page 29, Figures 3

reduce the ability to differentiate between assets that are projected to be in relatively better or worse condition in the future.

QUESTION (C):

c) Why can't assets with a health score greater than 10 be in service today?

RESPONSE (C):

Please see response to part (b). Toronto Hydro's CBRM methodology is based on the CNAIM Framework. The CNAIM Framework adopts a standardized 0 to 10 scale for the current health score. As such, the calculated current health score cannot go beyond 10.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-153

References: Exhibit 2B, Section D4, p. 2
Exhibit 2B, Section D4, Appendix B, p. 2
NOTE: The report did not provide page numbers so OEB staff is unsure what constitutes Page 1 of Appendix B.
Exhibit 2B, Section D2, p. 6

Preamble:

Toronto Hydro is planning expenditures on the basis of being a summer peaking utility when its studies indicate that it is moving towards becoming a winter peaking utility in the 2030s.

QUESTION (A) AND (B):

a) Please explain why using the Summer Peak to drive the investment in long lived (multi-decade) assets is the prudent choice when the FES clearly indicates in all cases that Toronto Hydro is a Winter Peaking utility in the 2030s and beyond.
b) Please explain how Toronto Hydro's plans can be optimal if it is using a summer peak for planning purposes when it is becoming a winter peaking utility.
    i. Is Toronto Hydro only planning investments for the 2025-2029 period, and how does this summer peaking planning strategy reconcile with the "least regrets" strategy it purports to use?
    ii. How was the shift from summer to winter peaking accounted for in long-term regional planning with the IESO given that those forecasts are for 20 years?

RESPONSE (A) AND (B):

Please see Exhibit 2B, Section D4 at pages 8-12. Unlike the 10-year System Peak Demand forecast that Toronto Hydro has relied upon to prepare the investment plan in this application, the outputs of the Future Energy Scenario (FES) model do not predict what is likely to occur in the future.

Rather, the FES provide insight into future possible pathways of decarbonization, and were used to evaluate the System Peak Demand forecast and resulting capacity investments from a "least regrets" perspective. To that end, although the FES model suggests that Toronto Hydro will be a winter peaking utility the 2030s, Toronto Hydro expects to remain a summer peaking utility in the 2025-2029 rate period. This is because the 10-year System Peak Demand forecast, which underpins this rate application does not include the impact of wide-scale building electrification, as the policy and consumer-behaviour drivers of this type of demand remain uncertain.

To stress test the System Peak Demand forecast against the least regrets planning philosophy, Toronto Hydro assessed whether the utility could accommodate a growing winter peak (driven by building electrification) in the 2025-2029 rate period, if needed. To that end, the utility looked at scenarios of forecasted building heating loads derived from the FES outputs, and concluded that the capacity investment plan can meet higher levels of building heating loads (which contribute to winter peak) should this driver of electrification materialize at a faster pace than expected in the 2025-2029 rate period. This analysis gave Toronto Hydro confidence that the investments in system capacity that the utility proposes to make in the 2025-2029 rate period are least regrets to address growth and electrification drivers that the utility faces in this decade and the early part of the next decade. That being said, it is possible that the utility could be faced with incremental capacity constraints at a localized level as a result of accelerated transportation and building electrification demand in the next rate period. To address this challenge, the utility proposes a Demand Related Variance Account (DRVA) to track variances in actual versus forecasted expenditures in a number of demand-related investment programs. For more information about this proposal please refer to Exhibit 1B, Tab 2, Schedule 1 at pages 35-47.

The long-term regional planning process is underway and expected to wrap-up in the summer of 2024.[1] As part of this process, the IESO is considering the impact of electrification on both summer and winter forecasts over the longer-term outlook of 20 years. To consider the longer-term winter

[1] https://www.ieso.ca/Get-Involved/Regional-Planning

peak impact of electrification, Toronto Hydro layered heating load to its base 10-year System Peak Forecast to derive a long-term 20-year scenario.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-154

Reference: Exhibit 2B, Section D4, Pages 10-18

Preamble:

Toronto Hydro discusses the primary drivers of capacity needs and related investments over the 2025-2029 rate period, including customer connections, electrification of transit, electric vehicles, hyperscale data centres and Municipal Energy Plans and has shown the anticipated impact of these drivers relative to base load. Specific areas of Toronto Hydro's service territory are highlighted where significant load growth is expected, including: Port Lands, East Harbour, Horseshoe East (including the Golden Mile) and Horseshoe West (including Downsview).

QUESTION (A):

a) Please identify how Toronto Hydro adopted the direction from the OEB's January 2023 Framework for Energy Innovation both in how it investigated the use of third party owned DERs to meet planning needs as well as meaningfully investigated a market-driven solution before building/owning the solution themselves.

RESPONSE (A):

Toronto Hydro has been actively pursuing and deploying non-wires solutions since 2018 (at Cecil TS) and continues to build on this experience with the Etobicoke project in the Manby/Horner area of its grid. For the 2025-2029 rate period Toronto Hydro set an ambitious target to triple the amount of flexible system capacity to be procured from market-based providers. Procuring this capacity could help avoid about 25 percent of the total load required to be transferred in the targeted station areas. The history of this work, as well as the future plans are outlined in detail in the evidence at Exhibit 2B Section E7.2. For additional information about Toronto Hydro's 30 MW non-wires system capacity please see the response to 1B-Staff-88.

QUESTION (B):

b) Please explain in detail how Toronto Hydro is responding to the policy direction outlined in the OEB's Framework for Energy Innovation?

RESPONSE (B):

As noted in the response to part (a), Toronto Hydro has developed a plan to procure and leverage services from DERs with an ambitious target of 30 MW. In addition, Toronto Hydro has also put forward: (i) a Benefit Cost Analysis and an incentive proposal (as outlined Exhibit 1B, Tab 3, Schedule 1) that aligns with the OEB's policy direction; and (ii) an Innovation Fund proposal to explore more nascent areas of DER integration, enabling further development of capabilities in the area of DER integration. For more information on how innovation has shaped the 2025-2029 rate application, including integrating policy directives from the FEI report, please see Exhibit 1B, Tab 4, Schedules 1 and 2.

QUESTION (C):

c) Please list all non-wires solutions Toronto Hydro has considered for the areas identified to see significant load growth over the near and medium term, including grid modernization, geo-targeted conservation and demand management programs and discuss the decision factors for each, including benefit-cost analysis for various options to address these areas with non-wires solutions.

RESPONSE (C):

Please see the responses above. Toronto Hydro's use of non-wires solutions focuses on practical applications where i) capital avoidance or deferral opportunities can be identified and measured, and ii) non-wires solutions can be deployed with confidence that critical customer outcomes (i.e., reliability and cost-effectiveness) can be maintained.

To be able to leverage other types of DERs, particularly non-dispatchable resources, as part of distribution planning and system management, it is essential to have well-developed tools for grid

observability and for DER monitoring and forecasting. Toronto Hydro is making significant efforts to improve grid observability, control and automation through *Intelligent Grid* and *Grid Readiness* initiatives, several of which could significantly improve monitoring capabilities for DERs (discussed in detail in Exhibit 2B, Section **Error! Reference source not found.** and D5.2.2).

QUESTION (D):

d) Please discuss and provide any analysis conducted of how expanded EV charging, predominantly during off-peak hours, could potentially lower costs for utility customers due to greater utilization and revenues from existing distribution system assets.

RESPONSE (D):

As noted in Exhibit 2B, Section D5.2.2.5, Toronto Hydro partnered with Plug'n Drive and Elocity Technologies to trial an EV Smart Charging Pilot aimed at understanding EV charging patterns and behaviours in Toronto and gathering information to assist in the development of future EV programs. Benefits of this pilot include supporting the development of additional tools for EV owners to monitor, schedule, and control their charging sessions, and collecting data and insights to understand impacts of EV charging on the distribution grid.

Third party aggregators what have developed controllability are free to participate in the LDR programs. Toronto Hydro is agnostic to the technology used to bid capacity into the program. Further details can be found in Exhibit 2B, Section 7.2.

QUESTION (E):

e) Please discuss and provide any analysis conducted that indicates when various aspects of Toronto Hydro's system would require capital upgrades to support various EV and DER adoption levels.

RESPONSE (E):

Toronto Hydro's System Peak Demand forecast in Exhibit 2B, Section D4 and the Customer and Generation Connections forecasts presented in Exhibit 2B, Section E5.1 consider growth, electrification and DER adoption rates that also underpin investment needs in the following capital expenditure programs: Load Demand, Stations Expansion, GMPC, Connections and Renewable Enabling Energy Storage Systems.

Toronto Hydro has conducted area-specific analyses in select neighborhoods to evaluate the impact of increased number of residential service upgrades on the local distribution system. This assessment aimed at visualizing and understanding the impact of these upgrades on the system, and to identify necessary alternatives. The conclusion drawn from these analyses to date is that Toronto Hydro will likely not need to do a complete overhaul of its distribution system to accommodate these connections. Rather, it is necessary to make investments to improve grid observability in order to monitor the loading conditions on primary and secondary system assets, helping to inform decision making (please see Intelligent Grid, Exhibit 2B, D5.2.1, p. 10-12 for details). Examples of such decisions include, but are not limited to, installation of upgraded or additional transformers, upsizing of buses and transferring loads among nearby feeders, busses or stations.

While Toronto Hydro's capacity plan ensures that the distribution system is adequately sized, external factors such as government incentives or market evolution could further accelerate customer adoption of electric vehicles or other fuel switching technologies. To that end, Toronto Hydro proposes a flexibility mechanism (known as a variance account) to reconcile differences between forecasted and actual demand-driven costs and revenues.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-155

Reference: Exhibit 2B, Section D4, p. 11

Preamble**:**

With regards to "Figure 4: Toronto Hydro System Peak Demand Forecast by Driver".

QUESTION(A):

a) Does Toronto Hydro consider DERs a negative peak demand or a source of capacity supply?

RESPONSE (A):

Toronto Hydro's System Peak Demand Forecast is a gross forecast. As a result, Figure 4 only displays drivers of load growth.

QUESTION (B):

b) Are DERs considered a negative energy load or a source of energy generation?

RESPONSE (B):

DERs are not considered negative energy load or energy generation as far as the peak demand forecast is concerned.

QUESTION (C):

c) Please restate Figure 4 from Reference 1 and provide tabular data so that System Peak Demand Forecast by Driver is stated in MW.

   i. If applicable, update Figure 4 to show DERs separately.

RESPONSE (C):

Toronto Hydro produces its System Peak Demand Forecast in apparent power, MVA. Please see the response provided to interrogatory 2B-SEC-46 part (b) for the requested tabular data in MVA. Regarding DERs, please see the response provided to part (a) above.

QUESTION (D):

d) Please provide a new figure and provide tabular data that shows System Energy by Driver in GWh or MWh, and as applicable show DERs separately.

RESPONSE (D):

Toronto Hydro is unable to provide the requested information as the utility's Peak Demand Forecast does not reflect a forecast of Energy Delivery (i.e. is not forecast using GWh or MWh). Please refer to the response provided to part b) above with respect to DER.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-156

References: Exhibit 2B, Section D4, Appendix A

Exhibit 2B, Section D4, Appendix B

Preamble:

Toronto Hydro has explained the "Future Energy Scenarios tool" and provided an appendix with an explanation of its outputs and a detailed report from the consultant that performed the study.

QUESTION (A):

a) Please confirm that the Future Energy Scenarios tool is not an internal tool, and more akin to a service purchased from a consultant. Please elaborate.

RESPONSE (A):

As noted in Exhibit 2B, Section D4, Appendix A, Section 1.3 (page 3), Toronto Hydro engaged a leading UK consultant, Element Energy, to develop the Future Energy Scenarios modelling tool. This model is now available as a software tool for internal business users at Toronto Hydro.

QUESTION (B):

b) Please provide the "Business Case" or similar document produced by the business unit that "uses" the Future Energy Scenarios tool to justify its acquisition or development. Please provide any other documentation used by or presented to Toronto Hydro decision makers to release the funding to acquire / develop the tool.

RESPONSE (B):

In the development of the Climate Action Plan in 2021-22, Toronto Hydro leaders engaged in numerous conversations about the energy transition. Through these conversions, a need was identified for greater strategic insight into the wide range of potential peak demand scenarios

associated with various external perspectives on the likely future of the energy system. This need was investigated by looking at tools and best practices from other jurisdictions, including the work undertaken by Element Energy in the UK. A decision to procure a third-party service to develop this capability was made late in 2021 (background presentation setting out the context, purpose and target benefits attached as Appendix A), following which Toronto Hydro undertook a competitive process to procure the services. Element Energy was the successful vendor of that process, and the scope of work (attached as Appendix B) initiated the work with Element on this project.

QUESTION (C):

c) Please provide a brief summary of the benefits and costs for this tool, as portrayed to Toronto Hydro decision makers at the time of deciding to pursue this tool. Please reference the material from part b).

RESPONSE (C):

A brief summary of the expected benefits can be found in Appendix A to the response to part (b). The estimated cost was $990,000 for the model development and implementation project, plus annual maintenance costs of $36,000 per year for three years. The final cost of development and implementation was $1.29 million. Project variances were due to greater than anticipated stakeholder engagement efforts in the design of the scenario worlds and unforeseen challenges with model configuration.

Future Energy Scenarios - Proposal

26 July 2021

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Context

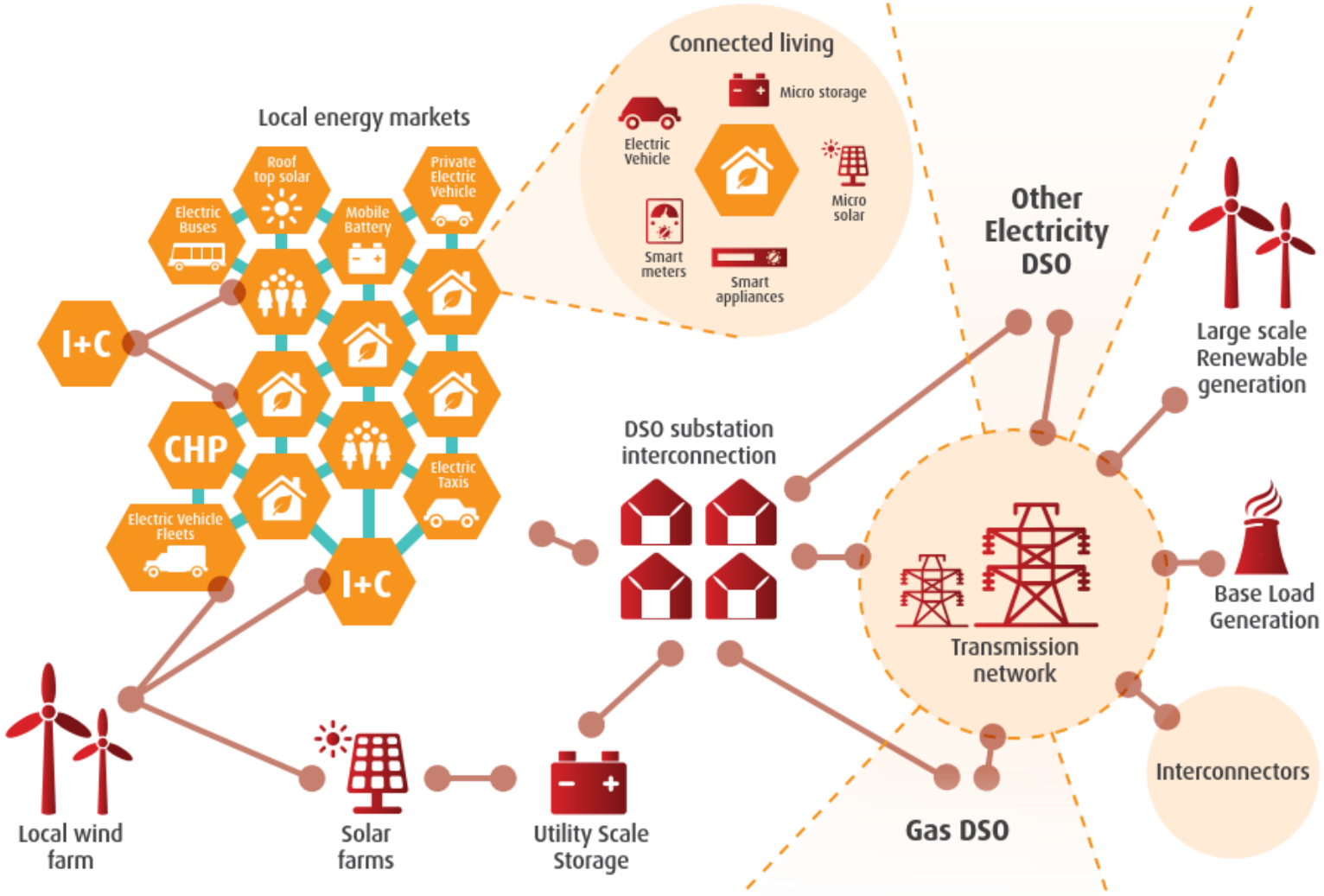
- Ontario’s energy system is set to undergo a revolution as it becomes increasingly decarbonized, decentralized, and digitized
- These changes are driven by national, provincial and municipal 2050 Net Zero targets, specifically focusing on the electrification of transport and heating, as well as increasing the penetration of renewable distributed generation
- Toronto Hydro and its distribution system will play a central role in enabling the achievement of 2050 Net Zero targets
- In this context, long-term, scenarios-based forecasting will play an increasingly significant role in planning, including the development and justification of plans within regional resource and infrastructure planning and regulatory processes.

Future of the energy system (2030? 2050?)

Decarbonization
- Electrification of Heat and Transport
- Increased Distributed Renewable Generation
- Micro generation and storage
- Grid Scale Storage

Digitalization
- Grid IT/OT
- Smart Homes
- Virtual Power Plants
- Flexible Connections

Decentralization
- Microgrids
- Local Energy Markets
- Community Energy



Source: UK Power Networks, Future Smart Consultation Report

Purpose of the Future Energy Scenarios Study

- To provide Toronto Hydro and its stakeholders with an in-depth understanding of the way in which local electricity demand, consumption, and generation (including distributed resources) will change in the future, in order to:
  i. plan efficient and timely network capacity investments (including NWAs);
  ii. develop a grid modernization plan to enable and optimize increasing levels of DERs, EVs, NWAs, etc.;
  iii. develop a common strategic outlook to support different forecasting needs across the company, including load forecasting and revenue forecasting.

- Despite national, provincial and municipal clarity on achieving Net Zero by 2050, there is still significant uncertainty on how this ambitious goal will be achieved.

- Furthermore, the uptake of DERs such as EVs will likely cluster in certain geographic locations, and it is vital to capture these locations and better understand constraints.

- A Future Energy Scenarios study will capture this future uncertainty, as best as possible, and increase the robustness of Toronto Hydro's investment strategy

Target Benefits

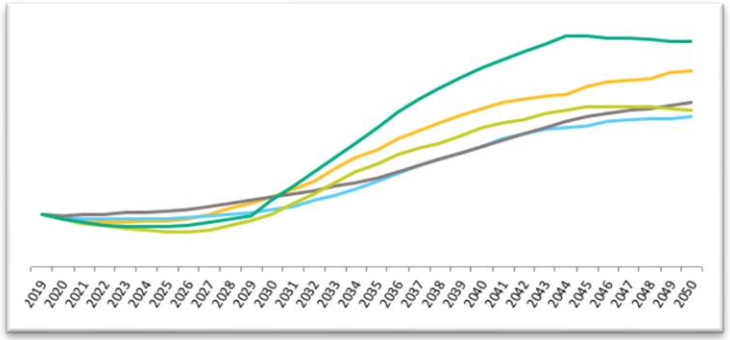
Creating a single Future Energy Scenarios report that models demand, consumption, and generation (including DERs) from today to 2050 as it pertains to Toronto Hydro's service territory will allows us to:

- Demonstrate reasonable and efficient investment plans in the 2025-2029 Rate Application
- Enable better decision making and strategic planning for both capacity-driven investment and other grid modernization investments
- Develop a Toronto Hydro position on the 2050 energy system, consistent across various business units, including revenue and connections forecasting
- Inform decisions on R&D projects and support effective implementation of the UoF strategy
- Enhance customer and stakeholder engagement activities

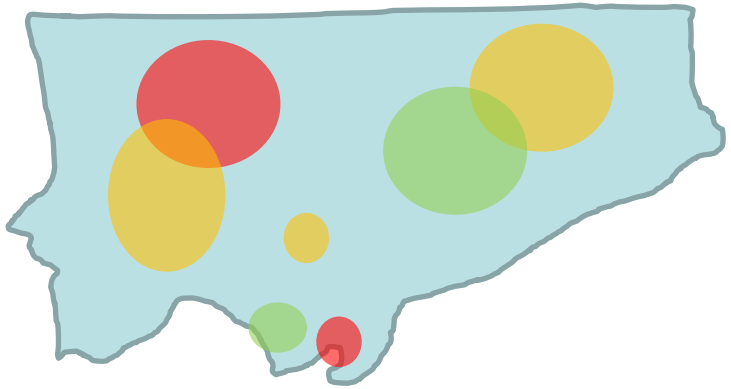
Scope

1. 2050 Demand & Generation Scenarios

- Domestic housing stock
- Industrial and commercial floorspace
- Distributed generation (BTM and FTM)
- Electric Vehicles
- Decarbonized heating (heat pumps)
- Battery storage
- Energy efficiency measures (CDM)
- Demand side response (flexibility)



2. Geospatial Disaggregation



Disaggregate network level forecasts down to an appropriate geospatial resolution to enable investment planning activities

3. Integrate into Business Processes

Strategic Investment Planning:

- Inform capacity driven investment planning programs; “least regret investment”
- Inform intelligent grid projects and strategic targeting of enhanced monitoring and control
- Align with regional planning process

Stakeholder Engagement & CIR Filing 2025-2029:

- Inform stakeholder engagement activities with customers; *bring them along on the journey*
- Solidify a Toronto Hydro position on a plausible future energy system
- Drive discussion on role of LDCs in the future energy system with OEB and policy makers

Agreement for Professional Consulting Services

THIS AGREEMENT is made this 7th day of February, 2022,

BETWEEN:

Toronto Hydro-Electric System Limited,

a corporation incorporated under the laws of Ontario

(hereinafter called "Toronto Hydro")

and

Element Energy Limited,

a limited company incorporated under the laws of England and Wales

(hereinafter called the "Consultant")

WHEREAS:

A. Toronto Hydro has retained the Consultant to provide certain consulting services as detailed in SCHEDULE A (collectively, the "Services");

B. The Consultant has indicated to Toronto Hydro that it has the skill and expertise to provide the Services on the terms and conditions set forth herein;

C. The Consultant has agreed to provide the Services to Toronto Hydro and Toronto Hydro has agreed to purchase the Services, upon the terms and conditions as set forth below; and

D. this Agreement is issued in connection with RFP # 21P-0905 October 6, 2021 (the "RFP"), including any schedules, attachments, amendments, supplements or addenda thereto and the Consultant's submission in response thereto dated October 10, 2021 (the "Proposal").

NOW THEREFORE, in consideration of the mutual covenants set forth herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. INTERPRETATION

Unless otherwise indicated, all capitalized terms in this Agreement shall be as defined in SCHEDULE B and any reference to currency in this Agreement shall refer to lawful money of Canada.

2. RELATIONSHIP OF THE PARTIES

2.1 Retainer

Toronto Hydro hereby retains the Consultant to provide the Services, and the Consultant hereby agrees to provide the Services, during the Term, in accordance with the terms and conditions of this Agreement.

2.2 Independent Contractors

(a) Notwithstanding any provision hereof, this Agreement does not constitute and shall not be construed as constituting a partnership, joint venture, principal/agency relationship, or employer/employee relationship between the parties. The Consultant and Toronto Hydro shall at all times remain independent contractors of each other, and neither party shall represent itself to be an agent or employee of the other.

(b) Without limiting the generality of paragraph 2.2(a), the Consultant hereby acknowledges and agrees that neither it nor its Representatives shall be eligible or entitled, by reason of this Agreement, to participate in any employee-related program offered by Toronto Hydro or any of its Affiliates, including, without limitation, any benefit, insurance, compensation, health plan, bonus or retirement program.

(c) The Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities or claims whatsoever against Toronto Hydro or its Representatives resulting from or relating to the Consultant or its Representatives being deemed to be an employee of Toronto Hydro or any of its Affiliates.

2.3 Conflicts of Interest

The Parties acknowledge that there is potential for a conflict of interest based on services provided by the Consultant from time to time to Toronto Hydro. The Consultant agrees to take all reasonable steps to remove, mitigate or minimize such conflict of interest.

3. TERM

3.1 Term

Unless otherwise terminated in accordance with the provisions hereof, this Agreement shall be for a term of one (1) year, commencing on February 7, 2022 and terminating on February 6, 2023 (the “Initial Term”).

3.2 Toronto Hydro may, at its sole option, upon written notice to the Consultant, at least sixty (60) days before the end of the Initial Term, elect to renew this Agreement for three (3) additional

one (1) year terms (each a "Renewal Term"). The same terms and conditions contained herein shall apply during the Renewal Term, save and except as amended in writing by the parties.

3.3 The Initial Term and the Renewal Term, if any, shall hereinafter together be referred to as the "Term".

4. SERVICE REQUIREMENTS

4.1 Services

During the Term, the Consultant shall perform the Services as detailed in SCHEDULE A hereto.

4.2 Applicable Laws

(a) The Consultant shall, at its sole expense, obtain and maintain during the Term of this Agreement, all permits, licences and approvals required by all Applicable Laws to perform its obligations under this Agreement. The terms and conditions of this Agreement shall be carried out in strict compliance with all Applicable Laws and in the event of any conflict between any Applicable Laws, the Applicable Laws with the most stringent standard shall apply.

(b) Without limiting the generality of the foregoing, and to the extent applicable to the Consultant, the Consultant shall comply with the *Municipal Freedom of Information and Protection of Privacy Act* (Ontario) ("MFIPPA"), the *Personal Information Protection and Electronic Documents Act* (Canada) ("PIPEDA"), the Information Protection and Privacy Contract Requirements set out in SCHEDULE C of this Agreement, and any other applicable privacy legislation (collectively, "Privacy Laws") with respect to any personal information collected, used or disclosed in connection with this Agreement and shall indemnify and hold harmless Toronto Hydro and its Representatives from and against any and all claims, demands, suits, losses, damages, causes of action, fines or judgments (including related expenses and legal costs) they may incur related to or arising out of any non-compliance therewith.

(c) Without limiting the generality of Subsection 4.2(b) above, the Consultant shall comply with the Information Protection and Protection of Privacy Contract Requirements attached as SCHEDULE C hereto.

(d) Where any Deliverable is subject to the approval or review of any authority, department, government or agency other than Toronto Hydro, such applications for approval or review shall, unless otherwise authorized by Toronto Hydro in writing, and where it is agreed in writing that these shall be prepared by the Consultant, be approved and submitted by and through the offices of Toronto Hydro, and the Consultant shall not have any direct dealings with the authority, department, government or agency in question with regards to the Deliverable.

(e) The Consultant and the Consultant's personnel shall comply with all rules and direction of Toronto Hydro, whether specified in this Agreement or otherwise, while working on Toronto Hydro's premises or when accessing or connecting to Toronto Hydro's information technology systems, including rules and directions concerning health,

safety, security and environmental protection, including without limitation, Toronto Hydro's *Code of Business Conduct and Whistleblower Procedure,* Toronto Hydro's *Disclosure Policy,* Toronto Hydro's *Social Media and Digital Communication Policy,* Toronto Hydro's *Accessibility Policy,* Toronto Hydro's *Workplace Harassment Policy and Program,* Toronto Hydro's *Violence Prevention in the Workplace Policy,* Toronto Hydro's *Workplace Alcohol and Drug Policy*, Toronto Hydro's *Environmental Policy,* Toronto Hydro's *Occupational Health and Safety Policy,* Toronto Hydro's *Privacy Policy,* Toronto Hydro's *Cyber Security Policy*, Toronto Hydro's *Technology Use Guidelines*, Toronto Hydro's *Physical Security Policy*, Toronto Hydro's *COVID-19 Vaccination Policy,* and the *Affiliate Relationships Code for Electricity Distributors and Transmitters* issued by the OEB (together, the "Guidelines"). The Consultant agrees to comply with and to direct its Representatives to comply with such Guidelines, as amended.

4.3 Performance

(a) The Services shall be performed in accordance with the standards and specifications stated in this Agreement, and Toronto Hydro shall have the right at all reasonable times, to inspect or otherwise review the Services performed or being performed. The Consultant shall, upon the request of Toronto Hydro, acting reasonably, provide Toronto Hydro with written reports of the status of the Deliverables and the Consultant's progress in providing the Services.

(b) In the event of any dispute between Toronto Hydro and the Consultant relating to the quality or acceptability or rate of progress of any of the Services, or relating to the interpretation of any instructions or specifications concerning the Services, Toronto Hydro and the Consultant shall attempt to mutually reach a resolution in good faith. Failing a good faith resolution, the affected party shall have the right to bring a claim.

5. REPRESENTATIONS, WARRANTIES, INDEMNITIES AND INSURANCE

5.1 Representations and Warranties

The Consultant hereby represents, warrants and agrees that:

(i) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) has/have the necessary experience and qualifications to perform the Services;

(ii) it (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) will perform the Services in a diligent, expeditious and workmanlike manner, consistent with standards generally observed by reputable and competent members of the same industry providing similar services;

(iii) all Services shall be the Consultant's (or, where the Consultant is a corporation or partnership, its Representatives performing the Services) original work and none of the Services or any invention, development, use, production, distribution or exploitation relating thereto will infringe, misappropriate or violate any intellectual property or other right of any person or entity.

5.2 Indemnity

a) The Consultant shall be liable for and shall indemnify and hold harmless Toronto Hydro and its Representatives from all claims, demands, actions, penalties, damages, losses, judgments and settlements, liabilities, costs, expenses, including legal fees and other related costs and expenses arising out of, related to, or incident to, the Consultant or any of its Representatives' negligent performance of the Services under this Agreement, including, without limitation:

i. any breach, violation or non-performance by the Consultant or any of its Representatives of any terms, conditions, warranties, obligations or covenants contained in this Agreement;
ii. any breach or violation by the Consultant or any of its Representatives of any Applicable Laws; and
iii. any negligent actions, omissions, negligence or wilful misconduct of the Consultant or any of its Representatives

except to the extent caused by the negligence or wilful misconduct of Toronto Hydro or its Representatives.

b) In no event shall either party be liable for loss of profit or use or for any indirect, special, incidental or consequential damages of any nature or kind including but not limited to delays, loss of revenue, loss of use, loss of data, loss of product, costs of capital or costs or replacement power, even if that party has been advised of the possibility of such damages.

c) Subject to section 5.2(d), the Consultant's liability for a claim for damages shall be limited to two (2) times the amount payable by Toronto Hydro to the Consultant pursuant to this Agreement.

d) Notwithstanding the foregoing, no exclusion or limitation of liability shall apply to:

i. Breach of the confidentiality or privacy obligations in this Agreement;
ii. Intentional misconduct or gross negligence;
iii. Breach of Applicable Law; or
iv. Breach of intellectual property indemnity in Section 9.

5.3 Insurance

(a) The Consultant shall, during the Term, and at its own expense, maintain and keep in full force and effect (and, when requested, provide Toronto Hydro with proof thereof):

(b) commercial general liability insurance on an occurrence basis having inclusive coverage limit, including personal injury and property damage, of not less than four million Canadian dollars ($4,000,000) per occurrence and in aggregate which commercial general liability insurance shall be extended to cover contractual liability, products and completed operations liability, and owners/contractors protective liability;

(c) Computer Security and Privacy Liability insurance covering actual or alleged acts, errors or omissions committed by the Consultant or its Representatives of not less than five million Canadian dollars ($5,000,000.00). The policy shall expressly provide, but not be

limited to, coverage for the following perils:

i. unauthorized use/access of a computer system

ii. defense of any regulatory action involving a breach of privacy

iii. failure to protect confidential information (personal and commercial information) from disclosure notification costs, whether or not required by statute;

(d) With the exception of Professional Indemnity insurance, all insurance coverages and limits required to be maintained hereunder shall: (i) be primary to any insurance maintained by Toronto Hydro, which insurance shall be excess and non-contributory; (ii) contain a cross liability clause and a severability of interest clause;

(e) The Consultant agrees that the insurance required hereunder in no way limits the Consultant's liability pursuant to the Liability and Indemnity provision in Section 5.3.

(f) With the exception of Professional Indemnity insurance, a waiver of subrogation shall be provided by the insurer(s) to Toronto Hydro.

6. FEES

6.1 Fees

(a) Subject to paragraphs 6.1(c) - 6.1(f), in exchange for the performance of the Services in accordance with the terms hereof, Toronto Hydro shall pay the Consultant the rates outlined in SCHEDULE A, not including HST (the "Fee").

(b) The Fee noted in subsection 6.1(a) shall be the only fee payable by Toronto Hydro under this Agreement. Without limiting the generality of the foregoing, the Consultant hereby agrees and acknowledges that all out-of-pocket expenses, travelling costs, and other disbursements shall be at the sole expense of the Consultant, except with the prior written approval from Toronto Hydro.

(c) Any disbursements for additional incidentals incurred by the Consultant in relation to this Agreement ("Disbursements") must be pre-approved by Toronto Hydro in writing.

(d) The Consultant shall not incur or submit invoices for any work outside the scope of the Services without prior written approval from Toronto Hydro.

(e) The Consultant shall make all payment of taxes, employment insurance premiums, pension plan contributions and any other taxes or other payment of any nature, imposed by any authority in respect of the Fee paid by Toronto Hydro to the Consultant under this Agreement (together, the "Remittances"), and the Consultant hereby covenants and agrees to indemnify and save harmless Toronto Hydro and its Representatives from and against all costs, liabilities and claims whatsoever against Toronto Hydro or its Representatives, in any way arising out of or relating to any failure to deduct, withhold, or remit any Remittance.

(f) Without limiting the generality of paragraph 6.1(a), Toronto Hydro reserves the right to deduct any applicable non-resident withholding taxes from any Fee owing to the Consultant under this Agreement and remit such amounts to the applicable taxation authority.

6.2 Payment

The Consultant shall submit invoices to Toronto Hydro on a monthly basis containing:

(i) a description of the Services performed during the invoice period;

(ii) the monthly payment amount;

(iii) the total HST applicable to the Services during the invoice period, as well as the Consultant's HST registration number; and

(iv) a detailed description of the Disbursements incurred around the invoice period, supported by documentation in a form acceptable to Toronto Hydro.

Unless otherwise provided in this Agreement, the Consultant shall invoice Toronto Hydro after final inspection and acceptance by Toronto Hydro of the Services performed and subject to receipt of all documents required by this Agreement. **Invoices must be sent electronically to: AP@torontohydro.com.** Subject to approval of the invoice by Toronto Hydro, receipt of all documents required by this Agreement, and final review by Toronto Hydro, Toronto Hydro shall make payment to the Consultant via electronic funds transfer not later than thirty (30) days following receipt of an acceptable invoice and the EFT Information (as set out below). **The Consultant must provide Toronto Hydro with, in the case of the first payment only, (i) a void cheque, pre-printed deposit slip or bank confirmation letter and (ii) the email address where the Consultant wishes to receive remittance information (together, "EFT Information"). EFT Information must be sent electronically to efthelp@torontohydro.com or to 14 Carlton Street, Toronto, ON, M5B 1K5, Attention: Treasury Department.** Toronto Hydro reserves the right to pay the Consultant through other payment methods.

7. SUSPENSION OR TERMINATION

7.1 Suspension or Termination

(a) Toronto Hydro may, at any time during the Term by notice in writing, suspend all or a portion of the Services. Upon receipt of such written notice, the Consultant shall perform no further work other than as directed by Toronto Hydro, and shall be entitled to payment for time spent in performing the Services up to the date of suspension.

(b) Either party may terminate this Agreement immediately upon written notice where the other party enters into liquidation, whether compulsory or voluntarily, or where a proceeding in receivership, bankruptcy or insolvency has been instituted by or against such party or its property.

(c) Toronto Hydro, at its sole discretion, may terminate this Agreement immediately upon

written notice where due to an act or omission of the Consultant or any of its Representatives has been in material default in the performance of its duties, obligations or undertakings under this Agreement, and has not taken immediate steps to remedy such default within two (2) Business Days following written notice of the specific default by Toronto Hydro. For the purposes of this section, a material default shall include, without limitation, a breach of any of the representations or warranties contained herein or the failure or refusal to provide the Services in accordance with the terms and conditions of this Agreement.

(d) Notwithstanding any other provision in this Agreement, Toronto Hydro, at its sole discretion, shall have the right to terminate this Agreement, for any reason, upon 60 days' written notice to the Consultant.

(e) The Consultant shall have the right to terminate in the event of a breach by Toronto Hydro that is not remedied by Toronto Hydro within 60 days after receiving notice from the Consultant.

(f) In the event that this Agreement is terminated in accordance with this section 7.1 by either party, the Consultant shall be entitled to payment for time spent in performing the Services up to the date of suspension.

7.2 Effect of Termination

Upon the termination or expiration of this Agreement, upon Toronto Hydro's request, the Consultant shall return to Toronto Hydro and delete any and all electronic copies, with the exception of file server backups, the Consultant may have of all documents and materials in its possession relating to the Services or this Agreement, including all Confidential Information and all Deliverables, whether completed or not.

8. CONFIDENTIALITY

8.1 Non-Disclosure

In performing the Services required by this Agreement, the Consultant may be provided access to Confidential Information. The Consultant acknowledges and agrees that:

(a) the Consultant shall not disclose, permit access to, transmit, or transfer the Confidential Information to any third party without the prior written authorization of Toronto Hydro;

(b) the Consultant shall protect the confidentiality of the Confidential Information in its possession by exercising the same security measures it normally exercises with respect to its own confidential information and at minimum a reasonable standard of care;

(c) upon the request of Toronto Hydro, and in any event upon the expiration or termination of this Agreement for any reason, the Consultant shall, with the exception of file server backups, return (or delete, in the case of electronic documents) forthwith to Toronto Hydro all Confidential Information, including all copies and other materials containing the Confidential Information, which are in the possession or under the control of the Consultant; and

(d) the Consultant shall not use any Confidential Information for any purpose other than to perform the Services required by this Agreement. Without limiting the foregoing, the Consultant shall not, and shall not permit any of its Representatives to, use any Confidential Information in furtherance of its, or their, individual business or for its, or their, own benefit, profit or advantage, or for the benefit, profit or advantage of any other party.

Notwithstanding the foregoing, the Consultant may disclose such Confidential Information to any of the Representatives of the Consultant who agree to be bound by the obligations of confidentiality herein and who have a reasonable need to know such Confidential Information in the course of their duties for the Consultant but only for the purposes of the Consultant exercising its rights and obligations under this Agreement; and in the event that the Consultant believes it is required by law to disclose, or is requested by a governmental authority to disclose, any Confidential Information to a governmental authority; provided that the Consultant shall, to the extent permitted by law, first inform Toronto Hydro of the request or requirement for disclosure to allow an opportunity for Toronto Hydro to apply for an order to prohibit or restrict such disclosure.

8.2 Non-Solicitation

Not applicable.

9. <u>INTELLECTUAL PROPERTY</u>

9.1 Use

Nothing in this Agreement shall be deemed to transfer, license, assign, permit the use of, or otherwise convey an interest in whole or in part to the Consultant of any Intellectual Property belonging to Toronto Hydro or any of its Representatives or any third party whose Intellectual Property is in Toronto Hydro's custody or control, and the use by the Consultant of any such Intellectual Property shall be subject to the prior written approval of Toronto Hydro.

9.2 Ownership

The Consultant shall retain all intellectual property rights in the Deliverables provided by the Consultant for use by Toronto Hydro, and subject to payment in full, shall grant Toronto Hydro a licence to use the Consultant's intellectual property for the purposes specified in this Agreement. The Parties acknowledge and agree that the reporting outputs produced by the model may be provided to third-parties, including, but not limited to, the City of Toronto, the IESO, and the OEB, by Toronto Hydro in accordance with the Consultant's obligations set out in Section 1 of SCHEDULE A below.

9.3 Intellectual Property Protection

The Consultant expressly warrants that the manufacture, delivery, sale or use of the Consultant's Services will not infringe any Canadian or foreign patents, trademarks, copyrights, industrial design or other intellectual property rights and the Consultant shall indemnify and save Toronto Hydro harmless from all claims, judgments and decrees that may be entered against Toronto Hydro or its Representatives and against all damage, liability, costs and

expenses (including legal fees and other attendant costs and expenses) Toronto Hydro incurs by reason of any infringement or claim thereof except to the extent that such infringement arises out of, or is caused by an instruction by Toronto Hydro, or by any use or modification of the services or deliverables in a manner not consistent with the purpose of the Services under this Agreement.

9.4 Pre-Existing Intellectual Property

Any pre-existing Intellectual Proprietary ("Pre-Existing IP") of Consultant or its licensors used to perform Services, or included in any Deliverable, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of the Consultant and its licensors (collectively, "Consultant Information"). For greater clarity, Consultant Information shall further include Consultant Software and any intellectual property, including Pre-Existing IP developed by Consultant during the Term of this Agreement, including that intellectual property that may occur during the provision of the Services under this Agreement, except that to the extent such Consultant Information incorporates Toronto Hydro Confidential Information, such Confidential Information remains the exclusive property of Toronto Hydro and Consultant shall not implement or use such Confidential Information except for the provision of the Services. To the extent that Consultant incorporates any Consultant Information into the Deliverable(s) and subject to payment in full of the fees under this Agreement, Consultant hereby grants to Toronto Hydro a fully paid up, royalty free, irrevocable and non-cancellable, non-exclusive, right to use the Consultant Information, except that any such use must be in conjunction with the Deliverables in which the Consultant Information is incorporated and not as a separate item. Consultant shall provide Toronto Hydro with a list of any freeware, shareware or open source software used in the Deliverables. Any pre-existing intellectual property of Toronto Hydro, including but not limited to software, appliances, methodologies, code, templates, tools, policies, records, working papers, know-how, data or other intellectual property, written or otherwise shall remain the exclusive property of Toronto Hydro.

10. HEALTH AND SAFETY

The Consultant shall be responsible for managing the health and safety of its own personnel and other Representatives.

11. MISCELLANEOUS

11.1 Survival

In addition to the terms in this Agreement that by their nature survive the expiry or termination of the Agreement, the terms of section 5 (Representations, Warranties and Indemnities), section 8 (Confidentiality), section 9 (Intellectual Property), and subsection 11.3 (Injunctive Relief) shall survive the expiry of this Agreement for a term of five (5) years.

11.2 Subcontracting

The Consultant may not subcontract the performance of any part of the Services without Toronto Hydro's prior written approval. Where Toronto Hydro provides its prior written approval to the Consultant to subcontract all or part of the Services, then the Consultant shall enter into agreements with such permitted subcontractor(s) to require the permitted subcontractor(s) to provide Services in accordance with all of the terms of this Agreement. Notwithstanding the foregoing, the Consultant shall remain liable for any and all acts or omissions of any subcontractor(s) as if such acts or omissions were those of Consultant.

11.3 Injunctive Relief

(a) The Consultant acknowledges and agrees that the terms of section 8 (Confidentiality) and section 9 (Intellectual Property) of this Agreement are reasonably necessary to protect the legitimate interests of Toronto Hydro, are reasonable in scope and duration, and are not unduly restrictive.

(b) The Consultant further acknowledges that a breach of any of the terms of section 8 (Confidentiality) or section 9 (Intellectual Property) would render irreparable harm to Toronto Hydro, and that a remedy at law for breach of these sections would be inadequate, and that Toronto Hydro shall therefore be entitled to seek any and all equitable relief, including, without limitation, injunctive relief, and any other remedy that may be available at law or in equity.

11.4 Force Majeure

Either party will be relieved of liability for delays in performance of its obligations hereunder where such delay is a result of Force Majeure. The party affected by the Force Majeure shall give prompt notice thereof to the other party and, upon cessation of the Force Majeure, shall take all reasonable steps to resume the performance of its obligations hereunder. If a delay in performance by reason of Force Majeure extends beyond thirty (30) Business Days, then either party may terminate this Agreement by written notice.

11.5 Non-Exclusive Agreement

This Agreement will not be interpreted to grant to the Consultant exclusive rights to provide the Services or to bind Toronto Hydro in any way to an exclusive relationship with the Consultant with regards to the Services or any other service.

11.6 Waiver

No delay on the part of either party in exercising any of its rights hereunder or failure to exercise the same, nor the acquiescence thereto shall operate as a waiver except in the specific instance for which it is given and where such waiver is provided in writing by the party waiving its rights.

11.7 Amendments

None of the terms, conditions or provisions of this Agreement shall be varied, modified or altered except by written agreement signed by an authorized representative of each parties.

11.8 Assignment

Save and except for Toronto Hydro's right to assign this Agreement to any of its Affiliates, neither party may assign this Agreement or any of their rights or obligations hereunder, without the prior written authorization of the other party, acting reasonably.

11.9 Enurement

This Agreement shall enure to the benefit of, and be binding upon, the parties hereto and their respective successors and permitted assigns.

11.10 Severability

In the event that any provision or portion of this Agreement is determined to be invalid or unenforceable for any reason, the remaining provisions or portions of this Agreement will be unaffected and will remain in full force and effect to the fullest extent permitted by law.

11.11 Neutral Construction

The parties to this Agreement agree that this Agreement was negotiated fairly between them at arm's length, that the final terms of this Agreement are the product of the parties' negotiations, and that this Agreement shall be deemed to have been jointly and equally drafted by them, and that the provisions thereof should not be construed against a party on the grounds that such party drafted the Agreement in whole or in part.

11.12 Entire Agreement

This Agreement constitutes the entire agreement between the parties relating to the subject matter hereof. This Agreement supersedes any and all prior correspondence, warranties, covenants, collateral undertakings, or agreements, oral or otherwise, express or implied, unless otherwise contained herein.

11.13 Notices

(a) All questions or other communications regarding this Agreement, including any notices required by this Agreement, are to be addressed to the following addresses:

to Toronto Hydro:

Name:	**Matthew Higgins**
Title:	Director, Integrated Planning & Modernization
Address:	500 Commissioners St., Toronto Hydro, ON M4M 1N7
Telephone:	(416) 450-2713
Email:	mhiggins@torontohydro.com

with copy to:

Title:	EVP, Public and Regulatory Affairs & Chief Legal Officer
Address:	14 Carlton, Toronto Hydro, ON M5B 1K5
Telephone:	(416) 542-3000
Email:	legal@torontohydro.com

to the Consultant:

Name:	**Mark Hughes**
Title:	Partner
Address:	Element Energy, Suite 1, Bishop Bateman Court, Thompson's Lane, Cambridge, CB5 8AQ, UK
Telephone:	+44 (0)1223 852 499
Email:	mark.hughes@element-energy.co.uk

(b) All notices or communications shall be deemed to be received on the date of acceptance (as evidenced by the signature of the party) if delivered by personal delivery or courier, on the fifth (5th) Business Day after mailing, if mailed by first class mail, or on the first (1st) Business Day after transmission, if sent by facsimile (provided the transmission is evidenced by documented proof of proper fax transmittal).

11.14 Governing Law

This Agreement shall be governed by and construed in accordance with the law of the Province of Ontario and the laws of Canada applicable therein.

[remainder of this page intentionally left blank]

11.15 Execution

This Agreement may be signed in counterparts and delivered by electronic means, each of which shall be deemed an original and all of which, together, shall have the same effect as if all constitute one and the same Agreement.

IN WITNESS WHEREOF, the parties have duly executed this Agreement as of the date first written above:

Element Energy Limited

Per: _____

Name: Mark Hughes

Title: Partner

I have authority to bind the Consultant.

Toronto Hydro-Electric System Limited

Per: Elyberogiannis _____

Name: Elias Lyberogiannis

Title: Executive Vice President, Planning, Chief Engineering, and Modernization Officer

I have authority to bind Toronto Hydro.

SCHEDULE A

SERVICES AND RATES

1. Services to be Performed

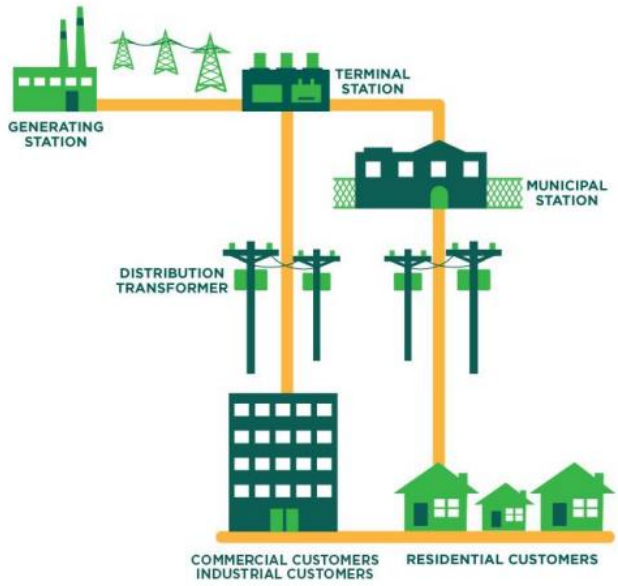
(a) Future Energy Scenarios Model

Toronto Hydro requires the development of a future energy scenarios model that produces scenario-based 2050 forecasts for peak load (kVA), generation (kW), and energy consumption (kWh). The model will be used to understand the range of possible future energy scenarios in order to inform capacity-driven investment, grid modernization investment, as well as revenue forecasting.

Toronto Hydro is supplied electricity from Hydro One Networks Inc. (HONI) at 230kV, 115kV, 27.6kV, or 13.6kV at 37 Terminal Stations (TS) located across the City of Toronto. Electricity is then delivered to end-users through the distribution system. Refer to Figure 1 below for a basic structure of the electricity system infrastructure. The future energy scenarios must be modelled, at a minimum, at the 37 Terminal Stations and associated buses. A more granular geospatial resolution may also be considered. The project is proposed to be carried out in two phases, as described in the following sections. Any alternative approaches should be described in detail and provided in addition to proposed approach. If alternative approaches are included, a clear justification of why the approach is more favourable to Toronto Hydro is required.

The Consultant shall designate a primary contact who will delegate work to its team as requested by Toronto Hydro, and is the key contact person for managing the working relationship with Toronto Hydro.

Figure 1. Basic electricity system infrastructure



Phase 1: Energy Scenario Development & Stakeholder Engagement

This phase requires the development of a minimum of 3 and up to 5 future energy scenarios. The future energy scenarios must model the base load as well as the uptake of the key drivers listed in table 1 below up to 2050. The model must not rely on pre-existing Toronto Hydro models and must build up these models using a bottom-up approach and aggregate up to the terminal station bus level.

The forecasts for technology uptake must be built using the Consultant's own models, tools and methodologies. It is preferred that technology uptake scenarios are modelled bottom-up, using consumer choice modelling by analyzing economic and demographic data and leveraging publicly available data for the City of Toronto. This requirement will enable Toronto Hydro to increase the sophistication of its modelling practices and future-proof the model for when Toronto Hydro chooses to model at a more granular geospatial resolution.

Table 1. Key drivers required for the future energy scenarios model

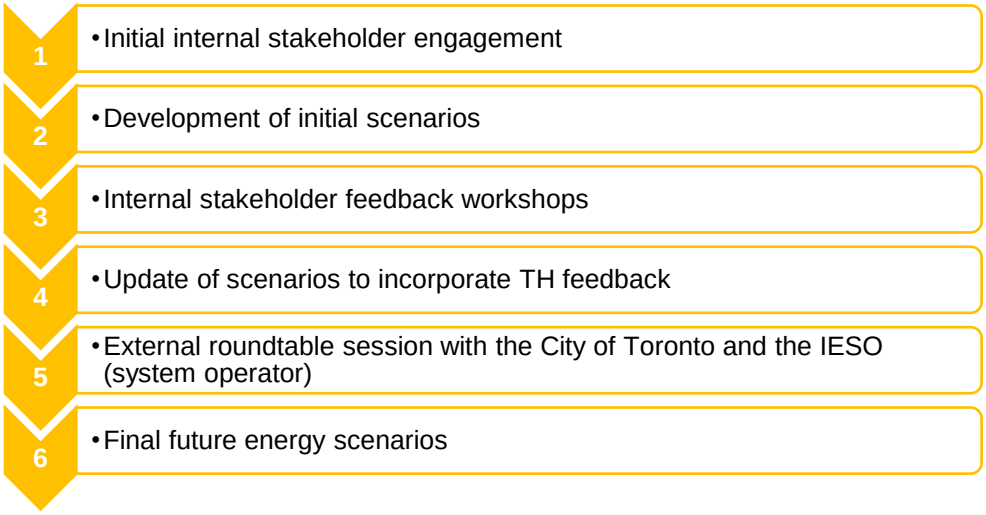
No.	Key Driver
1	Residential housing growth
2	Industrial & Commercial growth broken down by type (retail, office, industrial etc.)
3	Electric vehicle uptake by type (light duty private, fleet, buses, taxis etc.)
4	Distributed generation by type and size (solar, wind, bio-gas, diesel, and natural gas/CHP must all be considered)
5	Appliance growth by type
6	Conservation demand management driven by province wide programs and by natural customer choices (also referred to as energy efficiency)
7	Decarbonized heating (air source and ground source heat pumps)
8	Domestic and grid-scale Battery Energy Storage Systems (BESS)
9	Customer flexibility (services available to manage network constraints, such as vehicle to grid, smart EV charging and other demand side response technology)
10	Any other key drivers deemed important for the Toronto Hydro service area as part of the

	research and stakeholder engagement activities in this phase

(b) Stakeholder Engagement

The scenarios must be designed through continuous engagement with internal project stakeholders to seek agreement on assumptions and projections. The Consultant is also required to support some external stakeholder engagement to meet, at a minimum, the level of engagement outlined in figure 2 below. The timing of the roundtable sessions with external stakeholders will be determined by Toronto Hydro in accordance with its regulatory stakeholder engagement process.

Figure 2. Minimum level of internal and external stakeholder engagement required for the development of the future energy scenarios



Phase 2: Network Data Cleansing and Modelling

This phase requires the cleansing of Toronto Hydro network and customer data, as well as the modelling of the future energy scenarios. This requires:

- Cleansing and analyzing network load, energy and generation data.
- Cleansing and analyzing network topology and connectivity data.
- Cleansing and analyzing customer connection requests data for inclusion in the forecast (for first 1-5 years).
- Producing annual and monthly peak demand (kVA), energy consumption (kWh), generation (kW) and customer number forecasts from 2022 to 2050. Coincident and non-coincident peak demand should be calculated. Forecasts are required at the following levels:
    - Total distribution system, aggregate and by customer class
    - By each terminal station bus level, aggregate and by customer class
    - By each key driver, aggregate and by customer class
        - For EVs, Distributed Generation, and Heat Pumps, forecasts should also include the volume of each type of technology

The following data sets provided by Toronto Hydro will aid the Consultant with this task. The Consultant must specify any other data sets required outside of the list below. The Consultant should assume an

extensive level of cleansing required for most of the data sets provided.

- Complete network topology of all transformer stations per voltage level and their associated feeders, along with the number, location and type of customers connected.
- Hourly monitored demand data for all substations for the most recent full year.
- List of known distributed generation and energy storage installations across the network with technology type, start year, and connectivity to the network.
- Hourly monitored generation data for large-scale distributed generation installations, where available.
- Total units distributed (kWh) annually and hourly by customer class for the most recent full year
- Customer numbers by customer class.

(c) Non-Functional Requirements

- The future energy scenarios model must be agile, enabling Toronto Hydro to quickly and easily change parameters and assumptions for each scenario, without having to re-configure the model each time.
- The model must be designed in a manner that allows Toronto Hydro to update various elements of the model internally, without the reliance on the Consultant. Training for the model must be included in the Consultant's proposal.
- The model must be easy to use and include a functional user interface
- The model must be delivered with a detailed user manual explaining the inner mechanics of the model.
- The model must provide visual graphs and charts that are useful for communicating the output of the model in a stakeholder friendly manner. At a minimum, the visuals should include:
    - Each of the technology drivers, aggregated and by single driver, at a network level and at each substation, from current year to 2050.
    - The base load, aggregated and by type of customer, at a network level and at each substation, from current year to 2050.
    - Each of the future energy scenarios.
- If the proposed model is cloud-based, the Consultant must meet Toronto Hydro's IT Security standards for how the model is hosted and updated in the future.
- Toronto Hydro will own all rights, title, and interest, including without limitation, all intellectual property rights in the information provided by Toronto Hydro to the Consultant as part of this project, including any output of the model.

(d) Project Management Requirements

The Consultant is required to participate in weekly project meetings through video conferencing with the core internal Toronto Hydro team, and to provide project status updates at these meetings in an agreed upon format. They must also participate in internal workshops with a wider group of internal stakeholders as and when required, through virtual video conference calls or in-person.

(e) Project Deliverables

The project Deliverables shall include:

- The Future Energy Scenarios model that meets the requirements outlined in earlier sections.

- A detailed user manual for the model that outlines the inner mechanical workings of the model and that may be used for training of Toronto Hydro staff.
- A detailed internal-facing final report that outlines all of the modelling assumptions, input data, modelling methodologies, as well as the results from the project.

The Consultant may also be required to deliver, at Toronto Hydro's request, an external-facing report that meets regulatory requirements and appropriately describes the results of the future energy scenarios model. The Fees for this additional Deliverable shall be in accordance with the rates set out below..

(f) Annual Update and Maintenance of Model

The Consultant must outline the recommended level of model maintenance and updates, and the pricing for this activity on an annual basis. These costs should be separated and will not be considered as part of the initial project execution but will be taken into consideration when assessing the suitability of the model for Toronto Hydro. Should Toronto Hydro require the Consultant to provide annual updates, Toronto Hydro may do so as part of this Agreement at its own discretion.

(g) Participation in Toronto Hydro's Regulatory Application Process

The Consultant must be available to speak to the work carried out as part of this project in a regulatory proceeding as required by the Ontario Energy Board and as directed by the Toronto Hydro Regulatory team.

(h) Weather Correction of Network Data

The Consultant will provide a weather correction service (i.e. correcting hourly true demand data for each network asset, or on other such frequencies as requested by Toronto Hydro) as part of Phase 1 and Phase 2. The Fees for such service shall be a lump-sum, as more particularly set out in section 2(a) of this SCHEDULE A below.

2. <u>Rates</u>

a) Model Fees

In exchange for the Services set out in Section 1 of this SCHEDULE A (and in particular, subsections (a), (b), (c), (d), (e), and (h) thereto), Toronto Hydro shall pay the Consultant the following Fees on a milestone basis, as more particularly set out in the tables below:

Phase 1		
Milestone #	**Description**	**Fixed Cost/Fee ($)**
MS 1:	Kick-off meeting	$0.00
MS 2:	Initial round of stakeholder engagement conducted	$30,245.00
MS 3:	Final round of stakeholder engagement (internal and external) completed	$165,290.00
MS 4:	Final scenarios with associated documentation to Toronto Hydro	$65,875.00

Total		**$261,410.00**

Phase 2		
Milestone #	**Description**	**Fixed Cost/Fee ($)**
MS 1:	Kick-off meeting	$0.00
MS 2:	Present proposed approaches for customer archetypes, geographical distributions, profile shapes and load factors to Toronto Hydro	$22,625.00
MS 3:	Provide preliminary model outputs to Toronto Hydro for review	$112,060.00
MS 4:	Final EELG model with associated documentation to Toronto Hydro	$43,150.00
Total		**$177,835.00**

	Total Project Cost (Phase 1 and Phase 2):	**$439,245.00**
Weather Correction of Network Data		
Rate	Weather correction (annual or on a frequency prescribed by Toronto Hydro)	**$33,600.00**

	Project Total	**$472,845.00**

b) Annual Maintenance

In addition to the Fees set out in subsection 2(a) above, should Toronto Hydro elect to exercise the Renewal Terms of this Agreement, Toronto Hydro shall further pay to the Consultant, the following Fees for the Services set out in subsection 1(f) of this SCHEDULE A above. The Fees indicated below shall be payable on the commencement of each Renewal Term:

Annual Maintenance		
Year	**Description**	**Annual Fixed Cost/Fee ($)**
1	Year 1	$35,850.00
2	Year 2	$35,850.00
3	Year 3	$35,850.00
Maximum Possible Total		**$107,550.00**

c) Consultant Rate Card

In addition to the Fees further set out above, where Consultant shall be required to assist Toronto Hydro with respect to any external discussions, at Toronto Hydro's sole option and request, as more

particularly set out in section 1 of this SCHEDULE A above (in particular, subsections (e) and (g) thereto), Toronto Hydro shall compensate the Consultant on an hourly basis in accordance with the following rates for each of Consultant's personnel:

Rate card		
Rate ID	**Role / Description**	**Hourly rate ($)**
Rate 1:	Partner	$295.00
Rate 2:	Principal Consultant	$200.00
Rate 3:	Senior Consultant	$175.00
Rate 4:	Consultant	$155.00

SCHEDULE B

DEFINITIONS

In this Agreement, the following definitions shall apply:

"Affiliates"	has the meaning prescribed to it in the *Business Corporations Act* of Ontario, as amended from time to time;
"Agreement"	means this Agreement for Professional Consulting Services, including all recitals, schedules and attachments thereto;
"Applicable Laws"	means all federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to the Consultant's services under this Agreement, including without limitation all applicable OEB codes, rules or guidelines;
"Business Day"	means a day on which banks are open for business in the City of Toronto, Ontario, but does not include a Saturday, Sunday, or a civic or statutory holiday in the Province of Ontario;
"Confidential Information"	means the terms of this Agreement and any and all data or information relating to the business, management or affairs of Toronto Hydro, its customers, employees, or any of its Affiliates disclosed by Toronto Hydro to the Consultant pursuant to this Agreement, whether or not such Confidential Information is expressly identified as confidential. Notwithstanding the foregoing, Confidential Information does not include any information or data which: (a) information or data that is or becomes publicly known through no breach of the terms or conditions of this Agreement; (b) information or data that is independently developed without reference to Confidential Information and without breach of the terms and conditions of this Agreement; or (c) Confidential Information that is required by court order or other legal compulsion to be disclosed, in which case the Consultant shall give Toronto Hydro prior written notice of such disclosure, as permitted by law;
"Deliverable"	means any and all works prepared, generated, created or designed by the Consultant pursuant to this Agreement, including without limitation all drawings, models, designs, formulae, methods, documents, reports, software, specifications, or source codes, and any related works, enhancements, modifications or additions thereto;
"Disbursements"	shall have the meaning as prescribed in paragraph 6.1(c);
"Fees"	shall have the meaning as prescribed in paragraph 6.1(a);

"Force Majeure"	means any impediments beyond the control of the applicable party due, wholly or in part, directly or indirectly, to include: strikes, lockouts, riots, epidemics, war, governmental regulations, fire, explosions, acts of God, or any other impediment beyond the control of the party affected;
"Hourly Rate"	shall have the meaning prescribed in paragraph 6.1(a);
"HST"	means Harmonized Sales Tax;
"Guidelines"	has the meaning prescribed in paragraph 4.2(e);
"Intellectual Property"	includes all trademarks, copyrights, patents, business names, trade secrets, proprietary software, analysis or techniques (whether or not patented or patentable), confidential or secret designs and processes, source codes, plans or devices, or other proprietary and intellectual property rights;
“Representatives”	in respect of a party, means such party's directors, officers, employees, agents and contractors, the party's Affiliates, and all such Affiliates' respective directors, officers, employees, agents and contractors;
"Remittances"	has the meaning prescribed to it in paragraph 6.1(e);
"Term"	has the meaning prescribed to it in subsection 3.1; and
"Toronto Hydro"	means Toronto Hydro-Electric System Limited.

SCHEDULE C

INFORMATION PROTECTION AND PRIVACY CONTRACT REQUIREMENTS

The Vendor shall comply with the all of the provisions of the Toronto Hydro Information Protection and Privacy Contract Requirements ("**IPPCR**"), which are scheduled to and form an integral part of the Agreement.

1. **Definitions**. In this IPPCR, the following terms have the following meanings and any capitalized terms that are not defined below have the meaning attributed to them in the Agreement:

(a) "**access**", in connection with TH Data, means capable of being accessed by a person, whether or not that person has the right or authority under any law or agreement to access the TH Data;

(b) "**Authorized Users**" means those employees and representatives of Vendor and of any subcontractors of Vendor who require access to TH Data for the purpose of providing the Services;

(c) "**disclose**", in connection with TH Data, means the access of TH Data by or the transfer custody or control of TH Data to a third party who is not an Authorized User or a subcontractor using the TH Data solely for the purposes of the Agreement;

(d) "**including**" means including without limitation;

(e) "**IPC**" means the Information and Privacy Commissioner of Ontario;

(f) "**Personal Information**" means information about an individual (or any information that is combined with such information) including information that can be used to authenticate that individual, that is:

(i) provided to Vendor by Toronto Hydro; or

(ii) collected, accessed, used, stored or disclosed by Vendor on behalf of Toronto Hydro

in connection with Vendor's obligations pursuant to the Agreement;

(g) "**Privacy Laws**" means all laws and regulations and orders, standards, guidelines and recommendations of a regulatory authority with jurisdiction regarding Personal Information, including the *Municipal Freedom of Information and*

Protection of Privacy Act (Ontario) ("**MFIPPA**"), as amended from time to time, all regulations made pursuant to MFIPPA, and any applicable orders, standards, guidelines or recommendations of the IPC;

(h) "**Security Incident**" means any set of facts or circumstances that would lead a reasonable person to conclude that there has been the loss of or improper, unauthorized or unlawful access to, use of, destruction of, or disclosure of TH Data;

(i) "**store**" and "**stored**" means held, backed up or stored by any means whatsoever, including in hard and electronic formats and includes storage in a server or database or any form of electronic memory;

(j) "**Toronto Hydro**" means the Toronto Hydro-Electric System Limited;

(k) "**TH Data**" means (i) the Personal Information and (ii) any other related data that Vendor collects, uses, or stores pursuant to the Agreement that contains the confidential or proprietary information of Toronto Hydro and that is intermingled with the TH Data;

(l) "**use**" means to handle TH Data in any manner, including to copy, download and temporarily hold TH Data; and

(m) "**Vendor"** means, with respect to this SCHEDULE C, the Consultant.

2. **Conflict**. The provisions of this IPPCR are in addition to any obligations of Vendor under the Agreement. In the event of a conflict or inconsistency between this IPPCR and any other provision of the Agreement (including any contractual duties of confidentiality), the provisions of this IPPCR shall prevail to the extent of the conflict or inconsistency.

3. **Compliance**. Vendor represents, warrants, and covenants that it:

(a) does and will comply with all Privacy Laws applicable to the Personal Information; and

(b) has developed and implemented, and will maintain and monitor, a written and comprehensive information security program in compliance with this IPPCR and applicable Privacy Laws; and

(c) will certify, in writing, its compliance with the foregoing annually upon request from Toronto Hydro.

4. **Relationship**. Vendor is a third-party service provider to Toronto Hydro. Vendor is responsible for ensuring the compliance with the terms of this IPPCR by all of its Authorized Users and subcontractors.

5. **Ownership of TH Data**. Nothing in the Agreement provides Vendor, its subcontractors or Authorized Users with any rights in or to the TH Data or data derived from the TH Data. As between Vendor and Toronto Hydro, TH Data will remain under the control of Toronto Hydro, including without limitation, when Vendor is using or storing TH Data. Vendor shall not and shall not permit its subcontractors to aggregate or otherwise modify TH Data for any purpose other than as provided for in the Agreement. Vendor shall not and shall not permit its subcontractors to withhold any TH Data from Toronto Hydro to enforce any alleged payment obligation or in connection with any dispute relating to the terms of the Agreement or any other matter between Vendor and Toronto Hydro.

6. **Restrictions Relating to TH Data**. Vendor shall and shall cause its subcontractors to:

   (a) only collect, access, store, and use Personal Information to the extent required for the purpose of fulfilling Vendor's obligations under the Agreement;

   (b) not disclose TH Data except (i) in accordance with the provisions of the Agreement and this IPPCR, (ii) if required by applicable law (provided Vendor provides notice in accordance with section 12 of this IPPCR), or (iii) with the written consent of Toronto Hydro; and

   (c) ensure Authorized Users are bound by written policies, procedures or confidentiality agreements containing (i) a duty to protect the confidentiality of the TH Data, (ii) restrictions on the collection, access, storage, use and disclosure of Personal Information, and (iii) return or destruction of TH Data that are consistent with and no less restrictive as the terms of this IPPCR.

7. **Subcontractors**. Vendor shall only permit subcontractors to collect, access, store, use or disclose TH Data with the written approval of Toronto Hydro, acting reasonably, which approval may be withheld until Toronto Hydro has been provided with satisfactory evidence that the subcontractor has entered into a contract with Vendor containing (i) a duty to protect the security, integrity, confidentiality and availability of the TH Data and (ii) restrictions on the collection, access, storage, use and disclosure of the TH Data that are consistent with the terms of this IPPCR.

8. **Security Administration**.

(a) Vendor shall and shall require its subcontractors to establish and maintain administrative, technical and physical safeguards to protect the security, integrity, confidentiality and availability of the TH Data, including to protect the TH Data against any anticipated threats or hazards and to protect against any loss of or unauthorized or unlawful access to, use of, or disclosure of the TH Data.

(b) Vendor shall and shall require its subcontractors to take reasonable steps, through security and privacy awareness training and the application of appropriate sanctions, to ensure compliance by all Authorized Users and subcontractors with Vendor's privacy and security obligations under this IPPCR. The training shall be consistent with best practices in the industry and designed, at a minimum, to educate all such individuals on maintaining the security, confidentiality, integrity and availability of TH Data, and shall occur before such individuals are allowed access to TH Data and no less than annually thereafter.

(c) Without limiting the generality of paragraph 8(a), Vendor shall and shall require its subcontractors to implement the following safeguards in respect of the Personal Information or TH Data, as applicable (unless otherwise agreed to in writing by Toronto Hydro):

(i) TH Data must be stored in facilities meeting or exceeding then-current industry standards relating to the protection of sensitive information;

(ii) Personal Information must be encrypted when transferred electronically between Vendor and Toronto Hydro and between Vendor and subcontractors;

(iii) TH Data must be encrypted in transit when accessed or transmitted over the Internet;

(iv) TH Data may only be accessed by Authorized Users or subcontractors over the Internet using currently accepted industry standard communications encryption and multi-factor user access authentication, provided that the scenario model that forms part of the Services under the Agreement shall, at all times, where commercially feasible, be hosted on Toronto Hydro's cloud environment, unless otherwise agreed by the parties in writing;

(v) TH Data must be encrypted when stored;

(vi) TH Data in electronic form must be physically or logically segregated from other data stored by Vendor;

(vii) Each individual with access to TH Data in electronic form must be identified by a unique user ID;

(viii) The security access principles of "segregation of duties" and "least privilege" shall be implemented to restrict access to TH Data;

(ix) All sessions involving access to TH Data must be logged and logs retained for a sufficient period of time to permit an investigation into unauthorized access;

(x) All applicable and necessary security patches will be deployed promptly to all systems in which TH Data is stored or through which TH Data is accessed or used, including operating system and open source and application software; and

(xi) Only supported software (software under active maintenance, including operating system, open source, application software and/or the like) will be deployed on any systems in which Personal Information is stored or through which it is accessed and used.

(d) If Vendor or its subcontractors will be accessing, using or storing TH Data in connection with an Internet facing application, at Toronto Hydro's request and cost, the Vendor shall or cause its subcontractors to provide Toronto Hydro (at least semi-annually) a summary attestation from a vulnerability threat assessment test or such other testing demonstrating that the Internet facing application has no material security vulnerabilities. The attestation report must include, at a minimum, a definition of how the vulnerabilities are rated (e.g., high / medium / low, serious / moderate / minimal) and evidence that the application has no open vulnerabilities at the highest rating and shows the number of vulnerabilities at any lower ratings. The vulnerability threat assessment shall be performed by an assessor mutually agreed to by Vendor and Toronto Hydro acting reasonably.

(e) Toronto Hydro may provide Vendor with test data that is approved for use within its development and test environments. Vendor agrees that no other TH Data will be used by Vendor or its subcontractors in development and/or test systems unless authorized by Toronto Hydro.

(f) Vendor shall and shall require its subcontractors to maintain and enforce retention policies for any and all reports, logs, audit trails and any other documentation that provides evidence of security, systems, and audit processes and procedures.

(g) Vendor shall and shall require its subcontractors to implement procedures to ensure that, upon termination of employment or affiliation with Vendor or its subcontractors, each Authorized User's ability to access TH Data is terminated, any and all TH Data being temporarily held by such Authorized User for the provision of the Services is returned to Vendor and such Authorized User is reminded of his or her continuing obligations with respect to the confidentiality of the TH Data.

9. **Improvements**.

(a) If, in the opinion of the Chief Security Officer of Toronto Hydro (or equivalent), acting reasonably, there is a real risk of the loss of or improper, unauthorized or unlawful access to, use of, destruction of, or disclosure of TH Data, Toronto Hydro may, in addition to any other rights it may have under the Agreement, suspend the Agreement until such risks are mitigated to the satisfaction of Toronto Hydro, acting reasonably. If the parties cannot agree, within 15 days, on a timeline for the implementation of remedial action to mitigate such risks, Toronto Hydro may terminate this Agreement pursuant to Section 7 of the Agreement. The parties agree to discuss in good faith, responsibility for the costs of any such correction of deficiency or improvement.

(b) If Vendor proposes to materially modify the process, method or means by which TH Data is stored, accessed or otherwise transmitted or handled, Vendor shall provide Toronto Hydro at least ninety (90) days prior written notice. Toronto Hydro shall have the right, acting reasonably, to determine if the modifications represent unacceptable risks to TH Data and to prohibit Vendor from implementing any such material modification until such time as the risks can be mitigated or an alternate provider of the services under the Agreement can be found.

10. **Assurance and Assistance**.

(a) Toronto Hydro's rights under paragraph 8(a) of this IPPCR may be exercised by an authorized representative of Toronto Hydro who enters into a confidentiality agreement with Vendor in a form acceptable to Toronto Hydro and Vendor

acting reasonably or by the IPC or other regulator with jurisdiction.

(b) Vendor acknowledges that Privacy Laws and regulatory requirements to which Toronto Hydro is subject may change during the term of the Agreement. Vendor shall:

(i) vary or eliminate any practice that causes Toronto Hydro to be in violation of Privacy Laws; and

(ii) provide information and assistance to Toronto Hydro, acting reasonably, that Toronto Hydro requires for privacy impact assessments and threat risk assessments, and/or any other purposes as reasonably required by Toronto Hydro in relation to cybersecurity controls protecting TH Data.

11. **Security Incidents**. Vendor shall notify Toronto Hydro promptly of a Security Incident and, in any case, within 24 hours of the Vendor becoming aware of a Security Incident pertaining to Personal Information, and in any case within 72 hours of becoming aware of any other Security Incident. In the event that Vendor notifies Toronto Hydro of a Security Incident or the Vendor is notified by Toronto Hydro or any third party of a Security Incident, Vendor shall and shall cause its Authorized Users and subcontractors to:

(a) fully cooperate with Toronto Hydro and its third-party advisors in investigating and resolving the vulnerability giving rise to the Security Incident;

(b) provide Toronto Hydro with information regarding: (i) the Personal Information that is the subject of the Security Incident; (ii) the names and contact information (if known) of individuals who may be affected by the Security Incident; (iii) the steps taken to contain the Security Incident and to mitigate any harm to individuals as a result of the Security Incident; and (iv) any remedial actions taken to prevent further occurrences of the Security Incident;

(c) fully cooperate with Toronto Hydro with respect to: (i) reporting the Security Incident to the IPC and any other governmental authority with jurisdiction; (ii) answering all inquiries of the IPC and any other governmental authority with jurisdiction; (iii) providing notification to individuals affected by the Security Incident; and (iv) providing notification or reports to other third parties who may assist in mitigating the possible harm to affected individuals.

Unless otherwise required by applicable Privacy Laws or other laws, the decision whether to make a report to the IPC and any other governmental authority or to notify individuals and third parties, and the content of any such reports and notifications shall be solely at the discretion and direction of Toronto Hydro.

12. **Individual Access Requests**. Vendor shall and shall cause its subcontractors to:

(a) notify Toronto Hydro promptly of any request by an individual for access to or correction of Personal Information that is about that individual and promptly follow all instructions provided by Toronto Hydro with respect to responding to such requests;

(b) cooperate with Toronto Hydro by:

(i) furnishing it with complete information concerning Vendor's access and use of Personal Information, including responding, if requested to do so, to any inquiry by a privacy regulatory authority and/or to any complaint; and

(ii) cooperating in the conduct of any regulatory or court proceedings arising out of a complaint relating to the management of Personal Information, including attending hearings and assisting in securing and giving evidence and obtaining the attendance of witnesses.

13. **Judicial or Governmental Requests**. Vendor shall notify Toronto Hydro promptly of any request, order, subpoena, or warrant from a domestic or foreign court or governmental authority (including domestic or foreign law enforcement) for access to or the production of all or any part of the TH Data stored by Vendor or its subcontractors, unless Vendor or its subcontractors is prohibited from doing so by a court or governmental authority with jurisdiction over Vendor, its subcontractors or the TH Data. At Toronto Hydro's expense, Vendor shall, if requested to do so, provide reasonable assistance to Toronto Hydro in objecting to access to or the production of all or part of the TH Data.

14. **Return of TH Data**. Upon the termination or expiry of the Agreement (for any reason), Vendor shall and shall cause each subcontractor to forthwith return to Toronto Hydro, as directed by Toronto Hydro, all TH Data, with the exception of file server backups, being stored by Vendor or its subcontractors or, at Toronto Hydro's option, destroy all such TH Data as directed by Toronto Hydro (including any copies thereof), and provide Toronto Hydro with an officer's certificate attesting to such destruction. Any TH Data stored on file server backups will remain encrypted for one (1) year following the date

of the last file server backup performed by the Vendor upon which the Vendor or its subcontractors will destroy all such TH Data, and upon request, provide Toronto Hydro with an officer's certificate attesting to such destruction. Vendor shall not access any archival copies retained (including file server backups) except in accordance with the terms of this Agreement.

15. **Indemnification**. Vendor shall, at its own expense, defend, indemnify and hold Toronto Hydro harmless from and against any and all claims, suits, demands, actions, damages, losses, liabilities, proceedings, litigation, costs and expenses, including reasonable legal fees, relating to or arising out of this IPPCR, resulting from a claim by a third party that arises out of or is related to a fact or circumstance involving (i) any misrepresentation or breach of warranty made by Vendor or its subcontractors or (ii) any breach of this IPPCR by Vendor, Authorized Users or Vendor's subcontractors. The right to indemnification in this section 14 is in addition to any right to indemnification in the Agreement.

16. **Survival**. Notwithstanding the termination or expiry of the Agreement, Vendor shall and shall cause each subcontractor to continue to govern itself in accordance with this IPPCR and the obligations of Vendor under this IPPCR shall survive the expiry or termination of the Agreement until Vendor and each subcontractor no longer has custody or access to the TH Data and has destroyed all copies of the TH Data in accordance with this IPPCR.

17. **Notices**. Any notice required in this IPPCR to be provided to Toronto Hydro shall be made in writing to:

Privacy Officer, Toronto Hydro-Electric System Limited

Address: 14 Carlton Street, Toronto Hydro, ON M5B 1K5
Telephone: (416) 542-3000
Email: legal@torontohydro.com

RENEWAL AND AMENDING AGREEMENT

THIS RENEWAL AND AMENDING AGREEMENT (the "Amending Agreement") is made effective as of June 1, 2022 (the "Effective Date") between **ELEMENT ENERGY LIMITED** (the "Consultant") and **TORONTO HYDRO-ELECTRIC SYSTEM LIMITED** ("Toronto Hydro").

WHEREAS:

1. Toronto Hydro and the Consultant (each a "Party" and collectively, the "Parties") previously entered into an agreement for professional consulting services dated February 7, 2022 (the "Consulting Agreement"), pursuant to which the Consultant would develop a future energy scenarios model (the "FES Model"), as well as related services related to maintenance of the model, stakeholder engagement on behalf of Toronto Hydro, and weather correction of network data (the "Services");

2. The Parties hereto wish to amend the Consulting Agreement to clarify the scoping requirements related to the FES Model, set out related changes to pricing, implementing a change request process, and renewing the term of the Consulting Agreement for a further one (1) year, as more particularly set out herein;

NOW THEREFORE, THIS AMENDING AGREEMENT WITNESSES that in consideration of the mutual covenants contained herein and for other valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Toronto Hydro and the Consultant agree as follows:

1. Any capitalized terms used but not defined herein shall be as defined in the Consulting Agreement, where applicable. The recitals above are agreed by the Parties to be true and deemed to form part of this Amending Agreement as if specifically restated herein.

2. The first paragraph to section 1(a) Future Energy Scenarios Model of SCHEDULE A of the Consulting Agreement is hereby deleted and replaced with the following:

   Toronto Hydro requires the development of a future energy scenarios model <u>(the "FES Model")</u> that produces scenario-based 2050 forecasts for peak load (kVA), generation (kW), and energy consumption (kWh). The model will be used to understand the range of possible future energy scenarios in order to inform capacity-driven investment, grid modernization investment, as well as revenue forecasting.

3. The Parties agree to utilise one (1) of the Renewal Terms set out in section 3.2 of the Consulting Agreement, and to renew the Term outlined in section 3.3 of the Consulting Agreement until February 6, 2024.

4. The following is hereby inserted as subsection 1(b.1) to SCHEDULE A of the Consulting Agreement. For greater clarity, the newly added subsection 1(b.1) shall be inserted following subsection 1(b) but prior to subsection 1(c) of SCHEDULE A of the Consulting Agreement:

   <u>(b.1) On-Premise Hosting Requirements</u>

   <u>Phase 3: On-Premise Hosting</u>

   <u>The Consultant shall further ensure that the model be hosted and deployed at Toronto Hydro's premises. In addition to the per-phase requirements and other components of the Services described in this SCHEDULE A, Consultant shall ensure the FES Model shall adhere to the specifications set out in APPENDIX A.1 – On-Premises Hosting Requirements attached to this SCHEDULE A of this Agreement.</u>

5. The document attached hereto as Appendix 1 to this Amending Agreement is hereby appended as APPENDIX A.1 – On-Premises Hosting Requirements to SCHEDULE A of the Consulting Agreement. For greater clarity, APPENDIX A.1 shall form part of SCHEDULE A to the Agreement and shall not constitute an independent schedule.

6. Section 2(a) of SCHEDULE A of the Consulting Agreement is hereby deleted and replaced with the following:

a) Model Fees

In exchange for the Services set out in Section 1 of this SCHEDULE A (and in particular, subsections (a), (b), (c), (d), (e), and (h) thereto), and APPENDIX A.1 to this SCHEDULE A, Toronto Hydro shall pay the Consultant the following Fees on a milestone basis, as more particularly set out in the tables below:

PHASE 1		
Milestone #	**Description**	**Fixed Cost/Fee ($)**
MS 1:	Kick-off meeting	$0.00
MS 2:	Initial round of stakeholder engagement conducted	$30,245.00
MS 3:	Final round of stakeholder engagement (internal and external) completed	$165,290.00
MS 4:	Final scenarios with associated documentation to Toronto Hydro	$65,875.00
TOTAL		**$261,410.00**

PHASE 2		
Milestone #	**Description**	**Fixed Cost/Fee ($)**
MS 1:	Kick-off meeting	$0.00
MS 2:	Present proposed approaches for customer archetypes, geographical distributions, profile shapes and load factors to Toronto Hydro	$22,625.00
MS 3:	Provide preliminary model outputs to Toronto Hydro for review	$112,060.00
MS 4:	Final EELG model with associated documentation to Toronto Hydro	$43,150.00
TOTAL		**$177,835.00**

PHASE 3		
MS 3.1:	All resources set up and Element Energy able to access all required aspects of TH IT environment	$0.00
MS 3.2:	Initial adaptation of subset of model functionality to enable trial deployment on TH premises completed	$18,825.00
MS 3.3:	Fully adapted model deployed to Dev environment with deployment steps documented	$34,300.00
MS 3.4:	User Acceptance Testing (UAT) completed	$29,800.00
MS 3.5:	Model Go-Live completed	$11,570.00
TOTAL		**$94,495.00**

TOTAL PROJECT COST (PHASE 1 & PHASE 2, & PHASE 3)	**$533,740.00**

Weather Correction of Network Data		
Rate	Weather correction (annual or on a frequency prescribed by Toronto Hydro)	**$33,600.00**

PROJECT TOTAL	**$567,340**

7. Section 2(c) of SCHEDULE A to the Consulting Agreement is hereby deleted and replaced with the following:

c) Additional Services Fees

In addition to the Fees and Services further set out above, Consultant shall, at Toronto Hydro's sole option and express request, further assist Toronto Hydro by providing the following Services:

i. Providing assistance with respect to any external discussions, as more particularly set out in section 1 of this SCHEDULE A above (and in particular, subsections (e) and (g) thereto);
ii. Ad-hoc Services with respect to the functionality of the FES Model as may otherwise be agreed upon in writing between Toronto Hydro and the Consultant, including, but not limited to:
    a. Extensions of phase 1 of the Services as described above, including the building of more iterations or updates to the FES Model outputs, as may be required by Toronto Hydro for senior management review and approval;
    b. The provision of more detailed documentation as may be required by Toronto Hydro;
    c. The operation of different output scenarios and generation of additional reports as may be required by Toronto Hydro; and
    d. Other additional services as may be agreed upon by Toronto Hydro and the Consultant in writing.

For all additional Services as described under this subsection 2(c), Toronto Hydro shall compensate the Consultant on a time and materials basis in accordance with the following rates, as applicable, for each of Consultant's personnel:

Rate card		
Rate ID	**Role / Description**	**Hourly rate ($)**
Rate 1:	Partner	$295.00
Rate 2:	Principal Consultant	$200.00
Rate 3:	Senior Consultant	$175.00
Rate 4:	Consultant	$155.00

With respect to the Services described in subsection 2(c)(ii) above only, where such additional Services require a material change in the scope or implementation of the Services, the parties shall document such change through entering into a change request in the form prescribed in APPENDIX A.2 to SCHEDULE A of this Consulting Agreement. No obligations shall exist with respect to the additional Services until such change request has been executed by an authorised representative of both parties.

8. The document attached hereto as Appendix 2 to this Amending Agreement is hereby appended as APPENDIX A.2 – CHANGE REQUEST FORM to SCHEDULE A of the Consulting Agreement. For greater clarity, APPENDIX A.2 shall form part of SCHEDULE A to the Agreement and shall not constitute an independent schedule.

9. All other terms and conditions of the Consulting Agreement remain continuously in full force and effect, unamended and shall be deemed to apply to this Amending Agreement.

10. This Amending Agreement, together with the Consulting Agreement, shall hereinafter constitute the entire agreement between the Parties with respect to the Services as further described in the Consulting Agreement, and supersedes any and all other agreements, understandings, discussions, negotiations, representations and correspondence which may have been made by or between the Parties respecting the same.

IN WITNESS WHEREOF the Parties hereto have executed this Amending Agreement as of the date first written above.

ELEMENT ENERGY LIMITED

Per: _____

Name: Mark Hughes

Title: Partner

I have the authority to bind the Consultant.

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

Per: _____

Name: Elias Lyberogiannis

Title: Executive Vice President, Planning, Chief Engineering & Modernisation Officer

I have the authority to bind Toronto Hydro.

Appendix 1 to this Amending Agreement

APPENDIX A.1 – On-Premises Hosting Requirements

[please see attached]



TH - FES Model -
Phase 3 On Premise

APPENDIX A.1

On-Premises Hosting Scope Requirements: FES Model for Toronto Hydro

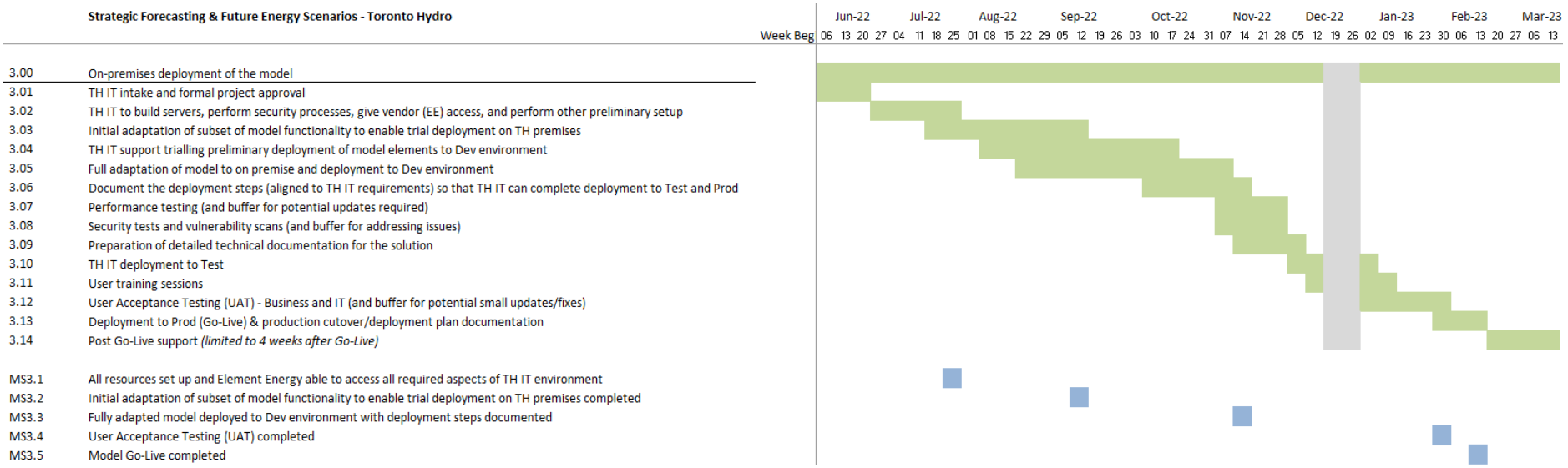
Authors: Rebecca Feeney Barry (Element Energy), Madhushan Perera (Element Energy), Mark Hughes (Element Energy)
Date: 27-06-2022

Project Summary

Topic	Details
Application/System Name	Future Energy Scenarios (FES) Model
Brief Summary including interfaces (if any)	Hosted on Toronto Hydro premises. The FES Model is a strategic load forecasting system. It is used to view and run scenarios of load, generation, and storage growth to 2050. The application is accessed via a bespoke web interface available on Toronto Hydro's intranet.
Number of Users	1 – 3
User Location	Within Toronto Hydro
Hours of Operation	TBD

Draft On-Premises Deployment Timeline

The below Gantt illustrates the extension to the original project timeline and outlines the set of high-level steps and requirements to deploy the solution on Toronto Hydro premises. In conjunction with Toronto Hydro's IT team, the model deployment timeline will be further refined. It is expected that tasks that are predominantly led by the Toronto Hydro IT team (i.e. 3.01, 3.02, 3.04, 3.10, 3.13) will require only minimal effort / time from Element Energy. Should this not be the case, the timeline and allocated budget will need to be reviewed accordingly. Additionally, many tasks are also likely to require significant joint effort from both teams (i.e. 3.06 to 3.09); time will need to be made available to progress these tasks together (e.g. task 3.08 will require dedicated time from Toronto Hydro's IT team to aid the resolution of issues as they arise based on the conducted security tests by Toronto Hydro).



The table below lays out each task, aligned to the Gantt above:

Task Number	Task
3.01	TH IT intake and formal project approval
3.02	TH IT to build servers, perform security processes, give vendor (EE) access, and perform other preliminary setup

3.03	Initial adaptation of subset of model functionality to enable trial deployment on TH premises
3.04	TH IT support trialling preliminary deployment of model elements to Dev environment
3.05	Full adaptation of model to on premise and deployment to Dev environment
3.06	Document the deployment steps (aligned to TH IT requirements) so that TH IT can complete deployment to Test and Prod
3.07	Performance testing (and buffer for potential updates required)
3.08	Security tests and vulnerability scans (and buffer for addressing issues)
3.09	Preparation of detailed technical documentation for the solution
3.10	TH IT deployment to Test
3.11	User training sessions
3.12	User Acceptance Testing (UAT) - Business and IT (and buffer for potential small updates/fixes)
3.13	Deployment to Prod (Go-Live)
3.14	Post Go-Live support (limited to 4 weeks after Go-Live)

Note: System Integration Testing is out of scope and not shown in the project plan above.

The table below lays out each milestone, aligned to the Gantt above:

Milestone Number	Description	Associated Deliverable(s)
MS3.1	All resources set up and Element Energy able to access all required aspects of TH IT environment	[TH] Element Energy user accounts with access to all required components of TH IT environment.
MS3.2	Initial adaptation of subset of model functionality to enable trial deployment on TH premises completed	[EE/TH] Successful test / proof-of-concept deployment of a subset of model functionality in TH Dev environment.
MS3.3	Fully adapted model deployed to Dev environment with deployment steps documented	[TH/EE] Installation/configuration and deployment document including updated technical documentation (e.g. architecture diagram).
MS3.4	User Acceptance Testing (UAT) completed	[EE] UAT test cases, [TH] two rounds of UAT, [TH] sign-off to proceed to Go-Live
MS3.5	Model Go-Live completed	[TH/EE] Production cutover/deployment plan and documentation of steps

Model Data Requirements

The below lists give an overview of the key data inputs that are used in the load model itself. It should be noted that the validation of data and its incorporation into the model will be conducted prior to the on-premises deployment of the model and so are out of scope for this document. For further details on testing and validation, please see subsection "Full Diagnostic Testing of the Load Model" under "Reference notes".

Please note that when the model is deployed on Toronto Hydro premises, there will be no data integration within the scope of deployment. The data will be imported to the on-premises database using a data import script provided by Element Energy in a one-time annual data upload. If the model needs to be refreshed or updated, the input data in the database will be fully replaced.

Network Topology

- Network topology for all assets to be included in the model and mapping between levels.
- List of distribution transformers, with associated customer counts, locations, and connectivity.
- Load transfers to be incorporated into the base topology.

Demand

- Hourly monitored demand data for all substations (terminal stations and terminal station buses) for the most recent full year.
- Total units distributed, annual total and per hour if available, split into customer categories if available, for the most recent full year.
- List of new demand connections with demand type, capacity (kW), start year, connectivity.
- Hourly load for high voltage (HV) customers with demand type and connectivity.

Generation & storage

- List of known distributed generation and energy storage installations across the network with technology type, capacity (kW), connectivity.
- List of distributed generation and energy storage pipeline data with technology type, capacity (kW), start year, connectivity.
- Half-hourly monitored generation data per generator (or generation type) for the most recent full year.

Other

- Historic temperature data for Toronto.
- Profile shapes and load factors for DERs and net zero drivers.

System Requirements

Component	Requirements
Virtual machines	• 2 Linux machines, one hosting the UI and one for the backend API which runs the model. o The backend API machine: 8 vCPUs and 32GB of RAM. o The frontend machine: estimate of 4 vCPUs and 8GB of RAM (this will require testing). • These two machines communicate via an API hosted by the backend machine. • Red Hat Enterprise Linux v8/v8.2 is supported for the Linux Operating System.
Databases	• 2 SQL Server databases, one for the UI (Django web application), and one for the backend API. o The UI database is likely to be small (<100MB), and it is expected that the backend data base be larger (<500MB). o Microsoft SQL Server 2017 configured with Always On Availability Groups is supported.
Object storage	• Azure blob storage is normally used to store results in CSV and Parquet format, in a location that can be accessed by both the UI and backend model machines. o An initial volume requirement for this is 200GB. o Should Toronto Hydro wish to use NAS File based storage, this can be acceptable and supported (instead of Object/Blob storage) but will require some code changes within the model. o The protocol to connect to the NAS (e.g. NFS, CIFS) will need to be investigated further in conjunction with support from Toronto Hydro's IT team (including any best practices here).
Frontend access	• The UI VM hosts a web application which needs to be accessible to TH users via the TH intranet. • The webserver the model development team normally uses is Nginx, which runs in docker on the same VM as the UI. o The configuration of the application to allow Toronto Hydro users to access it via their intranet will need to be investigated further in conjunction with support from Toronto Hydro's IT team.
Deployment	• Docker images are deployed to the Azure container registry, and these are pulled by start-up scripts on the virtual machines. • The Docker platform will need to be installed and configured. o To determine how best to deploy docker images to the servers without an Azure container registry, further investigation is required in conjunction with support from Toronto Hydro's IT team.
Authentication	• Utilise Azure AD (or TH ADFS) for authentication; to implement OAuth 2.0 Authorization against Toronto Hydro's OAuth Provider (Microsoft Active Directory Federation Services), further investigation is required in conjunction with support from Toronto Hydro's IT team.
Test/development environment	• A development/test environment will be built such that new versions of the application can be tested prior to deployment. o Two separate environments will be built: one for test QA, and one for production.

Backups/resiliency	• Azure backup services will be used for backup of the databases, virtual machines, and model outputs. o Should Toronto Hydro wish to back up the databases using Native SQL Server tools (which will have the capabilities of doing point in time restores and servers backing up daily via snapshot based host level backups), this should be suitable.
Dependency Software	• To identify software to be pre-installed in the TH servers, further investigation is required in conjunction with support from Toronto Hydro's IT team to compile a list of requirements. • Based on current knowledge, no software licenses are needed. o Should any software need to be procured and/or licensed by Toronto Hydro, further investigation will be conducted in conjunction with support from Toronto Hydro's IT team.
Software	• The software to be deployed will be the "Strategic Forecasting System" application. Docker software will be required on the servers, as the application is run inside a Docker container. o Further investigation alongside Toronto Hydro's IT team is required to understand what dependency software may be required and how it will be sourced to be used in this project deployment.
Hardware Dependency	• The servers, databases, and file storage are required.
Access	• The Element Energy team will require SSH access to the VMs and access to the file storage in order to configure and test the solution. o This can be via a VPN or similar; Toronto Hydro's IT team are to provide recommendations on how we access the system.

Performance Expectations

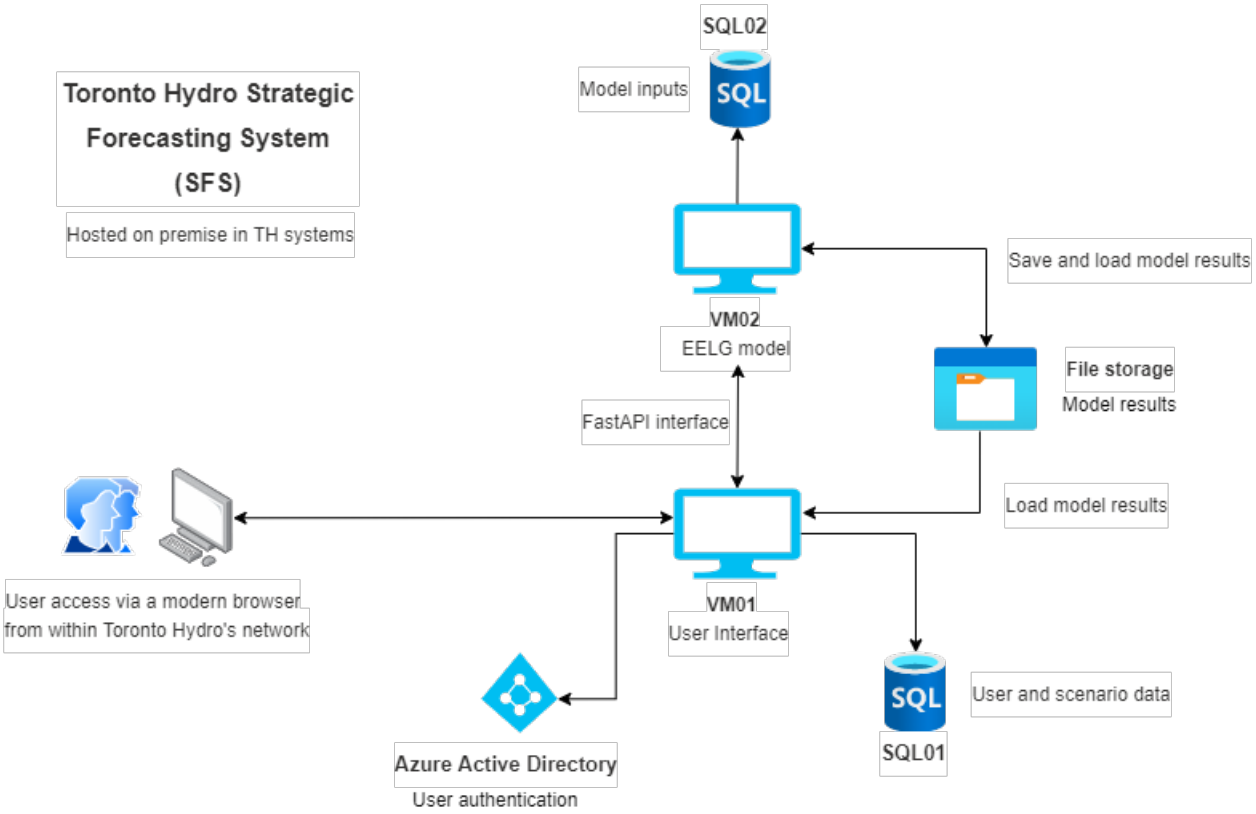
Run time

The development team cannot guarantee the speed until the model is fully set up. For the level of granularity of the model outputs (i.e. terminal station and terminal station bus), the runtime should still be relatively fast – i.e. the run time should be on the order of seconds for a single site, or minutes when running for all terminal stations. The solution is not suitable for low voltage modelling.

Simultaneous users

An on-premises solution would only allow a small number of simultaneous users (i.e. subject to testing, it is estimated 1-3 concurrent users). We expect that only one “multi-asset” (bulk run of all HV substations) would be able to run at a time. User requests for these model runs will be queued accordingly.

System Architecture Diagram



The proposed system architecture is shown in the diagram above. This includes two virtual machines, two SQL Server databases, and file storage to store model results. VM01 hosts the Django based user interface and a Nginx web server. VM02 hosts an API which allows users to run model calculations for custom scenarios. User and scenario data are stored in SQL01, which is used by the user interface. Model input data is uploaded in bulk to SQL02 and is used for model calculations. Model results are saved to persistent file storage. Based on discussions with TH IT, we intend to use Azure Active Directory for user authentication.

Deployment requirements

TH = Toronto Hydro
EE = Element Energy

Component	TH Responsibilities	EE Responsibilities	Deliverables
Performance testing	• TH may need to implement hardware upgrades should the performance of the initial deployment not be considered adequate after testing.	• Test runtimes for a sample of substations, and for all substations on the Dev system. • Test number of concurrent users for scenario configuration and single asset calculations.	• [EE] Report runtimes and concurrent user support for different model run types on the Dev system.
User training	• TH (i) super users and (ii) general users will undergo a training session of the tool.	• An initial training session with 2-3 model superusers will be hosted prior to user acceptance testing (UAT). • A final training session will be held for a wider group of model users. • Training material / documentation will be provided.	• [EE] Two training sessions held and training material / documentation. • [EE] User manual explaining how to navigate the tool.
User acceptance testing (UAT)	• TH super users will undergo User Acceptance Testing (UAT) to confirm that TH can use the provided functionality before deploying it to all users.	• Develop UAT template for TH super users to utilise and fill out during testing. • Prioritise and respond to TH feedback on the tool (as required).	• [EE] Provision of UAT template. • [TH] Completed UAT template and confirmation to proceed to Go-Live.
Support design	• TH will define the surrounding operational and technical support structure to facilitate effective use of the deployed solution in line with existing Toronto Hydro on-premises hosting IT support procedures. o Regarding the potential Support Model & Service Level Agreement, this will need to be further investigated. For reference, please refer to the "Support Model & Service Level Agreement"	• TBD – potentially Tier 3 support.	• [TH] Defined support model and service level agreement. • [TH] Provision of Tier 1 and Tier 2 Support. • [EE] Provision of Tier 3 Support.

	subsection under "Reference notes" further down in this document. It is likely that TH will provide the Tier 1 and Tier 2 services.		
Communication / Change plan	• TH will put in place their own communication strategy / change plan to allow for future changes to the solution and effectively communicate those changes to the relevant individuals / teams within the business. o E.g. this may be a document which outlines the process to request and approve changes, as well as to communicate these changes to the key internal stakeholders within the business that (i) own the solution, (ii) are required to be informed prior to changes, and (iii) are required to be informed after a change has been implemented.	• EE is happy to support Toronto Hydro with this process. o This support component is to be further investigated to understand if Toronto Hydro have a formal change process to which this application will need to adhere. If not, EE can simply notify application users and a chosen Toronto Hydro IT representative by email prior to any change once the application has gone live. • The previously mentioned EE-hosted training sessions will be a key part of the overall communication strategy.	• [TH] TH communication strategy. • [EE] Training sessions.
Compliance with TH IT Standards	• Ensure the deployed tool undergoes Nexpose and Webinspect security tests and vulnerability scans.	• Address all critical, medium and high priority issues flagged based on CVSS rating, and apply fixes as required. • Develop installation and configuration documentation and provide to TH to setup the Production environment. • Develop technical documentation for the solution implemented.	• [TH] Confirmation of underwent Nexpose and Webinspect security tests and vulnerability scans. • [EE] Installation and configuration documentation. • [EE] Technical documentation for the solution implemented.
Data validation	This will be out of scope at the on-premises deployment stage of the project.		
Functional testing	Phase 2 of the project will include functional testing of the model, including data validation, in-built model testing, and manual QA/QC tests on final outputs. Element Energy will document this testing in Phase 2, with Toronto Hydro's participation. The		

	scope of phase 3 testing will only involve regression testing, which requires re-running all test cases carried out in phase 2 to ensure the on-premise deployment of the model is functioning per requirements from phase 2.
Systems integration testing (SIT)	This will be out of scope at the on-premises deployment stage of the project.
Coding standards	Coding standards are not applicable.
Mobile Application	Mobile application standards are not applicable.

Reference notes

On-premises Deployment & LV Modelling

The below two sets of notes have been agreed by Element Energy and Toronto Hydro regarding the on-premises deployment, which has been confirmed as the path forward for this iteration of the model. Future iterations of the model deployment may consider cloud-based deployment.

On-premises deployment

- An on-premises solution will run more slowly compared to a cloud-based system since there does not exist the same scalability around accessing computing power.
    - A corollary of the above point is that the on-premises solution would not be suitable for modelling LV networks in future, as these require large volumes of parallel computations.
    - Running calculations for all TS's and buses in the network will take longer and it is expected that only one scenario will be able to run at a time. In contrast, via a cloud solution, multiple scenarios could be run in parallel.
- An on-premises solution would only allow a small number of simultaneous users (i.e. subject to testing, it is estimated 1-3 concurrent users).
- These points have been reviewed with Toronto Hydro and these drawbacks were deemed acceptable for the initial deployment of this project.

Future LV modelling (not currently in-scope)

- LV modelling would likely only be possible in the cloud.
    - This can be assessed further after initial deployment of this iteration of the modelling tool, but the current assumption is that it is unlikely that an on-premises solution would be sufficiently capable (particularly considering Toronto Hydro's needs for model run time).
    - The compute requirements for the LV modelling are much more significant. For example, on other projects, this model uses one 120 core VM per model run, with many model runs occurring in parallel, along with an autoscaling database. The ability to achieve comparable runtimes with on-premises hardware is highly uncertain.
- A cloud solution would also enable the model to support more concurrent users and would allow for better performance in general.
    - It would minimise the time that is needed to spend adapting/configuring the model (i.e. adapting the model from on-premises to cloud for LV modelling is expected to be much less time-intensive than potentially amending an on-premises solution to work for LV modelling).

Support Model & Service Level Agreement

The following text is based on what was included in Element Energy's original proposal for this work, describing the support model and potential Service Level Agreement. This proposal was drafted with the context of a cloud-based deployment but has been amended below to reflect support for an on-premises model. Considering that the decision from Toronto Hydro for this iteration of modelling is to deploy on-premises, this support model and service agreement will need to be amended to be adapted for the decided deployment solution. After deployment of the FES Model, Element Energy

and Toronto Hydro will finalize the ongoing support agreement for the model based on the below guidance. The below information is for reference only.

Initial proposal for ongoing support

For the on-premises model, we propose that all support queries will initially be handled by the Toronto Hydro IT help desk. Queries are divided into three Tiers. For Tier 1 we anticipate that support will be delivered by the internal Toronto Hydro IT help desk and will provide the following services:

- Initial support level for basic user issues.
- Provide guidance on simple questions e.g. how to access and navigate the software.
- Handle straightforward issues such as username/password problems and creating new user accounts (we propose that existing Toronto Hydro Active Directory user credentials are used for authentication, so this would be covered by existing IT processes).

This Tier 1 support will be accessed via the standard internal Toronto Hydro IT support channels. Element Energy will provide the Toronto Hydro IT support help desk with the necessary system documentation to be able to address queries of these types.

We propose that Element Energy will handle Tier 2 and Tier 3 level support, though if the system is deployed to a Toronto Hydro on-premises environment, Tier 2 support may be provided by Toronto Hydro's existing IT team should that be the preferred option. Support issues of this nature will be escalated from the internal help desk to Element Energy and charged on a time materials basis as per the day rates provided in the pricing schedule.

Tier 2 support includes:

- More in-depth technical support level.
- Reviews information captured by Tier 1 support personnel.
- Troubleshoots errors by reviewing status of model components and log files.
- Handles global model configuration issues.
- Handles whole system environment and data interface issues.
- Escalates technical model issues to relevant Tier 3 support group.

Tier 3 support includes:

- Most advanced technical support level.
- Reviews troubleshooting logs provided by Tier 1 and Tier 2 support personnel.
- Debugging and error fixing of technical issues in individual calculation modules.
- Answer questions on detailed model queries if not covered by model documentation.
- Liaise with module developer to roll out bug fixes to model users.

How Tier 2 and Tier 3 queries are escalated to the Element Energy support team will depend upon the priority level of the query in question. We split queries into priority levels, and have different response time requirements for each level. Since the forecasting system is not a piece of critical infrastructure, Priority level 1 queries are not supported under this service level agreement. For Priority level 2 or 3 we expect that the help desk will both email and call the nominated Element Energy support contacts to ensure that they are made aware of the issue in a timely fashion. For Priority level 4 an email to the Element Energy helpdesk will be sufficient. The Element Energy help

desk will then acknowledge receipt of the issue to the original system user within the response time outlined in the table below. The Element Energy troubleshooting team will then handle the query and aim to resolve the issue within the timeline laid out below.

Priority	Response	Resolution	Success target	Availability	Recovery Time Objective (RTO)	Recovery Point Objective (RPO)
1	Not supported			98% available	Less than 2 days	Less than 24 hrs
2	12 hrs	2 days	99%			
3	24 hrs	5 days	99%			
4	Reasonable endeavours					

Full Diagnostic Testing of the Load Model

In parallel with the review by Toronto Hydro, Element Energy will conduct full diagnostic and quality assurance testing of the load model, in order to sense check and validate the outputs as well as testing that all functionality works correctly and that there are no bugs. Input assumptions and functionalities will have been tested and sense-checked when under development, and similarly unit tests already exist in the EELG model and will be added as any new functionality is added. Hence, Element Energy will follow a pre-defined list of quality assurance checks and tests (both manual and automated) to ensure quality of model outputs.

Appendix 2 to this Amending Agreement

APPENDIX A.2 – CHANGE REQUEST FORM

[please see attached]



APPENDIX A.2 -
CHANGE REQUEST F

Change Request #[x]

Change Request Number:	
Toronto Hydro Contact:	
Vendor Contact:	
Requestor:	
Date of Request:	
Priority:	High ☐ Med. ☐ Low ☐

Description of Change: i.e., nature and scope	
Impact of Change: i.e., pricing i.e., schedule/timing	
Reason for Change:	
Ramifications of Change:	Schedule ☐ Staffing ☐ Other ☐ (explain ramifications below)
Toronto Hydro's Responsibilities:	
Vendor's Responsibilities:	

Approval of Change Request			
Toronto Hydro-Electric System Limited			**[INSERT VENDOR NAME]**
Name:			**Name:**
Signature:			**Signature:**
Title:			**Title:**
Date:			**Date:**

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-157

References: Exhibit 2B, Section D4, Appendix B

Preamble:

Toronto Hydro's Future Energy Scenarios utilizes a multitude of external data sources

QUESTION(A):

a) Please complete the following table:

Data Source	Model Input that uses the source	Date that source was published

RESPONSE FROM TORONTO HYDRO (A):

Please see the tables provided in Toronto Hydro's response to interrogatory 2B-Staff-159, part a) and 2B-PP-36, part c). The date for each of the sources is provided within the reference.

QUESTION (B):

b) What is the time period over which Element Energy performed its work to run their model. Please explain the instances where Element Energy did not use the most recently available information. For example, staff note Element Energy references the "City of Toronto 2012 Growth Plan" in Figure 21, where the City of Toronto has published more recent growth plans[1]

[1] The City of Toronto's Official Plan Review notes a 2019 growth plan that came into effect and other related strategies and assessments available since the 2012 Growth Plan. The City's Official Plan Review website is available at https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/official-plan/official-plan-review/

RESPONSE FROM ERM (B):

The first phase of the project, which included all information and data gathering, was conducted between January and July 2022. The data referenced was provided to Element Energy by the City of Toronto and was the latest information available at the time.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-158

References: **Exhibit 2B, Section D4, Appendix A**

Exhibit 2B, Section D4, Appendix B

Exhibit 2B, Section D4, Figure 5

Exhibit 2B, Section D4

Preamble**:**

Figure 3 from Reference 1 is reproduced below.

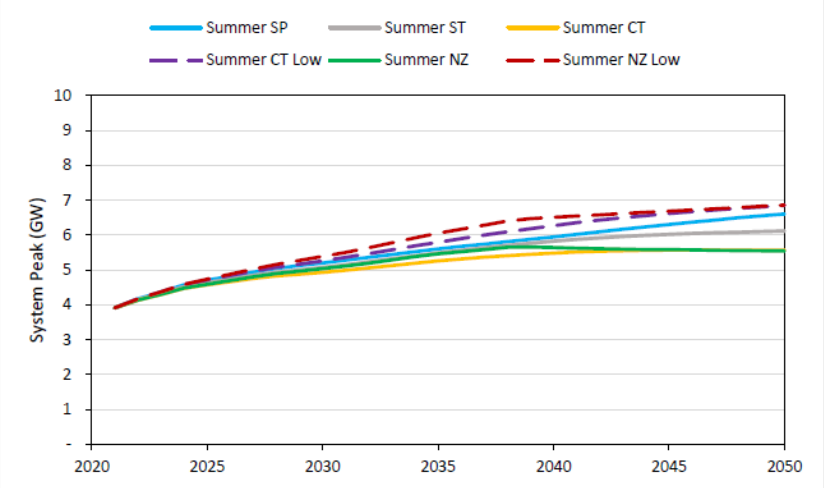
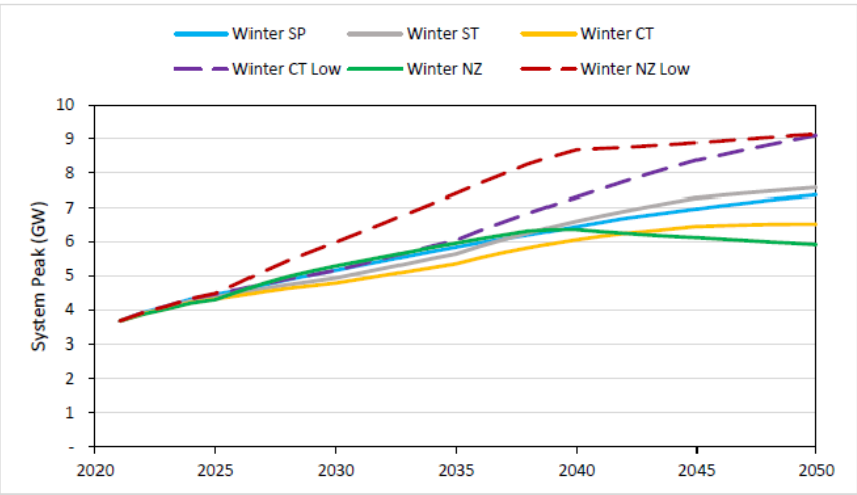
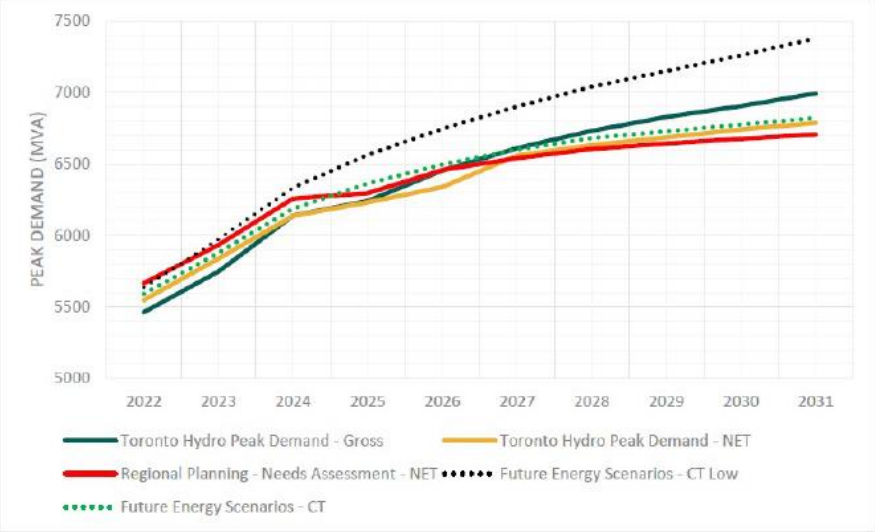


Figure 4 from Reference 1 is reproduced below.



Reference 3 is reproduced below.



QUESTION (A):

a) Please complete the following table for all the years shown in Figure 3 above, with MW values:

Summer System Peak for Scenario Worlds

Peak Load (MW)	SP	ST	CT	CT-low	NZ	NZ-low
2021						
2022						
2023						
2024						
2025						
Through to						
2050						

RESPONSE (A):

Please see Table 1.

Table 1. Summer System Peak (Coincident) for Scenario Worlds (MW)

	SP *(MW)*	ST *(MW)*	CT *(MW)*	CT Low *(MW)*	NZ *(MW)*	NZ Low *(MW)*	Stations *(MVA)*
2021	3,912	3,912	3,912	3,912	3,912	3,912	n/a
2022	4,170	4,144	4,135	4,170	4,135	4,170	n/a
2023	4,366	4,323	4,298	4,368	4,298	4,369	4,905
2024	4,574	4,514	4,472	4,579	4,481	4,589	5,080
2025	4,706	4,632	4,575	4,718	4,591	4,737	5,229
2026	4,817	4,737	4,664	4,842	4,695	4,879	5,383
2027	4,936	4,842	4,753	4,967	4,801	5,024	5,475
2028	5,042	4,931	4,827	5,077	4,896	5,159	5,659
2029	5,123	4,999	4,878	5,166	4,966	5,272	5,835
2030	5,201	5,069	4,932	5,257	5,036	5,385	5,941
2031	5,282	5,148	4,994	5,360	5,109	5,504	6,029
2032	5,363	5,232	5,060	5,467	5,194	5,635	6,136
2033	5,445	5,318	5,128	5,577	5,290	5,779	n/a
2034	5,526	5,405	5,196	5,688	5,380	5,919	n/a
2035	5,604	5,486	5,258	5,793	5,463	6,051	n/a
2036	5,674	5,565	5,316	5,899	5,525	6,169	n/a
2037	5,740	5,637	5,365	5,998	5,586	6,286	n/a
2038	5,809	5,704	5,409	6,093	5,648	6,405	n/a
2039	5,877	5,766	5,449	6,185	5,657	6,471	n/a
2040	5,948	5,823	5,483	6,271	5,644	6,515	n/a
2041	6,021	5,878	5,515	6,355	5,625	6,548	n/a
2042	6,094	5,922	5,537	6,430	5,608	6,582	n/a
2043	6,166	5,960	5,552	6,498	5,596	6,616	n/a
2044	6,237	5,994	5,563	6,562	5,586	6,651	n/a
2045	6,305	6,024	5,573	6,620	5,581	6,685	n/a
2046	6,371	6,045	5,574	6,670	5,573	6,719	n/a
2047	6,433	6,065	5,573	6,719	5,566	6,754	n/a
2048	6,497	6,082	5,570	6,766	5,559	6,790	n/a
2049	6,553	6,100	5,570	6,810	5,553	6,825	n/a
2050	6,606	6,118	5,571	6,854	5,547	6,859	n/a

QUESTION (B):

b) Please complete the following table for all the years shown in Figure 4 above, with MW values:

Winter System Peak for Scenario Worlds

Peak Load (MW)	SP	ST	CT	CT-low	NZ	NZ-low
2021						
2022						
2023						
2024						
2025						
Through to 2050						

RESPONSE (B):

Please see Table 2.

Table 2. Winter System Peak (Coincident) for Scenario Worlds (MW)

	SP *(MW)*	ST *(MW)*	CT *(MW)*	CT Low *(MW)*	NZ *(MW)*	NZ Low *(MW)*	Stations *(MVA)*
2021	3,671	3,672	3,671	3,671	3,671	3,671	n/a
2022	3,920	3,896	3,886	3,920	3,876	3,920	n/a
2023	4,114	4,072	4,046	4,116	4,029	4,117	4,812
2024	4,318	4,260	4,217	4,324	4,197	4,332	4,988
2025	4,451	4,378	4,320	4,465	4,302	4,481	5,142
2026	4,577	4,494	4,420	4,603	4,541	4,804	5,290
2027	4,730	4,622	4,531	4,760	4,778	5,134	5,383
2028	4,890	4,739	4,631	4,905	4,981	5,443	5,537
2029	5,028	4,834	4,707	5,030	5,143	5,724	5,642
2030	5,163	4,934	4,788	5,163	5,288	5,996	5,699
2031	5,303	5,075	4,901	5,335	5,424	6,266	5,740
2032	5,441	5,218	5,014	5,512	5,559	6,546	5,795
2033	5,578	5,364	5,129	5,694	5,697	6,834	n/a
2034	5,713	5,508	5,241	5,876	5,834	7,117	n/a
2035	5,843	5,646	5,353	6,052	5,963	7,401	n/a
2036	5,979	5,874	5,535	6,334	6,092	7,702	n/a
2037	6,091	6,072	5,686	6,587	6,208	7,980	n/a
2038	6,206	6,259	5,825	6,832	6,320	8,260	n/a
2039	6,322	6,436	5,951	7,069	6,360	8,482	n/a
2040	6,446	6,601	6,065	7,298	6,363	8,682	n/a
2041	6,570	6,753	6,163	7,521	6,305	8,711	n/a
2042	6,687	6,891	6,245	7,748	6,252	8,747	n/a
2043	6,781	7,027	6,312	7,967	6,206	8,790	n/a
2044	6,874	7,157	6,385	8,177	6,162	8,835	n/a
2045	6,966	7,275	6,453	8,375	6,124	8,887	n/a
2046	7,054	7,345	6,478	8,526	6,083	8,934	n/a
2047	7,137	7,411	6,499	8,676	6,043	8,989	n/a
2048	7,218	7,470	6,511	8,822	6,002	9,044	n/a
2049	7,292	7,523	6,516	8,960	5,962	9,096	n/a
2050	7,363	7,577	6,518	9,101	5,921	9,144	n/a

QUESTION (C):

c) Please add the summer and winter peak system load forecasts that underly the investment plan, as shown in Reference 3 to the tables of a) and b), acknowledging that the forecasts of Reference 3 may not be performed through to include 2050.

RESPONSE (C):

Please refer to Tables 1 and 2 as provided above. Please note that the graph referenced in Reference 3 was updated on January 29, 2024.

QUESTION (D):

d) Reference 2 states that the "steady progression" (SP) scenario world is aligned with the TransformTO "Business as Planned" scenario. With Reference 4, Toronto Hydro states that its system peak demand forecast is generally aligned with the Consumer Transformation (CT) scenario. Please articulate the key differences and similarities, as they relate to Toronto Hydro's investment plan, between the SP scenario, the CT scenario, and the forecasts that underly the proposed investment plan in this proceeding.

RESPONSE (D):

The key assumptions used for the SP and CT scenarios are explained in Exhibit 2B, Section D4, Appendix B, Section 2 (pages 3 – 7) while the description of the process for the forecasts that underly the proposed investment plan can be found in Exhibit 2B, Section D4.1.1 (pages 2 – 6).

QUESTION (E):

e) Please articulate how the Future Energy Scenarios (FES) tool has informed system planning for the rate period of this application. How did the FES tool inform capital investments and operations and maintenance plans for this period? How will the FES tool continue to be used moving forward?

RESPONSE (E):

Please refer to response in 3-Staff-274 g), 1B-CCC-30 and Exhibit 2B, Section D4, Appendix A, Section 1.3 (page 4). The FES tool continues to be valuable because it allows Toronto Hydro to identify investments that would be required to reinforce the grid in different scenarios. This capability supports Toronto Hydro's least regrets planning philosophy in that it allows the utility to stress test its Peak Demand Forecast against plausible scenarios to ensure that the utility (1) does not overbuild the system and (2) does not become a barrier to particular decarbonization pathways.

The FES tool may be updated on an as-needed basis when material new information is released.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-159

Reference: **Report of the Board: Renewed Regulatory Framework for Electricity Distributors: A Performance-Based Approach, October, 2012**
Exhibit 2B, Section D4, Appendix B

Preamble:

Reference 1 states that "the output of any methodology will need to be transparent, robust and reproducible, and include forecast information from independent and authoritative sources where these are publicly available."

None of the links in the footnotes in Reference 2 are functioning hyperlinks.

QUESTION (A):

a) Please provide all the links in the report as attachments to the response to this interrogatory. Where the footnote references a data file, provide as xlsx/csv file where it is available in that format from the source.

RESPONSE FROM ERM (A):

Section	Section Heading	Provided Link(s)
Executive Summary	N/A	CER, Canada's Energy Future, 2021 IESO, Annual Planning Outlook, 2022 City of Toronto, TransformTO, 2021
3.2	Local Factors and Customization to Toronto	City of Toronto, About Toronto Neighbourhoods, 2022. *Note that since the time of analysis, some neighbourhoods have been split up because of very high population growth. Effective after April 12, 2022, the number of neighbourhoods in Toronto is 158.*

4.1.1	Core Demand - Archetype Definitions	Statistics Canada, The Census of Population – Neighbourhood Profiles, 2016 Natural Resources Canada, Survey of Household Energy Use Data Tables, 2015 North American Industrial Classification System NAICS & SIC Identification Tools | NAICS Association
4.1.2	Core Demand - Building Stock	Watson & Associates, City of Toronto Development Charge Background Study, 2008 Toronto Data Management Group, Traffic Zones Boundary Files, 2006 (Toronto Hydro's network area covers 677 traffic zones). City of Toronto, SmartTrack Stations Program, 2021
4.1.3	Core Demand - Core Electrical Efficiency	National Resources Canada, Canada-wide Energy Use Dataset | Energy Efficiency Trends Analysis Tables, 2000 – 2018 National Resources Canada, 2015 Survey of Household Energy Use (SHEU-2015) Data Tables , 2015 National Resources Canada, Energy Star | Choosing and Using Appliances With EnerGuide, 2013 Natural Resources Canada, Residential Sector Canada Table 37: Appliance Stock by Appliance Type and Energy Source Toronto Public Health, Protecting Vulnerable People from Health Impacts of Extreme Heat, July 2011 Natural Resources Canada Comprehensive Energy Use Database (2000 – 2018) | Commercial/Institutional Sector – Ontario Natural Resources Canada, Canada-wide Energy Use Database (2000 – 2018) | Total End-Use Sector - Energy Use Analysis Efficiency Canada and Carleton University, Canada's Climate Retrofit Mission, June 2021 City of Toronto, City of Toronto NetZero Existing Buildings Strategy and Technical Appendix, 2021
4.1.4	Core Demand - Flexibility Measures	Ontario Energy Board (OEB), Frequency of Regulated Price Plan Switching Under Consumer Choice, 2021
4.2.2	Low Carbon Heating - Policy Assumptions	The Independent Electricity System Operator, Pathway to Decarbonization – Assumptions for Feedback, March 2022
4.2.3	Low Carbon Heating - Thermal Efficiency	Natural Resources Canada, National Energy Use Database – Ontario, 2018 The City of Toronto, Net Zero Existing Buildings Strategy, May 2021
4.2.4	Low Carbon Heating - Uptake	The Canadian Gas Association, Potential Gas Pathways to Support Net Zero Buildings in Canada, October 2021

	Modelling Results	
4.3.1	Electrification of Transport - Modelling Approach	Government of Canada, Incentives for Zero-Emissions Vehicles (iZEV), April 2022 Statistics Canada, Vehicle registrations by type of vehicle, September 2020 Ontario Data Catalogue, Vehicle Population Data 2016, March 2019 Statistics Canada, New zero-emission vehicle registrations, January 2022 Toronto Transit Commission, Service Summary 2021, January 2022
4.3.2	Electrification of Transport - Cars and Light Trucks	Canada Energy Regulator, Canada's Energy Future, 2021 Bloomberg NEF, Electric Vehicle Outlook, 2021
4.3.3	Electrification of Transport - Medium- and Heavy-Duty Trucks	Government of Canada, Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles Program, July 2022 California Air Resource Board, Medium- and Heavy-Duty ZEV requirement, 2020
4.3.4	Electrification of Transport - Buses	Toronto Transit Commission, TTC Green Initiatives, 2022
4.3.5	Electrification of Transport - Rail	The City of Toronto, Transit Expansion, June 2022
4.3.6	Electrification of Transport - Charging Distribution	Element Energy and WSP Parsons Brinckerhoff, Plug-in electric vehicle uptake and infrastructure impacts study, 2016 Element Energy, Electric Vehicle Charging Behaviour Study, 2019 Statistics Canada, 2021 Census of population, 2021 Toronto Metropolitan University, Household car ownership, 2018 City of Toronto Open Data Portal, Land use zoning by-law, 2022 Element Energy for Transport & Environment, Battery electric HGV adoption in the UK: barriers and opportunities, November 2022
4.3.7	Electrification of Transport - Smart Charging and Vehicle-to-Grid	Element Energy, V2GB – Vehicle to Grid Britain Requirements for market scale-up (WP4), June 2019 Bauman, J. et. al., Residential Smart-Charging Pilot Program in Toronto: Results of a Utility Controlled Charging Pilot, June 2016 IAEE, Driver Experiences with Electric Vehicle Infrastructure in Ontario, Canada and the Implications for Future Policy Support, Fourth Quarter 2020 FleetCarma, Charge the North, 2019
4.4.1	Electricity Generation -	IESO, Active Generation Contract List, June 2021

	Modelling Approach	
4.4.2	Electricity Generation - Solar Photovoltaics	NREL, Solar Futures Study, 2021 OEB, Electricity Rates, 2022 IESO, microFiT Program, 2022 IESO Capacity Auction, 2022 City of Toronto, Physical area of parking lots, 2019
4.4.4	Electricity Generation - Non-Renewables	Ontario Clean Air Alliance, Ontario Municipalities that have endorsed gas power phase-out, March 2021
4.5.1	Energy Storage - Domestic Battery Storage	NREL, Cost Projections for Utility-Scale Battery Storage: 2021 Update, June 2021 KPMG, Development of decentralized energy and storage systems in the UK, October 2016
4.5.2	Energy Storage - Industrial and Commercial Battery Storage	IESO, Hourly Ontario Energy Price, 2022 IESO, Industrial Conservation Initiative Backgrounder, July 2022 IESO, Ancillary Services, 2022

1

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-160

Refences: **Exhibit 2B, Section D5, Page 4**

Exhibit 2B, Section D5, Page 69

Preamble:

Regarding Toronto Hydro's forecasted DER penetration, DER caused potential complexity to system operations, and DER hosting and load capacity map.

QUESTION (A):

a) Please provide Toronto Hydro's DER connection policies that are being put into place to limit the complexity and instability caused by DERs?

RESPONSE (A):

Toronto Hydro has clear DER connections guidelines, as outlined in Toronto Hydro's Conditions of Service Reference 3 document. By following these guidelines and working with its customers through the DER Connections process, Toronto Hydro ensures that safety, technical and operating requirements are satisfied with respect to DER connections. This helps the utility manage potential complexities that may be introduced to the grid.

QUESTION (B):

b) Is Toronto Hydro implementing policies to incentivize DER development in areas where the grid has excess capacity, and disincentivize DERs in areas with restricted capacity?
   i. If yes, please provide documentation.
   ii. If no, please explain why this is prudent from a ratepayer and legislative perspective.

RESPONSE (B):

Toronto Hydro supports DER connections in accordance with the Distribution System Code (DSC) and plans to incent DER development by providing customers with better visibility and essential information regarding available capacity (Hosting Capacity Assessment and Maps – Exhibit 2B, Section D5.3.4) so that customers can be well informed about system constraints when planning their DER projects. In addition, through an expanded Local Demand Response initiative as part of the Non-Wires Solution program (Exhibit 2B, Section E7.2) Toronto Hydro continues to offer financial incentives (i.e. capacity payments) for DER resources that can offer demand response services to the grid. This offering includes the development of online DR Capacity Auction tool to make it easier for customers and aggregators to participate in Local DR.

QUESTION (C):

c) Who bears the cost of expenditures needed to enable DER connections on feeders that do not have excess hosting capacity?
    i. Why is this prudent from a ratepayer perspective?

RESPONSE (C):

In accordance with section 3.3.3 of the DSC, system enhancements costs are borne by the distributor rather than by individual customers. Distribution investments to connect, or enable the connection, of Renewable Energy Generation ("REG") facilities to Toronto Hydro's distribution system are eligible for provincial rate recovery under section 79.1 of the *Ontario Energy Board Act, 1998*. Please see Exhibit 2A, Tab 5, Schedule 1 for more information.

QUESTION (D):

d) Does the Hosting Capacity Analysis (HCA) discourage or otherwise inhibit potential DER candidates from connecting to the grid in areas that have capacity constraints? Please discuss.
    i. If not, what is the value to ratepayers of the expenditures required for the HCA?

RESPONSE (D):

Yes. A public-facing HCA map or data portal can potentially discourage DER candidates from connecting to the grid in areas with capacity constraints. This is because the map may show that the local grid cannot support additional DERs without significant upgrades or modifications. Knowing this, potential candidates might choose not to invest in DERs in these areas due to the anticipated costs, delays, or uncertainties associated with grid upgrades.

Conversely, a HCA map can also empower DER candidates by providing them with preliminary information about the grid's capacity. This transparency enables them to make more informed decisions regarding where and how to invest in DER technologies. For example, they might decide to install DER in areas with more capacity or consider smaller systems that fit the existing grid capabilities.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-161

Reference: Exhibit 2B, Section D5.2.1, Page 11

Preamble:

Toronto Hydro writes that it is "adding more sensors, relays and monitoring technology at specific nodes across the distribution grid, including customer meters. These assets will provide additional data collection points across the grid, which Toronto Hydro will leverage to improve overall situational awareness ("grid transparency"), facilitate quicker fault location, and gain access to important insights at the edge of the grid."

QUESTION (A):

a) Please provide several representative examples where Toronto Hydro is proposing to put these sensors and relays and explain why they are being proposed for these locations relative to the rest of Toronto Hydro's territory.

RESPONSE (A):

To clarify, the reference to "specific nodes" is intended to convey the fact that there are various locations within the design of the distribution system (as opposed to the geography) where certain sensors and technologies can provide value. Some examples include:

- AMI 2.0 meters, which provide observability and control at the customer-level;
- Network Condition Monitoring and Control technologies, which provide observability and control on Toronto Hydro's network system; and
- Stations Digital Relays, which provide observability and control at the stations level.

For a comprehensive overview of how these technologies support Toronto Hydro's Grid Modernization Strategy, and how the utility is pacing and prioritizing deployment, please refer to Exhibit 2B, Section D5.2.1 and Sections E5.4, E6.6, and E7.3.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-162

Reference: Exhibit 2B, Section D5.2.1.2, p. 14

Preamble:

"One of the most significant objectives for Toronto Hydro's Grid Modernization Strategy in the 2025-2029 rate period is to advance the ongoing process of readying Horseshoe system feeders for the transition to a self-healing operation beginning in 2030."

QUESTION (A):

a) Please quantify the anticipated improvement in SAIDI and SAIFI after Toronto Hydro transitions to self-healing operations in the Horseshoe region.

RESPONSE (A):

Based on preliminary network simulations, Toronto Hydro estimates that a successful full-scale implementation of Fault Location, Isolation, and Service Restoration ("FLISR"), otherwise referred to as Distribution Automation ("DA"), across the Horseshoe region could deliver improvements in the range of 20% and 25% for SAIDI and SAIFI, respectively.

QUESTION (B):

b) If Toronto Hydro anticipates a material improvement in SAIDI and SAIFI due to self-healing operations, please reconcile the associated investments against Toronto Hydro's strategy of maintaining historic reliability.

RESPONSE (B):

Toronto Hydro expects to realize the improvements from automated FLISR beginning in 2030. Please see response 1B-Staff-175 for more information on Toronto Hydro's reliability objectives related to modernization more broadly.

QUESTION (C):

c) Why is the horseshoe the area of focus versus the downtown or other parts of Toronto?

RESPONSE (C):

Toronto Hydro's Horseshoe and Downtown systems are fundamentally different in design. The Horseshoe area is configured as an open-loop primary system, with many feeder ties (including intra- and inter-station feeder ties) and sectionalizing points which are SCADA-enabled. The Horseshoe system also has a high proportion of overhead feeders, which are exposed to the elements. By contrast, the Downtown system is largely a combination of dual-radial and networked configurations, which are designed to provide a very high degree of day-to-day reliability for high density areas and critical loads. The Horseshoe system, due to its various design features, is substantially less reliable on a day-to-day basis, and is also more exposed to major reliability events due to high winds and ice accumulation. In fact, the Horseshoe system accounts for 76% of total system SAIDI and 89% of total system SAIFI on average.

The system design differences stem from the fundamental trade-off between cost and reliability in distribution system design. The density and criticality of loads in the Downtown area (combined with the fact that space for utilities is at a premium in the urban core) justifies a higher-cost, largely underground system, whereas this is less the case in the comparatively lower density Horseshoe area of the city. FLISR implementation represents an opportunity for Toronto Hydro to stack a proven and cost-effective digital enhancement on top of the existing features of the Horseshoe system in order to deliver a necessary step-change improvement in the long-term reliability, resiliency, and operational efficiency of this system. For more details on FLISR, please refer to Section D5.2.1.2 and D5.3.2.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-163

References: Exhibit 2B, Section D5.2.1.2, Page 15

Exhibit 1B, Tab 3, Schedule 3, App A, Page 30

Preamble:

Toronto Hydro states that a U.S. Department of Energy report on FLISR implement found that "FLISR reduced the number of Cis ("Customers Interrupted") by up to 45 percent and reduced the CMIs ("Customer Minutes of Interruption") by up to 51 percent for a relevant outage event." The footnote indicates that the time basis of calculating momentary outages in the study is different than that used by Toronto Hydro.

QUESTION (A):

a) Please quantify the reported improvement in Toronto Hydro's FLISR metrics if Toronto Hydro uses the same metric definition as in the U.S. Department of Energy Study.

RESPONSE (A):

As detailed in Exhibit 2B, Section D5.2.1.2, Toronto Hydro anticipates substantial benefits from the introduction of automatic FLISR starting in 2030. See response to interrogatory 2B-Staff-162, part (a) for anticipated benefits of a full-scale implementation of FLISR across the Horseshoe Region.

It is important to note that the level of benefits achieved from automatic FLISR will ultimately depend on the specific technical and operating realities with respect to integrating FLISR into Toronto Hydro's existing distribution system. The utility will have a more accurate expectation of likely benefits once it has made substantial progress on the "manual FLISR" implementation planned for the 2025-2029 rate period.

The maximum benefits cited from the U.S. Department of Energy report were derived from feeder-level data collected from 266 FLISR events observed over the course of a year. By comparison, Toronto Hydro evaluated the expected impact of FLISR on its system-wide reliability statistics, meaning that the benefits are statistically diluted by including outages that would not be impacted by FLISR (see 2B-Staff-162 for more information).

QUESTION (B):

b) Please update Table 11 in Reference 2 (PDF Page 364/1113) based on using the same definition of SAIFI for Toronto Hydro and its peers.

RESPONSE (B):

Please note the reliability benchmarking results provided in Table 11, and others in the Reliability Benchmarking Study prepared by Clearspring Energy Advisors, are based on different interruption reporting practices, which are not applied to Toronto Hydro and other distributors in Ontario. Most notably, Toronto Hydro and its peer distributors in Ontario and across Canada follow a one-minute threshold for sustained interruptions, which differs from the predominant five-minute interruption definition used in the US for sustained interruptions, as detailed in Exhibit 1B, Tab 3, Schedule 3, App A, Pg. 25. Based on available data, Toronto Hydro is not able to reproduce Table 11 on a one-minute sustained interruption threshold, however, in order to maintain consistency with the benchmarking approach, it provided its interruption data on a 5-minute sustained interruption threshold, which underpins the information provided in Table 11.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-164

References: Exhibit 2B, Section D5.2.2, Page 28
Exhibit 2B, Section D5.2.2, Page 35
Exhibit 2B, Section E3, Page 14

Preamble:

Toronto Hydro states, in Table 3. Grid Readiness Program Summaries, Technology - Grid protection, Monitoring and Control, "Toronto Hydro has identified and forecasted a number of stations with short circuit capacity limits, capping the amount of DER connections. Additionally, several feeder circuits have surpassed the recommended generation to minimum load ratio..."

QUESTION (A):

a) Which stations have been identified and forecasted to experience short circuit capacity limits in the planning period?

RESPONSE (A):

Please see Exhibit 2B, Section E5.5 at page 7, Table 4.

QUESTION (B):

b) Please expand Table 3 from the second reference to include columns that indicate for each station:
   i. the first year in which its short circuit capacity will be exceed in its present configuration,
   ii. the year in which the bus-tie reactors will be installed,
   iii. the new short circuit capacity once bus tie reactors are installed, and
   iv. the first year in which that capacity will again be exceeded.

RESPONSE (B):

Please see updated Table 3 below.

Table 3: Locations of Proposed Bus Tie Reactors (2025-2029)

Station Name	Bus	Forecasted Year of Capacity Exhaustion	Planned Installation Year	Bus-tie Reactor Size*	Forecasted Year of Capacity is to be exceeded**
Cecil	CE-A1A2	2025	2027	To Be Determined	To Be Determined
Esplanade	X-A1A2	2025	2028	To Be Determined	To Be Determined
Leslie	51-BY	2025	2029	To Be Determined	To Be Determined
Richview	88-BY	2023	2025	To Be Determined	To Be Determined
Runnymede	11-JQ	2025	2026	To Be Determined	To Be Determined
Woodbridge	D6-BY	2023	2029	To Be Determined	To Be Determined

Notes:
(*) – To be determined after HONI study.
(**) – To be determined after bus-tie reactor size is determined.

QUESTION (C):

c) What is the lead time required to acquire and install each of the bus tie reactors planned for the upcoming test period?

RESPONSE (C):

Lead time estimates varies from 1 to 2 years. This includes the feasibility study, procurement, installation and commissioning of the projects.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-165

Reference: Exhibit 2B, Section D5.2.2.4, Page 42

Preamble:

Toronto Hydro states, "As of the end of 2022, Toronto Hydro has 2,424 unique DER connections to its distribution grid with a total capacity of 304.9 MW."

QUESTION (A):

a) Please provide a table that breaks down the DERs connected to Toronto Hydro's system by technology (CHP, solar PV, battery, etc.) type, capacity (MW), customer class, and connected station.

RESPONSE (A):

Please see Tables 1-14 below.

Table 1: Batteries Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Basin	Commercial / Industrial	0.500
Bridgman	Commercial / Industrial	0.037
	Residential	0.008
Cecil	Commercial / Industrial	2.000
Esplanade	Commercial / Industrial	1.050
Fairchild	Commercial / Industrial	1.000
Finch	Commercial / Industrial	1.498
John	Commercial / Industrial	0.300
Malvern	Commercial / Industrial	5.200
Manby	Commercial / Industrial	2.365
	Residential	0.003
Rexdale	Commercial / Industrial	0.600

Station	Customer Class	Capacity (MW)
Richview	Commercial / Industrial	1.000
	Residential	0.003
Runnymede	Commercial / Industrial	0.999
Scarborough	Commercial / Industrial	0.999
Sheppard	Commercial / Industrial	1.139
Total Battery Capacity (MW)		**18.7**

Table 2: Bi-Fuel (Natural Gas & Diesel) Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Cecil	Commercial / Industrial	1.275
Terauley	Commercial / Industrial	5.400
Total Bi-Fuel (Natural Gas & Diesel) Capacity (MW)		**6.675**

Table 3: Biogas Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Horner	Commercial / Industrial	4.700
Sheppard	Commercial / Industrial	0.500
Total Biogas Capacity (MW)		**5.200**

Table 4: CHP Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Bermondsey	Commercial / Industrial	0.035
Cavanagh	Commercial / Industrial	0.120
Duplex	Commercial / Industrial	0.035
Ellesmere	Commercial / Industrial	0.755
Fairbank	Commercial / Industrial	0.210
Fairchild	Commercial / Industrial	0.146
Finch	Commercial / Industrial	2.528
Horner	Commercial / Industrial	0.397
Leaside	Commercial / Industrial	0.140
Leslie	Commercial / Industrial	0.375

Station	Customer Class	Capacity (MW)
Manby	Commercial / Industrial	0.525
Rexdale	Commercial / Industrial	0.125
Richview	Commercial / Industrial	0.140
Runnymede	Commercial / Industrial	0.490
Scarborough	Commercial / Industrial	0.390
Sheppard	Commercial / Industrial	0.380
Warden	Commercial / Industrial	0.845
Total CHP Capacity (MW)		**7.636**

Table 5: Diesel Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Basin	Commercial / Industrial	5.000
Bathurst	Commercial / Industrial	6.000
Bermondsey	Commercial / Industrial	4.250
Cecil	Commercial / Industrial	1.500
Ellesmere	Commercial / Industrial	5.000
Esplanade	Commercial / Industrial	1.000
Fairbank	Commercial / Industrial	1.350
Fairchild	Commercial / Industrial	0.900
Horner	Commercial / Industrial	1.200
John	Commercial / Industrial	4.050
Leaside	Commercial / Industrial	9.350
Leslie	Commercial / Industrial	7.800
Richview	Commercial / Industrial	1.600
Terauley	Commercial / Industrial	8.550
Wiltshire	Commercial / Industrial	0.500
Total Diesel Capacity (MW)		**58.050**

Table 6: Gas Engine Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Cavanagh	Commercial / Industrial	0.250
Gerrard	Commercial / Industrial	4.233

Station	Customer Class	Capacity (MW)
Total Gas Engine Capacity (MW)		**4.483**

Table 7: Gas Turbine Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Esplanade	Commercial / Industrial	0.750
Total Gas Turbine Capacity (MW)		**0.750**

Table 8: Microturbine Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Agincourt	Commercial / Industrial	0.060
Scarborough	Commercial / Industrial	0.035
Total Microturbine Capacity (MW)		**0.095**

Table 9: Natural Gas Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Agincourt	Commercial / Industrial	0.220
Bathurst	Commercial / Industrial	20.000
Bermondsey	Commercial / Industrial	0.999
Bridgman	Commercial /Industrial	0.355
Cecil	Commercial / Industrial	6.000
Duplex	Commercial / Industrial	0.342
Esplanade	Commercial / Industrial	7.150
Fairbank	Commercial / Industrial	0.340
Fairchild	Commercial / Industrial	1.750
Finch	Commercial / Industrial	6.829
Horner	Commercial / Industrial	4.000
John	Commercial / Industrial	8.500
Leaside	Commercial / Industrial	7.900
Leslie	Commercial / Industrial	1.250
Richview	Commercial / Industrial	0.540
Runnymede	Commercial / Industrial	18.200
Scarborough	Commercial / Industrial	4.099
Strachan	Commercial / Industrial	1.600

Station	Customer Class	Capacity (MW)
Warden	Commercial / Industrial	0.750
Total Natural Gas Capacity (MW)		**90.824**

1 **Table 10: Photovoltaic Connected by Station, Customer Class and Capacity (MW)**

Station	Customer Class	Capacity (MW)
Agincourt	Commercial / Industrial	5.622
	Residential	0.203
Basin	Commercial / Industrial	0.668
	Residential	0.038
Bathurst	Commercial / Industrial	7.115
	Residential	0.503
Bermondsey	Commercial / Industrial	4.299
	Residential	0.387
Bridgman	Commercial / Industrial	0.440
	Residential	0.146
Carlaw	Commercial / Industrial	0.955
	Residential	0.258
Cavanagh	Commercial / Industrial	2.608
	Residential	0.242
Cecil	Commercial / Industrial	0.468
	Residential	0.226
Charles	Commercial / Industrial	0.292
	Residential	0.069
Copeland	Commercial / Industrial	0.208
Dufferin	Commercial / Industrial	1.458
	Residential	0.679
Duplex	Commercial / Industrial	0.198
	Residential	0.151
Ellesmere	Commercial / Industrial	4.837
	Residential	0.401
Esplanade	Commercial / Industrial	0.668
	Residential	0.038
Fairbank	Commercial / Industrial	3.369
	Residential	0.493

Station	Customer Class	Capacity (MW)
Fairchild	Commercial / Industrial	2.801
	Residential	0.488
Finch	Commercial / Industrial	11.702
	Residential	0.491
Gerrard	Commercial / Industrial	0.015
	Residential	0.020
Glengrove	Commercial / Industrial	0.475
	Residential	0.157
Horner	Commercial / Industrial	3.349
	Residential	0.386
John	Commercial / Industrial	0.040
Leaside	Commercial / Industrial	0.919
	Residential	0.441
Leslie	Commercial / Industrial	5.228
	Residential	0.474
Main	Commercial / Industrial	1.274
	Residential	0.265
Malvern	Commercial / Industrial	3.269
	Residential	0.188
Manby	Commercial / Industrial	4.477
	Residential	0.604
Rexdale	Commercial / Industrial	6.251
	Residential	0.223
Richview	Commercial / Industrial	6.018
	Residential	0.409
Runnymede	Commercial / Industrial	2.230
	Residential	0.302
Scarborough	Commercial / Industrial	7.330
	Residential	0.690
Sheppard	Commercial / Industrial	4.990
	Residential	0.841
Strachan	Commercial / Industrial	1.291
	Residential	0.102

Station	Customer Class	Capacity (MW)
Terauley	Commercial / Industrial	0.354
	Residential	0.020
Warden	Commercial / Industrial	3.538
	Residential	0.721
Wiltshire	Commercial / Industrial	0.316
	Residential	0.110
Woodbridge	Commercial / Industrial	0.100
	Residential	0.062
Total Photovoltaic Capacity (MW)		**110.003**

Table 11: Steam Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Cecil	Commercial / Industrial	0.500
Strachan	Commercial / Industrial	0.275
Total Steam Capacity (MW)		**0.775**

Table 12: Turbo Expander Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Leslie	Commercial / Industrial	1.000
Total Turbo Expander Capacity (MW)		**1.000**

Table 13: Underwater Compressed Air Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Strachan	Commercial / Industrial	0.660
Total Underwater Compressed Air Capacity (MW)		**0.660**

Table 14: Wind Turbine Connected by Station, Customer Class and Capacity (MW)

Station	Customer Class	Capacity (MW)
Fairchild	Residential	0.003
Manby	Residential	0.007

Station	**Customer Class**	**Capacity (MW)**
Sheppard	Residential	0.003
Strachan	Commercial /Industrial	0.750
Total Wind Turbine Capacity (MW)		**0.763**

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-166

Reference: Exhibit 2B, Section D5, Page 59

Preamble:

With regards Toronto Hydro's commentary around AMI 2.0 and future-proofing the meter to provide over-the air updates.

QUESTION (A):

a) Would updating meters after they are sealed require a re-sealing event?

RESPONSE (A):

No, over-the-air firmware upgrades do not require re-sealing.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-167

Reference: Exhibit 2B, Section D5, Page 30

Preamble:

In order to equip customers with easily accessible and up-to-date information as to where DERs can be accommodated most efficiently, Toronto Hydro has proposed a creation of a Hosting and Load Capacity Map (or equivalent data portal) which will provide estimate available capacity for DER interconnection and load capacity at different locations on the network.

QUESTION (A):

a) Please confirm whether the Hosting and Load Capacity map (or equivalent data portal) will provide estimated available capacity for connections other than DERs (for example, load connections such as EV charging connections).

RESPONSE (A):

Toronto Hydro is currently in the planning phases of these projects and assessing the scope and intricacies involved. As stated in Exhibit 2B Section D5.3.4, the utility will explore opportunities to calculate and present complimentary analyses, including load capacity constraints. The utility's priority remains to ensure that any tools or information provided to customers is accurate, reliable, sustainable (i.e., cost-effective), and aligned with Toronto Hydro's commitment to delivering value-for-money.

QUESTION (B):

b) Please confirm how often the data on the Hosting and Load Capacity Map (or equivalent data portal) will be updated.

RESPONSE (B):

As Toronto Hydro is currently assessing the requirements and developing a plan for this project, the utility cannot confirm how often the Hosting and Load Capacity Map would be updated. Toronto Hydro is currently reviewing industry best practices for similar maps and will use the outcome of this review, along with thorough stakeholder and customer engagement, as input to determine the update frequency.

QUESTION (C):

c) Please provide the "Business Case" or similar document produced by the business unit related to the creation of a Hosting and Load Capacity Map (or equivalent data portal). Please provide any other documentation created by Toronto Hydro that provides an overview of the technical requirements of this map or data portal.

RESPONSE (C):

Toronto Hydro has just begun exploring options for the creation of the hosting and loading capacity maps and therefore no "Business Case" or similar document exists. Toronto Hydro is currently reviewing industry best practices for similar maps and will identify next steps including defining the technical requirements.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-168

Reference: Exhibit 2B, Section E1.1, p. 1

Exhibit 1B, Tab 1, Schedule 3, p.5

Preamble:

Toronto Hydro states "In the current rate period, Toronto Hydro's operating parameters shifted from a relatively linear and stable environment to a more dynamic growth-oriented context."

QUESTION (A):

a) Please reconcile the statement above with the negative Total Normalized MVA (% change), and Total Normalized GWh (% change) as shown in Table 5 in Reference 2.

RESPONSE (A):

Reference 1 refers to significant increases in *future* customer demand driven by an unprecedented energy transition that is creating new and expanded roles for electricity within the economy. To gain insight into the challenge posed by the energy transition, Toronto Hydro commissioned an industry leading consumer-choice modelling Future Energy Scenarios study to assess the impacts of different energy transition scenarios on Toronto Hydro's distribution system. The Future Energy Scenarios study (filed in Exhibit 2B, Section D3) reveals that in the next two-three decades, a significant increase in peak demand across all scenarios is expected to occur, including the least ambitious steady progression scenario that falls short of meeting Net Zero 2050 objectives. This outlook is consistent with other leading studies, such as the Independent Electricity System Operator's ("IESO") Pathways to Decarbonization ("P2D") report, which estimates that in a high-growth scenario, in less than 30 years, Ontario could need more than double its electricity generating capacity.

Reference 2 refers to Toronto Hydro load forecast for billing purposes in the 2025-2029 rate term.

Please see response to 1B-PP-18 for the further details.

QUESTION (B):

b) Is the described shift in operating parameters from "linear and stable" to "more dynamic growth-oriented" a key driver of Toronto Hydro's step-increase in overall capital spending relative to historical spending?

RESPONSE (B):

As noted in Exhibit 2B, Section A at page 2, investing in the performance and long-term viability of an aged, deteriorated, and highly utilized system, while preparing the system to meet the demands of increased electrification, is a key priority of Toronto Hydro's 2025-2029 Distribution System Plan.

As noted in Exhibit 2B, Section E4.2 on page 15, compared to the current 2020-2024 rate period, there is a shift in the 2025-2029 rate period towards System Access and System Service investments to:

i) keep pace with the demands of customers in a city that is growing, digitizing and decarbonizing its economy, and

ii) prepare the grid for the energy transition that is set to unfold over the next two decades by modernizing the utility's infrastructure and operations to improve resiliency, enable DER integration and deliver long-term reliability and efficiency benefits to customers.

Please see Exhibit 2B, Section E4 starting on page 15 for a detailed summary of forecast (2025-2029) vs. historical (2020-2024) expenditures by investment category.

QUESTION (C):

c) Does the shift from "linear and stable" to "more dynamic growth-oriented" materially affect the pace of renewal spending? If yes, please explain why.

RESPONSE (C):

When normalized for inflation, the pace of renewal investment in the next rate period is increasing by approximately 25% compared to historical investment levels (see 2B-Staff-69). As summarized in Exhibit 2B, Section E4.2.2 at page 17, this increase is necessary to manage significant safety, reliability, and environmental asset risks, maintain the system in a state of good repair by managing the overall health demographics of assets, and ensure stable and predictable grid performance for current and future customers. Expansion of capacity as part of renewal projects is not a major incremental driver of the proposed level of System Renewal expenditures in this rate filing.

However, Toronto Hydro expects that the shift to a more dynamic growth-oriented context could place incremental pressures on the System Renewal programs and influence the way renewal projects are prioritized. The utility expects that accommodating neighbourhood-level growth due to electrification will require upgrading the capacity of primary cables and conductors, distribution transformers, secondary buses, and protection schemes, which in turn could have cascading effects such as the need to accelerate voltage conversion projects. When Toronto Hydro replaces an asset or rebuilds an area as part of a planned renewal project, it examines the demand in the area to determine whether the new equipment should be built to a larger standard and whether the feeder more broadly requires reconfiguration or load balancing. In a high electrification scenario, a greater share of the allotted System Renewal funding will need to go toward these expansionary costs, in turn reducing the extent to which expenditures are targeted more narrowly at mitigating asset failure risk. In the long-term, Toronto Hydro cannot neglect asset deterioration and asset failure risk, as this would lead to worsening reliability, heightened safety and environmental risks, and an overall backlog of deteriorating assets that would need to be addressed at higher costs in the future. Therefore, in the long-term, under a high electrification scenario, the utility expects the dual drivers of reliability and growth to result in a higher overall need for System Renewal investment.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-169

Reference(s): Exhibit 2B, Section E1.1, Page 2
Exhibit 2B, Section E1.2, Page 4
Filing Guidelines for Incentives for Electricity Distributors to Use Third-Party DERs as Non-Wires Alternatives, March 28, 2023, Ontario Energy Board
FRAMEWORK FOR ENERGY INNOVATION: Setting a Path Forward for DER Integration, January 2023, Ontario Energy Board

Preamble:

Toronto Hydro states "Sustainment and Stewardship: Risk-based investments in the renewal of aging, deteriorating and obsolete distribution equipment to maintain the foundations of a safe and reliable gird."

QUESTION (A):

a) Toronto Hydro is proposing to increase its renewal spending by 35% relative to historical levels (reference 2). Please explain the extent to which this overall increase is being driven by any of the following factors:
   - changes in the rate of deterioration of Toronto Hydro's assets
   - a backlog in historically unaddressed renewal needs
   - a change in the deemed acceptable failure risk threshold for specific asset types
   - other reasons.

RESPONSE (A):

Toronto Hydro continues to face asset demographic challenges in operating a mature distribution system. As summarized in Exhibit 2B, Section A3.1, both condition and age demographics identify a number of critical asset classes with significant investment needs over the 2025-2029 period. These needs are driven by various factors, including those listed in the question above. Through its

investments in Sustainment and Stewardship, Toronto Hydro is aiming to maintain reliability and asset risk current levels. Toronto Hydro has not materially changed its risk threshold for any major asset classes from the previous rate period. However, as part of the utility's strategy for improving resiliency in parts of the overhead system that are critical and vulnerable to increased adverse weather, Toronto Hydro has reintroduced an Overhead Infrastructure Resiliency segment to allow for targeted relocation and undergrounding (Exhibit 2B, Section E6.5), and this partially explains the increase in the Overhead System Renewal program compared to 2020-2024.

The following paragraphs provide a brief summary of the three major drivers of increases in the System Renewal category: inflation; overhead and underground system health and reliability; and asset deterioration in stations.

Inflation

As discussed and illustrated in Exhibit 2B, Section D2.1.3, and as reflected in the unit cost pressures noted in other interrogatory responses (e.g., 2B-Staff-212), Toronto Hydro has dealt with significant inflationary pressures in the current rate period. Calculating the actual amount by which labour and materials inflation has impacted historical costs at the project level is a data-intensive undertaking. However, using the OEB's inflation factor, in combination with Toronto Hydro's forward-looking inflation assumptions, to adjust all of the expenditures in the 2020-2029 period to 2020 dollars, the utility estimates that 60% of the increase in System Renewal expenditures is due to inflation.[1]

Overhead and Underground System Health and Reliability

The condition of Toronto Hydro's overhead and underground systems has deteriorated since 2018. As shown in Table 2 in Exhibit 2B, Section E2, the percentage of assets on the overhead system that are in HI4/HI5 condition has increased from 6% to 9%. While the underground system percentage is stable at 3%, the projected rate of deterioration is higher looking out to 2029 as compared to the equivalent analysis done in 2018 (i.e., seven percentage points vs. four percentage points of

[1] Toronto Hydro applied the 2021-2023 OEB inflation factors to 2020-2022. The OEB's inflation factors lag actual inflation by approximately two years.

deterioration without investment). Toronto Hydro also notes that the most critical asset on the underground system from a reliability perspective is primary cable. This asset class is not reflected in the condition models, and as discussed in Exhibit 2B, Section E6.2, Toronto Hydro has seen a deterioration in reliability performance for this asset type during this rate period, with customer interruptions increasing from a previous low of 105,000 in 2019 to 199,000 in 2022. For more information, please refer to 2B-Staff-211.

Deterioration in asset condition and performance is partly related to the deferral of volumes of work from the 2020-2024 period. This deferral was the result of inflationary pressures, as well as the need to constrain expenditures in the major renewal programs as a means of balancing-out unanticipated cost pressures from demand-related programs. This is discussed in Exhibit 2B, Section E4.1. In recent years (and continuing through 2025), Toronto Hydro has also been focused on removing transformers at risk of containing PCBs from its overhead and underground systems, and this has diminished the utility's ability to target assets and areas of the system in the worst condition and most at risk of failure.

The Horseshoe area renewal programs are the capital programs that have the most significant impact on the day-to-day reliability of the grid. Toronto Hydro has proposed the minimum pace of investment necessary to manage asset risk and maintain reliability performance over the 2025-2029 period. For full details on the programs, please refer to Exhibit 2B, Sections E6.2 and E6.5 For more information on drivers of increases in the Overhead System Renewal program, please refer to 2B-Staff-219. For a comprehensive discussion on expected changes in asset demographics as a result of Toronto Hydro's 2025-2029 investment plan, please refer to 2B-SEC-44.

Asset Deterioration in Stations

Toronto Hydro also intends to accelerate its investment in the Stations Renewal program beyond the pace set during the 2020-2024 period by 61%. This is in response to a considerable backlog of aging and deteriorating assets, with the goal of securing the long-term reliability performance of these critical asset populations. Table 2 in Toronto Hydro's response to 2B-SEC-44 highlights the

condition demographics for key station assets. Additionally, the program is experiencing rising unit costs for MS Switchgear, Power Transformers, and MS Primary Supply projects. For more detailed information on the expenditure increases within the Stations Renewal program, refer to Exhibit 2B, Section E6.6.

QUESTION (B) AND (C):

b) Please provide a copy of Toronto Hydro's internal distribution system planning process and identify how it addresses non-wires solutions. What are the planned changes to the planning process to better address identified non-wires objectives as per References 3 and 4.

c) In the present application did Toronto Hydro evaluate Non-Wires Solutions whenever existing traditional "wires" assets (such as poles, conductor systems, underground cable, transformers, switchgear, etc.) were identified as requiring replacement?

   i. If yes, please provide documentation of some representative evaluations that have been undertaken.

   ii. If no, please explain why not, considering the recent guidance in References 3 and 4.

RESPONSE (B) AND (C):

Toronto Hydro's capacity planning process involves a ground up analysis of system capacity needs, driven by load forecasts, as described in Exhibit 2B, Section D4. Planners pre-screen the types of needs that could reliably be addressed by non-wires solutions based on credible opportunities to defer or avoid capital investment through procurement of non-wires capacity. This pre-screening is based on the size of the capacity need and the ability for Toronto Hydro to aggregate sufficient quantities of dispatchable demand response (DR) to meet this need. For example, granular feeder-level issues are difficult to address using NWS, as the total capacity of dispatchable DR on an individual feeder is rarely sizeable enough to meet the need. On the other hand, station level issues are often driven by capacity requirements that are too large to be reliably and cost-effectively met through DR.

Where appropriate use cases have been identified, the planning process includes a consideration of non-wires solutions at the options analysis phase. Figure 1 below provides a high-level summary of this process.

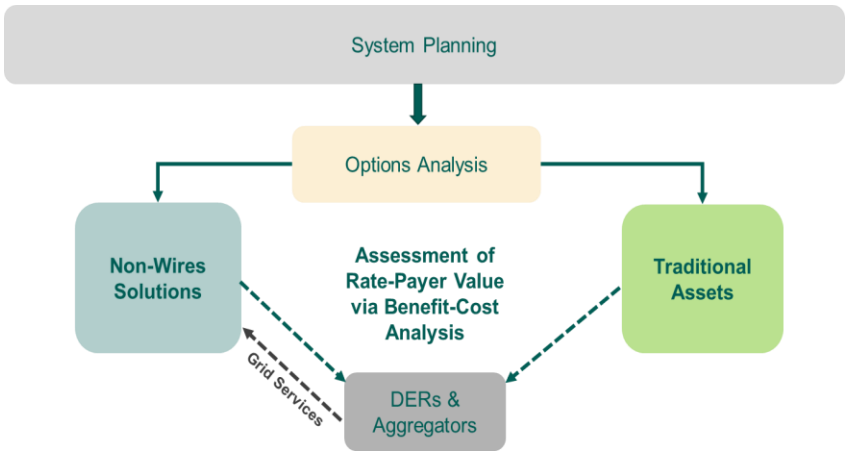


Figure 1. High-level Schematic of Toronto Hydro's Planning Process

Based on experience over the last two rate periods, Toronto Hydro's identified use case of non-wires solutions focuses on capital deferral or avoidance of bus-level load transfers, which can be achieved through the procurement of dispatchable demand response from aggregators or customers. Toronto Hydro also assesses non-wires solutions as alternatives to Station Expansion, as illustrated in the Downsview TS business case at Exhibit 2B, Section E7.2 Appendix A, and discussed in the response to 2B-Staff-253.

In accordance with the use case and the guidance in Reference 3, Toronto Hydro set an ambitious target to procure 30MW of non-wires capacity to defer or avoid approximately 25% of the load transfers that would otherwise be required at the targeted stations in the next rate term. As the NWS market matures, and the ability the procure reliable DER services increases, Toronto Hydro will continue evolve its planning process to identify and develop other credible use cases of non-wires solutions. Please see the responses to 1B-Staff-88 and 1B-Staff-89 for more information.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-170

References: Exhibit 2B, Section 1.1, p. 2
Exhibit 2B, Section E1.2, p. 4

Preamble:

Toronto Hydro states "Modernization: Developing advanced technological and operational capabilities that enhance value and make the system better and more efficient over time."

QUESTION (A):

a) Does Toronto Hydro quantify the expected value enhancement and system efficiency improvements per dollar spent "developing advanced technological and operational capabilities"?
   i. If yes, please provide documentation of value quantifications of representative modernization investments.
   ii. If no, please explain why Toronto Hydro is confident that all of its planned modernization investments cost effectively add value for ratepayers.

Contextualize your answer in consideration of the proposed 56% increase in System Service spending over the upcoming test period relative to historical as shown in reference 2.

RESPONSE (A):

Yes. While there is no single "value […] per dollars spent" metric, Toronto Hydro undertakes business case evaluations and expected benefits analyses for modernization projects at the appropriate stage prior to release of funding.[1] The exact form of these analyses will vary depending on the type of

[1] Note that for its full-scale programmatic system investments, including segments within the System Enhancements program, Toronto Hydro is in the process of developing a value framework that will eventually support project-based comparison of quantified value. For more information, see Exhibit 2B, Section D1.

investment and the nature of the benefits (e.g., software vs. field technology; pilot vs. full implementation).

For grid modernization field technologies that have reached the level of full-scale implementation (e.g., overhead SCADA switches), investment decisions are handled in the same manner as any other system investment program, i.e., as part of the utility's Investment Planning & Portfolio Reporting ("IPPR") process and associated Scope & Project Development process (refer to Exhibit 2B, Section D1.2 for more information). Through the IPPR process, planners propose investment pacing options which are evaluated on a risk and outcomes basis (using relevant leading and/or lagging indicators). Management assesses trade-offs versus other programs that may achieve (i) similar outcomes in different ways, or (ii) different, but no less important, outcomes (e.g., reliability vs. compliance). This process results in an integrated capital expenditure (and maintenance) plan, designed to achieve an appropriate balance of outcomes within the given financial constraints, leveraging a combination of Growth, Sustainment, and Modernization investments. Throughout this process, Toronto Hydro's objectives for customer-focused outcomes remain tied to objectives established within the applicable five-year Distribution System Plan.

Note that the System Service investment category consists of both Modernization and Growth (Stations Expansion) investments. The largest driver of increases in this category is the accelerated pace of Contingency Enhancement (Exhibit 2B, Section E7.1) – specifically, the deployment of additional SCADA tie and sectionalize points and the introduction of reclosers as part of the broader strategy of enhancing System Controllability & Automation in the Horseshoe, and the longer-term goal of achieving self-healing grid operations in the Horseshoe beginning in 2030. For a full overview of the need for and expected benefits of Toronto Hydro's System Controllability & Automation investments (including various quantified benefits), please refer to Exhibit 2B, Section D5.2.1.2.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-171

Reference: Exhibit 2B, Section E1.2, Page 4

Preamble:

With respect to Table 2: Planned Capital Investment by OEB Investment Category ($ Millions)

QUESTIONS (A) AND (B):

a) Please compare the proposed increase in System Access spending to the historical and forecasts rates of energy and demand growth.

b) Please provide a chart showing actual and forecast trends in System Access spending, peak load demand and annual energy deliveries for each year from 2020 to 2029, expressed in terms of percentage change relative to the prior year.

RESPONSES (A) AND (B):

Please see the table below. Please note that the System Access category is made up of five programs, not all of which relate directly to load growth. In particular, three of the five programs (i.e. (i) the Metering program which also addresses a renewal need, (ii) the Externally Initiated Plant Relocations and Expansion program, which is driven by third-party initiated infrastructure development in the City of Toronto, and (iii) Generation Protection Control and Monitoring program, which is driven by DER connections) have a very limited relation to load. Excluding these three programs, Table 1 below provides the information requested.

With respect to the trends observed in Table 1 below, Toronto Hydro notes that this comparison is not meaningful for a number of reasons.

- First, the system access investments captured below (namely Customer Connections and Load Demand) reflect the targeted and localized system expansion and enhancement

investments to ensure timely and efficient connections and service upgrades, and to alleviate capacity constraints to maintain service quality in high-growth areas (e.g., the downtown core and along the transit corridors). As observed in the table, the rate of change of expenditures in these programs can swing significantly from one year to another due to the myriad of factors as noted in the evidence at Exhibit 2B, Section E5.1.3.

- Second, the level of investment in system access is affected by customer contribution rates, which can vary significantly year-over-year based on: (i) the size and location of the connection; (ii) the degree of system expansion required to meet the obligation to serve, (iii) economic evaluations of the customers' load and revenue projections vis-à-vis the cost of expansion, and (iv) the impact of different cost allocation rules under the Distribution System Code amendments.
- Lastly, consistent with the customer connection horizon outlined in the DSC, there is an approximate five-year lag between Customer Connection related investments and energy/demand materialization on the system.

	2021	2022	2023	2024	2025	2026	2027	2028	2029
System Access: Customer Connections & Load Demand Expenditures	105%	-12%	-8%	-9%	43%	7%	-2%	7%	6%
System Peak Demand Forecast	-0.1%	-3.2%	3%	3.6%	2.9%	2.9%	1.7%	3.4%	3.1%
Electricity Consumption (Revenue Forecast)	-0.4%	1.8%	-1.3%	0.0%	-0.9%	-0.2%	-0.1%	0.5%	-0.2%

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-172

References: Exhibit 2B, Section E1.3, Page 5

Exhibit 1B, Tab 5, Schedule 1, Appendix A, Page 5

Preamble:

Toronto Hydro states that: "Toronto Hydro strives to maintain and improve reliability at local, feeder-wide, and system-wide levels by continuously optimizing its system and deploying cost-effective technologies and solutions."

Question (A):

a) Does Toronto Hydro quantitatively evaluate its reliability investments to determine if they are cost neutral or cost reducing?
   i. If yes, please provide some representative benefit-cost analyses.
   ii. If no, please explain how Toronto Hydro determines that its proposed reliability improvement investments are benefit-cost effective.

RESPONSE (A):

Toronto Hydro is unclear as to what is meant by "cost neutral or cost reducing" in the context of "reliability investments." Investments to maintain or improve reliability are typically evaluated through a "least cost" lens. This involves identifying the most cost-effective solutions to achieve desired reliability levels. It prioritizes investments that provide the greatest reliability improvements for the lowest cost. Toronto Hydro achieves this through its outcomes-oriented, programmatic approach to investment planning, which is driven by customer needs and preferences. The utility has a diverse portfolio of established investments across its System Renewal and Service programs which contribute to reliability performance. Through the Investment Planning & Portfolio Reporting process, the utility assesses trade-offs across investment programs and develops an overall expenditure plan that is calibrated within given financial

constraints to deliver the best achievable reliability outcomes across relevant time horizons. Note that cost, (including cost-savings from new technology) is a factor in this "least cost" investment planning approach. However, cost is treated as its own variable to be optimized through the planning process. This is achieved by (i) constraining the investment plan within budget parameters, and (ii) updating bottom-up capital and operational cost assumptions to ensure savings from past and future technology deployments are embedded in expenditure plans each year. An example of this would be the operational savings from deploying Network Condition Monitoring & Control technology, which have been embedded in future expenditure plan assumptions for the relevant maintenance program. (See Exhibit 2B, Section E7.3, page 12 for more information.)

As discussed in Section D1.2.1.1, as part of its ongoing multi-year effort to implement an industry leading Engineering Asset Investment Planning ("EAIP") platform, Toronto Hydro is developing a custom value framework which assigns relative value to investments based on their likely contribution to Toronto Hydro's key performance outcomes (including System Reliability). This will further deepen the utility's "least cost" optimization approach by increasing the consistency and objectivity of these evaluations at the project level.

Outside of this programmatic approach to investment planning, the utility also endeavors to offer customers value-for-money by exploring new technologies adopted by the industry, which may be more cost-effective than the current status quo. Toronto Hydro's Product Change Committee reviews and conducts pilot projects to assess the feasibility of new technologies and products. Typically, after a detailed pilot phase, the technology or product is evaluated for its cost-effectiveness in contributing to the utility's objectives, including the improvement of system reliability. For example, following a successful evaluation of mid-line reclosers through multiple pilot projects, the utility is now proceeding to deploy this innovative and cost-effective technology system-wide (Exhibit 2B, Section E7.1). The additional reliability benefits, such as reducing interruption frequency and duration for customers, supplement the remotely operated SCADA switches that Toronto Hydro has used for decades.

QUESTION (B):

b) Has Toronto Hydro identified unacceptable reliability trends relative to its historical performance or its peers? Please explain.

   i. If no, is Toronto Hydro only undertaking reliability improvement investments that are either cost neutral or cost reducing?

RESPONSE (B):

Toronto Hydro views its reliability performance as acceptable, both in comparison to historical data and in competitiveness among its peers. The utility continuously assesses reliability performance and trends relative to historical data, using measures reported on the EDS, as well as internally tracked measures. Toronto Hydro also completed a Reliability Benchmark study as part of developing this rate application, as detailed in Exhibit 1B, Tab 3, Schedule 3, Appendix A. In addition to tracking reliability measures, the utility investigates outages that significantly impact its customers on a weekly basis. In addition to interruptions originating from the distribution system, Toronto Hydro works in close partnership with Hydro One to ensure Loss of Supply events are investigated thoroughly and mitigated through appropriate action.

Toronto Hydro recognizes that on-going investments are required to maintain current levels of reliability performance and developed a plan that largely maintains system reliability over the next rate period while investing in modernization efforts capable of providing reliability benefits over the longer term to manage the impacts of electrification and other pressures and complexities. Please refer to the response to part (a) above, which describes the utility's programmatic, outcomes-focused, least-cost approach to investment planning.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-173

Reference: Exhibit 2B, Section E1.3, Page 5

Preamble:

Toronto Hydro States: "Expected load changes can impact service consistency and demand requirements for the system. To address this, Toronto Hydro proactively adjusts and expands its infrastructure to optimize reliability and meet evolving customer needs."

QUESTION (A):

a) Please explain how Toronto Hydro evaluates non-wires solutions, for example, to ensure that the capacity of its existing wires assets is being optimally utilized prior to undertaking incremental system investments to expand capacity.
    i. Please provide several representative examples.

RESPONSE (A):

Please see Toronto Hydro's response to 2B-Staff-169 (b) and (c) for an explanation of how Toronto Hydro evaluated non-wires solutions. As described in the Load Demand program, a key tool for meeting capacity needs and ensuring system reliability and efficiency is bus level load transfers (i.e. load transfers between station buses to alleviate overloaded buses).[1] The Flexibility Services non-wires program directly supports Load Demand by identifying opportunities to defer or avoid these load transfers when and where it is appropriate. Station bus load forecasts are re-evaluated annually. Based on updated results, it may be necessary for Toronto Hydro to reprioritize load transfers. As part of this prioritization process, there is explicit consideration of the application of LDR.

[1] Exhibit 2B, Section E5.3.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-174

Reference: Exhibit 2B, Section E2, Page 14

Preamble:

Regarding the number of network transformers that materially deteriorated and will be undergoing replacement.

QUESTION (A):

a) Please reconcile the quantities of network transformers to be replaced, the numbers indicated that Toronto Hydro is replacing 225 units by the end of 2029, but only 192 units are currently and forecasted to be in HI4 and HI5 condition by 2029.

RESPONSE (A):

Toronto Hydro would like to clarify that it forecasted a total of 149 units in HI4 and HI5 condition by 2029 (which includes 43 already in HI4 and HI5 as of the end of 2022) and not 192 as stated in the question. While network transformer condition demographics is an important factor, Toronto Hydro also considered other drivers when developing its 2025-2029 plan for network unit replacement. As noted in Exhibit 2B, Section E2, these included:[1]

> *(1) the continuing prevalence of non-submersible network units, which are at a higher risk of catastrophic failure due to flooding regardless of their condition; and (2) an anticipated wave of network demographic issues beyond 2029, with over 50 percent of network units projected to be at or beyond end of useful life by 2034 without intervention.*

Toronto Hydro considered the above in developing the plan to replace 26 units per year over 2025-2029, a reduction of approximately 26 percent from the 2020-2024 pacing.

[1] Exhibit 2B, Section E2 at page 14, lines 4-7.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-175

References: Exhibit 2B, Section E2.1.1, Page 4

Preamble:

From Table 1: 2025-2029 Performance Objectives Toronto Hydro states: "Improve system reliability through enhanced fault management, leveraging automation and advanced metering through AMI 2.0"

QUESTION (A):

a) On its face, this objective conflicts with the "Maintain Reliability" objective cited in the Sustainment and Stewardship investment priority. Please explain how Toronto Hydro harmonizes these conflicting objectives when assembling its investment portfolio?

RESPONSE (A):

Toronto Hydro's objectives for the "Sustainment and Stewardship" and "Modernization" categories address different (overlapping) time horizons and are fundamentally compatible. For Sustainment and Stewardship, the reliability objective for the lagging indicators of SAIDI/SAIFI (and in particular, SAIFI due to Defective Equipment) is to maintain current levels of performance over the 2025-2029 period by moving forward with a paced investment strategy that manages the deterioration of assets and maintains (but does not improve) overall population health through the rate period. For Modernization, Toronto Hydro is looking beyond 2029 in preparation for increasing pressures from electrification, DERs, and climate change (as discussed in Exhibit 2B, Section E2, pages 18-20). It is over this longer time horizon that Toronto Hydro is aiming to improve system reliability (and resiliency) through modernization. While these investments have a long-term focus, Toronto Hydro recognizes that there will be benefits to reliability as these technologies are gradually deployed throughout this rate period. These benefits are reflected in the SAIDI and SAIFI projections shown in Exhibit 1B, Tab 3, Schedule 1, Figures 1 and 2.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-176

Reference: Exhibit 2B, Section E2.1.1, Page 4

Preamble:

From Table 1: 2025-2029 Performance Objectives Toronto Hydro states: "Connect customers efficiently and with consideration for an increase in connections volumes due to electrification"

"Expand stations capacity to alleviate future load constraints, with consideration for increased EV uptake, decarbonization drivers, and other growth factors (digitization and redevelopment)"

QUESTION (A):

a) What analysis does Toronto Hydro undertake to evaluate the risk of temporarily or permanently stranding capital investments should the anticipated connection volume trends fail to materialize over the planning period, to align with the principle of "least regrets" investments?

RESPONSE (A):

Toronto Hydro relies on its Capacity Planning process to adequately size capacity expansion efforts to deliver reliable service and timely connections to its customers, resulting in its "least regrets" planning approach. In order to identify and minimize the risk of temporarily or permanently stranding capital investments, Toronto Hydro relies on a robust System Peak Demand Forecast methodology, that is updated annually, that integrates a number of drivers of growth. Toronto Hydro enhanced this methodology to consider additional factors ahead of preparing the 10-year forecast that informed the 2025-2029 rate period. In addition, to support its decision-making Toronto Hydro leveraged a long-term, multi-scenario growth modelling tool known as the Future Energy Scenarios ("FES") model to understand the range of possible scenarios under varying policy,

technology, and consumer behaviour. Please refer to Exhibit 2B, Section D4 for more details on Toronto Hydro's capacity planning process.

Integral to the planning process enhancements has been the integration of the use of Local Demand Response in the assessment of alternatives to traditional wires investments. This provides Toronto Hydro with the ability to monitor the realization of needs before committing to longer term investments in growing system capacity.

These approaches, along with coordinated planning with key stakeholders such as Hydro One (the transmitter) and the Independent Electricity System Operator, allow Toronto Hydro to assess capacity needs for its system carefully and minimize the risk of stranding capital investments.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-177

Reference: Exhibit 2B / Section E2.1.1 / p. 5

Preamble:

Toronto Hydro states: "In addition to setting these performance objectives, Toronto Hydro adopted top-down financial constraints to ensure that the principle of balancing price and service quality outcomes remained top of mind throughout the planning process."

"Price Limit: Toronto Hydro set an upper limit of approximately 7 percent as a cap on the average annual increase to distribution rates and charges."

QUESTION:

Please create a chart comparing historical and forecast Toronto Hydro annual rate increases against the historical and forecast annual Ontario Consumer Price Index from 2020 to 2029.

i. Please explain any significant deviations between Toronto Hydro rates and inflation.

RESPONSE:

Please see the requested chart below comparing Toronto Hydro annual rate increases against the historical and forecast (2%) annual Ontario Consumer Price Index. Taking into consideration the rate decrease in 2020 resulting from rate riders, including gains on sale of properties that were returned to customers, Toronto Hydro's rates are overall consistent with Ontario inflation over the 2020 to 2029. Material deviations over the period are observed in 2022, primarily due to the OEB's inflation factor being higher than the capital-related inflation that was embedded in rates for that year, and in 2025-2029 as the utility's must invest in the grid, its operations and workforce to address the needs and challenges identified in the evidence and deliver outcomes that are important to customers. Toronto Hydro notes that rates under Price Cap IR would presumably track closer to

Ontario inflation than its proposed rate plan. In the responses to 1B-Staff-12 and 1B-Staff-15, the utility presents the revenue deficiency and financial impacts of managing within Price Cap IR rates.

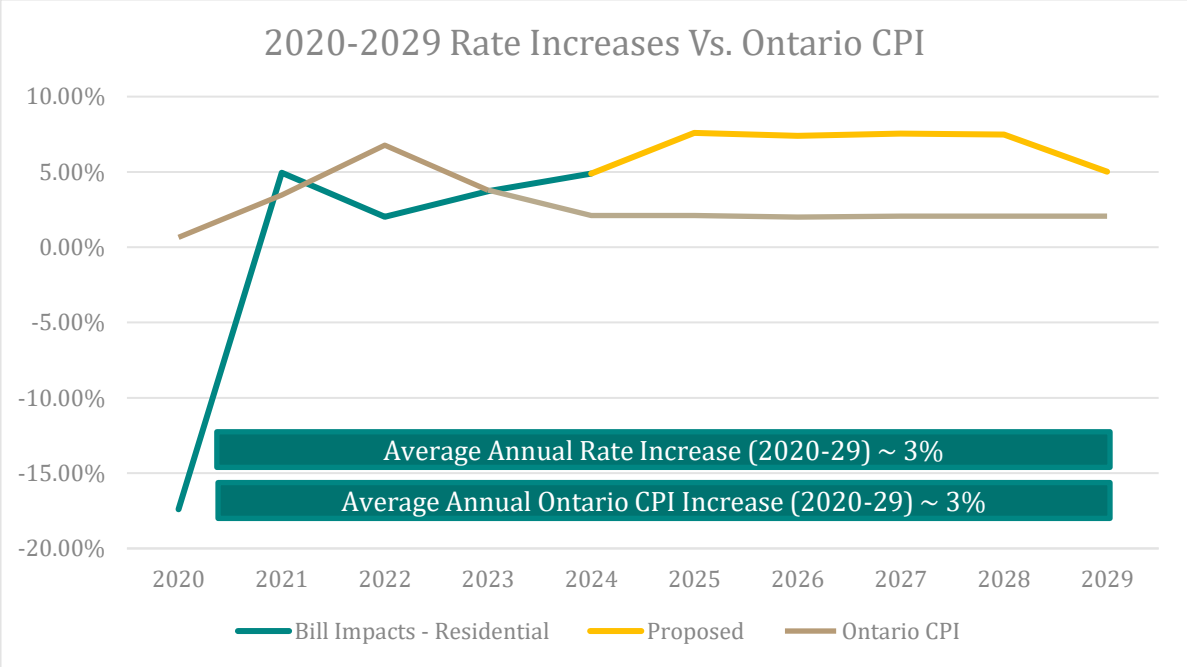


Figure 1 – 2025-2029 Rate Increases VS Ontario CPI

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-178

Reference: Exhibit 2B, Section E2, page. 7

Preamble:

Toronto Hydro states: "The utility developed initial capital program expenditure proposals with the aim of fulfilling strategic objectives in the focus areas of Growth, Sustainment, Modernization and General Plant. From this starting point, an iterative process generated multiple versions of the capital expenditure plan, eventually producing a draft plan that formed the basis of Phase 2 of Customer Engagement. The differences between the initial version of the plan - which on an aggregate basis was higher than the $4,000 upper limit on capital expenditures."

QUESTION (A):

a) How was the upper limit capital expenditure envelope size of $4 billion determined?

RESPONSE (A):

Please refer to the response to interrogatory 2B-SEC-33.

QUESTION (B) :

b) Does the resulting capital expenditure plan satisfy Toronto Hydro's acceptable risk exposure assessment?
   i) If yes, does this indicate that the initial capital expenditure plan was larger than necessary?
   ii) If no, is Toronto Hydro's position that the proposed capital expenditure plan is imprudent?

RESPONSE (B):

Yes. Through an iterative and integrated planning process, the initial capital expenditure plan was adjusted/constrained to arrive at a balance between price and outcomes that Toronto Hydro's deemed to be acceptable. Achieving this balance necessarily meant taking on some additional risk and/or reducing the pace of progress in certain areas of the plan, as explained in the evidence at Exhibit 2B, Section E2 page 7. For example, the Downtown Contingency segment of System Enhancements was substantially reduced by focusing on creating station switchgear ties between Copeland Station and Esplanade Station to manage (rather than alleviate) contingency concerns within the downtown system.

QUESTION (C):

c) Given that the capital expenditure constraints that were imposed appear to have been generated top-down, rather than using Toronto Hydro's Asset Management processes, please explain how Toronto Hydro validated that the resulting solution is optimal as per Toronto Hydro's Asset Management or Risk Management processes.

RESPONSE (C):

The capital expenditure plan is the output of an iterative planning process that centered around Toronto Hydro's Asset Management system. Leveraging the analytical tools and risk-based decision-making frameworks contained with the Asset Management system and processes described in Exhibit 2B, Section D1, along with other relevant inputs and information, Toronto Hydro was able to adjust/constrain the initial plan to arrive at a balance between price and outcomes deemed to be acceptable from a risk perspective. For example, the Cable Chamber Renewal segment within the Underground Renewal - Downtown program was reduced by approximately $25 million by scaling back the number of poor condition assets to be addressed in the next rate period. The risk associated with this reduction was deemed to be acceptable by targeting asset locations that have the highest failure consequences.

QUESTION (D):

d) Please provide documentation demonstrating that capital expenditure levels lower than the $4 billion upper limit did not satisfy Toronto Hydro's Asset Management and Risk Management processes.

RESPONSE (D):

The System Renewal evidence in Exhibit 2B, Section E6 demonstrates that the capital expenditures proposed are aligned with Toronto Hydro's Asset Management and Risk Management processes. Please refer to the Appendix A1 at page 10 filed in response to 1A-CCC-01 for a high-level summary analysis of capital expenditure levels lower than the $4 billion upper limit.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-179

Reference: Exhibit 2B, Section E4.2.6, Page 20

Preamble:

Toronto Hydro states: "Toronto Hydro is expanding inspection and maintenance activities in key areas through the Preventative and Predictive maintenance programs, resulting in an 11 percent increase between 2024 and 2025, followed by a moderate 1 percent average annual increase from 2026-2029."

QUESTION (A):

a) Toronto Hydro is significantly increasing spending in at least three areas that directly affect system reliability, i) System Renewal spending by 35%, ii) System Service - System Enhancement program spending by 473%, and iii) Preventative and Predictive maintenance program spending by 11% followed by 1% compounding, in addition to significant amount of other program spending increases that will either directly or indirectly improve system reliability. Please reconcile these parallel spending increases with Toronto Hydro's strategy of maintaining reliability in response to indicated customer preferences.

RESPONSE (A):

Toronto Hydro is investing the minimum necessary to manage asset risk and achieve the goal of maintaining system reliability as measured by SAIFI Defective Equipment. The increase in System Renewal expenditures is driven by a number of factors, including inflation. Please see Toronto Hydro's response to 2B-Staff-169 for a discussion regarding the drivers of the increase in capital expenditures within the System Renewal category.

Please see Toronto Hydro's response to 2B-Staff-175 for more details on how investments in the "Modernization" category reconcile with Toronto Hydro's objective to maintain reliability over 2025-2029.

The increases in Toronto Hydro's Preventative and Predictive maintenance programs support the utility's objective to maintain reliability and are largely complementary to System Renewal investments, and meet outcomes in other areas such as safety and environment in addition to reliability outcomes. As such, the increase in the preventative and predictive maintenance programs are not solely driven by reliability considerations. Below is a list of other factors that drive these increases:

- As discussed in Exhibit 2B, Section D3.1.1, a large majority of preventative programs are cyclical in nature in alignment with regulatory requirements.
- Inspections serve as the primary input into Toronto Hydro's Asset Condition Assessment ("ACA") methodology, which is a key input for decision-making within System Renewal programs. For example, Toronto Hydro intends to increase the maintenance schedule for wood poles from 10 years to 8 years in order to improve the collection of condition information for this asset class.
- Increases in asset populations naturally drive increases in inspection and maintenance expenditures.
- The introduction of new technologies and increased penetration of DERs on the system also drive incremental inspection and maintenance requirements.
- Inflationary pressures are expected to drive costs, especially within the Stations maintenance programs.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-180

Reference: Exhibit 2B, Section E4.2.6, Page 21

Preamble: Toronto Hydro states: "The increase in the Corrective Maintenance Program is driven by the need to address a growing backlog of P3 deficiencies within the system."

QUESTION:

a) Is the planned 35% increase in Renewal spending expected to help address the backlog of P3 deficiencies within the system?
   i. If yes, does this mean that the Corrective Maintenance Program will be reduced in future test periods? Please explain.
   ii. If no, are P3 deficiencies not correlated with asset condition, or is the planned Renewal spending not being directed to assets with P3 deficiencies that require urgent attention? Please explain.

RESPONSE:

Toronto Hydro does not expect the planned 35 percent increase in Renewal spending to materially help address the backlog of P3 deficiencies for the following reasons:

- The Renewal spending increase is driven by a number of factors, which are discussed in Toronto Hydro's response to interrogatory 2B-Staff-169 (a), but as noted in Exhibit 2B, Section E2.1.1 at page 3, one of the key objectives is to manage asset risk by maintaining overall health demographics of the asset population.
- As discussed in Exhibit 2B, Section D3.1.1.3, even if the increased spending did lead to materially improved health demographics, this would not necessarily lead to a corresponding reduction in the volume of deficiencies requiring corrective maintenance as younger and healthier assets with defects may be more suited to being repaired than replaced.

- Planned renewal investments may support in addressing some of the backlog of P3 deficiencies where they happen to intersect with assets or areas targeted for capital intervention. However, based on recent historical data, on average there has been less than 1 percent of P3 work cancelled due to overlap with planned projects and therefore any impact is expected to be very limited.

ii. Toronto Hydro respectfully rejects the premise of the last part of the question. P3 deficiencies can be, but are not necessarily, related to asset condition. The P3 backlog includes deficiencies, such as tripping hazards[1] and nomenclature updates, which are unrelated to the condition of an asset. In addition, as noted above, renewal expenditures are targeted to maintaining, and not improving, overall asset health demographics and as such would not be expected to impact overall P3 deficiency volumes even if there was a close correlation.

With respect to the idea of the utility's planned renewal not being directed to P3 deficiencies that require urgent attention, Toronto Hydro agrees that planned renewal is not generally being directed to P3 deficiencies and notes that it should not be, but disagrees that P3 deficiencies require urgent attention. By definition, P3 deficiencies are the lowest priority, and therefore the least urgent deficiencies requiring attention.[2] Where asset replacement (i.e. capital work) is required to address the deficiencies, these are carried out through the Reactive capital segment (Exhibit 2B, Section E6.7); otherwise, deficiencies are addressed through the Corrective Maintenance program (Tab 2, Schedule 4). Therefore, Toronto Hydro notes that the P3 backlog referenced consists of the lowest priority deficiencies, specifically to be addressed through Corrective Maintenance. Corrective maintenance allows Toronto Hydro to address repairable issues in the short term in order to maximize performance of an asset, which in turn may defer the need to replace the asset.

[1] For example tripping hazards unrelated to underlying civil asset deterioration such as unlevel ground around Toronto Hydro assets.
[2] While less urgent than P1 or P2 deficiencies, Toronto Hydro still needs to P3 deficiencies before they worsen and lead to bigger issues, unlike P4 deficiencies, which are the lowest priority identified and which require monitoring only.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-181

Reference: Exhibit 2B / Section E5.1. / p. 20

Preamble:

Toronto Hydro states it proposes to increase the Basic Connection Fee allowance for Class 1 to 5 from $1,396 to $3,059.

QUESTION (A):

Please provide the actual amounts incurred by Toronto Hydro for the basic connection fee, per year, from 2020 to the end of 2023.

RESPONSE (A):

The following table provides the annual count of new connections and the corresponding basic connection fee totals with the fee of $1,396.

	2020	2021	2022	2023	2020-2023
New Connections (count)	2,713	2,404	2,408	2,611	10,136
Basic Connection Total ($)	3,787,348	3,355,984	3,361,568	3,644,956	14,149,856

QUESTION (B):

Please provide the forecast expense for Toronto Hydro, per year, for the basic connection fee, over 2025 through 2029, at the new rate.

RESPONSE (B):

Please see the response to interrogatory 2B-SEC-62 d).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-182

Reference: Exhibit 2B, Section E5.1.3.1, page. 3

Preamble:

Toronto Hydro states: "The energy transition is also an important driver of the Load Connections segment as customers look to the electricity grid to meet more of their energy needs."

a) Please reconcile this statement with Toronto Hydro's projected decrease in forecast energy sales and billable demand.

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 1B-PP-18.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-183

References: Exhibit 2B, Section E5.1.3.1, page. 6

Preamble:

With respect to Figure 2 Historical and Forecast number of Toronto Hydro Customers.

QUESTION (A):

a) Please overlay on Figure 2 Toronto Hydro's historical and forecast annual capital spending on System Access connections.

RESPONSE (A):

The following figure overlays the historical and forecast annual net capital expenditures on customer connections, where 2012-2023 are actuals and 2024-2029 are forecasted:

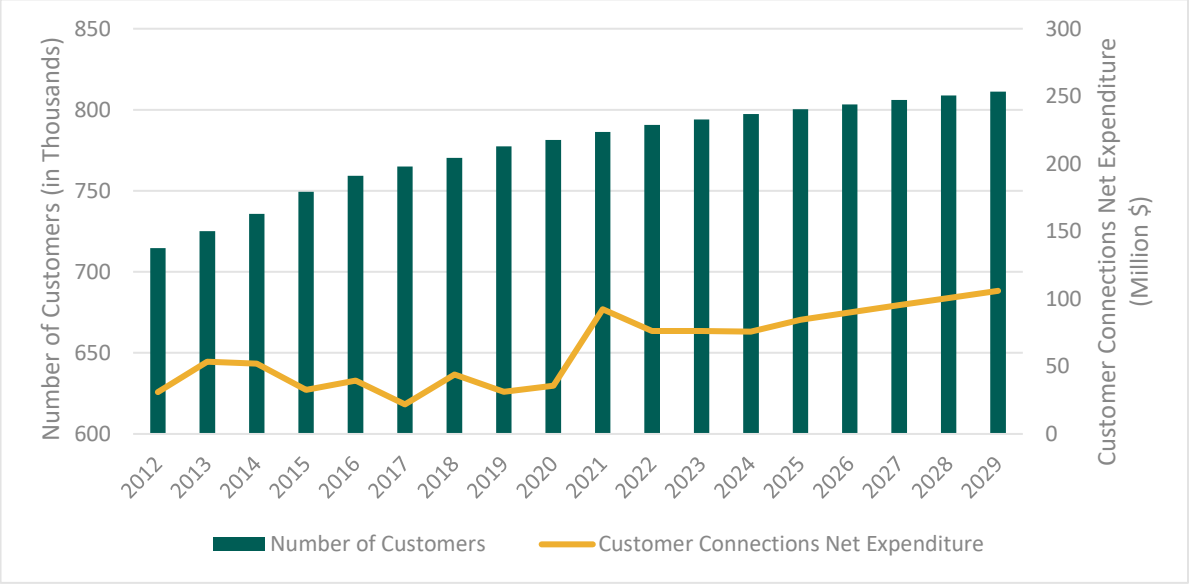


Figure 1: 2012-2029 Historical and Forecast Annual Net Customer Connections Expenditures

QUESTION (B):

b) Please provide the average growth rate for both customer count and connections spending for each of the following periods: 2012 - 2019, 2020 - 2024, 2025 - 2029.

RESPONSE (B):

The following table provides the average growth rates for Toronto Hydro's rate application periods for customer count and capital net expenditures.

Table 1: Average Growth Rates for Toronto Hydro's Rate Application Periods by Customer Count and Capital Net Expenditures

Rate Application Period	Average Customer Count Growth Rate for Period	Average Net Capital Expenditures for Customer Connections Growth Rate for Period
2012-2014	3.0%	68.1%
2015-2019	3.7%	-4.0%
2020-2024	2.0%	112.5%
2025-2029	1.4%	25.4%

QUESTION (C):

c) Please explain any discrepancies between the growth rates of connections spending and customer count.

RESPONSE (C):

Discrepancies between the observed growth rates between customer count and net capital expenditures is inherent to the data sets. It is difficult to make any meaningful comparative analysis between the two variables for reasons including:

- A single customer connection may represent a detached residence, a commercial or industrial facility, a hyperscale data centre, or a large multi-use development. Each of those will necessitate different types and levels investments to facilitate the connections. Please see Exhibit 2B, Section E5.1, page 5.

- The customer count may not fully reflect the number of customers served by Toronto Hydro. Toronto Hydro estimates that it serves approximately 340,000 end-use customers through bulk-metering and competitive sub-metering arrangements. As the sub-metering market has become more mature in Toronto over the last decade, a greater share of new multi-unit buildings opt for bulk-metering service connections. The practical effect of operating in this urban environment with a deregulated sub-metering market is a slower rate of formally reported customer growth from 2015 to 2029. Please see Exhibit 4, Tab 1, Schedule 1, pages 11-12.
- The geographical location of a customer can drive differences in required capital investments due to site location, available capacity, system constraints, design, system access configuration. Please see Exhibit 2B, Section E5.1, pages 7-10.
- Customers seeking upgraded connections would not be reflected in the customer count, despite those related costs being captured in the connection capital expenditures. Please see Exhibit 2B, Section E5.1, page 1.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-184

Reference: Exhibit 2B, Section E5.1.3.1, Page 8

Preamble:

With respect to Figure 3 High Voltage Connections 2020-2022

QUESTION (A):

a) Please update Figures 3, 4 and 6 to include the years 2023-2029. Please differentiate actual, estimated and forecast values.

RESPONSE (A):

The following are updates to Figures 3, 4 and 6 to include 2023 actuals. Toronto Hydro is unable to provide a forecast beyond 2023 for Figures 3, 4, and 6 as customer connections are typically based on size, required demand load, geographical location, and the available infrastructure.

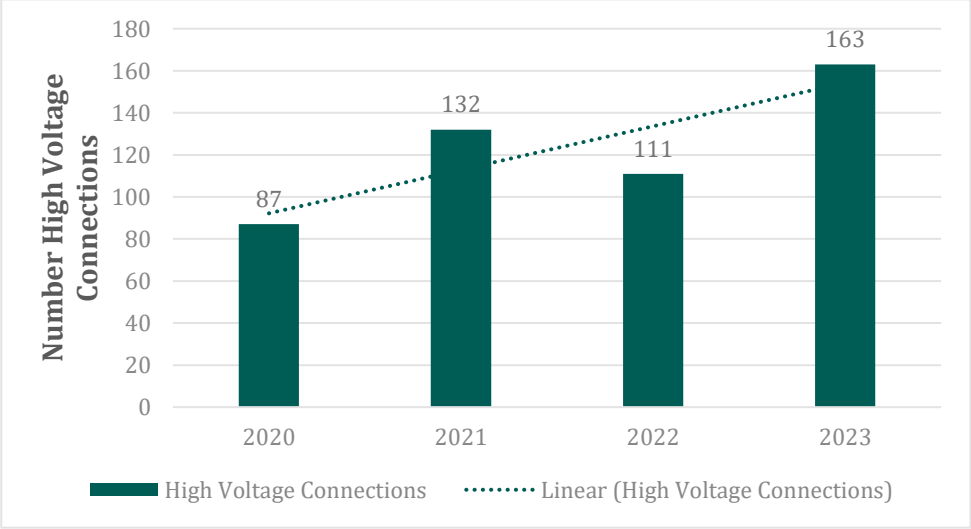


Figure 1: Updated Figure 3 - High Voltage Connections (2020-2023)

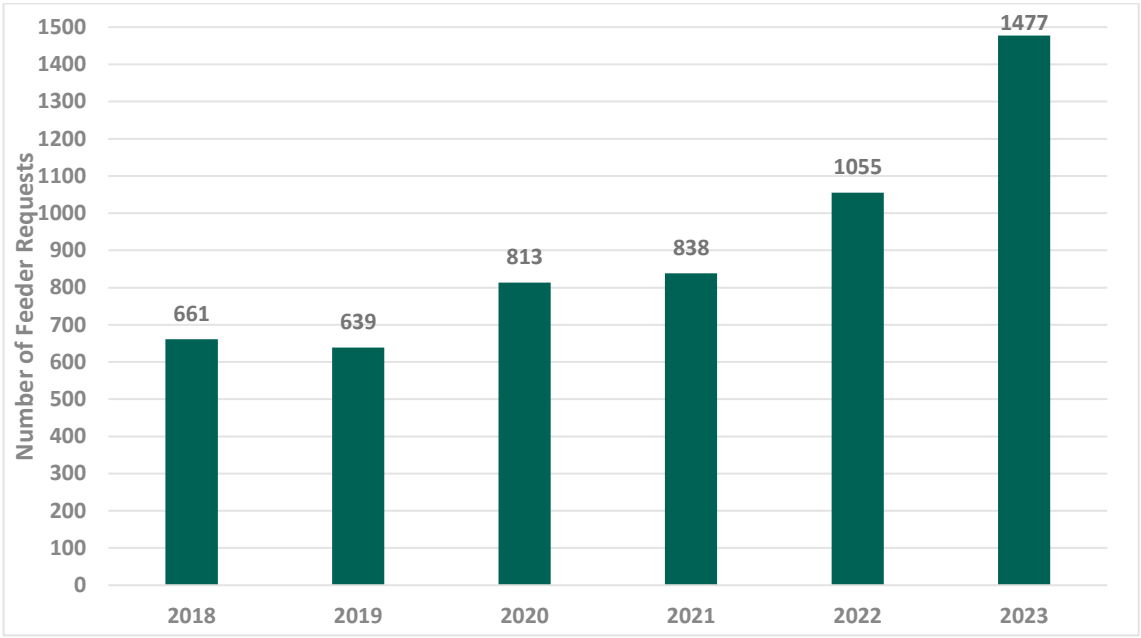


Figure 2: Updated Figure 4 - Feeder requests processed (2018-2023)

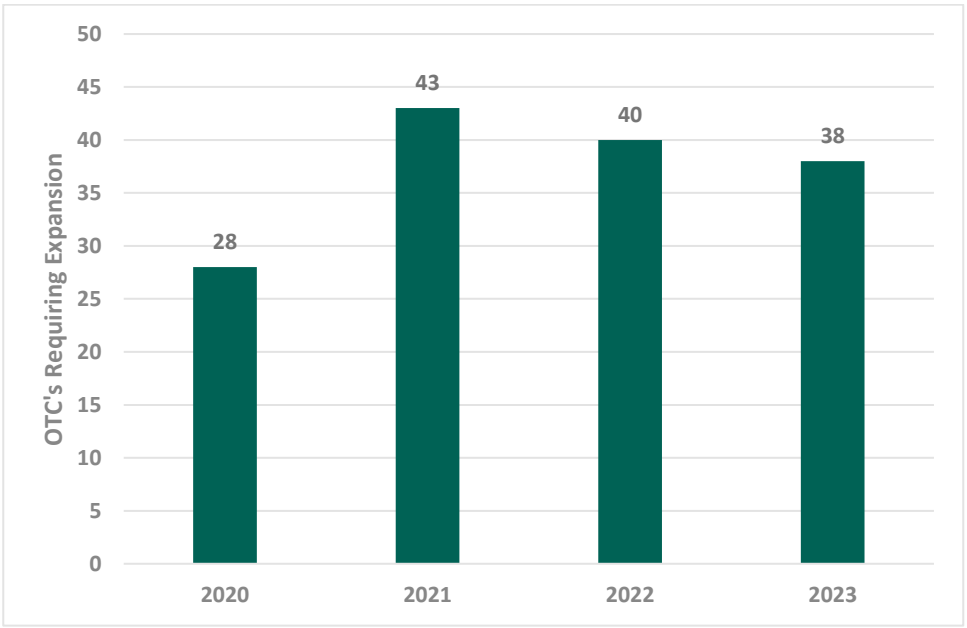


Figure 3: Updated Figure 6 - Offer to connect Requiring Expansion (2018-2023)

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-185

Reference: Exhibit 2B / Section E5.1.3.2 / p. 15

Preamble:

Toronto Hydro states: "Toronto Hydro forecasts over 1700 additional renewable connections (totalling over 74 MW) to the distribution system."

QUESTION(A):

a) Please explain how Toronto Hydro developed the additional renewable connections forecast and provide the confidence interval around the annual values given in Tables 6 and 7 (e.g.: +/- 5%, +10%/-25%, +/- 50%, etc.).

RESPONSE (A):

The renewable DER forecast is based on a model that uses historical data. It represents renewable DER intake in the years after the end of the Feed-In-Tariff (FIT) program. As renewable DERs and DER connections in general do not follow specific patterns and are primarily driven by customer demand, there is no confidence index associated with the analysis.

QUESTION (B):

b) The values shown in Tables 6 and 7 appear to be cumulative totals. Please provide tables showing the incremental annual additions for these same years.

RESPONSE (B):

Please see Table below.

Table 1: Annual Generation Connections (2023-2029)

Generation Type	2023	2024	2025	2026	2027	2028	2029
Renewable	227	183	227	256	322	364	404
Energy Storage	16	3	6	5	8	7	9
Non-Renewable	16	2	2	2	2	2	2
TOTAL	**259**	**188**	**235**	**263**	**332**	**373**	**415**

QUESTION (C):

c) Please describe the representative generation technologies comprising the Renewable and Non-Renewable categories shown in these tables.

RESPONSE (C):

In terms of renewable generation, solar is the dominant generation type used on the data used for forecast. Other technologies used historically are biogas and wind. For non-renewable, CHP, diesel and natural gas generator technologies comprise the technologies used.

QUESTION (D):

d) What is the forecast Energy storage volume (in MWh) in each year?

RESPONSE (D):

Battery Energy Storage is forecasted on the basis of capacity, not energy storage volume.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-186

Reference: Exhibit 2B, Section E5.1.3.2, Page 15

Preamble:

Toronto Hydro states: "Toronto Hydro forecasts over 50 additional Energy Storage connections…to the distribution system. This would increase…the total installed Energy Storage capacity to 89.5MW."

QUESTION:

Does Toronto Hydro anticipate that the total volume of energy storage connected to its system by 2029 will materially assist in mitigating customer outage durations associated with events caused by freezing rain, windstorms or floods, i.e., similar to the events listed in the Extreme Weather and Major Event Day sections of this application (e.g. Exhibit 1B Section 2.3.4, Exhibit 2B Section C2.3)? Please explain.

RESPONSE:

No. The non-wires solutions proposed for the 2025-2029 period are outlined in detail in Exhibit 2B Section E7.2. Toronto Hydro intends to utilize DERs, including energy storage resources, as demand response in a manner that is practical and prudent given the current availability of DER capacity, and level of market maturity. At this time, Toronto Hydro is not utilizing customer-owned DERs to manage grid outages. The use of customer-owned DERs for this purpose would require specific connection arrangements and requires further study. Toronto Hydro will continue to explore such use cases and determine whether they are practical or prudent.

Toronto Hydro's ESS program targets the enablement of REG connections and does not contemplate additional use cases to support the distribution system. Please see Exhibit 2B Section 7.2.2 for more details.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-187

Reference: **Exhibit 2B, Section E5.1.4.2, Page 24**

Preamble:

Toronto Hydro states: "Toronto Hydro does not propose any net expenditure under this Program for the years 2025 to 2029. If during the course of the project, Toronto Hydro does not use all of the fees collected from the customer to facilitate the DER connection, Toronto Hydro will refund the difference back to the customer."

QUESTIONS (A) AND (B):

a) Please identify all capital expenditures planned for 2025-2029 intended to enable the Toronto Hydro system to host new DERs connecting solely within the 2025-2029 test period.

b) Please identify all capital expenditures planned for 2025-2029 intended to enable the Toronto Hydro system to host new DERs connecting beyond the test period.

RESPONSES (A) AND (B):

Toronto Hydro intends to undertake investments in the following capital programs to enable the system to host DERs in the 2025-2029 period: (1) Generation Protection, Monitoring and Control (Exhibit 2B, Section E5.5); (2) Station Expansion – Sheppard TS (Section E7.4)[1]; and (3) Non-Wires Solutions (Section E7.2). Some of these expenditures may enable hosting capacity beyond the test period as well. In addition, Toronto Hydro is planning modernization and innovation investments to enhance the utility's ability to monitor and forecast distributed resources and facilitate and leverage DER connections. These investments will have benefits in the 2025-2029 period and beyond. Please refer to the *Grid Readiness* section of Toronto Hydro's Grid Modernization Strategy for more information (Exhibit 2B, Section D5.2.2).

[1] Updated January 29, 2024

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-188

Reference: Exhibit 2B, Section E5.2.4, Page 7

Preamble:

With respect to Table 1: Program Summary

QUESTION:

a) Toronto Hydro projects a $21.7M (40%) increase in net spending on this program, which appears to be largely driven by a $28.6M (9%) decrease in forecast Capital Contributions (i.e. a decreased in average contribution rate from 85% in the historic period to 79% in the forecast period). Please explain why Capital Contributions are expected to decrease and quantify the projects driving the bulk of the net spending increase.

RESPONSE:

The decrease in capital contributions is attributed to increased expansion work over the forecast period to meet anticipated future load growth. In particular, forecast expansion work associated with relocations under the *Building Transit Faster Act* contributes to approximately 70 percent of the proposed spending over the 2025-2029 period. Please refer to Exhibit 2B, Section E5.2.3.4, for more details on expansion work.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-189

Reference: Exhibit 2B / Section E5.3.2 / p. 2

Preamble:

With respect to the measures listed by Toronto Hydro for "Operational Effectiveness-Reliability" outcome.

QUESTION:

Although the preamble to the measures cell indicates that the Load Demand expenditures will contribute to Maintaining Toronto Hydro's System Capacity each of the four load demand measures indicate that the proposed investments are specifically intended to improve reliability. Please reconcile the apparent contradiction in corporate and program targets and quantify the proportion of spending in each element of this program that is intended to improve rather than maintain reliability.

RESPONSE:

Load Demand only invests in a small number of feeders relative to the overall feeder population, and while it improves reliability conditions on those few feeders, it is not enough on its own to overcome deterioration on other feeders over the period that cumulatively has a greater impact on overall system reliability.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-190

Reference: **Exhibit 2B / Section E5.3.3 / p. 3**

Preamble**:**

Toronto Hydro notes that "an overloaded bus is defined as reaching 95 percent of its firm capacity under normal and emergency operating conditions.".

QUESTION(A):

a) Please explain which of these conditions typically rules and why.

RESPONSE (A):

Toronto Hydro stations are rated using N-1 operating conditions. While the limited time rating (LTR) capacity refers to an unusual configuration in N-1, it is not considered an emergency condition. Please refer to Toronto Hydro's response to interrogatory 2B-Staff-256 part (d).

QUESTION (B):

b) Since these are planning limitations, are they evaluated in N-1 conditions?

   i. If yes, please explain why utilizing 95 percent of firm capacity limitation while also imposing an N-1 contingency is not an overly conservative planning criterion?

RESPONSE (B):

The N-1 condition is employed for planning station capacity. Please refer to Toronto Hydro's response to interrogatory 2B-Staff-256 part (e) for details. Additionally, the 95 percent rule is intended to ensure that there is readily available capacity for connecting customers efficiently.

QUESTION (C):

c) Does Toronto Hydro evaluate bus constraints at non-coincident bus loading peak or coincident system peak for planning purposes?

RESPONSE (C):

Toronto Hydro evaluates bus constraint at non-coincident bus peak loads.

QUESTION (D):

d) Please quantify the average annual hours where a typical bus is loaded at 95% or greater of its peak loading.

RESPONSE (D):

As noted in its response to interrogatory 2B-Staff-256 part (c), Toronto Hydro is unable to provide a response as it does not have the requested information.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-191

Reference: **Exhibit 2B / Section E5.3.3.4 / p. 16**

Preamble:

Toronto Hydro states: "Due to capacity constraints, Toronto Hydro is forced to impose summer switching restrictions during peak load conditions, such that certain feeders cannot be taken out of service during those periods. If restricted feeders are taken out of service, their corresponding standby infrastructure (standby feeders, adjacent network units) will be overloaded. This practice constrains Toronto Hydro's ability to complete new customer connections and hinders its ability to plan and execute other capital maintenance work in a timely and efficient manner."

QUESTION:

Toronto Hydro is projecting that it will change from a Summer Peaking to a Winter Peaking system. Please identify which of the proposed investments in become redundant after Toronto Hydro becomes a winter peaking utility or explain why if none of the investments will become redundant.

RESPONSE:

Based on the System Peak Demand Forecast in Exhibit 2B, Section D4, Toronto Hydro remains a summer peaking utility for this rate period, as explained in the response to 1B-Staff-153. In order to maintain service quality, Toronto Hydro must invest to manage restrictions during peak loads in both summer and winter months. Switching to a winter peak does not eliminate the summer peaks.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-192

Reference: Exhibit 2B, Section E5.3.3.4, Page 18

QUESTION (A):

a) Table 7: Summer Restrictions by year, indicates that by 2022, the number of summer feeder restrictions had dropped significantly from 2021. Table 2 indicates that Toronto Hydro plans to improve reliability by further reducing the number of feeder restrictions. Please reconcile this program target with the corporate goal of maintaining reliability.

RESPONSE (A):

The corporate goal of maintaining reliability is comprised of several components, which considers number of feeder restrictions as an input. Given that the program target only contributes to a portion of the corporate goal and due to the dynamic nature of Toronto Hydro's distribution system, the limit of the scale (i.e. level of spending) and geographic scope, a program-level goal of improving reliability is required to maintain overall system reliability.

The number of restricted feeders increases by 1 from 2021 to 2022, as indicated in Table 7 under Section E5.3.3.4. By reducing the overall number of restricted feeders and maintaining the total under 10, as specified in Section E5.3, reliability in the downtown area is expected to improve, which is one of the program measures listed in Table 2. Improving reliability at this granular level (i.e., at restricted feeders in the downtown area) will contribute to maintaining Toronto Hydro's overall reliability objectives given that there are contributing factors outside this program that also impact this objective.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-193

Reference: Exhibit 2B, Section E5.3.3.4, Page 19

Preamble:

Toronto Hydro states: "When certain stations are expanded or their switchgear is upgraded, Toronto Hydro must undertake supporting civil enhancement work in the egress cable chambers to enable additional capacity at the station. Table summarizes the expected station upgrades within the 2025-2029 rate period that may require civil egress rebuilds in order to optimally serve customers. These areas are shown geographically in Figure."

QUESTION:

Some of the spending in this program component appears to be intended to address existing deteriorated or obsolete civil structures, or else is driven by Renewal projects that will replace end of life substation equipment. Please explain why all such spending has not been categorized under System Renewal.

RESPONSE:

The spending in this program is not primarily to address deteriorated or obsolete civil structures, it is to alleviate emerging capacity constraints expected in Toronto Hydro's distribution system. While the civil enhancements planned as part of the program may rebuild deteriorated civil structures, it is not the primary driver behind the work. This work is driven by the capacity upgrades required in these areas. The switchgears identified in Table 8 in the Load Demand program (E5.3) are set to undergo an upgrade to increase their capacity. This means additional feeder positions and new feeders will be available and require sufficient civil infrastructure at the station egress to realize the additional capacity. Therefore, civil enhancements such as enhancing existing egress duct banks to increase the number of ducts, or building new duct structures is required to address the load growth needs of the system.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-194

References: Exhibit 2B, Section E5.4.5.1, Page 18

Preamble:

Toronto Hydro states that: "Toronto Hydro will not be able to capture the entire benefits of AMI 2.0 meters until the majority of the current meters are replaced."

Question (A):

a) In a table, please enumerate the benefits that the AMI 2.0 meters are providing and classify which of those benefits can or cannot be achieved until a majority of the current meters are replaced. In this table indicate the proportion of benefits achieved at 25%, 50%, 75% and 100% replacement penetrations.

RESPONSE (A):

Table 1: AMI 2.0 Benefits

AMI 2.0 Benefits	Can be Achieved Before Majority Replacement	AMI Replacement Penetration Level			
		~25%	~50%	~75%	~100%
		Proportion of Benefits Achieved			
Bi-Directional Metering	Yes	Medium	Medium	High	Full
Remote Connection/Disconnection	Yes	Medium	Medium	High	Full
Improved Bill Accuracy	No	None	None	Low	Full
Enhanced Outage Detection	No	None	None	Low	Full
Voltage Monitoring	No	None	None	Low	Full
System Planning and Load Forecasts	Partially	None	Low	Medium	Full
Improved Reliability and Power Quality	Partially	Low	Medium	High	Full
Data Analytics and Grid Modernization Enablement	No	None	None	Low	Full

AMI 2.0 Benefits	Can be Achieved Before Majority Replacement	AMI Replacement Penetration Level			
		~25%	~50%	~75%	~100%
		Proportion of Benefits Achieved			
Load Disaggregation and EV Detection	No	None	None	Low	Full
Customer Specific Technology Enablement	No	None	None	Low	Full

Proportion	Explanation
None	The benefit cannot be achieved at the specified penetration levels, due to a combination of lack of critical mass of penetration of meters or obsolete meters acting as a barrier.
Low	Minimal or very limited benefits achievable at the specified penetration levels, due to a combination of lack of critical mass of penetration of meters or obsolete meters acting as a barrier. Any benefits require a manual data extract and analysis and may have very limited benefits due to the amount of data flowing through.
Medium	Moderate benefits achievable at the specified penetration levels. Capabilities are limited by the penetration of meters and requires manual data extracts. This category represents a slightly improved benefit realization compared to low as some simple out of the box use cases can be operationalized.
High	Substantial benefits achievable at the specified penetration levels. Capabilities have increased as some geographical areas can utilize the full features of AMI 2.0 but processes remain manual as full penetration of AMI 2.0 meters is not realized.
Full	Benefit can be fully achieved at the specified penetration levels.

Notes: "Can be Achieved Before Majority Replacement" indicates whether a benefit can start being realized before the majority of meters are replaced.

For further detail on AMI 2.0 benefits as they pertain to modernizing the grid, please see Exhibit 2B, Section D5, subsection D5.3.1[1] and Section E5.4.[2]

[1] At p. 57-61.
[2] At p. 10-13.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-195

References: Exhibit 2B, Section E5.4.5.1, p. 19

Preamble:

Toronto Hydro states "Option 4 is selected based on the following criteria as summarized in Table 7."

QUESTION (A):

a) Has Toronto Hydro conducted a quantified risk assessment of each of the listed options?
   i. If yes, please provide documentation.
   ii. If no, please explain why not.

RESPONSE (A):

Toronto Hydro did not quantify the risks associated with the listed options since either the risk elements under consideration are not quantifiable, quantification would not materially improve the decision-making process, or the effort to quantify them would unreasonably delay benefits realization.

QUESTION (B):

b) What is the typical annual probability of failure of a meter that has reached age-derived EOL but whose seal has not yet expired?

RESPONSE (B):

For the annual probability of failure of a meter, please refer to page 5-177 of Concentric Advisors' 2022 Depreciation Study in Appendix D to Exhibit 2A, Tab 2, Schedule 1. The seal duration of the meter focuses on the accuracy of the metrology and is typically unrelated to other modes of meter failure or obsolescence.

QUESTION (C):

c) Does Measurement Canada allow re-sealing of meters that have a material likelihood of failing prior to the seal expiry? Please explain.

RESPONSE (C):

In Toronto Hydro's interpretation, Measurement Canada re-sealing requirements focus on meter accuracy, but do not include an evaluation of the likelihood of other meter failure modes, such as the failure of electronics, display, or communication components.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-196

REFERENCE: Exhibit 2B / Section E5.5.1 / p. 1

Preamble:

Toronto Hydro states "Installation of 315 monitoring and control systems ("MCS") for renewable DER facilities greater than 50 kW to provide situational awareness and control of DER facilities on the distribution system."

QUESTION:

Are DERs and Energy Storage projects responsible for the costs of providing adequate operational visibility to Toronto Hydro to enable safe operation of its system?

a. If not, please explain why not.

RESPONSE:

In accordance with section 3.3 of the Distribution System Code, non-renewable DERs and Energy Storage projects are responsible for the enhancements costs referenced. As a result, costs for these projects do not form part of the Generation Protection, Monitoring and Control (GPMC) program (Exhibit 2B Section E5.5).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-197

References: Exhibit 2B, Section E5.5.3.3, Page 10

Preamble:

Toronto Hydro states: "With the proliferation of DER in Toronto in recent years, several feeder circuits have already surpassed the generation to minimum load ratio of one-third. A total of eleven distribution feeders have ratios ranging from 0.30 to 11.51 (refer to Table 6: Existing Feeders with Generation to Load Ratio Greater Than One-Third below). These feeders currently present an increased risk of unintentional islanding conditions to the distribution system."

QUESTION (A):

a) Does Toronto Hydro calculate the expected output of DERs at the time of minimum feeder loading, or does Toronto Hydro use nameplate DER rating in its feeder analysis?
    i. If yes, does this mean that solar DERs, which can be expected to have zero production at the time of minimum feeder loading (typically during nighttime light load hours), are being overcounted in Toronto Hydro's analysis? Please explain.

RESPONSE (A):

Toronto Hydro currently uses the nameplate DER system rating in its feeder analysis irrespective of time day intervals. The utility does not have control over when exactly the minimum feeder load condition will occur, and therefore to mitigate risk to the system, Toronto Hydro seeks to comply with the IEEE 1547 requirement for anti-islanding which states that aggregate DER capacity is to be less than one-third of the minimum load. This is further detailed in Exhibit 2B, Section E5.5, page 10. Modification of this approach will be considered as more tools are developed to interface with DER's in a dynamic operational environment.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-198

References: Exhibit 2B, Section DE6.1.1, Page 1, Table 1: Program Summary

QUESTION (A):

a) Rear Lot conversion spending is forecast to increase by $58.7M (95%) relative to historical. Considering that Toronto Hydro has been implementing this conversion program for some time, and presumably the most problematic segments have been addressed first, what has changed to drive this sudden doubling in planned program spending?

RESPONSE (A):

The Rear Lot segment for the 2025-2029 period has increased by 6 percent compared to what Toronto Hydro proposed in the 2020 CIR application for 2020-2024. This increase is driven by inflationary pressures and not pacing, which is consistent with the 2020-2024 proposal. The reduced pace relative to what was proposed for 2020-2024 (in accordance with the OEB's decision) has contributed to increased need for investment in rear lot areas, which continue to deteriorate with new areas starting to experience worsening reliability. Therefore, if anything, the proposed pace of investment over 2025-2029 is conservative and Toronto Hydro expects that, beyond 2029, it will need to maintain this pace or even increase it as these areas continue to age and deteriorate (see Figure 3 in Exhibit 2B, Section E6.1 at page 6).

QUESTION (B):

b) Do any of the feeders being improved via the Rear Lot program also appear on the worst performing feeder list?

   i. If yes, does Toronto Hydro intend to offset the proposed increase in Rear Lot spending by commensurately reducing spending on the Worst Performing Feeders program?

RESPONSE (B):

The Rear Lot program feeders don't overlap with feeders addressed by the Worst Performing Feeder program. While the Worst Performing Feeder target those with higher frequency of outages, the rear lot feeders are targeted based on the duration of the outages and the challenges they pose due to legacy equipment and safety concerns.

QUESTION (C):

c) Does Toronto Hydro anticipate that completion of the Rear Lot program will improve or maintain its overall reliability performance?

RESPONSE (C):

Rear Lot conversion is expected to eliminate tree contacts and reduce outage duration on those areas converted and therefore, improve reliability for customers in those areas, who tend to experience below-average reliability. The completion of the Rear Lot Conversion program will take decades and if viewed in the long-term (i.e., by comparing reliability in the 2020s versus 2050s post completion), may see some improvements that could be attributed to the conversions (and which may be offset by other factors). However, for 2025-2029, Toronto Hydro expects rear lot conversions to contribute to maintaining its overall reliability performance.

QUESTION (D):

d) Please provide the total contribution of Rear Lot outages to Toronto Hydro's SAIDI and SAIFI results for 2012-2022.

RESPONSE (D):

Rear Lot outages contributed to 4 percent to Toronto Hydro's SAIDI performance and 2 percent to SAIFI performance over 2012-2022.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-199

References: Exhibit 2B, Section E6.1.1, Page 10

Preamble:

Toronto Hydro states: "64 percent of the poles with available asset condition assessment information are showing moderate to material deterioration."

QUESTION (A):

a) What is the expected annual failure probability for poles in HI3 and HI4 condition?

RESPONSE (A):

Toronto Hydro does not have probability of failure data specific to rear lot poles. Please see Toronto Hydro's response to interrogatory 2B-Staff-151 part (c) for the general probability of failures for wood poles.

QUESTION (B):

b) What is the typical failure mode of Rear Lot Poles and what is the typical triggering event?

RESPONSE (B):

The failure modes for rear lot poles are largely identical to the general failure modes for wood poles, which are provided in Exhibit 2B, Section D2.2.1.2, Table 2. Rear lot poles are subject to the same typical condition-based failures, but due to the location of the poles, there is reduced risk from vehicle damage.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-200

References: Exhibit 2B, Section E6.1.3.1, Page 18

QUESTION (A):

a) What is the useful life of primary overhead conductors?

RESPONSE (A):

The useful life of primary overhead conductors is 60 years.

QUESTION (B):

b) What is the annual probability of failure per km of primary overhead conductor that is past its useful life?

RESPONSE (B):

Please see Figure 1 below.

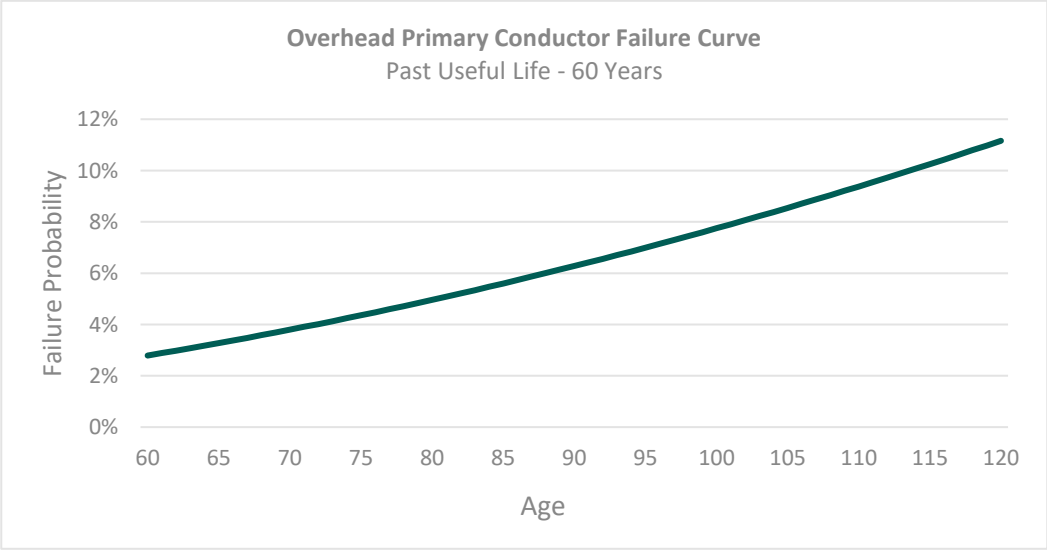


Figure 1: Overhead Primary Conductor Failure Curve (Past Useful Life)

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-201

Reference: Exhibit 2B, Section E6.1, Page 24

Preamble:

Toronto Hydro states that for the 2020-2024 period, "cost variance is driven by changes to the project schedule, including a number of projects that carried over from the 2015 - 2019 rate period."

QUESTION (A):

a) Does Toronto Hydro anticipate that any projects scheduled for completion in the 2020-2024 period will carry on to this test period. If yes, please provide a list of these projects, the expenditures that will occur in this test period, and the reason for the schedule change.

RESPONSE (A):

The Box Construction Conversion segment contains projects that involve work on a legacy system and the last projects to be completed in this segment are the most complex. There are a number of challenges that can impact the execution timelines of projects in this segment, including congestion and clearance issues for new asset installations, coordination issues with third parties (Ontario Line, Metrolinx, TTC, other developments, City of Toronto, Hydro One, etc.), coordination issues related to work zone, traffic, and pedestrian management. This can result in work being carried over from 2024 to the test period or work being advanced to take advantage of synergies with third parties. Please see Table 1 below for the list of projects along with the reasons and expenditures that are expected to be carried over from 2024 to the test period. Note that only the completion of "Danforth" has shifted from 2024 to the test period. The remaining projects listed in Table 1 only have a relatively small portion of total planned expenditures shifted into the test period from 2020-2024, and Toronto Hydro expects the overall projects will be completed in the 2025-2029 period as per the original plan.

Table 1: Box Construction Conversion Expenditure Carry-Over into 2025-2029 Period

Project	Expenditures Shifted into 2025-2029 ($M)	Reason for Schedule Change	Plan Construction Attainment
Danforth	2.54	Resource reprioritization	2025
Defoe-Strachan	0.34	Clearance, access and congestion issues	2026
Sherbourne	0.85	Clearance issues	2026
Highlevel	1.37	Supply chain and coordination issues	2029
University	3.04	Work zone coordination	2029

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-202

Reference: Exhibit 2B, Section E6.2.1, Pages 2, 15

Preamble:

Toronto Hydro states "As of 2022, there are 286 circuit-kilometers of direct-buried cable in dirt."

QUESTION (A):

a) What would be the expected impact on Toronto Hydro's SAIDI and SAIFI if the underground cable replacement program focused upon replacing the cables that are buried in dirt for the period 2025-29? In your answer, discuss Toronto Hydro's claim that XLPE cables installed in PVC ducts have expected service lives double those of XLPE cables directly buried in dirt.

RESPONSE (A):

In a hypothetical scenario where Toronto Hydro replaces only the remaining population of direct-buried cable in dirt (286 circuit-kilometers) during the 2025-2029 rate period, it anticipates that the cumulative impact on SAIFI and SAIDI for Defective Equipment interruptions would deteriorate by 6% and 5%, respectively, by the end of 2029, compared to Toronto Hydro's proposed 2025-2029 investment plan. This scenario does not replace any cables in PVC conduit or concrete-encased ducts. Due to the contiguous and integrated nature of Horseshoe distribution assets, this scenario is unrealistic. Toronto Hydro will inevitably need to replace some minimum amount of cable in PVC conduit and concrete-encased ducts as part of larger rebuild projects and in conjunction with other asset types. Furthermore, Toronto Hydro has included cables in PVC conduit and concrete-encased duct for replacement because these asset populations include aging cables at risk of failure, which should be addressed as part of a balanced underground renewal program.

Direct-buried cable in dirt has a useful life of 20 years, whereas cable in PVC conduit has a useful life of 50 years. The longer useful life for PVC Conduit is due to its enhanced protection against environmental conditions and mechanical stresses. For information on how Toronto Hydro determines its asset useful lives, please see response to 2B-Staff-131, part (a). Regardless of the different useful life values, failures can and do occur for cables in PVC conduit due to aging and a multitude of other factors, including insulation breakdown, moisture ingress, and overload.

QUESTION (B):

b) What is the annual expected failure rate per km for XLPE cables that are buried in dirt and for cables installed in PVC ducts?

RESPONSE (B):

Toronto Hydro estimates the historical failure rate (system interruptions per km) for direct-buried cable in dirt to be 0.11 and for cable in PVC conduit to be 0.12.

QUESTION (C):

c) What is causing the PVC ducts to become clogged with dirt?

RESPONSE (C):

PVC ducts can become clogged with dirt due to the following reasons:

- Some vintages of PVC ducts that have been installed in the past are of inferior quality and are prone to breakage
- Improper installation or ducts not being connected in a closed loop
- Unused ducts that are not properly sealed can experience dirt ingress; the dirt can be pushed further into the duct by ground water or local flooding events

QUESTION (D):

d) What mitigation alternatives are there to clear the dirt from these PVC ducts other than replacing the cables?

i. For the mitigation alternatives please provide comparative unit costing relative to cable replacement.

RESPONSE (D):

Toronto Hydro does not clear dirt from PVC ducts while the cable is in place. If the cable is functioning as required and there is a problem with the duct (clogged or damaged), Toronto Hydro will leave the cable until it needs to be replaced due to failure or a change in service, or until planned replacement can be carried out at the appropriate time. At the time a cable is being replaced, non-intrusive (plastic) mandrels are used to clear PVC ducts, provided there is space to fit a mandrel. Should the mandrel prove insufficient, alternative solutions, including installing new ducts or cleaning them out via power wash are considered.

Due to a drafting error, the explanation provided in Exhibit 2B, Section E6.2 incorrectly suggests that the issue of PVC ducts filling with dirt is a new or emerging issue driving incremental replacement. Toronto Hydro would like to clarify that this is not the case. The existing underground cable population in the Horseshoe consists of three predominant types, two of which (direct-buried cable in dirt and cable in PVC conduit) are legacy, obsolete standards. Cables in all three construction types (including concrete-encased ducts) experience failures and are addressed in different proportions by the planned investments in the Underground System Renewal – Horseshoe program. The utility expects that as the direct-buried cable population reduces through replacement, and cables in PVC conduit continue to age, cables in PVC conduit will become an increasing focus of the program.

QUESTION (E):

e) Please explain the scope of Toronto Hydro's plans to "install new TRXLPE cable in concrete-encased ducts instead of burying cable directly into the soil or in PVC duct" throughout the horseshoe area. For example, is the concrete-encasement for road crossings only, or road crossings and industrial locations.

i. If the ducts are to be concrete encased in residential neighbourhoods, please provide the business case for the incremental costs and any examples of other jurisdictions that have similar construction standards.

RESPONSE (E):

Toronto Hydro's long-established policy for rebuilding underground areas is to install underground cable in concrete-encased duct up to the lot-line. The issue of concrete-encasement and alternatives was adjudicated by the Ontario Energy Board in Toronto Hydro's 2012-2014 Incremental Capital Module application (EB-2012-0064). As written in the Board's Partial Decision and Order (April 2, 2013):

> "While no party challenged THESL's assessment of the need to replace this cable, Energy Probe cross-examined THESL's witnesses extensively on possible alternatives to THESL's plan to replace this cable with concrete encased ducts. THESL's uncontradicted evidence was that the suggested alternatives were unsuitable in the situations encountered by THESL and that its approach was the most cost effective over the long term. Energy Probe argued that a reduction of $10 million should be made to reflect the fact that THESL's proposal for concrete encased duct banks is not justified from a reliability standpoint and that alternatives such as direct boring and flexible conduit or direct burying are acceptable alternatives and much more cost effective. THESL argued that Energy Probe's position should be rejected by the Board since initial installation cost is not the only cost and THESL's evidence had presented substantial information on the repair cost advantages for cable in concrete encased ducts which had been ignored by Energy Probe. THESL also stated that its evidence had clearly explained that concrete encased ducts offer the longest life and greatest reliability and facilitate future repair and replacement." (pg. 22-23)
>
> "The Board accepts THESL's evidence that the most effective way to replace the direct buried cable is with concrete encased ducts, and that the project is prudent and nondiscretionary. There was no credible evidence to support the alternatives or reductions

sought by the intervenors. Having found that the work is required and prudent, any reduction to the program is arbitrary and not supported by any evidence." (pg. 24)

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-203

Reference: Exhibit 2B, Section E6.2.1, Page 2

Preamble:

Toronto Hydro states "As of 2022, there are 286 circuit-kilometers of direct-buried cable in dirt."

QUESTION (A):

a) Please provide the historical actual and forecast all in per km costs for the periods 2020-2024, and 2025-2029 for the following activities:
   i. New XLPE underground cable in concrete duct.
   ii. Removal of existing XLPE underground cable in concrete duct with new XLPE.
   iii. New XLPE underground cable in PVC duct.
   iv. Removal of existing XLPE underground cable in PVC duct with new XLPE in concrete duct.
   v. New XLPE underground cable direct buried in dirt.
   vi. Removal of existing XLPE underground cable direct buried in direct with new XLPE in concrete duct.
   vii. Removal of existing PILC/AILC in duct and replacement with new XLPE.
   viii. Removal of existing PILC/AILC direct buried in dirt and replacement with new XLPE in concrete duct.

RESPONSE (A):

i. Table 1 shows actual historical unit costs for installing new primary cable in concrete encased ducts and concrete encased duct banks in the 2020-2023 period, and the forecast unit costs for new cable in concrete encased ducts.[1] Note that there are additional civil

[1] For primary cable installations in the Horseshoe region, Toronto Hydro uses TRXLPE cable.

costs not reflected in these units (e.g., cable chambers and splice boxes). Toronto Hydro does not develop long-term program forecasts for underground civil infrastructure on the basis of unit costs. This is because civil costs (and volumes) are highly dependent on the specific placement of ducts and associated restoration costs. Toronto Hydro estimates the civil portion of the underground program by applying a historical ratio of civil to electrical costs.

Table 1: Historical and Forecasted Costs for Primary Cable Installation

	Actual ($)				Forecast ($)					
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
New primary UG Cable in Concrete Encased PVC Duct (per m)	172	180	253	329	248	255	262	267	275	282
Install of duct bank (per m)	906	987	933	1,153	-	-	-	-	-	-

ii. Table 2 below shows the cost per m of removing existing primary cable in the Horseshoe from concrete encased ducts. The response in the first row ("New primary UG cable in concrete encased PVC duct (per m)" of part "a." provides costs of installing new cable in concrete encased duct.

Table 2: Cost per m to Remove Existing Primary Cable from Concrete Encased Ducts in Horseshoe

	Actual ($)				Forecast ($)					
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Removal of existing primary underground cable (excl. PILC) in concrete encased PVC duct (per m)	64	60	67	73	75	77	79	81	83	85

iii. Toronto Hydro does not install XLPE cable in direct buried PVC ducts (this is an obsolete legacy standard) and therefore does not have unit cost information. Please see response to 2B-Staff-202, part (e) for more information.

iv. Assuming the cable can be removed from the duct, removal costs are equivalent to those provided have been provided in (ii) and installation costs have been provided in (i) above. If the cable cannot be removed, it is retired in place.

v. Toronto Hydro does not install underground cable direct-buried in dirt.

vi. Toronto Hydro does not remove underground cable direct buried in dirt. Instead, the cable is retired in place. The cost for installing new cable has been provided in (i) above.

vii. Please see Table 3.

Table 3: Cost of Removal of Existing PILC and AILC in Duct

	Actual ($)				Forecast ($)					
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Removal of existing PILC in duct and replacement with new TRXLPE[2] (per circuit m)	3880	1520	880	1030	1240	1500	1520	1540	1600	1630
Removal of existing AILC in duct and replacement with new XLPE (per circuit m)	N/A	520	220	300	250	570	590	610	650	670

[2] PILC and AILC are not part of the referenced Underground System Renewal – Horseshoe program. These unit costs include cable and all related civil infrastructure (ducts and cable chambers) and cannot be compared to the costs provided in response to parts (i) and (ii).

viii. The population of PILC/AILC direct-buried in dirt is exceeding small and Toronto Hydro has not performed this type of work in recent history. Therefore, the utility cannot provide any recorded unit cost.

QUESTION (B):

b) Please identify if there was no significant activity in any of the above categories.

RESPONSE (B):

The following categories of primary cable (and AILC) replacement/installation activities had no significant activity in 2020-2023:

i. New XLPE underground cable in PVC duct.
ii. New XLPE underground cable direct buried in dirt.
iii. Removal of existing PILC/AILC direct buried in dirt and replacement with new TRXLPE and XLPE in concrete duct.

QUESTION (C):

c) Please identify if there was significant activity in a category not listed above.

RESPONSE (C):

There are no additional categories of primary cable replacement/installation where significant activities were carried out.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-204

Reference: Exhibit 2B, Section E6.2.1, Page 2

Preamble:

Other distributors are undertaking extensive programs using cable injection remediation for earlier generation XLPE cables to mitigate water tree damage, as the per km costs are significantly lower than complete cable replacement.

QUESTION:

a) Has Toronto Hydro evaluated the costs and benefits of undertaking a cable injection program as an alternative to cable replacement?
   i) If yes, please provide benefit-cost analysis of the evaluation and explain why cable injection is not considered to be an economically viable solution to mitigate at least some of Toronto Hydro's underground XLPE cable deficiencies.
   ii. If no, please explain why not.

RESPONSE:

Toronto Hydro piloted cable injection in 2008 and found it to be unsuitable for use on its cable population. The 2008 pilot did not produce satisfactory results, with many cables failing within a year of injection. The utility reviewed updates to procedures for cable injection in 2015 and reconfirmed that cable injection was not compatible for Toronto Hydro's system. For cable injection to be effective, the conductors cannot be solid or strand-blocked (strand-filled), and connectors need to be "flow through" (not solid stop). This is generally not the case with Toronto Hydro's cable population.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-205

Reference: Exhibit 2B, Section E6.2.3, Page 8

QUESTION (A)

a) Please provide the ratio of Underground System Contribution to Overall System Customer Hours Interrupted for the 5-year period 2013-2017 vs. the 5-year period 2018-2022.

RESPONSE (A):

The normalized ratio is 31:30.[1]

QUESTION (B):

b) Please provide the ratio of Overall System Customer Hours Interrupted for the period 2013-2017 vs. the period 2018-2022.

RESPONSE (B):

The normalized ratio is 127:100.

QUESTION (C):

c) Please provide Toronto Hydro's total average customer count for the period 2013-2017 and the period 2018-2022

RESPONSE (C):

Toronto Hydro's total average customer count was 741,180 in the 2013-2017 period and 771,103 for the 2018-2022 period.

[1] Note that the statistics in all parts of this response are for the entire Toronto Hydro distribution system.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-206

Reference: **Exhibit 2B, Section E6.2.3.2, Page 18**

QUESTION (A):

a) Per Figure 14, 2022 appears to represent an outlier year versus the improving trend from 2017 to 2021. What occurred in 2022 to cause such a significant single year deterioration in performance?

   i. Did a large number of underground transformers suddenly deteriorate from acceptable to non-acceptable condition or were there other factors? Please explain.

RESPONSE (A):

Toronto Hydro disagrees with the characterization of 2022 as being a performance outlier. A review of the Figures 13-15, updated with 2023 results (see 2B-SEC-66), shows that this is not the case. In fact, a reasonable conclusion to draw from the 2013-2023 results is that 2021 performance was unusually good.

QUESTION (B):

b) Please plot the actual or estimated annual results for 2023 on Figure 14 and discuss the resulting trend implications.

RESPONSE (B):

Please see 2B-SEC-66 for an updated Figure 14 and 2B-Staff-207 for a discussion of the results.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-207

Reference: **Exhibit 2B, Section E6.2.3.2, Page 18**

QUESTION (A):

a) Per Figure 15, explain why despite there being more Customer Hours Interrupted in 2022 than in 2021, the 2022 results are significantly better than the results for the period 2013-2019.

RESPONSE (A):

2021 was an exceptionally good year for the number of outages caused by defective underground transformers and the impact of those outages on customers. Please see response to 2B-SEC-66, where the updated Figures 13-15 show a trend of performance deterioration between 2021 and 2023, with 2023 being the worst year for Customers Interrupted (CI) since the peak of 2017.

QUESTION (B):

b) Do the 2022 results indicate that Toronto Hydro maintained or improved the reliability performance of its Underground Transformer portfolio?

RESPONSE (B):

Due to the inherent volatility of annual reliability metrics, it is generally best to examine performance over longer time horizons and by leveraging rolling, multi-year averages. The following table compares the five-year averages for CIs and CHIs for underground transformers.

Table 1: 2013-2017 Avg. vs 2018-2022 Avg. CIs and CHIs for Underground Transformers

Measure	2013-2017 Avg.	2018-2022 Avg.
Customer Interruptions ('000s)	23	24
Customer Hours Interrupted ('000s)	22	13

The table shows that customer interruption performance has remained consistent, and customer hours interrupted have improved. This improvement may be partially due to Toronto Hydro's targeted and accelerated replacement of submersible transformers in poor condition during 2017-2018, aimed at addressing frequent oil leaks that had been observed in the population. However, identifying the exact factors behind this trend remains difficult due to the inherently unpredictable nature of reliability performance.

As discussed in part (a), 2023 results show a deteriorating trend in performance over the 2021-2023 period.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-208

Reference: Exhibit 2B, Section E6.2.3.2, Page 19

QUESTION (A):

a) Please provide the tabular data for Figure 16.

RESPONSE (A):

Please see Table 1 below.

Table 1: Number of Externally-Reported Oil Spills on Underground Transformers (padmount, submersible, and vault transformers)[1]

Year	Number of Spills*
2013	2
2014	24
2015	41
2016	65
2017	66
2018	135
2019	204
2020	133
2021	40
2022	26

QUESTION (B):

[1] Data from 2013 to 2017 may include +/- 1-2 spill(s) variance, annually

b) Please update Figure 16 to show data from 2013-2022 and include a trend line for externally reported oil spills from 2013-2022.

RESPONSE (B):

Please see Figure below. There was an error in the caption Figure 16 which has now been corrected to include number of spills on padmount, submersible and vault transformers across the entire system.

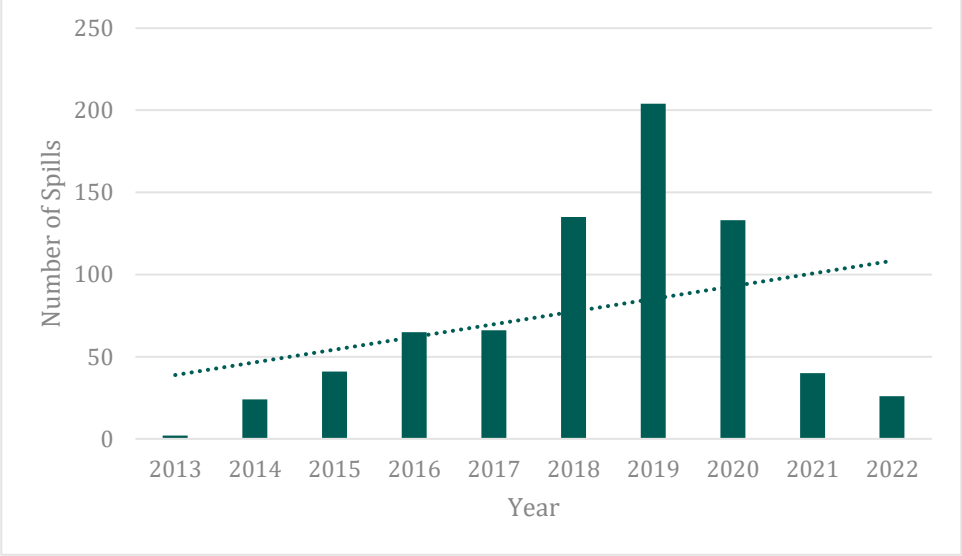


Figure 1: Number of Externally-Reported Oil Spills on Underground Transformers (padmount, submersible, and vault transformers) (Updated Figure 16)

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-209

References: Exhibit 2B, Section E6.2.3. 2, p. 21

Preamble:

Toronto Hydro states: "As of 2022, 26 percent of underground transformers in the Horseshoe area (i.e. 6,727 units) were at or beyond useful life (i.e. 30 years for padmount, submersible, and vault transformers)."

QUESTION (A):

a) Please explain how Toronto Hydro determined that the useful life for padmount, submersible and vault transformers should be set at 30 years, given that in 2022 6,727 of these transformers had been in service for more than 30 years, and in some cases significantly more than 30 years. In your response consider the information shown in Table 5 indicating that just 79 units out of the entire fleet of 25,209 units were assessed as being in HI5 - End of Serviceable Life condition in 2022, despite 6,727 of the units age-categorized as being beyond useful life.

RESPONSE (A):

The useful life of 30 years was adopted based on a review of the Depreciation Study completed by Concentric Inc., filed in Exhibit 2A, Tab 2, Schedule 1, Appendix D. Please see response to 2B-Staff-131, part (a), for a discussion regarding Toronto Hydro's useful lives and the extent to which they play a role in investment planning decisions. Please also see the response to 2B-SEC-44 for a comprehensive discussion regarding expected changes in asset demographics over the 2025-2029 period with investment.

Regarding Table 5 in Exhibit 2B, Section E6.2, the relatively small number of transformers in the worst condition band (HI5) as of 2022 is a positive indication as to the effectiveness of Toronto

Hydro's prioritization of the worst condition assets in investment planning. The fact that there were approximately 640 transformers in HI4 and HI5 condition in 2022 while over 6,500 units were operating beyond useful life underscores the benefits of having a robust condition model, which allows Toronto Hydro to focus more narrowly on replacing assets and rebuilding areas of the system that are most in need of investment.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-210

Reference: Exhibit 2B, Section E6.2.3.3, Pages 25-26

a) What occurred in 2021 to create the outlier results shown in Figures 22, 23 and 24?

RESPONSE:

Year-to-year variations in reliability for a given asset class are subject to a certain level of randomness, both in terms of frequency and impact of outages. There was a total of 23 outages that occurred in 2021 due to defective padmount switches. This is seven outages higher than the five-year average from 2016-2020 and three outages more than the worst year in that time period (i.e., 20 outages in 2016).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-211

Reference: Exhibit 2B, Section E6.2.4, Page 29

QUESTION (A):

a) Toronto Hydro plans to increase Horseshoe Underground System Renewal spending by $115.9M (32%) in 2025-2029 relative to 2020-2024. Please explain the spending increase in the context of Toronto Hydro's stated corporate goal of maintaining reliability performance and the improving reliability performance outcomes achieved for these assets at historical expenditure levels.

RESPONSE (A):

Exhibit 2B, Section E6.2 provides detailed analysis on the drivers and key assumptions behind the level of proposed expenditures in the Underground System Renewal – Horseshoe program. Toronto Hydro has proposed the minimum expenditures necessary to maintain reliability on this part of the system during the 2025-2029 period. The proposed investments are reflected in the SAIDI and SAIFI forecasts presented in Exhibit 1B, Tab 3, Schedule 1.

The reliability improvement trend that persisted between 2015-2019 was the result of significant capital investment in the replacement of direct-buried cable and associated assets beginning in the previous "ICM" period (circa. 2013), including an investment level of $115.5 million achieved in the year 2015. The pace of investment in this program dropped to around $70 million per year in 2018 and 2019. While the link between investments in one year and reliability performance in the next is clouded by the unpredictability of asset failure rates, Toronto Hydro notes that the previously positive reliability trend became a negative trend beginning in 2020. As further discussed in Section E6.2: "Through prioritized neighbourhood rebuild projects focused on replacement of high-risk direct-buried cross-linked polyethylene ("XLPE") cables, Toronto Hydro previously had success reducing the number of customer interruptions due to cable failure, from over 200,000 per year in

2013 to approximately 105,000 in 2019. However, more recently Toronto Hydro shifted focus away from rebuild projects addressing direct-buried cables in order to address the urgent environmental risk associated with PCBs. As a result, customer interruptions (and other reliability indicators) have started trending back up, reaching 199,000 in 2022."

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-212

Reference: **Exhibit 2B, Section E6.2, Page 30**

Preamble:

Table 8 provided by Toronto Hydro on Underground Circuit Renewal Horseshoe Program.

QUESTION (A):

a) In the last test period for the asset classes indicated in Table 8 what were the placeholder planning unit costs to determine program estimates and what were the actual unit costs incurred at program completion.

RESPONSE (A):

The following table shows the base unit costs that were assumed for estimating the 2020-2024 Distribution System Plan ("DSP"). Note that these unit costs do not include indirect engineering and administration costs, nor do they include the inflationary assumptions that were applied in the DSP. Both of these elements were layered on to the total estimated program cost as a final step.

Table 1: 2020-2024 Planning Assumptions

Asset Class	Planning Unit Cost				
	2020	**2021**	**2022**	**2023**	**2024**
UG Cable (per m)	$241	$241	$241	$241	$241
UG Transformers	$22,767	$22,767	$22,767	$22,767	$22,767
UG Switches	$87,333	$87,333	$87,333	$87,333	$87,333

The following table shows the actual unit costs. These unit costs are derived from in-service additions data and are therefore fully burdened.

Table 2: 2020-2023 Actual Costs

Asset Class	Actual Unit Cost			
	2020	2021	2022	2023
UG Cable (per m)	$172.4	$180.2	$253	$328.5
UG Transformers	$25,738	$40,002	$27,035	$37,806
UG Switches	$136,113	$147,194	$124,029	$144,211

The primary driver of cost increases across all asset classes during this period was price inflation. This is reflected in the commodity costs from the period, during which copper prices increased 88%, aluminum prices 142%, and steel 232%. Fluctuations in unit costs can also be attributed to annual variations in the mix of asset types being replaced (e.g., padmount vs. vault transformers; aluminum vs. copper conductors).

QUESTION (B) AND (C):

b) What percentage of the planned costs for this program for the period 2020-2022 were spent by the end of 2022?

c) What percentage of the planned costs for this program for the period 2020-2024 are forecast to be spent by the end of 2024?

RESPONSE (B) AND (C):

Toronto Hydro adjusts its plans on an annual basis as part of the Investment Planning & Portfolio Reporting process. For the Underground System Renewal – Horseshoe program, the 2020-2022 planning cycles resulted in an updated plan of $359.8 million for the 2020-2024 period (as show in Exhibit 2B, Section E6.2). As of the end of 2022, $188.8 million had been invested, equivalent to 52% of the updated plan. Toronto Hydro's latest reforecast, based on 2023 actuals (see response to 2B-Staff-104), is for a total of $363.1 million by the end of 2024, equivalent to 101% of the updated plan in Exhibit 2B, Section E6.2.

Compared to Toronto Hydro's original 2020-2024 DSP forecast of $460.3 million, the updated outlook of $363.1 million is a 21% reduction in spending. The reasons for constraining expenditures

in the 2020-2024 period are summarized in Exhibit 2B, Section E4.1 and further discussed in Section E2.2.1.1 and Section E6.2.4.1.

QUESTION (D) AND (E):

d) What percentage of the program scope that was planned to be completed for the period 2020-2022 was completed?
   i. If less than 100%, what actions has Toronto Hydro taken to improve its execution effectiveness?

e) What percentage of the program scope that was planned to be completed for the period 2020-2024 is forecast to be completed by end of 2024?

RESPONSE (D) AND (E):

As discussed in response to part (b), Toronto Hydro adjusts its plans on an annual basis as part of the Investment Planning & Portfolio Reporting process. The following table corresponds to the expenditure figures provided in part (b). Specifically, column A corresponds to the $359.8 million forecast for 2020-2024 from Exhibit 2B, Section E6.2, while column D corresponds to the latest $363.1 million outlook for the program. (The figures in this table reflect corrections made 2B-SEC-66.)

	A	B	C	D	E
Asset Class	**2020-2024 Planned**	**2020-2022 Actual**	**2020-2022 % Completion**	**2020-2024 Forecast**	**2020-2024 % Completion**
Total Cable (in circuit km)	196	129	66%	184	94%
Transformers	1,941	792	41%	1,999	103%
Switches	231	127	55%	144	62%

Toronto Hydro has also provided a comparison of the latest 2020-2024 outlook for volumes of work to the original 2020-2024 DSP forecast volumes (corresponding to the original $460.3 million expenditure plan) in response to 2B-PWU-3, part (a). To the extent that volumes of work for certain asset classes have been reduced by an amount greater than the 21% reduction in expenditures,

this can be attributed to a few major drivers: (1) volume and cost variances that occur as projects move from high-level estimates through detailed design and construction; (2) changes in the mix of assets addressed due to evolving program needs and constraints; and (3) significant inflationary pressures and supply-chain issues in the 2020-2023 period.

Toronto Hydro is committed to continuous improvement in its execution practices. Please refer to 2B-SEC-37 and 2B-AMPCO-29 for more information on Toronto Hydro's work program execution processes and the management of project variances.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2-STAFF-213

References: Exhibit 2B, Section E6.3, Page 20
Scorecard - Toronto Hydro-Electric System Limited, 2020
Scorecard - Toronto Hydro-Electric System Limited, 2021
Scorecard - Toronto Hydro-Electric System Limited, 2022

QUESTION (A) – (C):

a) Figure 15: Number of Lid Incidents in reference 1 shows that there were 9 lid incidents in 2020. Page 5 of the 2020 Scorecard MD&A states that of the 24 serious electrical incidents, "four involved lid ejections as a result of underground cable failures". Please reconcile the inconsistencies between these reports.
b) Figure 15: Number of Lid Incidents in reference 1 shows that there were 3 lid incidents in 2021. Page 5 of the 2021 Scorecard MD&A states that of the 22 serious electrical incidents, "four involved lid ejections due to underground cable failures". Please reconcile the inconsistencies between these reports.
c) Figure 15: Number of Lid Incidents in reference 1 shows that there were 5 lid incidents in 2022. Page 5 of the 2022 Scorecard MD&A states that of the 29 serious electrical incidents, "one (1) involved lid ejections due to underground cable failure". Please reconcile the inconsistencies between these reports.

RESPONSE (A) – (C):

Toronto Hydro notes that there is a one-year lag in reporting of serious electrical incidents ("SEI") in the scorecards, for example the 2022 Scorecard MD&A reports on incidents occurring in 2021 incidents not 2022.[1] Table 1 below compares the Scorecard MDMA lid ejection incidents with those reported in Figure 15 of Exhibit 2B, Section E6.3, considering this lag.

[1] The Scorecard relies on Electrical Safety Authority reporting for the SEI metric, which has on a one-year lag.

Table 1: Annual Comparison of Cable Chamber Lid Ejections

	Number of Lid Ejection Incidents	
	Scorecard MDMA	**Figure 15**
2019	4	4
2020	4	9
2021	1	3

The discrepancy noted in the table above is a result of the utilization of a predominantly manual process for reporting and recording data, which unfortunately led to unintentional omissions of certain incidents in the utility's reporting. During the data preparation phase for the application, Toronto Hydro took proactive measures to meticulously compile the numbers of lid ejections within the system, capturing some incidents which were inadvertently overlooked in ESA reporting.

In response to this oversight, Toronto Hydro has taken steps to enhance reporting procedures, provide comprehensive training to our staff, and bolster communication channels with the ESA. These measures have been implemented to mitigate the likelihood of similar discrepancies occurring in the future.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-214

References: EB-2018-0165, Exhibit 2B, Section E6.3, Page 18

Exhibit 2B, Section E6.3, Page 19

Preamble:

In reference 1, Toronto Hydro's 2020-2024 DSP, Toronto Hydro stated it planned to replace 252 cable chamber lids by the end of 2019 and 200 per year going forward.

In reference 2 Toronto Hydro states it has replaced 470 cable chamber lids since 2020, and plans to replace another 2,800 lids over 2025-2029, and that the increased pace is required to address the risk.

QUESTION (A):

a) Please confirm how many cable chamber lids Toronto Hydro replaced per year in the period 2020 through the end of 2023, and the cost per year.

RESPONSE (A):

Please see Table 1 below for cable chamber lid replacements and costs per year.[1]

Table 1: Cable Chamber Lid Replacements and Costs 2020-2023

	2020	2021	2022	2023
Lid Replacements	105	162	192	852
Cost ($M)	1.2	1.8	2.8	14.3

[1] Toronto Hydro notes that it incorrectly stated that it had replaced 470 lids on page 18 of Exhibit 2B, Section E6.3. The correct number is 459 as shown on pages 39 and 40 (Table 9) in Exhibit 2B, Section E6.3 and as shown in Table 1.

QUESTION (B):

b) How many chamber lids does Toronto Hydro forecast replacing in 2024?

RESPONSE (B):

Toronto Hydro forecasts replacing 180 cable chamber lids in 2024.

QUESTION (C):

c) If the total number of lids replaced from 2020 through 2024 is less than 1,000 (i.e. 5 x 200) please explain the reason for the reduction in scope to this program.

RESPONSE (C):

Toronto Hydro forecasts replacing more than 1,000 (1,491) cable chamber lids between 2020 and 2024. As shown in Exhibit 2B Section E6.3 Figure 15, in 2020, there was an increase in the number of lid ejections and, as a result, Toronto Hydro increased the pace of replacement of cable chamber lids between 2020 and 2024.

QUESTION (D):

d) After the 2024 program is complete, how many cable chamber lids remain that require replacement to mitigate the ejection risk?

RESPONSE (D):

The total number of chambers in the system is 10,500 and with the expected completion of 1,491 units by the end of 2024, Toronto Hydro forecasts that there will be 8,794 cable chamber lids remaining after 2024 and all of these require replacement to mitigate the lid ejection risk. Toronto Hydro has planned for an achievable pace of 2,800 cable chamber lids over the 2025-2029 period, prioritizing locations by relative risk.

QUESTION (E):

e) Have there been any injuries to workers or members of the public since 2020 due to the manhole lid ejection issue?

RESPONSE (E):

Toronto Hydro is not aware of any injuries to workers or members of the public since 2020 due to the manhole lid ejection incidents.

QUESTION (F):

f) Does the replacement of the cable chamber lids involve replacing the frame and cover, or replacing only the cover?

RESPONSE (F):

The replacement of cable chamber lids includes both the frame and the cover.

QUESTION (G):

g) Are the new cable chamber lids installed in new and rebuilt locations, or is another method used to mitigate the risk, such as arc proof tape?

RESPONSE (G):

Toronto Hydro installs new cable chamber lids on new and rebuilt cable chamber locations. Concurrently, Toronto Hydro has a cable testing program, which can help to identify potential issues with cables that may lead to cable chamber lid ejections. Currently, no alternative methods are employed. While arc proof tapes are typically utilized to safeguard cables from heat and flames resulting from nearby failures, their practical application within Toronto Hydro's system is limited due to the congestion in the cable chambers, where secondary distribution networks coexist with primary cables and other assets like communications equipment and street lighting.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-215

References: Exhibit 2B, Section E6.3.3.2, Page 16

Exhibit 2B, Section E6.4.3.2, Page 8

QUESTION:

a) For both of these programs (cable chamber renewal and network vault renewal) please confirm that all associated costs driven by replacement of the deteriorated civil works (e.g., electrical equipment replacements and/or cable replacements) are included in the civil works program spending.

   i. If not confirmed, please quantify the equipment and cable replacement costs primarily driven by civil remediations.

   ii. If not confirmed, please identify where the associated equipment and cable replacement costs are found in this application.

RESPONSE:

Confirmed. Toronto Hydro includes all associated costs driven by the planned replacement of the deteriorated civil works in the Cable Chamber Renewal and Network Vault Renewal segment spending.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-216

References: Exhibit 2B, Section E6.3.1, Page 2

Preamble:

Toronto Hydro states: "Replacement of legacy PILC and AILC cables will allow Toronto Hydro to maintain reliability performance by proactive replacement of high risk cables. This will also decrease the presence of designated substances (i.e. lead and asbestos) on the grid."

QUESTION (A):

a) Please describe and quantify the "designated substances" risks associated with leaving PILC and AILC cables in use vs. removing these cables.

RESPONSE (A):

PILC and AILC pose relatively low health risk to workers when left in the system undisturbed. However, any disturbance to the cable system due to cable faults, customer connection or planned renewal work would expose workers (e.g., via inhalation/ingestion) to the health hazards associated with designated substances such as lead or asbestos.

Proactive removal of these cables would decrease the overall frequency of exposure to these designated substances when working on or around them in the underground system. Eliminating the hazard (i.e., the designated substances) through removal of the cables is a more effective control to protect the health and safety of the workers as opposed to relying on less reliable administrative controls or personal protective equipment (e.g., respirators) to mitigate the exposure.

QUESTION (B):

b) How does Toronto hydro dispose of these cables following removal?

RESPONSE (B):

Toronto Hydro safely handles and disposes of asbestos and lead as prescribed in the *Ontario Occupational Health and Safety Act* (Reg. 8338), R.S.O. 1990 and the *Canadian Environmental Protection Act*, 1999.

Following the removal of lead or asbestos waste, smaller sections are wrapped up and sealed in plastic bags or sheeting and transported to designated bins. Cables removed on reels will have damaged or exposed ends of cables capped or tapped to prevent the release of the designated substance. Waste is removed from Toronto Hydro facilities by an appropriately licensed waste hauler vendor.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-217

Reference: Exhibit 2B, Section E6.3.3.3, Page 22

Preamble**:**

Toronto Hydro states "Defective equipment was the largest contributor to annual customer reliability representing about 70 percent and 80 percent of Customers Interrupted (CI) and Customers Hours Interrupted (CHI), respectively."

QUESTION (A):

a) The trend shown in Figure 18 indicates that defective equipment failures trended down significantly from 2018 to 2022, and failures from other causes trended up significantly. Please discuss the reasons for these apparent performance trends.

RESPONSE (A):

The Underground Residential Distribution system ("URD") serves a small portion of Toronto Hydro's distribution system, therefore the year over year reliability measures are substantially affected by individual outage incidents. URD equipment failures from 2018-2022 have generally dropped. Prior to 2020, Toronto Hydro managed these assets reactively and introduced as part of its 2020-2024 rate application a proactive renewal plan to address deteriorating URD assets.[1] Since 2020, these investments have resulted in improved reliability of the URD assets, and therefore, the apparent relative increase in interruptions is due to all other causes. The majority of these interruptions are generally beyond Toronto Hydro's control. As such, no concrete trends or conclusions related to the other causes of reliability performance should be inferred.

[1] EB-2018-0165, Exhibit 2B, Section E6.3.

QUESTION (B):

b) How many customers are supplied by this system?

RESPONSE (B):

Approximately 14,900 customers were supplied by the URD system as of February 2024.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-218

Reference: Exhibit 2B, Section E6.3.3.3, Page 22

Preamble:

Many Ontario distributors, as well as utilities in other Provinces, utilize a run-to-fail asset management strategy for pole-top transformers, to maximize the value extracted by customers from these assets, since they are relatively low-cost, quick to replace and economical warehoused in a range of standard sizes. Furthermore, because they have long service lives and can be replaced quickly upon failure, the net reliability impact of unit failure upon the customers connected to it is minimal over the longer term. Each unit failure interrupts customers for at most a few hours over a multiple decade reliable service life.

QUESTION (A):

a) Please provide a Benefit Cost Analysis supporting Toronto Hydro's decision to follow a proactive lifecycle management strategy for pole-top transformers.

RESPONSE (A):

Please see Table 2 on page 18 of Exhibit 2B, Section D3 which speaks to the approach for replacing pole top transformers.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-219

Reference: Exhibit 2B, Section E6.5.3.1. pages 7-8

Preamble:

Figure 1 indicates that less than a quarter of overhead system outages are caused by defective equipment, yet Toronto Hydro is accelerating its overhead system renewal expenditures by $139.5M (64%).

QUESTION (A):

a) Please explain why Toronto Hydro is increasing spending by 64% above historical levels to address a situation that is only responsible for 24% of historic overhead system outages.

RESPONSE (A):

The increase in this program does not represent an "acceleration" of investments.

The proposed Overhead System Renewal budget for the 2025-2029 period is higher than the 2020-2024 expenditures due primarily to the following reasons:

- the addition of the Overhead Infrastructure Resiliency segment ($85.9 million), which is a reintroduction and expansion of the work done through the Overhead Infrastructure Relocation program in Toronto Hydro's 2015-2019 Distribution System Plan;
- the deferral of work in the Overhead System Renewal segment from the 2020-2024 period into the 2025-2029 period, which was done to manage pressures across the broader capital expenditure plan; and
- inflationary increases.

Note that the proposed expenditure for the Overhead System Renewal segment (i.e. excluding the Overhead Infrastructure Resiliency segment) for the 2025-2029 period is $272.8 million. This is

aligned with the original plan of $265.7 million in the 2020-2024 DSP (and would in fact represent a reduction in spending after accounting for inflation).

QUESTION (B):

b) Please discuss what Toronto Hydro is doing to address the other 75% of outages and relevant costs.

RESPONSE (B):

While the Overhead System Renewal program is aimed at reducing the failure risk of overhead equipment, these investments may contribute to other reliability improvements, such as:

- A reduction of tree-contact outages by replacing bare conductors with tree-proof conductors or relocating existing pole lines away from high vegetation areas,
- A reduction of foreign interference outages by relocating poles lines in high traffic areas,
- A reduction of unknown outages caused by tree contacts, animal contacts and incorrect fuse protection settings by replacing existing overhead assets with new assets that meet current standards.

Toronto Hydro also manages overhead reliability performance through the Area Conversions (Section E6.1), Reactive and Corrective Capital (Section E6.7), System Enhancements (Section E7.1), Preventative and Predictive Maintenance (Exhibit 4, Tab 2, Schedule 1) and Corrective Maintenance (Exhibit 4, Tab 2, Schedule 4) programs.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-220

Reference: Exhibit 2B, Section E6.5.3.1, p. 10

Preamble:

Toronto Hydro states: "Through the Overhead System Renewal segment, Toronto Hydro replaces overhead transformers beyond useful life, which are at risk of failing and potentially posing an environmental risk due to oil leaks that may contain PCBs"

QUESTION (A):

a) What percentage of the transformers planned for replacement in 2025-2029 are suspected to contain PCBs.

RESPONSE (A):

With respect to the population of assets relevant to the referenced Overhead System Renewal program: Toronto Hydro expects to have an estimated remaining population of 618 overhead transformers at risk of containing PCBs as of the beginning of 2025. This number represents 13% of the overhead transformers planned for replacement in the 2025-2029 period. Note that this figure could increase or decrease slightly depending on 2024 work program execution and other updates (e.g., field inspections).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-221

References: Exhibit 2B, Section E6.5.3.1, pp. 11-12

Exhibit 2B, Section E6.5.1, p. 1

QUESTION (A):

a) Please reconcile the results shown in Figures 6, 7 and 8 with the statement made on lines 17-20 of Reference 2 that:

"Toronto Hydro has reduced the number of transformer related customers interrupted and customer hours interrupted from over 10,000 customers interrupted and 6,000 customer hours interrupted and per year on average to 4,133 customers and 4,360 customer-hours interrupted per year on average over the last five years (2018-2022)."

RESPONSE (A):

On average, Toronto Hydro saw over 10,000 customers interrupted and over 6,000 customer hours interrupted per year due to pole top transformers between 2013 and 2017. By contrast, on average, Toronto Hydro saw 4,133 customers interrupted and 4,360 customer-hours interrupted per year due to pole top transformers between 2018 and 2022.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-222

Reference: Exhibit 2B, Section E6.5.3.1, Page 12

QUESTION (A):

a) What drove the outlier results in 2022 shown in Figures 7: Customers Interrupted ("CI") for Pole-top Transformers and Figure 8: Customers Hours Interrupted ("CHI") for Pole-top Transformers?

RESPONSE (A):

There was one outage that contributed to an abnormal number of customers (CI) and a different outage that contributed to abnormal number of customer hours interrupted (CHI). Below are the details on each of those outages:

- F-2022-1213 on 34M2 (LEASIDE TS) with a CI of 3,177 (41.6% of 2022 CI)
- F-2022-978 on XJF2 (ELLESMERE MS) with a CHI of 3,340 (38.9% of 2022 CHI)

QUESTION (B):

b) Please update Figures 7 and 8 to show results from 2013-2022.

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-69.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-223

Reference: Exhibit 2B, Section E6.5.3.1, Page 14

a) Please explain why failures due to External Factors, Other and Unknown appear to significantly diminish for transformers older than 35 years relative to transformers that are younger than 35 years as indicated in Figure 11: Age and Cause Distribution for Failed Overhead Transformers 2018-2022.

RESPONSE:

Equipment failures result from a mix of cumulative (long-term) degradation factors and immediate degradation factors. Premature failures are typically linked to direct causes, while assets failing due to cumulative impacts over their lifespan are often considered end-of-life failures. For instance, a five-year-old transformer that starts leaking oil is attributed to a supplier quality paint issue. On the other hand, similar issues with a 40-year-old transformer would not likely be attributed to a supplier quality problem. Instead, such a failure would likely be categorized as an end-of-life failure, resulting from the cumulative impacts of environmental conditions or the natural degradation of the tank enclosure.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-224

Reference: Exhibit 2B, Section E6.5.3.1, Page 17

Preamble:

Toronto Hydro states: "Figure 15 illustrates that, despite ongoing renewal, approximately 287 poles on average had to be replaced reactively per year between 2019 and 2022."

QUESTION (A):

a) What are the primary failure modes of wood poles that require reactive replacement, and what are the most common triggering events?

RESPONSE (A):

Primary failure modes of wood poles are explained in Exhibit 4, Tab 2, Schedule 1 at pages 13-14 and Exhibit 2B, Section D2.2.1.2: Overhead Assets Failure Characteristics.

In summary, rot and decay are the most common and primary reasons for condemning a pole for replacement as they can weaken the mechanical strength and structure of the pole, which is the primary indicator of its health and remaining life. Ground rot at the base of the pole in particular is the worst location for rot to be in as the base is the most vulnerable to environmental degradation. Signs of mechanical damage such as holes or cracks and insect infestation, which can compromise the structure are another trigger for replacement.

QUESTION (B):

b) On average, how many poles per year does Toronto Hydro replace (or retire) under all of its capital and operating programs and projects; for example, road moves and widenings, reactive capital (storms, vehicle accidents, treefalls), Back Lot program, Box Frame program, voltage upgrades, underground conversions, and overhead system renewal?

RESPONSE (B):

On average, Toronto Hydro replaces approximately 4,100 poles per year under of all its programs.

QUESTION (C):

c) What is the ratio of poles replaced under the overhead renewal program to the poles replaced or retired under all other programs and projects?

RESPONSE (C):

The average ratio of poles replaced under the overhead renewal program to the poles replaced or retired under all other programs is approximately 35 percent. This number increases to 45 percent if the poles replaced under the externally driven programs are excluded, which is another significant contributor of pole replacements but is not driven by failure risk.

QUESTION (D):

d) Does Toronto Hydro consider all the pole replacements or retirements it is doing under these other programs or projects when evaluating the need to replace poles under the overhead system renewal program?

RESPONSE (D):

Yes, Toronto Hydro considers pole replacements under other programs when evaluating need under the Overhead System Renewal program. Please refer to 2B-SEC-44 for a discussion regarding expectations for wood pole replacements and demographic changes in the 2025-2029 period.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-225

Reference: Exhibit 2B, Section E6.5.4.1, page. 35

a) Does Toronto Hydro typically replace overhead conductors due to the condition of the conductors, or only when it is replacing a line segment for other reasons?

RESPONSE:

As a result of overhead line patrols, which are conducted every three years, and infrared scans of overhead primary lines, which are conducted annually, Toronto Hydro may determine that it is necessary to reactively replace defective or failed overhead conductors exhibiting deficiencies such as fraying or bird caging, excessive sag or low clearances, or the presence of thermal anomalies. In addition, Toronto Hydro will replace conductors as part of rebuilds and voltage conversion projects. Please refer to Section D3.1.2 of Exhibit 2B for more information regarding asset replacement practices.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-226

References: Exhibit 2B, Section E6.5, Page 35
Exhibit 2B, Section D3, Appendix A, Pages 4 and 6
Exhibit 2B, Section D3, Appendix B, Page 8

Preamble:

Over the planning period Toronto Hydro plans to replace 8,337 poles over 4 years which yields an average annual replacement rate of 2,084 poles per year. The condition assessment tables indicate that the number of wood poles in Hi4 and Hi5 will increase by 9,459 in 2022 and 32,158 in 2029. If Toronto Hydro was to maintain Hi4 and Hi5 at 2022 levels 22,699 poles would need to replaced between 2022 and 2029, yielding an annual replace rate of 3,242 poles per year.

QUESTION (A):

a) Toronto Hydro owns approximately 183,620 poles and approximately 107,000 wood poles were evaluated for asset condition between 2018-2022. Please explain why approximately 76,620 poles were not evaluated for condition assessment.

RESPONSE (A):

The total count of 183,620 poles mentioned in Exhibit 2B – Section A encompasses both streetlighting and distribution poles within the system. Among these, distribution poles consist of approximately 107,000 wood poles, 30,000 concrete poles, and 3,600 steel poles. Toronto Hydro's Asset Condition Assessment methodology specifically focuses on distribution wood poles as they are subject to a dedicated pole inspection program enabling the calculation of condition-based Health Scores. The condition of the remaining poles (concrete and steel) has not been assessed due to the lack of both a regular inspection program and an ACA methodology. Once inspections of these poles commence, ACA methodology and condition-based Health Scores will be established.

Please refer to Exhibit 4, Tab 2, Schedule 1, Segment 5 for details regarding overhead line patrols and pole inspections.

QUESTION (B):

b) Comparing the planned annual average replacement for wood poles of 2,084 per year to a condition replacement rate of 3,242, a shortfall of 1,158 assets appears to exist. Please explain how Toronto Hydro is achieving asset demographics, for example are there Hi4 and Hi5 pole replacements occurring in other spending categories that close the observed shortfall.

   i. Do the wood pole health indices for 2029 overstate the projected decay in wood pole asset condition, given that Toronto Hydro's consultant has indicated a potential miscalculation of wood pole useful life.

RESPONSE (B):

To clarify, the Overhead System Renewal program plans to replace 8,337 poles over five years, which is an annual replacement of 1,667 poles per year from 2025-2029. If no investment or pole replacement were done from 2022 till 2029, 32,158 poles are expected to reach HI4 and HI5 condition in 2029. Please see response to 2B-SEC-44 for a comprehensive overview of expected changes in asset demographics over the 2025-2029 period with investment, including a discussion regarding the utility's decision to restrain the pace of pole replacements.

i. In Toronto Hydro's experience, wood poles have proven to be a uniquely challenging asset to track and model from an ACA perspective. This is due primarily to the fact that inspections occur only once every 10 years, meaning that the model is in many cases relying on data that is upwards of nine years old. This, in Toronto Hydro's view, is the most significant factor in the comparatively high rate of deterioration seen in the Future Health Score model outputs (since the model is having to age the assets over a longer period of time, amplifying its effects). As discussed in Ex.2B, Section D3, App A, Toronto Hydro's assessment of the wood pole ACA model since its implementation in 2017 has led to

reasonable adjustments that better align model outputs with observed reality. Toronto Hydro aims to further mitigate this issue through its proposed reduction of inspection to an 8-year cycle and by introducing targeted wood pole inspections based on the asset condition assessment (see 2B-PWU-10).

Regarding the Normal Expected Life for assets, please refer to 2B-Staff-146.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-227

References: Exhibit 2B, Section E6.5, Page 35

Exhibit 2B, Section D3, Appendix A, Pages 4, 6

QUESTION (A):

a) Please update the following 3 tables to show pole top transformers.

i. Table 3: Summary of Health Index Distribution as of year end 2017

ii. Table 4: Summary of Health Index Distribution as of year end 2022

iii. Table 5: Summary of Health Index Distribution as of year end 2029

RESPONSE (A):

Due to the lack of a feasible and cost-effective method for collecting sufficiently detailed condition information in the field, there is no health score calculation methodology for pole top transformers.

QUESTION (B):

b) Provide an estimation of the pole top transformer asset condition assessment that are solely or primarily based on age.

RESPONSE (B):

Please see response to part (a).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-228

Reference: Exhibit 2B, Section E6.6, Pages 1-3

Preamble:

Toronto Hydro states that: "Toronto Hydro plans to invest $282.7 million in the Stations Renewal Program in 2025-2029, which is a $107.3 million or 61 percent increase over the projected 2020-2024 spending in the Program." From the previous application the projected station renewal program was $141.6M rather than $175.4M that is forecast above in the current application.

Source: EB-2018-01652B -DSP Section E6.6 Stations Renewal pp. 1-2	**Source: EB-2023-0195 2B-E6.6 Section E6.6 Stations Renewal pp. 1-2**
Transformer Stations 5 TS Switchgear 9 TS Outdoor Breakers 61 TS Outdoor switches **$74.5M**	**Transformer Stations** 3 TS Switchgear Complete four TS from the 2020-2024 period. 12 TS Outdoor Breakers 63 TS Outdoor Switches Refurbish one station building in preparation for switchgear replacements required over the 2030-2034 period. **$134M**
Municipal Stations 12 MS Switchgear 10 Power Transformers 10 Primary Disconnect Switches 1 MS Primary Breaker **$37.7M**	**Municipal Stations** 12 MS Switchgear 15 Power Transformers 1 MS Primary Supply **$70.3M**
Control and Monitoring 6 new RTU Renew 39 RTUs Upgrade Protections a 5 Pilot-Wire Locations Replace 45km Cu Control Cable **$22.1M**	**Control and Monitoring** 33 RTU Renew 251 Obsolete Relays **$64.7M**
Battery and Ancillary Systems 3 Sump Pumps 67 Battery and Charger Systems 6 Station Service Transformers 2 Air Compressors **$7.3M**	**Battery and Ancillary Systems** 55 Batteries 8 Charger Systems 3 Station Service Tx 5 Station AC Service Panels 3 Sump Pumps **$13.6M**
Plans to invest $141.6M	**Plans to invest $282.7M**

QUESTIONS (A) – (D):

a) Please reconcile the discrepancy between $141.6M detailed in the station renewals in the 2020-2024 period from the previous application and the $175.4M detailed in the 2025-2029 application.

b) For each grouping in the table above for the period of 2020-2024 provide the planned scope of work, and what scope was completed. The scope descriptions should include a count of the items planned and completed.

c) For each grouping in the table above for the period of 2020-2024 provide the planned expenditures and actual expenditure.

d) Please explain the basis for the forecasts for the scope of work for 2025-2029.

    i. Please provide the detailed estimates.

RESPONSES (A) – (D):

Please refer to the expenditure plan in Exhibit 2B, Section E6.6.4 for a detailed variance analysis of 2020-2024 capital expenditures and the 2025-2029 forecast.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-229

Reference: Exhibit 2B, Section E6.6.3.1, Page 13

Preamble:

Toronto Hydro states: "The failure risk of KSO circuit breakers is high and the impact of failure is significant."

QUESTION (A):

a) Figure 9 indicates that all KSO breakers are in asset condition HI2 or HI3. What is the annual probability of failure of breakers in each of these categories?

RESPONSE (A):

KSO circuit breakers represent approximately 1 percent of all circuit breakers and are actively being removed from the system. Therefore, the sample size is too small to generate a representative probability of failure.

QUESTION (B):

b) Risk is the product of probability x consequence. Is the consequence of failure of these breakers so high that even with a low failure probability they represent an unacceptable risk to Toronto Hydro? Please quantify and discuss any associated risk analysis that has been undertaken.

RESPONSE (B):

As described in Exhibit 2B, Section E6.6.3.1.2, KSO breakers supply large amounts of load therefore when they fail they have the potential to disrupt thousands of customers. Replacing these assets requires long lead times and maintaining the system in contingency while these replacements are

being completed can pose significant risks due to the added load on the surrounding parts of the system.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-230

References: Exhibit 2B, Section E6.6.3.2, Page 18

Preamble:

Toronto Hydro states: "Toronto Hydro's MS supply power to Toronto's suburban areas consist largely of residential and a few small general service customers (<1 MW). Major MS assets include switchgear, power transformers, and MS primary supplies composed of disconnect switches and power cable. A large portion of these assets are operating well beyond their useful life and are consequently at a heightened risk of failure."

QUESTION (A):

a) When Toronto Hydro states throughout this application that assets operating beyond their useful lives are at a heightened risk of failure, does Toronto Hydro actually mean that such assets exhibit a heightened probability of failure?

RESPONSE (A):

Toronto Hydro confirms that it expects assets operating beyond their useful life to have a higher probability of failure (on average, and before considering observed condition) than assets that are not as old. Toronto Hydro would like to further clarify that, in general, when it refers to assets operating beyond their useful lives as being a concern, this is meant to communicate the observation that there is a certain population of assets that are operating at an age where probability of failure is expected to increase at an accelerating rate, and that this population warrants consideration in asset management planning. Toronto Hydro does not replace assets simply because they have crossed the "useful life" threshold, and in fact runs many thousands of assets well beyond useful life.

QUESTION (B):

b) Where ACAs are not solely based on age, confirm that probability of failure should be determined based on the assessed ACA rather than asset age, since some older assets may be in good condition, and some relatively new assets may be in unsatisfactory condition.
   i. If not confirmed, why not?

RESPONSE (B):

Toronto Hydro confirms that for asset classes where condition information is available, the probability of failure should be assessed based on condition, where feasible (i.e., failure data exists).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-231

Reference: Exhibit 2B, Section E6.6.3.2, Page 21

Preamble:

Toronto Hydro states: "The useful life of a power transformer is 45 years."

QUESTION (A):

a) Would the same useful life apply to a transformer in a winter peaking system?

RESPONSE (A):

Toronto Hydro has not specifically assessed the impact of summer vs. winter peak on the useful life of transformers. Based on the System Peak Demand Forecast in Exhibit 2B, Section D4 (updated January 29, 2024), Toronto Hydro remains a summer peaking utility for this rate period.

QUESTION (B):

b) Toronto Hydro forecasts that it will become a winter peaking system. Should it be modifying the planning criteria it applies to make station asset investment decisions, since most station asset types will have higher capacity ratings in winter peak ambient temperature conditions than they will in summer peak ambient temperature conditions.

RESPONSE (B):

As noted in the response to part (a), Toronto Hydro remains a summer peaking utility for this rate period. The planning criteria used assesses the maximum ratio of load to transformer capacity, and considers all seasons. If and when Toronto Hydro's system evolves to a winter-peaking system, this criteria will not be affected.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-232

Reference: Exhibit 2B / Section E6.6.3.2 / p. 22

Preamble:

Toronto Hydro states: "Toronto Hydro has revised its target maximum age for its power transformers down from 70 to 65 years, in alignment with previous rate applications."

a) Please explain why this revised target maximum age remains appropriate since Toronto Hydro is becoming a winter peaking utility.

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-Staff-231 part (a).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-233

Reference: **Exhibit 2B / Section E6.6.3.2 / p. 23**

Preamble:

Regarding Table11: Power Transformers Proposed for Replacement

QUESTION (A):

a) Please confirm Dunsany MS Power Transformer 2408, Centennial MS Power Transformer 2412 are all scheduled for replacement solely due to age and not because of additional concerns.
    i. If not confirmed, please explain why not.

RESPONSE (A):

Power transformers replacements are not prioritized solely based on age. As described in Exhibit 2B, Section E6.6.4.2, Table 42 at page 56, Toronto Hydro considers the impact of failure, such as customer count, loading, degradation of oil, resiliency of operation, and voltage conversion plan in addition to age when prioritizing the replacement these assets. On average, the average Municipal Station ("MS") supplies approximately 500 customers. However, Centennial MS and Dunsany MS supply around 700 and 750 customers, respectively which represent 39 and 49 percent more than the average number of customers. As such, they are assigned a higher priority for replacement.

QUESTION (B):

b) Explain why Belfield MS Power Transformer 2504 is scheduled for replacement in 2029 at an age of 60 years despite exhibiting no concerns other than age, even though it will still be 5 years younger than Toronto Hydro's reduced maximum target age of 65 for Power Transformers in 2029.

RESPONSE (B):

Belfield Municipal Station consists of two Power Transformers (TR1 2503 and TR2 2504). As shown in Table 42 in Exhibit 2B, Section E6.6.4.2 at page 56, the need to replace Belfield MS Power Transformer 2504 is not solely based on age but due to the combination of age with the following:

- TR1 2503 will be 69 years old at the time of the project and has a high-power factor;
- A loading analysis of the area identified the need for only one power transformer, therefore resulting in the removal of TR2 2504 and replacement of TR1 2503;
- The primary supply to the MS also requires replacement due to the high risk of failure of direct buried ingress; and
- Belfield MS Switchgear is planned to be replaced in 2029. Coordination of the replacement in conjunction with the aforementioned work is a cost-effective alternative.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-234

Reference: Exhibit 2B, Section E6.6.3.3, Page 29

Preamble:

Toronto Hydro is planning to increase its Stations Control and Monitoring Renewal spending by $36.6M (130%).

QUESTION (A) AND (B):

a) What is the annual probability of failure of any of the existing electromechanical relays?
b) Are electromechanical relay failures trending up significantly?
    i. If yes, please provide documentation showing the increasing failure trends.

RESPONSE (A) AND (B):

Protection relay systems have built in redundancies that allow back-up systems to operate in the event of a single relay failure; and are inspected as part of a robust maintenance cycle. As such, Toronto Hydro does not track individual relay failures and is unable to provide their probability of failure or an indication whether electrotechnical relay failures are trending up

QUESTION (C):

c) Is adherence to Toronto Hydro's Grid Modernization Roadmap a major driver of the significantly increased planned spending on relay replacements relative to the historical period? Please discuss.

RESPONSE (C):

Confirmed. Toronto Hydro's planned investments in relays over the 2025-2029 period are driven by a combination of system observability, equipment obsolescence and improved fault location and protection equipment coordination. Modernizing old electromechanical relays to digital relays have

other benefits for the system that reduces maintenance costs, improves reliability, and enhances grid observability. For more detail, please refer to Control and Monitoring drivers at Exhibit 2B, Section E6.6.3.3 and Grid Modernization Section D5.1.

QUESTION (D):

d) What percentage of the electromechanical relays targeted for replacement operate obsolete or poor condition breakers or switchgear?

RESPONSE (D):

As the monitoring and control work is carried out on a programmatic basis, Toronto Hydro cannot readily identify which relays are specifically linked to obsolete and poor condition breakers and switchgear outside of specific assets identified in project scopes and details.

To clarify, Toronto Hydro replaces electromechanical relays either through targeted renewal or as part of a switchgear/breaker replacement.[1] As described in response to part (c), the proposed investments are driven by station modernization to enhance system and station observability and improve fault location. The latter is done in conjunction with switchgear and breaker replacement. Toronto Hydro notes that the 2025-2029 relay investments proposed in the Monitoring and Control segment do not overlap with planned switchgear and breaker replacements.

[1] Please refer to Exhibit 2B, Section E6.6.4.3 Table 50 at page 68

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-235

Reference: Exhibit 2B, Section E6.6.3.3, Page 30

QUESTION:

a) Is the use of "(Without Investment)" in the header cells in Tables 14 and 15 a typo?

   i. If no, how is the number of obsolete/past useful life assets being reduced in all instances by 2029 without investment?

RESPONSE:

No. Tables 14 and 15 demonstrate the deterioration of the assets over the 2025-2029 period should Toronto Hydro not intervene. These assets are targeted through switchgear renewal investments and MS Conversions as proposed in Exhibit 2B, Section E6.6.3.3, Page 33, Line 8.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-236

References: Exhibit 2B, Section E6.7, page. 13

Exhibit 2B, Section E5.4, pages. 16-17

Preamble:

Toronto Hydro states that the Reactive Meter Replacement costs for 2025-2029 were "derived based on a four-year weighted average of historical costs. The average percentage of meters failing remains the same but the population is increasing yearly".

QUESTION:

Please explain why Toronto Hydro used historic performance of aged meters and did not consider the impact of replacing meters in the AMI 2.0 program when projecting meter failures in the 2024-2029 period.

RESPONSE:

Toronto Hydro used the historical failure rate of meters to forecast reactive meter replacement volumes and costs for the 2025-2029 rate period since the failure rates of newer meter models and communication infrastructure that the utility will install as part of the AMI 2.0 initiative are currently unknown.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-237

Reference: Exhibit 2B, Section E7.4, Pages 30-32

Preamble:

OEB Staff have created the following table which summarizes actual and forecast costs for 2020-2024 from the variance explanation in the reference 1.

Reactive Hydro One Contribution and True-Up Costs	2020-2024 $ million
Copeland TS Phase 1 True-Up	9.9
Switchyard Expansion Bermondsey and Richview TS	8.5
New Cable Carlaw TS to Gerrard TS	2.4
Additional Unforeseen	1.9
Reactive Total	**22.7**

QUESTION (A):

a) Table 18 in reference 1 shows a 2020-2024 Actual/Forecast Costs of $24.9M for Reactive Hydro One Contribution and True-Up Costs. Please reconcile the difference between this value and the value compiled in the table above.

RESPONSE (A):

Table 1 below expands upon the table provided in the preamble, and shows the complete costs adding to $24.9 million for Reactive Hydro One Contribution and True-Up Costs.

Table 1: Complete Actual and Forecast Costs Reactive Hydro One Contribution and True-Up Costs over 2020-2024 ($ Millions)

Reactive Hydro One Contribution and True-Up Costs	2020-2024
Copeland TS Phase 1 True-Up	9.9
Switchyard Expansion Bermondsey and Richview TS	8.5

Reactive Hydro One Contribution and True-Up Costs	**2020-2024**
New Cable Carlaw TS to Gerrard TS	2.4
Additional Unforeseen	1.9
Renewal and Customer Connection Projects (To be reversed)	1.2
Long-Lead Item Procurement	1.0
Reactive Total	**24.9**

The difference between the $22.7 million shown in the preamble, versus the $24.9 million reported in Exhibit 2B, Section E7.4 at page 27[1] is due to an additional: $1.0 million advanced payment incurred in 2022 for long-lead item procurement, and an additional $1.2 million for renewal and customer connection projects for which costs will be recovered from the customer.

QUESTION (B):

b) For each of the projects in Table 19: Hydro One Contributions 2020-2024 Variances, and the projects that make up the Reactive Contributions and True-Ups:
   i. Please categorize the costs as construction costs or load true-up.
   ii. Please provide the agreements between Toronto Hydro and Hydro One.
   iii. Please provide any invoices and calculations from Hydro One (i.e. output of the Hydro One DCF model).
   iv. For those costs not yet invoiced by Hydro One, please provide the cost estimate and calculations from Hydro One (i.e. output of the Hydro One DCF model). In the absence of documentation from Hydro One, please provide Toronto Hydro's detailed DCF calculations for the true-up payment.
   v. In cases where Toronto Hydro was, or may be, required to make a payment during 2020-2024 due to reduced or unrealized load, please explain why the load forecast at the time of the agreement with Hydro One was not realized. (For example, the $5.7M incurred on the Copeland TS Phase 1. Project).

[1] As of Toronto Hydro's Application update submitted on January 29

RESPONSE (B):

i.

Subsegment	Project	Cost Categorization
Horner Expansion	Horner Expansion	Construction Cost
Hydro One Transformer Upgrades	Bridgman TS T11/T12/T13/T14 Upgrade	Construction Cost
	Cecil TS T3/T4 Upgrade	Load True-Up
	Charles TS T3/T4 Upgrade	Construction Cost
	Dufferin TS T1/T3/T4 Upgrade	Construction Cost
	Main TS T3/T4 Upgrade	Construction Cost
	Strachan TS T12 Upgrade	Construction Cost
	Strachan TS T14 Upgrade (Partial Cost)	Construction Cost
Reactive Hydro One Contribution and True-Up Costs	Copeland TS Phase 1 True-Up	Load True-Up and Construction Cost
	Switchyard Expansion Bermondsey and Richview TS	Construction Cost
	New Cable Carlaw TS to Gerrard TS	Construction Cost
	Additional Unforeseen	Forecast – Expected: Construction Cost
	Incorrect Mapping of Renewal Work	Construction Cost
	Customer Connection Requiring HONI Contribution	Construction Cost
	Incorrect Mapping of Partial Cost of Strachan TS T12 Upgrade	Construction Cost

With regards to ii. and iii. please see the agreements and invoices attached as appendices.

iv. The only project without a CCRA and formal cost estimate is the Bermondsey TS switchyard expansion. Hydro One provided Toronto Hydro a planning estimate for this project which is reflected in the forecast.

v. There were two load true-up payments in the 2020-2024 period: the Copeland TS Phase 1 True-Up, and the Cecil TS T3/T4 Upgrade.

With respect to Copeland TS – Phase 1, the CCRA was based on Toronto Hydro's 2013 System Peak Demand (2012 actuals). In 2015, Toronto Hydro recalibrated its load forecasting methodology to reflect the latest growth trends observed in actuals and align with the 2016 Regional Infrastructure

Plan methodology.[2] These changes coupled with a drop in peak demand in the surrounding area resulted in the load true up. However, it is important to note that Copeland TS is needed both to enable switchgear renewal at Windsor TS, and to provide thermal capacity and feeder positions to its surrounding area. The value of switchgear renewal and additional feeder positions is not substantially diminished by partially unrealized load.

Similarly, Toronto Hydro made a load true-up payment for the historic project, Cecil TS T3/T4 Upgrade which was executed in 2005. The payment was the result of differences in Toronto Hydro's 2021 System Peak Demand Forecast relative to Toronto Hydro's 2015 System Peak Demand Forecast, submitted for each respective true-up evaluation. This difference is attributed to lack of load realization from customers relative to load requested over the 2013-2017 period, and the impact of COVID-19 in the Cecil area. Additionally, as the in-service date for Copeland Phase II had not been set at the time of the 2015 forecast, it did not reflect the impact of future load transfers from Cecil to Copeland TS (post-Phase 2). These transfers were reflected in the 2021 forecast which formed the basis of the true-up.

[2] Toronto Hydro notes that the 2016 Regional Infrastructure Plan was the first following the launch of the IRRP process (in May 2015).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2-STAFF-238

Ref 1: Exhibit 2B, Section E7.4, Page 27

Preamble**:**

Table 15: Historical & Forecast Program Costs by Segments includes costs for Hydro One Contributions segment for the 2025 to 2029 forecast period totalling $103M.

QUESTION (A):

a) For each year of the forecast period please provide a list of projects and forecast costs, as well as a categorization of the costs as construction costs or load true-up.

RESPONSE (A):

Table 1: Hydro One Contribution Project List and Annual Expenditures Forecasted Over 2025-2029

Project or Subsegment	Categorization	Forecast				
		2025	2026	2027	2028	2029
Downsview SS	Construction Costs		0.6	1.7	2.9	0.6
Sheppard TS Bus Expansion	Construction Costs		0.5	4.5	5.0	5.0
Manby TS DESN Reconfigurations	Construction Costs		0.5	3.5	4.0	4.0
Basin TS - T3/T5 Upgrade	Construction Costs	1.6				
Duplex TS - T1/T2 Upgrade	Construction Costs	1.6				
Leslie TS - T1 Upgrade	Construction Costs	0.3				
Strachan TS - T14 Upgrade	Construction Costs	0.8				
Scarborough TS - T23 Upgrade	Construction Costs		0.4			
Strachan TS - T13/T15 Upgrade	Construction Costs			1.6		
Duplex TS - T3/T4 Upgrade	Construction Costs				1.6	
Carlaw TS - T1/T2 Upgrade	Construction Costs					1.6
True-Up Costs	Construction and/or True-Up Costs	3.5	2.0	1.3	1.3	1.3
Total	**N/A**	**7.8**	**4.0**	**12.6**	**14.8**	**12.5**

QUESTION (B):

b) For each project please provide:

i. A copy of the agreement between Toronto Hydro and Hydro One.

ii. Load realized for each year of the agreement to date.

iii. Past invoices and calculations from Hydro One for true-payments.

iv. Where there is a load true-up payment due in the period, please provide estimates and calculations from Hydro One for the true-up payment. In the absence of estimates from Hydro One, please provide Toronto Hydro's detailed calculations of the true-up payment.

RESPONSE (B):

Parts (i), (ii), and (iii):

As shown in Table 2 below, all projects in the Hydro One Contributions segment for the 2025-2029 period are presently in the planning phase. In this phase, the project has been proposed by one or both of Toronto Hydro and/or Hydro One, but neither scope of work nor estimates have been developed by Hydro One. Similarly, no agreements or invoices have been provided by Hydro One at this time.

As mentioned in 2B-E7.4 at page 27 of Toronto Hydro's application,[1] the purpose of the Reactive Hydro One Contributions & True-Up Costs subsegment is "to support expansion projects or true-up costs unforeseen at the time of the application". As a result, there are no agreements or invoices in place at this time for this subsegment.

Table 2: Status of Hydro One Contribution Projects Proposed for the 2025-2029 Period

Project	Status
Downsview SS	In Planning Phase
Sheppard TS Bus Expansion	In Planning Phase

[1] Updated January 29, 2024

Project	Status
Manby TS DESN Reconfigurations	In Planning Phase
Basin TS - T3/T5 Upgrade	In Planning Phase
Duplex TS - T1/T2 Upgrade	In Planning Phase
Leslie TS - T1 Upgrade	In Planning Phase
Strachan TS - T14 Upgrade	In Planning Phase
Scarborough TS - T23 Upgrade	In Planning Phase
Strachan TS - T13/T15 Upgrade	In Planning Phase
Duplex TS - T3/T4 Upgrade	In Planning Phase
Carlaw TS - T1/T2 Upgrade	In Planning Phase
Reactive Hydro One Contribution & True-Up Costs	Forecasted

Hydro One has not provided cost estimates for potential future load true-up payments. However, Toronto Hydro has anticipated the potential for load true-up payments for the following projects: Copeland TS Phase 1, Horner TS Expansion, and Runnymede TS Expansion. In the absence of precise information regarding how the load is going to materialize in these areas, Toronto Hydro developed a forecast on a best effort basis using the historical Copeland TS and Cecil TS load true-up payments in the 2020-2024 period as described in its response to 2B-Staff-237. The utility used the average MW of load trued-up (48 MW), the average of $k per MW per year ($3.2k /MW-year), and a 20-year period to derive an estimate of $3.07 million per station, resulting in the $9.4 million forecast (including inflation). Toronto Hydro would like to emphasize that the actual true-ups are entirely contingent on the rate of customer load materialization, which is outside of the utility's control. Any variances between the forecasted true-ups noted above, and the actual true-ups that take place in the next rate period would be reconciled as part of the proposed Demand-Related Variance Account – Expenditures Sub-Account.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-239

References: Exhibit 2B, Section E6.7.1, Page 2

Preamble:

Under worst performing feeders Toronto Hydro states: "The objective of this segment is to identify feeders performing poorly over a rolling 12-month period and perform work in an effort to mitigate further interruptions."

QUESTION (A):

a) How does Toronto Hydro identify and rank feeders that are performing poorly?

RESPONSE (A):

Toronto Hydro defines and prioritizes poorly performing feeders as described in Exhibit 2B, Section E6.7 at pages 2, 16, and 24.

QUESTION (B):

b) What is the reliability threshold for being included in the Worst Performing list, or is the Worst Performing feeder list comprised of a fixed number of feeders?
    i. If a fixed number, what is that number?
    ii. If a threshold, what is that threshold?
    iii. If a feeder is scheduled to be addressed under either the Back Lot, Box Frame or other programs, will another feeder be added to the Worst Performing Feeder list to replace it?

RESPONSE (B):

There is no fixed number of "Worst Performing Feeders". Toronto Hydro considers any feeder that meets the threshold as outlined in the evidence referenced in the response to part (a) to be a "Worst Performing Feeder".

i. Not applicable

ii. Please see response to part (a).

iii. A feeder remains on the Worst Performing Feeder list as long as it meets the criteria regardless of whether it is being addressed via other programs. Prior to issuing work under the Worst Performing Feeder segment, Toronto Hydro checks existing projects to ensure that any proposed asset replacements are not being targeted under any other programs.

QUESTION (C):

c) Please provide the SAIDI and SAIFI for the worst performing feeders over the last 10 years, and the number of feeders that were on the Worst Performing Feeder list for each of the last 10 years.

RESPONSE (C):

Please see Table 1 and Figure 1 below.

Table 1: SAIDI and SAIFI for FESI-7 and FESI-6 Large Customer feeders 2014-2023

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total SAIFI	0.42	0.51	0.43	0.20	0.30	0.19	0.41	0.33	0.40	0.43
Total SAIDI	14.38	17.31	8.97	4.58	6.90	4.25	10.07	6.89	7.85	9.96

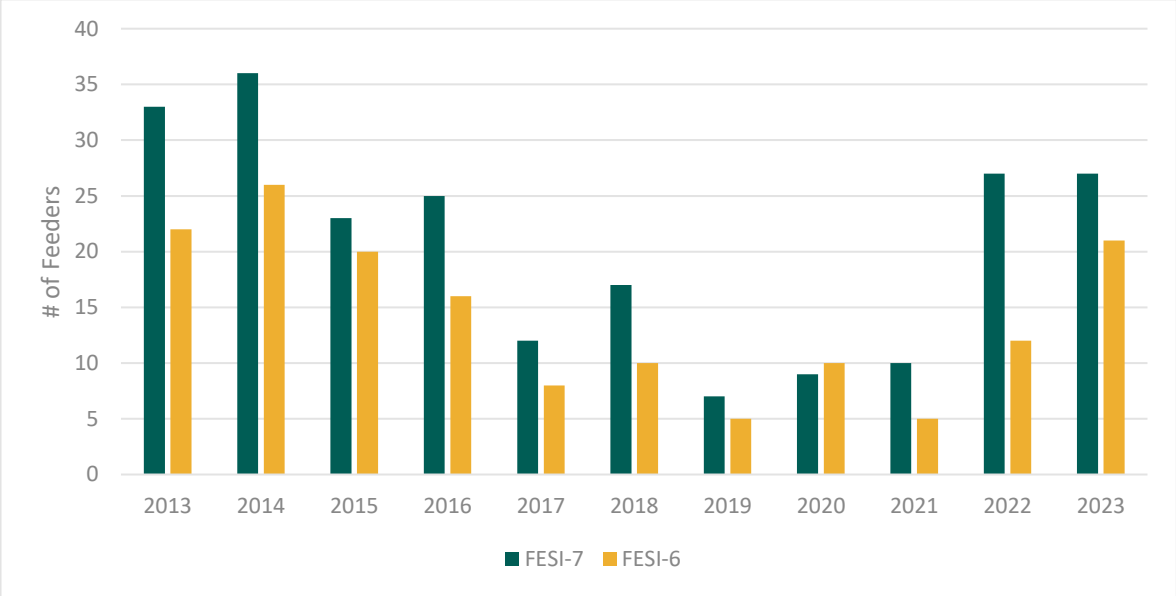


Figure 1: Number of FESI-7 and FESI-6 Large Customer Feeders 2013-2023[1]

QUESTION (D):

d) Please provide the average capital and OM&A spent to improve performance of the worst performing feeders, per year, for the last 10 years. Please discuss the effectiveness of these investments in terms of improved feeder performance.

RESPONSE (D):

Please see Table 2 below for the annual capital and OM&A spending on worst performing feeders.

Table 2: Annual Capital and OM&A Worst Performing Feeder Investments ($ Millions)

Year	Capital	OM&A
2014	3.08	0.63
2015	3.03	1.16
2016	4.09	1.86
2017	2.97	1.36

[1] In drafting this response, Toronto Hydro discovered that Figure 14 from Exhibit 2B, Section E6.7 at page 20 included some incorrect values. The correct values are included here.

Year	Capital	OM&A
2018	3.87	1.08
2019	3.72	1.09
2020	4.19	1.01
2021	3.67	1.10
2022	3.75	1.38
2023	5.71	1.84

On average over the last 10 years, Toronto Hydro has spent $3.8 million in capital and $1.3 million in OM&A investments per year on worst performing feeders. The performance of this program is measured largely by how many "Worst Performing Feeders" there are in a given calendar year. The annual number of FESI-7 and FESI-6 Large Customer feeders are a small subset of the more than 1,500 total feeders that make-up Toronto Hydro's distribution system and have been gradually trending down over the last 10 years as shown in Figure 1 in part (a). There was a noticeable increase in the number of FESI-7 and FESI-6 Large Customer feeders in 2022 and 2023. This is attributed to the increased sensitivity of the Outage Management System in recording interruptions, which is further explained in Exhibit 1B, Tab 2, Section 4 "Reliability Performance".

The Worst Performing Feeder program provides a near-term and cost-effective solution to address emerging issues on targeted feeders which are experiencing a disproportionate number of interruptions. Through this segment, Toronto Hydro replaces assets identified as having a risk of imminent failure before they would be scheduled for replacement under planned renewal programs, mitigating the risk of additional outages for customers already experiencing below-average reliability.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-240

Reference: Exhibit 2B, Section E6.7.1, Page 23

Preamble:

Figure 15: 2019-2029 Reactive Capital Work Requests Actuals and Forecast shows that the number of work requests decreased from 2019 to 2021 and increased slightly in 2022. Toronto Hydro predicts a steady level of work requests over the forecast period.

QUESTION (A):

a) Please explain the trend of work requests in this budget category.

RESPONSE (A):

As described in Exhibit 2B, Section E6.7, the work under the Reactive Capital segment is unplanned, unpredictable and non-discretionary. Hence, the data from year to year can vary significantly since the work is demand driven. The consistent decline in the number of work requests from 2019 to 2021 primarily stems from a reduction in the instances of oil leaks necessitating reactive transformer replacements. As Toronto Hydro continues to substitute non-submersible/non-stainless-steel transformers with stainless steel ones through its renewal programs, Toronto Hydro anticipates this decline in failures to persist and stabilize. Conversely, the incidence of deficiencies prompting reactive pole replacement requests has been increasing, attributed to the increasing number of poles surpassing their useful life and experiencing deteriorating asset condition.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-241

Reference: Exhibit 2B, Section E7.1, Page 1

QUESTION (A):

a) Confirm that the System Enhancements program will reduce the consequence of individual asset failures in many or most cases.
    i. If not confirmed, explain the purpose of the program, since it will not reduce the probability of asset failures.

RESPONSE (A):

Confirmed. Please refer to Exhibit 2B, Section E7.1, Page 5 for specific information on this topic.

Note that Toronto Hydro respectfully disagrees with the premise of part (i) of OEB Staff's question. The System Enhancements program contains a variety of field technology investments which will deliver benefits beyond reducing consequences of failure. The proposed System Observability segment of the program includes adding more sensors, relays and monitoring technology at specific nodes across the distribution grid. Gradually, these technologies will help the utility advance three core capabilities:

1. **Enhanced Fault Location:** Locating faults and other system disturbances faster and more efficiently in order to improve reliability and operate the grid more cost-effectively.
2. **Enhanced Decision-making and Grid Optimization:** Providing greater insight into real-time feeder and asset loading, condition, and other relevant operating characteristics. This assists the utility in managing short- and long-term uncertainty as well as driving optimal real-time operational decisions and longer-term investment planning decisions.
3. **Enhanced Asset Diagnostics:** Greater visibility into high-risk and previously hard-to-monitor assets will improve asset diagnostics, mitigating the risk of asset failure and impacts to personnel safety and environmental damage.

For more information on the multi-faceted benefits of Toronto Hydro's System Enhancements program, please refer to Exhibit 2B, Section E7, and the Intelligent Grid Section of Toronto Hydro's *Grid Modernization Strategy* (Exhibit 2B, Section D5.2.1).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-242

Reference: Exhibit 2B, Section E7.1, Page 1

Preamble:

The proposed Contingency Enhancement investment represents a $113M (568%) increase in segment spending.

QUESTION (A):

a) Please confirm that this increase is necessary to maintain rather than improve system reliability.
    i. If confirmed, please explain how Toronto Hydro has been able to significantly reduce its outage durations over the historical period despite a much slower pace of spending in this segment.
    ii. If not confirmed, please reconcile Toronto Hydro's strategic decision to increase spending in this segment by 568%, given its residential customers' preference to maintain reliability and control costs.

RESPONSE (A):

As mentioned in Exhibit 2B, Section E2, "Although Toronto Hydro's renewal and modernization efforts over the last decade have led to improvements in reliability performance that began in the mid-2000s, more recently this performance has plateaued." The investments in the Contingency Enhancement segment support Toronto Hydro's complimentary goals of maintaining reliability during the 2025-2029 period while improving reliability and resiliency for the longer-term. For more information, please refer to 2B-Staff-175.

QUESTION (B):

b) Toronto Hydro indicates elsewhere in the Application that Toronto Hydro has already implemented majority of its contingency enhancement plans. Has Toronto Hydro undertaken a benefit-cost analysis demonstrating that the proposed accelerated spending to rapidly complete this plan provides offsetting benefits of equal or greater value to customers?

   i. If yes, please provide the benefit-cost analysis documentation.

   ii. If no, please explain why not.

RESPONSE (B):

Toronto Hydro has not indicated that the majority of its contingency enhancement plans have been implemented. For a discussion regarding benefit-cost analysis related to modernization initiatives, including Contingency Enhancement, please refer to 2B-Staff-170. Pleaser also refer to 2B-Staff-162 for information on the expected long-term benefits of Fault Location Isolation and Service Restoration ('FLISR') implementation.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-243

Reference: Exhibit 2B, Section E7.1.1, Page 2

Preamble:

Toronto Hydro states: "Under the Downtown Contingency, this segment provides for plans to add provisions in the downtown core for incremental Toronto Hydro-controlled back-up supply stations… The planned enhancements will provide N-2 (i.e., two station loss-of-supply issues at the same time) operational capability to address serious loss-of-supply scenarios."

QUESTION (A):

a) Please identify all N-2 loss of supply events that have caused significant Downtown customer outage over the past 5 years.

RESPONSE (A):

For the requested time period, the following are major Downtown loss of supply events in which the station-to-station switchgear ties would have reduced the impact on customers:

- A barge crane contact with HONI overhead transmission line on August 11, 2022. This event is described at pages 17-18 of the referenced section.
- A Charles Station loss of supply event on February 1, 2024. This event occurred subsequent to the filing, and is not included in Table 5 of E7.1.3.2.

QUESTION (B):

b) Please identify all Toronto Hydro service areas where Toronto Hydro is proposing to apply an N-2 planning standard going forward.

RESPONSE (B):

The Copeland-Esplanade project described in the referenced program is Toronto Hydro's only proposed interstation switchgear tie at this time. Please refer to part (c) below for more information on N-2 standards.

QUESTION (C):

c) Please identify any other North American utilities Toronto Hydro is aware of which apply a similar N-2 planning standard and explain the circumstances under which the N-2 standard is applied by these utilities.

RESPONSE (C):

N-2 operational capabilities are a common element of distribution system design across North America. N-2 capability is typically established at the distribution level when serving dense service areas and/or critical loads, such as financial centres, hospitals, and transportation infrastructure. Note, for example, that Toronto Hydro's own Horseshoe distribution system has *de facto* N-2 capabilities, as it is designed such that load can be transferred between stations at the feeder level. This configuration is common for urban and suburban distribution utilities. Another example is the secondary network system which Toronto Hydro operates in parts of its dense urban core. Many other utilities around the world operate similar secondary network systems, as well as other, even more robust network grid systems, which offer a very high degree of reliability for critical loads and dense service areas (e.g., Manhattan) and ComEd.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-244

Reference: Exhibit 2B, Section E7.1.2, Page 4

Preamble:

Toronto Hydro states: "Continues to maintain Toronto Hydro's Total Recorded Injury Frequency (TRIF) measure and safety objectives by installing remote switching, thereby reducing crew exposure to safety risks associated with manual switching."

QUESTION (A):

a) Please provide a list of switches that have a known safety issue that are subject to a manufacturer's recall/bulletin or ESA safety alert or product recall. Include the manufacturer, model, make, number in service and if available, link to the public announcement.

RESPONSE (A):

There are no known safety issues related to manufacturer recalls, bulletins or ESA safety alerts for manual switches currently in Toronto Hydro's distribution system.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-245

Reference: **Exhibit 2B, Section E7.1.3.1, Page 7**

Preamble:

Toronto Hydro states: "This configuration ensures a contingency power source is available for the faulted feeder regardless of whether the fault occurs at the feeder, bus, or station level, effectively reducing the duration of an outage. During the 2018-2022 period, the average duration for outages on feeders with less than three SCADA tie-points was approximately 707 minutes per year per feeder, whereas the average duration of those feeders with three or more SCACA tie-points was approximately 496 minutes."

QUESTION (A):

a) How does Toronto Hydro's SAIDI performance trend for the Horseshoe area compare with the SAIDI trends of its Ontario peers?

RESPONSE (A):

As seen in Figures 1 and 2 below, Toronto Hydro's Horseshoe Region has shown strong performance in SAIDI (Excluding Loss of Supply and Major Events) in comparison to its peer distributors, and is generally within the range of SAIDI performance of other large distributors in Ontario. This reflects Toronto Hydro's commitment over the years of delivering safe and reliable power to our customers, minimizing the duration of interruptions.

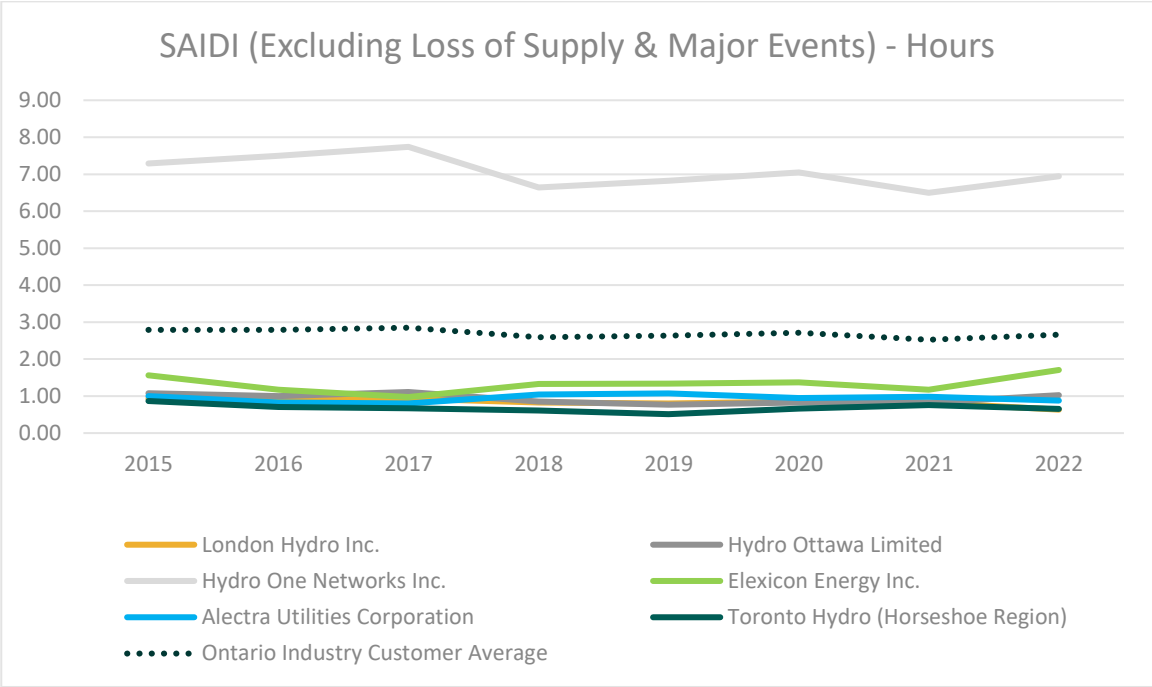


Figure 1: SAIDI Industry Comparison Including HONI (Excluding Loss of Supply and Major Events)

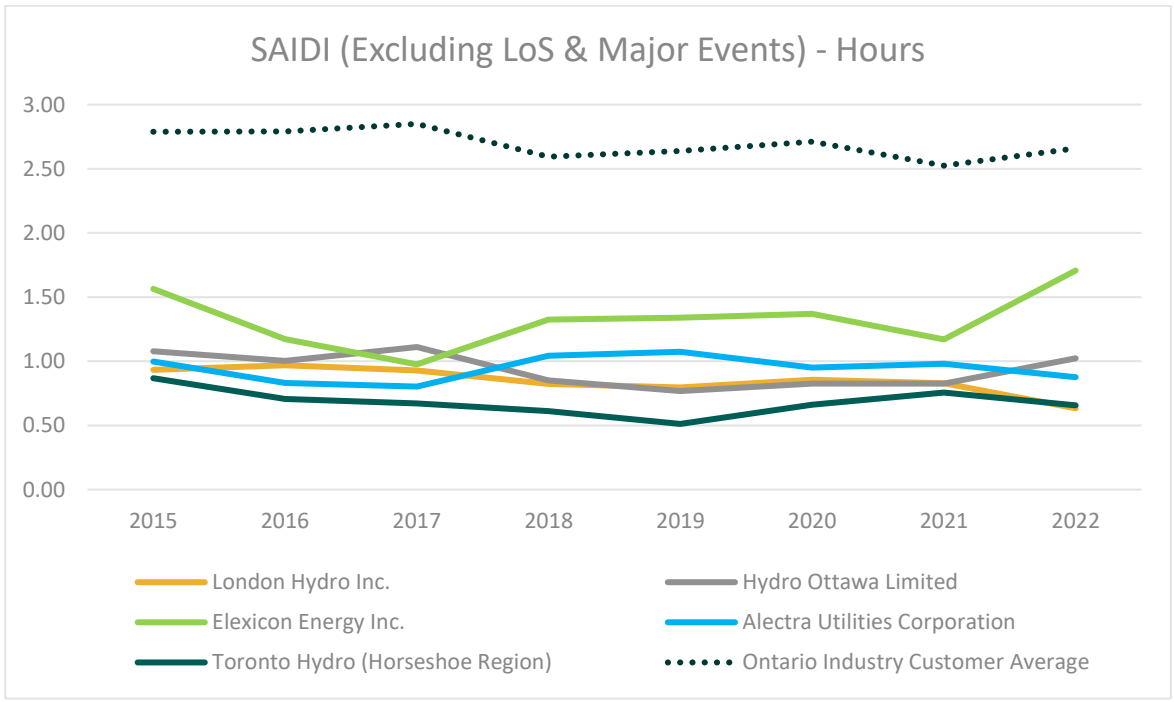


Figure 2: SAIDI Industry Comparison Excluding HONI (Excluding Loss of Supply and Major Events)

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-246

Reference: Exhibit 2B / Section E7.1.3.1 / p. 8

Preamble:

Toronto Hydro states: "This work is expected to result in an average of approximately 12.6 percent reliability improvement on the 94 feeders where SCADA switch installation work is expected to take place. This will result in an average yearly total customer minute out (CMO) reduction from 180,113 during the 2018-2022 period to an improved average yearly total CMO of 162,889. The potential SAIDI improvement as a result of this work is expected to be approximately 0.022 minutes per feeder per year."

QUESTION (A):

a) Please provide the cost in dollars per estimated "customer minute out" reduction for this project and all other projects that reduce customer outage minutes.

RESPONSE (A):

Based on the proposed 2025-2029 Contingency Enhancement Program ($133 million cumulative), Toronto Hydro estimates the CMO reduction over the rate period (2025-2029) to be approximately 2.6 million minutes, resulting in an effective cost of $50.95 per CMO reduced over 2025-2029. With an expected useful life of 30 years (Exhibit 2A, 2022 Depreciation Study, Pg. 48/383), considering average historical reliability performance and forecasted increases in number of customers (Exhibit 3, Tab 1, Schedule 1), the lifetime CMO reduction is estimated to be 37 million minutes, with an effective cost of $3.58 per CMO reduced over the lifetime of the assets (i.e., SCADA switches and reclosers).

Refer to Exhibit 1B, Tab 3, Schedule 1, Page 56-62 along with respective Table 22, 23, 24 and 25 for a benefit-cost analysis applying to all of Toronto Hydro's reliability-related investments in the 2025-2029 Distribution System Plan.

QUESTION (B):

b) Please explain how making incremental investments to materially reduce CMOs aligns with Toronto Hydro's stated strategy of making necessary expenditures to maintain rather than materially improve reliability.

RESPONSE (B):

Please refer to 2B-Staff-242 and 2B-Staff-175.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-247

Reference: Exhibit 2B, Section E7.2.1, Page 1

Preamble**:**

Toronto Hydro states: "The NWS strategy for the 2025-2029 period is focused on being flexible and adaptable to help system planners respond to load growth while navigating the underlying uncertainty that stems from changing demand patterns and increased reliance on electrification. This strategy builds on Toronto Hydro's experience utilizing DERs to reduce peak demand, helping to defer grid expansions or, in most cases, avoid grid expansions should demand not materialize as expected (e.g., lower than expected demand, fluctuating demand)."

QUESTION (A):

a) Please quantify by technology type the alignment of energy production by the DERs presently installed in Toronto Hydro's service area with the summer and winter peak demand hours on Toronto Hydro's distribution system.

RESPONSE (A):

As outlined in Exhibit 2B Section E7.2, Toronto Hydro plans for and procures third-party capacity in the form of dispatchable demand response to complement standard system planning approaches. The utility is unable to provide the requested data as Toronto Hydro does not procure energy (kWh) from DERs.

QUESTION (B):

b) Given the response to the prior question, please describe the effectiveness of Toronto Hydro's existing DER portfolio in mitigating capacity constraints encountered by Toronto Hydro during summer and winter peak demand periods.

RESPONSE (B):

Toronto Hydro does not control third-party owned, non-dispatchable DERs and thus cannot rely upon these assets to meet system needs (capacity needs or otherwise) on demand. Until a DER owner enters into a binding agreement with Toronto Hydro (via LDR procurement) to provide a specific service to the grid, Toronto Hydro will not consider this DER as a reliable system tool. As part of its Local Demand Response program, Toronto Hydro procured 8 MW of dispatchable demand response capacity between 2018-2020, 4 MW between 2022-2023, and 6 MW in 2024.

The non-wires solutions considered for the 2025-2029 rate period are described in Exhibit 2B Section E7.2. Toronto Hydro's use of NWSs is targeted and focuses on credible capital deferral opportunities, and thus, the application of these solutions is limited to instances where such deferral opportunities can be identified and measured. The use case identified at this time is limited to bus-level load transfer deferral or avoidance. This can be achieved through the procurement of dispatchable demand response from aggregators or customers. Toronto Hydro is agnostic to the technology (type of DER) or approach (load curtailment) utilized by aggregators or customers to deliver this demand response capacity. Participants are compensated based on measured and verified performance, utilizing the methodology outlined in IESO's Market Manual 12 – Issue 16.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-248

Reference: Exhibit 2B / Section E7.2.1 / p. 1

Preamble:

Toronto Hydro states: "NWSs are viewed as additive to conventional utility expansion strategies, enabling Toronto Hydro to expand its planning toolbox to include additional strategies for keeping up with load growth."

QUESTION:

Please provide examples of DERs or other Non-Wires Solutions presently existing on Toronto Hydro's system that enabled it to avoid more costly wires solutions to address system constraints.

i. Please quantify the cost savings for each of the examples.

RESPONSE:

The non-wires solutions considered for the 2025-2029 rate period have been outlined in detail in Exhibit 2B Section E7.2. Please refer to Toronto Hydro's responses to 1B-Staff-88 and 1B-Staff-89 for more information about the utility's non-wires strategy, investments and proposed incentives. Please also see Toronto Hydro's responses to other Staff interrogatories asking similar questions about the use of non-wires in planning: 2B-Staff-154, 2B-Staff-169, 2B-Staff-173, 2B-Staff-253, 2B-Staff-255.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-249

Reference: Exhibit 2B, Section E7.2.2.1, Page 19

Preamble:

Toronto Hydro states: "Toronto Hydro will build on its experience with BESS to move from individual pilot projects towards a standardized approach for design and deployment. The planned deployments will target areas with grid constraints to enable Renewable Energy Generation (REG) connections."

QUESTION:

Please quantify the capital and operating cost impacts of developing BESS using presently available commercial technology to address outage durations. Please express your answer in terms of average annual dollars per unit SAIDI improvement.

RESPONSE:

As outlined in Exhibit 2B Section E7.2.2, the use case for the proposed ESS deployments is to enable future renewable generation connections, not to address outage durations. As such, at this time, Toronto Hydro is unable to quantify the cost impacts of BESS to address outage duration. Toronto Hydro is currently undertaking preliminary engineering studies to assess the feasibility of utilizing BESS for the purpose of outage management and if appropriate, will evaluate the cost-effectiveness of this potential use case in the future.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-250

Reference: Exhibit 2B, Section E7.2.2, Pages 18-35

EB-2018-0165, OEB Decision and Order, Pages 114-115, 119

Preamble:

Toronto Hydro has proposed an expanded Energy Storage System as part of its Non-Wires Solutions for 2025-2029 to assist in providing distribution-level grid support. Toronto Hydro forecasts expenditures of $22.5 million over the 2025-2029 period to support the deployment of 9 projects with an aggregate capacity of 10.2 MW.

As part of the OEB's Decision in EB-2018-0165 it provided direction that it expected Toronto Hydro to respond to as part of any future application that seeks approval of Renewable Enabling Investments and Energy Storage Systems, including evidence of the benefits to power quality, reliability and capacity and an assessment of appropriate sharing of benefits for ESS projects as part of future requests for funding for provincial rate protection.

QUESTION (A):

a) Please discuss the pace of the BESS investment strategy. In particular, please provide more detail regarding the process Toronto Hydro will undertake in determining when to proceed with a BESS investment during the 2025-2029 term, including how Toronto Hydro plans to overcome the challenges faced in the recent past (siting, supply chain, integration into the existing system, low vendor interest).

RESPONSE (A):

As described in Exhibit 2B Section 7.2.2, Toronto Hydro intends to install front-of-the-meter, utility-owned and operated ESS to enable renewable DER connections. This plan is informed by a systematic analysis of feeders experiencing instability related to high-penetrations of renewable

DERs, which identified nine priority feeders to be targeted for ESS deployment. To ensure that ESS remains the appropriate solution, the analysis will be re-run to confirm the conditions of the feeder prior to project development. The methodology utilized is in compliance with the IEEE-1547-2022.

Of the challenges faced in 2020-2024, siting continues to be the most challenging. To manage this risk, Toronto Hydro is actively pursuing various pathways such as decommissioned Municipal Stations, private land opportunities, and public land opportunities in collaboration with the City of Toronto. For the remaining constraints, please refer to exhibit 2B Section 7.2.2.4 Page 28-30.

QUESTION (B):

b) Please discuss the status of the technical requirements currently in development to support the standardized process of ESS design and procurement, including what Toronto Hydro is using as the basis for the technical requirements.

RESPONSE (B):

As indicated in Exhibit 2B Section E7.2.2.4, Toronto Hydro has completed a technical specification review with respect to ESS technologies, which is continuously updated. The following list of engineering standards and codes have been used as a basis for Toronto Hydro's standardized technical specification document:

- Canadian Standards Association (CSA):
    - C22.2 No. 31 Switchgear Assemblies
    - C22.2 No. 94 Special Purpose Enclosures 2, 3, 4 and 5
    - C22/2 No. 193 High Voltage Full-load Interrupter Switches
    - CAN 3-C13 Instrument Transformers
    - C22.3 No 9 Interconnection of distributed resources and electricity supply systems
- Electrical and Electronic Manufacturers Association of Canada (EEMAC):
    - G8-3.2 Metal Clad and Station-type Switchgear
    - G10-1 Revenue Metering Equipment in Switchgear Assemblies
- Institute of Electrical and Electronic Engineers (IEEE):

- Std 48 Test Procedures and Requirements for High Voltage AC Cable Terminations
- C37.74 Standard Requirements for Subsurface, Vault, and Padmounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems up to 38 kV
- 386 Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600 V
- Std 80 Outdoor Grounding Requirements
- C37.20.2 IEEE Standard for Metal-Clad Switchgear
- C57.12.28 IEEE Standard for Pad-Mounted Equipment-Enclosure Integrity
- 519 Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
- 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems (if applicable)
- 1584 Guide for Performing Arc Flash Hazard Calculations

- ANSI/CAN/UL:
  - UL9540 Energy Storage Systems and Equipment
  - UL1741 Standard for Inverters, converters, Controllers and Interconnection
  - System Equipment for Use with Distributed Energy Resources (if applicable)
  - UL1642 Lithium Batteries
  - UL1973 Batteries for Use in Stationary Application
  - ANSI C37 series of Standards
- International Standard (IEC):
  - IEC 62933-2-1 Electrical Energy Storage (EES) Systems

QUESTION (C):

c) Please discuss how maintenance costs have been incorporated into the overall cost proposal for the ESS plan.

RESPONSE (C):

Maintenance costs for Toronto Hydro-owned ESS associated with annual inspection, testing, and cleaning are included in the Preventative and Predictive Stations Maintenance program forecast (Exhibit 4, Tab, 2, Schedule 3).

QUESTION (D):

d) Please provide more information on how the annual forecast BESS expenditures were developed, including the increase in planned expenditures in 2027 relative to other years.

RESPONSE (D):

The plan for BESS deployment focuses on deploying small-scale projects in 2025 and 2026 where potential sites have already been identified. Larger capacity systems will be deployed later on in the rate period. Toronto Hydro expects to carry the lessons learned from the smaller into the 2027 projects.

QUESTION (E):

e) Please provide more information on the how the total proposed cost of $22.5 million is broken out between that which is allocated to Toronto Hydro's rate base (i.e. six percent or $1.6 million) and that the remaining funding component through the provincial renewable enabling improvement revenue stream.

RESPONSE (E):

Please see Tables 1 and 2 for the capital expenditures and in-service additions 94/6 percent split, respectively. The in-service addition amounts are reflected in the Socialized Renewable Energy Generation Investments line item in Appendix 2-BA, Exhibit 2A, Tab 1, Schedule 2.

Table 1: Capital Expenditure 94/6 Split ($ Millions)

	2025	2026	2027	2028	2029	Total
Capital Expenditures (Rate Base at 6%)	0.2	0.2	0.5	0.2	0.2	**1.4**
Capital Expenditures (Socialized Renewable Energy Generation Investments at 94%)	3.3	3.4	7.1	3.6	3.8	**21.2**
Total	**3.6**	**3.6**	**7.5**	**3.8**	**4.0**	**22.5**

Note: Variances due to rounding may exist

Table 2: In-Service Additions 94/6 Split ($ Millions)

	2025	2026	2027	2028	2029	Total
In-Service Additions (Rate Base at 6%)	-	-	0.9	-	0.5	**1.4**
In-Service Additions (Socialized Renewable Energy Generation Investments at 94%)	-	-	13.9	-	7.3	**21.2**
Total	**-**	**-**	**14.8**	**-**	**7.8**	**22.5**

Note: Variances due to rounding may exist

QUESTION (F):

f) Please provide an assessment of the appropriate sharing of benefits for the proposed BESS projects between Toronto Hydro's customers and broader electricity customers across Ontario for those amounts requested to be recovered under the provincial renewable enabling improvement funding component.

RESPONSE (F):

Please see Exhibit 2A, Tab, 5, Schedule 1, section 2.2 (Energy Storage) for the requested assessment.

QUESTION (G)

g) Please discuss the nature of the proposed BESS investments and indicate if any are proposed to be behind-the-meter. If so, please discuss the nature of these projects and the anticipated benefits.

RESPONSE (G):

All proposed energy storage investments are front-of-meter.

QUESTION (H):

h) Please discuss the analysis Toronto Hydro has undertaken to understand the pace of battery technology evolution. As part of your response, please address how Toronto Hydro will assess the long-term viability and performance of battery technologies installed. Please also discuss the risk mitigation efforts to avoid investing in technologies that become obsolete in a short period of time.

RESPONSE (H):

Toronto Hydro has conducted an Energy Storage System (ESS) Technology Evaluation as referenced in Exhibit 2B Section E7.2, page 31 which took a technology agnostic approach to analyzing the available market options with renewable enablement as the primary use-case. The approach focused on the assessment of storage technologies (not just electrochemical storage) with relation to physical footprint, modularity, technology maturity, market availability, environmental impact, performance and financial metrics among others. The evaluation referenced supplier engagements that Toronto Hydro conducted as well as similar studies by the National Renewable Energy Laboratory and Pacific Northwest National Laboratory.

Toronto Hydro periodically updates the evaluation to assess the long-term viability of available storage technologies and ensures review of the available technologies ahead of each procurement to mitigate the risk of investing in technologies that may become obsolete before the deployment end-of-life. Toronto Hydro maintains awareness of the rapidly changing landscapes in storage technology development through industry engagements with suppliers.

QUESTION (I):

i) The ESS strategy is being prioritized to reduce the minimum load to generation ratio for specific feeder stations. Please discuss the process Toronto Hydro proposes to undertake

to assess the performance and reliability of planned BESS investments to ensure they meet or exceed performance requirements.

RESPONSE (I):

Toronto Hydro will use real-time feeder loading and generation data to perform measurement and verification to ensure the MLGR ratio is within compliance with the IEEE-1547-2022, utilizing standard IEEE methodologies.

QUESTION (J):

j) Please discuss the consideration of life cycle environmental impacts of the planned BESS investments, including the process to disposing of batteries after their useful life.

RESPONSE (J):

Toronto Hydro has conducted a storage technology evaluation of the different options and assessed the environmental impacts of each within business-specific applications. Toronto Hydro actively considers alternative storage technologies during its procurements that are more sustainable and easier to recycle whilst also balancing the performance requirements and market maturity to ensure service reliability.

QUESTION (K):

k) Please discuss how Toronto Hydro proposing to assess how potential BESS projects contribute to the resilience and security of Toronto Hydro's system.

RESPONSE (K):

The primary use case of Toronto Hydro's proposed BESS projects is renewable enablement. Enhancing Toronto Hydro's grid resilience and security through BESS is currently being evaluated through on-going engineering studies and will be pursued as a secondary use case if appropriate.

QUESTION (L):

l) Please discuss how current and future ESS projects may contribute to the Local Demand Response program, if at all.

RESPONSE (L):

The non-wires solutions considered for the 2025-2029 rate period have been outlined in detail in Exhibit 2B Section E7.2. Toronto Hydro's use of NWSs is targeted and focuses on credible capital deferral opportunities, and thus, the application of these solutions is limited to instances where such deferral opportunities can be identified and measured.

Toronto Hydro would not utilize its own front-of-the-meter ESS assets to participate in a competitive, market-based program such as LDR. The ESS assets could provide targeted peak-shaving benefits to the connected feeder, however, this would occur outside of the LDR program.

QUESTION (M):

m) Please provide a project schedule and expected completion date for the Optimal Planning Program developed in partnership with Toronto Metropolitan University.

RESPONSE (M):

The Optimal Planning Program developed in partnership with the Toronto Metropolitan University's Centre for Urban Energy (in Exhibit 2B Section E7.2, page. 20) was concluded in June 2023. This project was successful in developing a technology agnostic tool to help evaluate the net benefits associated with various ESS configurations and ownership models.

The project also developed a software tool, which is utilized by Toronto Hydro to analyze the opportunity to layer use-cases for a given ESS deployment and helps determine the ESS sizing. The tool can also aid in quantifying potential wholesale market revenues (i.e. IESO services) should the decision be made to pursue such activities in the future.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-251

Reference: Exhibit 2B, Section E7.2.2.3, Pages 21-22

Preamble:

With regards to Toronto Hydro's commentary on "Renewable Enabling BESS"

QUESTION:

Must increased REG penetration in Toronto Hydro's service area be accompanied by associated ESS developments to avoid creating system capacity deficiencies? Please discuss.

i. If yes, quantify the revenue requirement impacts of the associated ESS needed to support the anticipated REG developments over the test period.

RESPONSE:

As described in Exhibit 2B, Section E7.2.2.3, Toronto Hydro's pre-application process enables the discovery of potential distribution system issues that must be addressed to accommodate a proposed DER. High penetration of renewable energy generation sources on one feeder can lead to grid instability if not managed appropriately. This does not mean that all feeders will experience these issues. As noted in Table 14 of Exhibit 2B, Section E7.2.2.3, Toronto Hydro has identified 23 feeders that are currently of concern, and an additional 24 that could experience issues by 2029. Based on this analysis, 9 priority feeders have been selected and the expenditure plans related to the ESS requirements have been provided in Exhibit 2B, Section E7.2.2.4. The associated costs have been captured in the current filed application documents (see Table 18, Exhibit 2B, Section E7.2.2.4). The associated revenue requirement can be found in Exhibit 2A, Tab 5, Schedule 2, Appendix "OEBAppendices 2-FA-FB - EnergyStorage_20231117.XLSM"

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-252

Reference: Exhibit 2B, Section E7.4, Appendix A, page. 6

Question (A):

a) Toronto Hydro is anticipating overall area load growth for the Downsview area of 40-70% due mainly to electrification of heating and transportation. Please provide a load forecast for the Downsview area (for each station) that breaks out the heating and transportation demand. Please also confirm what percentage of the transportation demand is due to EVs and the percentage due to electrification of public transit.

RESPONSE (A):

Please note that the referenced range is not forecast; it refers to growth modelled by the Future Energy Scenarios (FES), which was used to stress-test the need for Downsview TS in accordance with the least regrets planning approach outlined in the evidence at Exhibit 2B, Section D4. For more information about the Downsview area station bus load forecast please see the response to 2B-Staff-256.

Please note that Toronto Hydro's capital plan for Downsview TS was developed using the "25 Year Forecast" as provided in Exhibit 2B, Section E7.4, App A p. 7, as per Toronto Hydro's application evidence update submitted on January 29. As discussed, the 25 Year Forecast was produced by adding 70% of the demand forecast produced by a preliminary study from DPM Energy to Toronto Hydro's 10-year System Peak Demand Forecast. Please note additionally that Toronto Hydro's System Peak Demand Forecast does not model heat loads due to the decarbonization of heat. Finally, the DPM Energy study does not provide an estimate for heating demand separate from overall building demand. For these reasons, Toronto Hydro is not able to provide a forecast for the heating demand for the Downsview area.

The EV demand for each station is provided in Table 1. Regarding public transit, Toronto Hydro has also included the Finch West LRT in its load forecast (not shown in Table 1), contributing an additional 5.3 MVA to Bathurst TS.

Table 1 : EV Load by Station Forecasted for the Downsview Area (MVA)

Station	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Bathurst TS	0.0	0.0	0.0	0.1	0.1	0.3	1.5	2.8	4.1	5.5	6.8	8.2	9.6
Fairbank TS	0.2	0.4	0.8	1.2	1.8	2.7	4.2	5.7	7.2	9.0	10.8	12.9	15.1
Fairchild TS	0.2	0.3	0.6	0.9	1.6	2.6	3.6	4.6	5.7	7.0	8.4	10.4	12.4
Finch TS	0.4	1.1	2.1	3.2	4.7	6.6	9.2	12.0	14.6	17.7	21.1	24.6	28.6

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-253

Reference: Exhibit 2B / Section E7.4 / App A / pp. 18, 19

QUESTION (A):

a) Please confirm that the cost of option 6 - New TS incudes the cost of load transfers that will need to be implemented to manage local station capacity at 90% until Downsview TS comes into service. i. If not confirmed, please provide the total cost of Downsview TS that takes necessary load transfers into account.

RESPONSE (A):

The cost of option 6 – New TS does not include the cost of load transfers. Please refer to Toronto Hydro's response to interrogatory 2B-SEC-59.

QUESTION (B):

b) Please update Table 4-Summary of Options to include the total costs of each of the options. If this is not feasible, please explain why not.

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-59.

QUESTION (C):

c) Did Toronto Hydro consider the use of non-wires options in the area including flexibility options and energy storage solutions to defer the need for a new TS?

i. If yes, please provide the benefit cost analysis.

ii. If not, why not.

RESPONSE (C):

Toronto Hydro has considered the use for non-wires options in the Downsview Area. However as discussed in 2B-E7.4 App A pp. 11, non-wires options are not capable of addressing the magnitude of load growth forecasted for the Downsview Area. Ultimately, new station capacity is required to supply the loads and electrical energy needs of the Area, especially upon considering that flexibility options and energy storage solutions do not provide net electrical energy.

Instead, Toronto Hydro has chosen to combine the complementary strengths of wires and non-wires options to meet the needs of the Downsview Area. Toronto Hydro is proposing to construct Downsview TS to meet the long term needs of the Area, but is forecasting the station to be complete in approximately 10 years: Q4 2033. Until Downsview TS is ready, Toronto Hydro is proposing to manage station loading through its Load Demand (wires) and Non-Wires Solutions (non-wires) Programs. In particular, Toronto Hydro's Non-Wires Solutions Program is proposing to target the Finch TS service area with Flexibility Services (previously "Local Demand Response"). Please see 2B-E7.2.1.3 for more details.

Regarding the request for a benefit cost analysis, please refer to Toronto Hydro's response to interrogatory 2B-SEC-59.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-254

References: Exhibit 2B, Section E7.4, App B, p. 6

QUESTION (A):

a) Toronto writes that it is anticipating Scarborough area load will grow by 75-105 % due mainly to electrification of heating and transportation. Please provide a 20-year demand and energy forecast for the area that breaks out heating, EV charging, and public transit for each station.

RESPONSE (A):

This project is no longer in scope in this proceeding, as Toronto Hydro retracted the request related to Scarborough TS (Exhibit 2B, Section E7.4 at Appendix B) through the evidence update which was submitted on January 29, 2024.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-255

REFERENCES: Exhibit 2B, Section E7.4, App B, Pages 18,19

QUESTION (A):

a) Please confirm that the cost of option 5 - New DESN incudes the cost of load transfers that will need to be implemented to manage local station capacity at 90% until the new DESN comes into service. If not confirmed, please provide the total cost accounting for load transfers.

QUESTION (B):

b) Please update Table 7-Summary of Options Outcomes to include the total cost of each option.

QUESTION (C):

c) What non-wires options were considered in this area to defer the need for the new DESN? ii. Please provide the benefit cost analysis.

RESPONSE (A), (B), AND (C):

This project is no longer in scope in this proceeding, as Toronto Hydro retracted the request related to Scarborough TS,[1] through the evidence update which was submitted on January 29, 2024.

[1] Exhibit 2B, Section E7.4, Appendix B

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-256

Reference: **Exhibit 2B, Section E7.4.1, Page 1**

Preamble:

Toronto Hydro states: "A demand study of the Downsview area has forecasted a load demand of 195 MW by 2035."

QUESTION (A):

a) Assuming the Downsview TS is not constructed, please provide the summer and winter planning capacity and forecast peak summer and winter demand for each year from 2030 - 2035 for Bathurst TS, Finch TS, Fairchild TS and Fairbank TS.

RESPONSE (A):

Tables 1 and 2 below respectively show the summer and winter peak forecasts for the Downsview Area, assuming Downsview TS is not constructed, over 2030-2035. Please note that building heating loads are not included in the forecasts shown in Tables 1 and 2, as noted in the evidence in Exhibit 2B, Section D4 and in the response to 2B-Staff-153.

Table 1: 2030-2035 Summer Forecast for the Downsview Area without Downsview TS

Station	Summer LTR (MW)	2030	2031	2032	2033	2034	2035
Bathurst TS	361	76%	77%	78%	80%	81%	83%
Fairbank TS	182	92%	96%	98%	99%	101%	102%
Fairchild TS	346	70%	71%	71%	71%	71%	71%
Finch TS	366	96%	99%	100%	101%	101%	102%
Area Non-Coincident %	**1255**	**83%**	**85%**	**85%**	**86%**	**87%**	**88%**

Table 2: 2030-2035 Winter Forecast for the Downsview Area without Downsview TS

Station	Winter LTR (MW)	2030	2031	2032	2033	2034	2035
Bathurst TS	389	66%	66%	68%	69%	70%	72%
Fairbank TS	202	72%	74%	76%	77%	78%	80%
Fairchild TS	389	59%	59%	59%	59%	59%	59%
Finch TS	394	80%	82%	82%	83%	84%	84%
Area Non-Coincident %	**1374**	**69%**	**70%**	**71%**	**71%**	**72%**	**73%**

QUESTION (B) :

b) When is Downsview area forecast to become winter peaking?

RESPONSE (B):

Toronto Hydro's 10-Year System Peak Demand Forecast does not forecast the Downsview areas to become winter peaking within the 10-Year Period. In a scenario where building heating loads are modelled, such as those being explored through long-term regional planning, the Downsview areas could become winter peaking by 2040.

QUESTION (C) :

c) What is the annual duration of the period in which demand is forecast to exceed the available Bathurst TS, Finch TS, Fairchild TS and Fairbank TS planning capacity in each year from 2030 to 2035?

RESPONSE (C):

The System Peak Demand Forecast, which is the basis for the capacity planning process both at the distribution level and for Regional Planning at the needs assessment stage, does not include a demand duration station forecast.

QUESTION (D) :

d) Please explain how the summer and winter planning capacity is determined for each of the above substations.

RESPONSE (D):

As stated in Hydro One's 2022 Needs Assessment Report at page 12: "Normal planning supply capacity for transformer stations is determined by the Hydro One summer 10-Day Limited Time Rating (LTR) of a single transformer at that station". Toronto Hydro uses the same capacity, the summer LTR, as the summer capacity for the transformer stations supplying its service territory. Similarly, Toronto Hydro uses the Hydro One winter LTR as the winter capacity for the transformer stations supplying its service territory.

QUESTION (E) :

e) Assuming all equipment is in service what is the operational capacity at each of these substations in each year from 2030 to 2035?

RESPONSE (E):

Please see the response to d) above. Consistent with Hydro One definitions, Toronto Hydro defines transformer station capacity as the LTR of a single transformer; or equivalently for a DESN where two transformers supply load in parallel, the LTR capacity under the loss of one transformer (N-1). Toronto Hydro's capacity planning process, consistent with the Regional Planning process, does not give consideration to capacity when all equipment is in service.

QUESTION (F)

f) What is the probability of a contingency exceeding the operational capacity at each of these substations in each year from 2030 to 2035?

RESPONSE (F):

Please see the response to part (c) above. Toronto Hydro has forecasted when peak demand is forecasted to exceed Summer LTR, as shown in Table 1.

QUESTION (G) :

g) Please provide any risk analysis that Toronto Hydro has undertaken to determine the risk of not being prepared to serve all loads in the Downsview Area post 2030.

RESPONSE (G):

Please see the Downsview TS Business Case in Exhibit 2B, Section E7.4 at Appendix A (updated January 29, 2024) for the risk analysis. Toronto Hydro has taken the Downsview Area Secondary Plan into consideration by producing the 25 Year Forecast (Table 2), and has considered the possible impacts of electrification by leveraging the Future Energy Scenarios (FES). These tools were used to assess when capacity constraints would (per the 25 Year Forecast) or could (per the FES) be encountered. Following that, Toronto Hydro assessed 6 options, described pages 9-19, to determine if and how it would be able to manage the risk of capacity constraints. Through this analysis, Toronto Hydro concluded that it would only be able to manage all loads in the Downsview Area in the long term by investing in its proposed Downsview TS.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-257

Reference: Exhibit 2B, Section E8.1, Pages 1, 4, 6

Preamble:

Toronto Hydro notes the following regarding EDC 1, "for example, EDC 1 will continue to require at least two to three shutdowns per year to allow for the execution of necessary and essential facilities operations and maintenance activities aiming to safeguard the integrity of the location."

QUESTION (A):

a) Please clarify the sentence above, what kinds of operations and maintenance activities need to be undertaken at EDC 1 owing to its particular site condition.

RESPONSE (A):

A number of construction and planned maintenance activities are required at the facility housing EDC 1, which necessitate power shutdowns. Examples of these activities include tying in the electric feed for new or replaced equipment (like electric vehicle chargers or electric-powered roof top units replacing a gas unit), and planned shutdowns for routine building maintenance. The shutdowns triggered by these activities affect the synchronising switchboard, which eliminates the backup generator redundancy and thus increases the risk of sudden failure of EDC 1 for the duration of the shutdown.

QUESTION (B):

b) Would these same activities and mitigations not need to be undertaken at EDC 2 or the newly proposed site?

   i. If yes, how does Toronto Hydro propose to manage these issues and what are the related costs?

RESPONSE (B):

No, the building power shutdowns due to operations and maintenance uniquely affect EDC 1 only because the facility housing EDC 1 has a shared generator that supports both the main building and the EDC. Any similar activities do not affect EDC 2 nor would they affect the proposed site. EDC 2 is currently aligned with Tier II requirements of the Uptime Institute's Tier Classification System and the proposed EDC will align with Tier III requirements, meaning both locations will feature independent generator backup dedicated to the data centre alone. This independence would fortify the redundancy of EDC 2 and the proposed EDC, eliminating the current risks and costs associated with EDC 1 being impacted by shutdowns in its current location.

QUESTION (C):

c) Please provide a table that shows EDC1, EDC2 and the new site's square footage and how each of the sites compare in capital cost/square footage.

RESPONSE (C):

Toronto Hydro is unable to provide the capital costs for EDC 1 and EDC 2 because the utility no longer has any records dating back to their construction. The proposed EDC's cost has been shown in the currency of the year of project completion.

Table 1: Proposed EDC Cost

Location	Square feet	Capital Cost ($ million)	$/sq. f.t
EDC 1	3,530	Unavailable	
EDC 2	8,700	Unavailable	
Proposed EDC	11,500	72.0	6,260

QUESTION (D):

d) Is the proposed cost of $72M for a new EDC site an all-in cost? In other words, does this cost include facilities and IT infrastructure and security?

i. If not, please provide the all in cost for the new EDC.

RESPONSE (D):

Yes, the proposed cost of $72 million is the all-in cost including inflation.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-258

Reference: Exhibit 2B, Section E8.1, Page 7

Preamble:

Toronto Hydro notes that the assets at EDC 1 will be retired.

QUESTION (A):

a) Could the existing assets at EDC 1 be used to reduce the costs of assets needed at the new proposed location?
    i. If yes, what are the related cost savings and are they included in the proposed costs of the new EDC?
    ii. If no, why not?

RESPONSE (A):

Toronto Hydro does not expect that it can use existing assets at EDC 1 to reduce the costs of assets needed at the new proposed location for the following reasons:

1. While construction is ongoing at the proposed new EDC location, EDC 1 must remain in operation to maintain redundancy with EDC 2.
2. The assets constituting EDC 1 are at or beyond useful life and their reuse would not yield any material savings or benefits over their replacement.
3. Reusing the assets constituting EDC 1 at the proposed new EDC location would require investments in additional electrical equipment, which would materially add to project costs.

QUESTION (B):

b) How do the EDC 1 assets compare in age and useful life to assets at EDC 2? Please provide this information in a table and aggregate by asset type, as necessary.

RESPONSE (B):

Table 1: Useful Life Comparison- EDC 1 and EDC 2 Assets

Asset	EDC 1		EDC 2	
	Useful Life, Years	Years Remaining	Useful Life, Years	Years Remaining
Computer Room Air Conditioning Units	15	12	15	5
Fire Protection	20	-9	25	14
Controller	15	1	30	2
Fire Alarm Panel	15	9	15	4
Generator	25	11	25	15
Windows	45	11	N/A	N/A

Note: A negative number in years remaining indicates the number of years the asset has exceeded its useful life.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-259

References: Exhibit 2B, Section E8.1, Page 8

Exhibit 2B, Section E8.1, Page 11

Preamble:

Toronto Hydro notes the Tier Classification System of the Uptime Institute.

QUESTION (A):

a) Is Toronto Hydro required to abide by certain Tier Classification requirements?
   i. If yes, what are these requirements?
   ii. What standard, legislation and/or guidance governs the operations of Toronto Hydro's EDCs?

RESPONSE (A):

Although there is no governing body that mandates Toronto Hydro's compliance with the Uptime Institute's Tier Classification System, the utility recognizes significant value in designing and planning its EDC components in accordance with a body of internationally recognized data centre standards.

Toronto Hydro follows key design and operation standards with respect to its EDCs, including:

- **TIA-942**: Telecommunications Industry Association's standardizing the design and implementation of data centre infrastructure, and operations with guidelines on reliability, scalability, efficiency of cabling, network architecture, power distribution, cooling system and security measures.
- **Uptime Institute's Tier Standards**: These standards affect both design and operations through their guidelines specifying tier classification, redundancy, cooling efficiency, and

operational best practices to minimize downtime and ensure consistent availability of critical IT services.

- **ISO/IEC 27001**: This international standard specifies the requirements for establishing, implementing, maintaining, and continually improving an information security management system ("ISMS") within the context of the organization's overall business risks. Implementing this standard provides the EDC with robust security controls, risk management processes, and continual monitoring and improvement measures, enhancing the security posture of the EDC and protecting sensitive information from threats and vulnerabilities.
- **ANSI/BICSI 002**: This standard provides guidelines for data center design and implementation, covering aspects such as cabling, pathways, spaces, and grounding. The structured and standardized approach to infrastructure design leads to improved performance, scalability, and manageability of the EDC.
- **ASHRAE Guidelines**: The American Society of Heating, Refrigerating and Air-Conditioning Engineers provides guidelines for data center environmental conditions, including temperature, humidity, and airflow management. These conditions are crucial for maintaining optimal operating conditions and equipment reliability, ensuring energy efficiency equipment longevity and overall reliability of the EDC facility.

QUESTION (B):

b) What is the Tier Classification for EDC 2, and how does that compare to the classification proposed for the proposed EDC?
   i. If they will be different, will EDC2 need to be upgraded to a new classification?
   ii. If yes, when would this upgrade need to take place and at what cost?

RESPONSE (B):

EDC 2 is a Tier II classification and the proposed EDC will be aligned to a Tier III classification. The primary difference between Tier II and III is how the EDC and the electrical distribution interact with the backup generator. Both tiers feature two backup generators, but under the Tier II

classification both generators are tied into a single distribution path, meaning a failure at that distribution path, such as a failure of the synchronization switchboard, input switchboard, or emergency switchboard would result in system failure. Under Tier III, each generator has its own distribution path to the EDC, providing greater redundancy between the two backup generators and better resiliency for the EDC.

Toronto Hydro currently does not estimate any material benefits to upgrading EDC 2 to a new classification, as the assets that constitute EDC 2 are relatively newer and remain within their useful lives.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-260

References: Exhibit 2B, Section E8.1, Page 18

Preamble:

With respect to EDC redundance and replacing EDC 1, Toronto Hydro states that, "A complete EDC failure would result in all of Toronto Hydro's business applications becoming unresponsive and non-functional. In the event of a distribution system outage, this would have cascading and substantial financial and economic impacts on customers within the City of Toronto."

QUESTION:

a) Please confirm that this comment refers to failure of both EDC sites and not just EDC 1, given that there are two locations to provide back up capability in the event of one site failing?

RESPONSE:

Confirmed. However, 1:1 redundancy will be lost in approximately 5 years time as described in 2B, E8.1, pg 16-17

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-261

Reference: Exhibit 2B, Section E8.1, Page 21

Preamble:

Toronto Hydro is requiring $72 million over the 2025-2029 rate period to relocate the existing EDC 1 to the new site and be operational by 2029.

QUESTION:

a) Please provide a table showcasing the progressive spending for the EDC relocation over the next 5 years

RESPONSE:

The following table outlines the estimated annual spend of the total EDC project.

Table 1: Estimated Annual Spend of the Total EDC Project

EDC: Forecast					
Year	**2025**	**2026**	**2027**	**2028**	**2029**
Forecasted Spend	$5.4M	$16.5M	$22.5M	$20.6M	$7.0M

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-262

Reference: Exhibit 2B, Section E8.1, Page 28

QUESTION:

a) Please provide the benefit-cost analysis that justified Toronto Hydro's selected option for the new EDC.

RESPONSE:

Please refer to section E8.1.4 "Options Analysis/Business Case Evaluation" of Exhibit 2B, Section E8.1.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-263

References: Exhibit 2B, Section E8.1, Pages 23-24
Exhibit 2B, Section D8
Accounting Order (003-2023) for the Establishment of a Deferral Account to Record Incremental Cloud Computing Arrangement Implementation Costs[1]

Preamble:

On November 2, 2023, the OEB released a letter regarding a new Accounting Order to establish a deferral account to record cloud computing implementation costs. Amongst other things, the establishment of the generic deferral account allows utilities to perform optimized planning by allowing cloud computing implementation costs to be recovered outside of a rate rebasing year and potentially reduces rate impacts through a disposition period.

QUESTION (A):

a) Please provide the forecasted capital and OM&A spend on cloud computing solutions for the 2025-2029 period at the project level.

RESPONSE (A):

All currently forecasted spend on cloud computing solutions for the 2025-2029 rate period fall under OM&A. Toronto Hydro notes that while cloud computing is typically treated as an OM&A expense, the accounting treatment is unique to each contract and may also result in the costs being treated as capital. Please also refer to Toronto Hydro's response to interrogatory 2A-PP-24, subpart (c).

Table 1 below outlines the forecasted 2025- 2029 OM&A spend on cloud computing solutions, all included In the Information Technology OM&A program budget:[2]

Table 1: 2025-2029 IT forecasted OM&A spend on cloud computing solutions:

	$ Millions				
	2025 Forecast	**2026 Forecast**	**2027 Forecast**	**2028 Forecast**	**2029 Forecast**
Cloud Implementation	5	5.5	6	6.5	7
Cloud Subscription Fees	4.4	5.2	5.7	6.3	7
Total	**9.4**	**10.7**	**11.7**	**12.8**	**14**

Toronto Hydro is currently unable to break down this information at the project level because the development of specific cloud-based solutions for 2025–2029 rate period is still ongoing as part of the utility's IT investment planning process.[3] As part of that process, Toronto Hydro must assess and evaluate whether or not on-premise cloud technology is suitable to fulfill its business needs. The utility's above forecast is based on 2020-2024 expenditures on cloud-based solutions at an aggregate level.

QUESTION (B):

b) Please discuss whether Toronto Hydro has assessed the impact of having a generic account available for cloud computing implementation costs in their 2025-2029 plan. If not, why not.

   i. Please discuss any barriers to implementing cloud-based solutions as a result of the analysis.

RESPONSE (B):

[2] Exhibit 4, Tab 2, Schedule 17.
[3] The process is outlined in Exhibit 2B, Section D8, subsection D8.5 at p. 7-10.

Given that the proposed five-year OM&A funding through the Revenue Growth Factor[4] includes a forecast for incremental cloud implementation and subscription costs,[5] Toronto Hydro decided not to pursue a deferral account for 2025-2029 in this regard.

In the unfortunate event that parties oppose the custom funding request for OM&A and the OEB is inclined to entertain such a request, Toronto Hydro would seek alternative relief for a generic account to capture variances for cloud-related costs (implementation and subscription costs) to ensure that the utility is able to fund these prudent and necessary expenditures and reduce the financial barriers to adopting cloud-based solutions.

QUESTION (C):

c) In light of the new deferral account is Toronto Hydro reassessing its position on cloud computing as an alternative to the EDC project?

RESPONSE (C):

No, Toronto Hydro is not reassessing its position on cloud computing as an alternative to the EDC relocation project, as the new deferral account does not mitigate the reliability and operational risks that a cloud-based solution would introduce relative to an on-premises solution. As discussed in Toronto Hydro's options analysis for the EDC relocation project,[6] the introduction of a cloud-based solution would make the utility dependent upon its vendor(s) to manage the reliability and business continuity of the EDC, which is beyond Toronto Hydro's risk tolerance given the critical functions performed by the EDC. Operational Technology (OT) systems such as Supervisory Control and Data Acquisition ("SCADA") and the Network Management System ("NMS") are critical systems that ensure reliability of Toronto Hydro's daily operations. By having these systems on Toronto Hydro's premises as opposed to on the cloud, Toronto Hydro has full control and flexibility to manage the reliability of its critical operations as outlined in Exhibit 2B, Section E 8.1.4.3.2 pg 25-

[4] Exhibit 1B, Tab 2, Schedule 1.
[5] Exhibit 4, Tab 2, Schedule 17.
[6] Exhibit 2B, Section E8.1, subsection 8.1.4.3 at pages 25-26.

26. In addition, the introduction of a cloud-based solution to EDC 1 or the proposed EDC would render existing systems in EDC 2 incompatible with the new cloud-based components, triggering the need for further investments.

QUESTION (D):

d) In light of the new deferral account and the expanding number of cloud computing offerings, would Toronto Hydro consider reducing the size of the new EDC by implementing more cloud computing solutions? Please explain and include financial impacts to the new EDC project, as well as potential future savings for the existing EDC.

RESPONSE (D):

For the reasons discussed in the response to subpart (c) and the options analysis in Exhibit 2B, Section E8.1, Toronto Hydro does not consider full or partial implementation of cloud computing solutions to be a feasible alternative.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-264

Reference: Exhibit 2B, Section E8.2, Pages 8, 9, 11, 14, 17

Preamble:

With respect to Toronto Hydro's proposed Facilities Management and Security Investments and Figures 3, 4, 5, 8 and 16, and fire alarm systems.

QUESTION (A):

a) Please confirm whether the pictures included in the figures references above that depict architectural, structural and mechanical and plumbing deterioration are in fact outliers and not representative of the majority of facilities managed by Toronto Hydro?

RESPONSE (A):

The pictures used throughout Exhibit 2B, Section E8.2 are representative of the majority of stations facilities managed by Toronto Hydro and are not outliers.

QUESTION (B):

b) Please explain in detail how Toronto Hydro has been managing these facilities prudently given the state of the deterioration at some of these facilities as depicted in the figures.

RESPONSE (B):

As discussed in detail in Toronto Hydro's Facilities Asset Management Strategy,[1] the utility employs a comprehensive asset management approach that monitors and records the condition of facilities assets on an ongoing basis and at varying intervals as appropriate, in accordance with applicable legislative and technical standards. This approach provides Toronto Hydro central visibility into

[1] Exhibit 2B, Section D6.

conditions of its building assets at all times and supports the utility's decision-making by pinpointing the most critical needs by building system via a ranked, quantified evaluation of assets.

However, Toronto Hydro is also bound by fiscal prudence and the regulatory framework to prioritize its facilities investments in a manner that delivers that optimum value to ratepayers. As the OEB itself noted, "*it is particularly important that planning be optimized in terms of the trade-offs between capital and operating expenditures, and that investments be prioritized and paced in a way that results in predictable and reasonable rates.*"[2] Given the vintage of the majority of Toronto Hydro's facilities,[3] the deterioration of a portion of facilities assets is unavoidable; the real challenge is to optimize costs and prioritize asset replacements in a prudent manner, which the utility accomplishes through the application of its Facilities Asset Management Strategy.

[2] OEB Handbook for Utility Applications (October 13, 2016), p. 13.
[3] Exhibit 2B, Section D6, p. 7, lines 11-13 and Section E8.3, p. 25, lines 9-12.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-265

Reference: Exhibit 2B, Section E8.2, Page 2, 26

Preamble:

In describing general plant investments related to work centres, Toronto Hydro states it plans to invest to decarbonize in line with its Net Zero 2040 Strategy.

QUESTION (A):

a) What are the annual capital expenditures in Facilities Management and Services related to Toronto Hydro's Net Zero 2040 Strategy?

RESPONSE (A):

Approximately $31.8 million of the Facilities Management and Services capital budget will be directed to work centre GHG emissions reduction initiatives by replacing end of life natural gas fired assets in accordance with Toronto Hydro's Facilities Asset Management Strategy.[1] Please refer to the below table for an estimated annual breakdown.

Table 1: Estimated Annual Breakdown

Program/Segment ($M)	2025	2026	2027	2028	2029	2025-29
Facilities Decarbonization Strategy	6.1	6.3	6.4	6.4	6.6	**31.8**

[1] Exhibit 2B, Section D6.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-266

References: Exhibit 2B, Section E8.3, Pages 3-4

EB-2018-0165, Decision and Order, December 19, 2019, Page 104

Preamble:

In reference 2 the OEB directed Toronto Hydro "to provide more detailed cost benefit analysis between EV, hybrid and combustion engines for its fleet program for future rebasing applications. In addition, the OEB directs Toronto Hydro to develop utilization measures beyond fleet use in standard hours." In response to the cost benefit analysis, Toronto Hydro's evidence stated that various phasing and cost options were analyzed for electrifying its fleet and the results of this analysis informed Toronto Hydro's procurement strategy for EVs and hybrid vehicles.

Question (A):

a) Please provide a copy of the analysis done to assess the costs and benefits between EVs, hybrids and combustion engine vehicles and the results of this analysis.

RESPONSE (A):

Toronto Hydro continues to work on obtaining disclosure consent from the third parties that authored the report on EV Phase-In. Once consent is obtained, Toronto Hydro will update this interrogatory response. Following the commissioning of this third-party report, Toronto Hydro further calibrated its business plan in support of the Fleet and Equipment Services capital program for 2025-2029, in view of material developments since the analysis was undertaken, such as the COVID-19 pandemic, EV pricing and availability, global supply chain challenges, and the Net Zero by 2040 mandate.

QUESTION (B):

b) Please explain Toronto Hydro's proposal for developing utilization measures beyond fleet use in standard hours.

RESPONSE (B):

For a discussion of the current metric, please refer to Exhibit 2B, Section E8.3, subsection 8.3.3.4 "Business Operations Efficiency" at pages 9-11. The previous utilization measure known as "standard utilization percentage" only considered vehicle usage during the standard field operations working hours of 7:30 am- 3:30 pm, which excluded vehicle utilization for units that operated outside of these hours such as shift workers, early starts, alternate shift schedules, overtime, etc. and as such, was not a true reflection of vehicle utilization. The old method of calculation was based on the number of hours the vehicle is utilized outside of its home zone between the hours of 7:30 am- 3:30 pm, divided by 8. By contrast, the current "days used" metric that Toronto Hydro adopted in the 2020-2024 rate period removes the limitations of a specific shift schedule and looks at daily usage throughout the month.

Toronto Hydro-Electric System Limited
EB-2023-0195
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Appendix A
FILED: March 11, 2024
(110 Pages)

FINAL REPORT October 2021

Electric Vehicle Phase-in Plan

PREPARED FOR TORONTO HYDRO-ELECTRIC SYSTEM LTD.

AUTHORS: ROGER SMITH, MATTHEW PITTANA, JANA CERVINKA. CHIEF DATA ANALYST: HUGH ROBERTS

RICHMOND
Sustainability Initiatives

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Terms and Abbreviations

BAU – Business-as-usual
BEV – Battery-electric vehicle
BET – Battery-electric truck
CAC – Criteria air contaminants; a cause of ground level smog
CAFE – Corporate average fuel economy
Capex – Capital expense
CO_2 or CO_2e – Carbon dioxide or carbon dioxide equivalent
Downtime – Period when a vehicle is unavailable for use during prime business hours
EV – Electric vehicle
EVSE – Electric vehicle supply equipment
FAR™ – Fleet Analytics Review™ (Fleet Challenge Excel software tool)
GHG – Greenhouse gas (expressed in CO_2 equivalent tonnes)
HD or HDV – Heavy-duty vehicle (Classes 7-8)
HEV – Hybrid-electric vehicle
ICE – Internal combustion engine
KPI – Key performance indicator
LCA – Lifecycle analysis
LD or LDV – Light-duty vehicle
LMHD – Light-, medium-, and heavy-duty vehicle
LTCP – Long-term capital planning
MD or MDV – Medium-duty vehicle (Classes 3-6)
MHD or MHDV – Medium- and heavy-duty vehicle (Classes 3-8)
MHEV – Mild hybrid-electric vehicle
MT – Metric tonne
OEM – Original equipment manufacturer
Opex – Operating expense
PHEV – Plug-in hybrid electric vehicle
PM – Preventative maintenance
ROI – Return-on-investment
Solution – A technology, best management practice, or strategy to reduce fuel use and GHGs
TCO – Total cost of ownership
WACC – Weighted average cost of capital
ZEV – Zero-emission vehicle

Disclaimer

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Foreword

This Electric Vehicle Phase-in Plan (also referred to as the Plan), has been prepared for Toronto Hydro-Electric System Limited (herein referred to as Toronto Hydro or the utility) by Richmond Sustainability Initiatives (RSI) of Toronto, Ontario and its project team Fleet Challenge (FC), collectively referred to as RSI-FC. We have included this foreword because we feel it is important for readers of this report to first have a full understanding of the situation and context.

The Plan is based on our team's detailed data analysis of one-year of historical data for **385 Toronto Hydro fleet vehicles** as submitted by the utility.

The RSI-FC team has made considerable effort to make the Electric Vehicle Phase-in Plan as meaningful and relevant as possible to Toronto Hydro. Our team analyzed and evaluated baseline fleet results and modelled an electric vehicle transition that makes economic sense and is reasonably attainable in the medium- to long-term. Results of scenario analysis are presented for the utility's consideration.

Our analysis for battery-electric vehicle (BEV) phase-in has been completed using a specialized software tool that was developed by RSI-FC, which is referred to as the Fleet Analytics Review™ (FAR). FAR has been designed to efficiently estimate the cost-benefit and GHG emissions-reduction potential of many best management practices and fuel-reduction solutions that have been proven to be beneficial to commercial and municipal fleets, including BEVs.

The Electric Vehicle Phase-in Plan provides a viable roadmap for consideration by Toronto Hydro's management, which can be implemented from 2022 through to 2037. Due to the limited availability of BEVs in the short-term, we have modelled BEV phase-in over a 15-year budget period following the year 2022 (i.e., from 2023-2037).

In addition to our electric vehicle phase-in analysis, we conducted a unit-by-unit analysis to determine electric vehicle supply equipment (EVSE), or charging infrastructure, requirements for Toronto Hydro's fleet, using an EVSE costing software tool.

We have made every effort to ensure that the business assumptions and estimates employed in our analysis are as accurate as possible – based on our years of experience working with commercial and municipal fleets, market research, and valuable input from Toronto Hydro Fleet Management.

Fossil fuel-use reduction translates directly to greenhouse gas reduction[1] (hereafter referred to as GHG reduction, carbon reduction, or CO_2 reduction); therefore, all references to fuel savings include the consequential GHG impacts (i.e., increase or decrease).

[1] The terms greenhouse gas, GHG, carbon, CO_2e, and CO_2 are synonymous for the purposes of this report.

Cautious Approach

Long-term capital planning (LTCP) for electric vehicles is dependent on the *speed and degree* of implementation. There are various uncertainties with electric vehicles that would modify capital expenses (Capex), operating expenses (Opex), and GHG reductions, including:

- Future BEV acquisition costs;
- Unexpected charging infrastructure costs (such as inadequate electrical capacity in facilities); and
- The timing of transitioning specific segments of the fleet based on market conditions (i.e., availability and supply).

For these reasons, our team, with input from Toronto Hydro Fleet Management, took a cautious approach with BEV acquisition costs by adding premiums ranging from 48% to 100% (lower ratios for light-duty units and higher ratio for medium- and heavy-duty units) for BEVs over internal combustion engine (ICE) counterparts. There is a strong likelihood that the acquisition cost of BEVs will decline with time as both supply increases and as battery technology continues to improve, and we have modelled this for the utility's consideration.

Challenges to Electric Vehicle Transition

The reality is that electric vehicle transition will require a degree of extra effort and cost to implement, as well as new operational challenges that must be resolved. The successful planning and execution of installing the correct charging infrastructure, including Level 2 electric vehicle charging stations and/or Level 3 direct current (DC) fast-charging stations, is of paramount importance for the smooth phase-in of electric vehicles into Toronto Hydro's fleet. Moreover, electric vehicles offer a different experience for operators in terms of both driving and re-fuelling (charging); therefore, change management is a critical piece of successful electric vehicle transition.

GHG Emissions Calculation Methods

Internationally, there are two standard reporting methods for vehicle GHG emissions modelling: (1) tailpipe combustion, and (2) fuel lifecycle (sometimes referred to as fuel cycle or well-to-wheel). Modelling of fuel lifecycle GHG emissions of motor fuels is used to assess the overall GHG impacts of the fuel, including each stage of its production and use, in addition to the fuel actually used to power a vehicle. Modelling of tailpipe emissions includes only the emissions produced by the vehicle itself through combustion. Lifecycle GHG emissions are, therefore, greater than tailpipe emissions.

While lifecycle emissions have been established for most fuel types, lifecycle emissions are often difficult to quantify for electric vehicles because of the different mixes of electricity sources in different jurisdictions and at different times of day (i.e., fossil-fuel based, nuclear, and renewables). Given that most electricity in the City of Toronto comes from nuclear power, as well as for simplicity of our

analysis, we employed the tailpipe combustion method. Using this method, BEVs emit zero emissions. Although not providing a complete well-to-wheel picture of GHG emissions, the results of our modelling employing the tailpipe combustion method gives a clear indication as to the degree of GHG reduction potential through transitioning the fleet to BEVs.

Executive Summary

In September 2021, Toronto Hydro engaged Richmond Sustainability Initiatives – Fleet Challenge (RSI-FC) of Toronto, Ontario, to develop an Electric Vehicle Phase-in Plan for its fleet assets.

Through the development and implementation of an Electric Vehicle Phase-in Plan, RSI-FC aims to assist Toronto Hydro in realizing:

- A long-term capital budget plan for phasing in battery-electric vehicles (BEVs) and charging infrastructure;
- A fleet asset management strategy for selecting which internal combustion engine (ICE) vehicles are the best candidates to replace with BEVs based on a data-driven assessment and return-on-investment (ROI);
- Improved fuel efficiency and reduced fuel cost;
- Reduced GHG and air pollutant emissions; and
- Continued leadership in environmental sustainability.

About Richmond Sustainability Initiatives

Since 2005, RSI-FC has collaborated with fleet managers, technology providers, subject matter experts, and auto manufacturers to find viable solutions, technologies, and best management practices for reducing operating costs and vehicle emissions. From the beginning, we have remained a self-supporting and independently funded program without commercial biases or influences, providing fleet review and consulting services to dozens of leading private and public sector fleets in Canada and the United States.

About Fleet Analytics Review™

For the development of the Electric Vehicle Phase-in Plan, RSI-FC employed our innovative, leading-edge data-modelling techniques and our proprietary software, Fleet Analytics Review™ (FAR). FAR is a software tool designed and developed by our company specifically for complex fleet planning. FAR enables our team to develop short- to long-term green fleet plans and strategies by calculating GHG emissions reductions and return-on-investment (ROI) for various best practices and technologies – all driven by actual historical data. In turn, this allows us to evaluate the business case of each solution and provide meaningful recommendations for long-term capital planning (LTCP).

Vision, Goal, and Objectives

The vision for the Electric Vehicle Phase-in Plan is to assist Toronto Hydro in transitioning its fleet to battery-electric vehicles (BEVs) through a streamlined fleet asset management strategy and long-term capital budget plan. With this vision in mind, the goal is to provide an ambitious, yet feasible,

roadmap for the utility to phase-in BEVs and achieve significant GHG emissions reductions in a fiscally responsible manner. To guide Toronto Hydro in achieving this goal, we have thoroughly analyzed the utility's in-scope fleet data and we have identified various paths for electrification with varying degrees of speed and implementation.

The objectives of the Electric Vehicle Phase-in Plan were to:

(1) Present findings of RSI-FC's Electric Vehicle Survey to gauge the current view and opinions of employees on battery-electric vehicles and charging requirements;

(2) Develop a fleet and GHG emissions baseline for current fleet assets;

(3) Data-model various fleet electrification pathways over a 15-year budget cycle and estimate their impacts (Operating expenses, Capital expenses, and GHG emission reductions) relative to the baseline;

(4) Data-model electric vehicle supply equipment (EVSE) requirements on a unit-by-unit basis and estimate charger costs over a 15-year budget cycle; and

(5) Create a fleet electrification plan, both in terms of BEV phase-in and charging infrastructure, that is achievable, based on ROI and in consideration of the utility's fleet budget constraints – with a degree of ambition.

Electric Vehicle Survey Results

Based on results and comments expressed in the electric vehicle survey, it is clear that Toronto Hydro Fleet's user-group stakeholders are, overall, very supportive of the transition to electric vehicles.

Although views are mostly similar, there are some differences in opinions between the management and driver/operator cohorts regarding views of electric vehicles. Generally, drivers/operators are more doubtful/unaware of the capabilities and benefits of modern-day electric vehicles.

Regarding charging requirements, both groups are generally undecided about the adequacy of Level 2 (slow) charging for the fleet, and feel more strongly about the use of Level 3 (fast) charging. RSI-FC's analysis of Toronto Hydro's charging requirements based on Level 2 charging (see *Section 7*) addresses this very concern.

In terms of change management approaches, survey results show that driver/operators are moderately supportive of BEV test drives but are highly in favour of BEV orientation, while managers are in strong support of both options. Efforts in familiarizing employees with driving and charging

BEVs would likely close knowledge gaps, hesitancies, and resistance towards this technology, allowing for a more seamless transition over the coming years.

Baseline Analysis

The Electric Vehicle Phase-in Plan is based on our team's detailed data analysis of one-year of historical data for **385 Toronto Hydro fleet vehicles** as submitted by the utility.

Key fleet-wide results from the one-year review period (August 2020 to July 2021) are shown below:

- There were 211 gasoline-powered units, 160 diesel-powered units, 1 plug-in hybrid-electric (PHEV) units, and 13 battery-electric vehicle (BEV) units.
- All units were owned.
- The original purchase price for the fleet was $48,630,000.
- The current-day estimated replacement cost (like-for-like replacements) was $67,549,000.
- The estimated market/trade-in value was $22,359,540.
- The total cost of preventive maintenance (PM) was $481,389.
- The total cost of reactive repairs was $1,663,860.
- The estimated total cost of fuel was $757,168.
- The total cost of repairs and maintenance, fuel, capital, and downtime was $4,399,845.
- Total kilometres-travelled was 1,796,605.
- Total fuel used was 633,851 litres.
- Total tailpipe GHG emissions were 1,624 metric tonnes CO_2e.
- The average unit annual mileage was 4,667 km.
- The average fuel consumption for the entire fleet was 56.6 l/100km.
- The average unit age was 6.7 years.

Business Case Optimization & Capex Benchmarking

In 2017, a lifecycle analysis (LCA) study was undertaken by RSI-FC for each vehicle category at Toronto Hydro to determine optimized economic lifecycles. After modelling the baseline with optimized economic lifecycles, it was apparent that some vehicles deliver better return-on-investment (ROI) than others. Lower ROI would result if a vehicle, still in good condition, was replaced prematurely; value will be lost.

The approach used by RSI-FC was to defer some vehicles to ensuing capital budget years to ensure full value is received from each unit. In our data-modeling, without knowledge of the physical condition of units due for replacement based on vehicle ages, our analysts selectively and strategically made deferrals for units showing low/no ROI over the budget cycle to maximize operating expense (Opex) benefits and balance year-over-year capital expenses (Capex). As a result,

the annual capital budget over the 15-year cycle ranged from $5.3-7.9 million and averaged $6.2 million.

This step was intended to provide a benchmark for a balanced long-term capital budget if like-for-like replacements were to be made – and as a comparison for long-term capital planning for BEV phase-in.

BEV Phase-in Scenario Results

RSI-FC data-modelled several fleet electrification pathways, or scenarios, for Toronto Hydro – ranging from aggressive to conservative – and we calculated the potential impacts of each relative to the 2020-21 baseline. Details of our approaches and scenario results, as well our analysis for electric vehicle supply equipment (EVSE) requirements, are provided in *Sections 6 and 7*.

These "what-if" scenarios assessed the potential outcomes if each electrification pathway being modelled was in place for the same types of vehicles, the same number of vehicles, travelling the same number of kilometres as the baseline period.

Our modelling estimated annual capital costs as well as operating cost impacts and GHG emissions reductions relative to 2020-21 baseline. In *Table 1* (below), results are summarized and include average annual Capital expenses (Capex) over the budget cycle, average annual Operating expense (Opex) changes over the budget cycle relative to the baseline, and annual tailpipe GHG reduction by 2037 relative to the baseline. Due to the limited availability of BEVs in the short-term, we have modelled BEV phase-in over a 15-year budget period following the year 2022 (i.e., from 2023-2037).

On the positive side of the analysis, the most aggressive fleet electrification scenarios have the potential to reduce Toronto Hydro's fleet tailpipe GHG emissions by 100% by 2034 – before the end of the modelling period. The more cautious and fiscally prudent scenarios have the potential to reduce Toronto Hydro's fleet tailpipe GHG emissions by just over 70% by 2037 – with the potential to achieve even greater results should more internal combustion engine (ICE) units be replaced with BEVs towards the end of the modelling period, depending on pricing outcomes for BEVs compared to ICEs.

Firm acquisition costs for battery-electric medium- and heavy-duty trucks are unknown at this time, but initially expected to be significantly more than today's standard ICE trucks. This is reflected in our modelling based on discussion with Toronto Hydro Fleet Management. Moreover, BEV prices for all classes are expected to decrease over time and possibly reach parity with standard gas and diesel trucks; however, the timing for this is unknown. To model the possible implications of BEV price reductions over time, we applied a sliding scale to both the aggressive and fiscally prudent BEV phase-in scenarios (*Table 1*, below).

Due to the significantly higher acquisition costs *currently* anticipated for soon-to-emerge electric trucks, and owing to the fact that Toronto Hydro is, like all municipal utility fleets, a low-mileage operation, the fuel cost savings from a transition to electric vehicles will not offset the additional vehicle capital costs in many vehicle applications, resulting in a forecasted increase in operating expenses as shown in *Table 1*.

Note: The significantly higher operating expenses shown in Table 1 are due to the significantly increased cost of capital for acquiring new vehicles based on year-over-year book values of units.

Table 1: Summary of fleet-wide results of scenario analysis over the period 2022-2037 relative to the 2020-21 baseline.

FAR #	FAR Scenario Description	Implementation Timing[2]	Average Annual Vehicle Replacement Capex[3] [4]($ millions)	Average Annual Opex[5] [6] Impacts Over Baseline ($ millions)	Annual Tailpipe GHG Reduction[7] Over Baseline (tonnes CO_2e)	Annual Tailpipe GHG Reduction Percentage Over Baseline
1	Optimized lifecycles	2022 - 2037	6.7	+0.94	41	2.5%
2	Optimized lifecycles + ROI (benchmarking scenario)	2022 - 2037	6.2	+0.89	37	2.3%
3.1	BEV phase-in: aggressive and cautious pricing	2022 - 2037	*10.7	+3.23	1,623	100%
3.2	BEV phase-in: aggressive and optimistic pricing (sliding scale)	2022- 2037	*7.6	+2.29 (**est.)	1,623	100%
4.1	BEV phase-in: balanced, cautious pricing, more ICE replacements	2022-2037	8.3	+1.77	1,146	71%
4.2	BEV phase-in: balanced, optimistic pricing (sliding scale), more ICE replacements	2022-2037	7.0	+1.49 (**est.)	1,146	71%
5	BEV phase-in: balanced, cautious pricing, few ICE replacements due to greatly extended lifecycles	2022-2037	9.8	+2.31	1,503	93%

* Note that both of these scenarios involve significant Capex "spikes" in the short- to medium-term.
* Estimated based on applying a sliding scale in BEV pricing.

Electric Vehicle Supply Equipment Planning

Based on our analysis of Toronto Hydro's charging requirements, 381 out of 385 units would be capable of fully recharging during overnight off-peak hours with the use of lower-power Level 2 chargers. Therefore, our recommendation is to focus on Level 2 charging for every unit on a nightly basis, and evaluate higher-power (Level 3) charging for higher-mileage units.

[2] For data-modelling purposes, fleet-wide implementation is modelled over the period from 2022-2037 for the same types of vehicles, the same number of vehicles, travelling the same number of kilometres as the 2020-2021 baseline.
[3] Average annual Capital expenses (Capex) for the entire modelling period (2022-2037), including compounding inflation for each year at current rate of inflation.
[4] For BEV charging infrastructure, additional capital costs were estimated separately using an EVSE costing tool.
[5] Average annual Operating expenses (Opex) for the entire modelling period (2022-2037) , including compounding inflation for each year at current rate of inflation.
[6] For data-modelling purposes, Opex includes the annual cost of capital based on year-over-year book values of units.
[7] Annual GHG reduction by the end of the modelling period (2037) is relative to the 2020-2021 baseline.

Our charger costing outlook, based on a balanced BEV phase-in approach, shows that Toronto Hydro's fleet would be 100% BEV-ready by 2034 based on the current size of the fleet. Given our estimations, this translates to an average annual charger cost (excluding infrastructure) of about $74,000 per year for the next 13 years.

Preparing for a Battery-Electric Vehicle Future

Vehicle investments are long-term; units purchased today will remain in service for up to a decade or longer. ICE vehicles are quickly becoming outdated as BEVs rapidly take over. Globally, numerous jurisdictions have already legislated the end of the ICE – some as soon as 2030. On January 28, 2021, General Motors pledged to cease building gasoline and diesel cars, vans, and SUVs by 2035. Even more recently, on June 29, 2021, the Canadian government announced a mandatory target for all new light-duty cars and passenger trucks sales to be zero-emission by 2035, accelerating Canada's previous goal of 100 percent sales by 2040[8]. ICE vehicles purchased today for a fleet with a current-day value in the millions of dollars may be nearly worthless when ICEs become obsolete.

BEVs have a fraction of the moving parts of an ICE vehicle, cost far less to maintain, offer better performance, and can have a much lower total cost of ownership (TCO) for higher-mileage applications. For these reasons, if the condition of currently-owned Toronto Hydro fleet ICE vehicles will allow, we suggest prolonging their lifecycles until BEV replacements are available.

Today, only light-duty (cars, SUVs), transit buses, and refuse trucks (the latter of which are not applicable to this study) are available in BEV models. However, by the mid 2020s the types of vehicles that comprise a major portion of the Toronto Hydro fleet, including pickups and vans, will likely be available as BEVs. Therefore, the time is now to **begin preparing for the transition to BEVs** by investing in electric vehicle supply equipment (EVSE) while awaiting suitable BEVs to become readily available.

[8] Source: https://www.canada.ca/en/transport-canada/news/2021/06/building-a-green-economy-government-of-canada-to-require-100-of-car-and-passenger-truck-sales-be-zero-emission-by-2035-in-canada.html

Summary of Recommendations

In *Table 2* (below), we summarize our recommendations for Toronto Hydro's Electric Vehicle Phase-in Plan in terms of both (1) capital planning for transitioning the fleet to electric and (2) electric vehicle supply equipment (EVSE) requirements. Moreover, we have included recommendations on collaboration/partnerships and risk/change management for creating a culture of receptiveness to innovation and forward thinking.

Table 2: Summary of recommendations for Toronto Hydro's Electric Vehicle Phase-in Plan

Area/ Topic	Recommendations
Battery-Electric Vehicle Phase-In	(1) Through a lens of an aggressive BEV phase-in, allocate the majority of fleet capital spending on BEVs for appropriate vehicle categories as BEV models become available. (2) Through a lens of a balanced, selective BEV phase-in and fiscal prudence, prioritize replacement of ICE units with BEVs *that would maximize ROI* – typically ones that have relatively high annual mileage. (3) For units due for replacement that are still in good condition, conduct a temporary pause on purchasing new internal combustion engine (ICE) vehicles for the short term – 1-2 years for pickups, 2-3 years for medium- and heavy-duty vehicles (MHDVs) – while awaiting battery-electric vehicle (BEV) counterparts to become available and taking into consideration procurement timelines. Extend ICE lifecycle whenever possible. (4) Employ a strategy that calls for increased capital spending upfront (i.e., in the next few years) for ICE units in greatest need of replacement, in an effort to modernize Toronto Hydro's fleet with like-for-like (i.e., ICE) replacements and allow for balanced, within-budget capital spending on BEVs down the road. Consider applying the decision matrix used by our team to determine which units to replace with ICE units in the short-term. (5) Conduct pilot projects for several BEV types when they become available (e.g., pickups, passenger minivans, etc.) to track range capabilities and cost savings and assess the units' performance for all seasons and varying weather conditions.

Area/ Topic	Recommendations
	(6) Assuming the pilot projects are successful, acquire BEVs in bulk to replace units that would provide the greatest ROI. (7) Closely monitor the acquisition costs for BEVs and re-evaluate the business case (cost-benefit) for individual units as prices change/ decline. (8) Consider purchasing plug-in hybrid vehicles (PHEVs) for lower-mileage units which would be able to fulfil daily duties on battery-power only and recharge overnight – essentially functioning like fully-electric vehicles.
Electric Vehicle Supply Equipment	(1) Over the next 10+ years, allocate capital towards chargers (and charging infrastructure, which is outside the scope of this study) required for the transition to BEVs for all vehicle categories. (2) Focus on Level 2 charging for every unit on a nightly basis, and evaluate higher-power charging (Level 3) for higher-mileage units. (3) Our general recommendation is for two Level 3 chargers be installed at each of the main Work Centers (Commissioners Work Center, Rexdale Work Center, and Milner Work Center) as a risk management strategy for time-dependent and/or urgent situations. However, without knowledge of the intricacies and specific use cases for each fleet vehicle, our secondary recommendation is to identify the most appropriate Work Centers for investment in higher-power (Level 3) charging, i.e., ones that consist of vehicles that may not always rely on overnight charging only. (4) Monitor upcoming funding opportunities from NRCan's Zero Emission Vehicle Infrastructure Program (ZEVIP), which may greatly offset the capital costs required to install charging infrastructure (outside the scope of this report). (5) Assess existing electrical capacity at facilities to determine whether substantial upgrades for charging multiple vehicles are required, as well as standby generator capacities

Area/ Topic	Recommendations
	(outside the scope of this report). A qualified electrical professional should be consulted to assess the situation and make recommendations. (6) Explore supplying power to each site/garage on two separate feeds from the grid to reduce the risk of local failure taking power away from the whole site. (7) To mitigate the risk of power grid failure or local failure at a site/garage, ensure backup generators have sufficient capacity to deal with short power outages, and assess the need for higher-capacity generators for longer outages. (8) Explore solar energy technology options to supply energy for EV charging to reduce GHG emissions that may be produced from the electricity supply used for charging. (9) Provide or expand on current high-voltage safety awareness and/or skills training to include operating and maintaining Toronto Hydro's electric vehicle charging stations, and closely monitor the launch of new electric vehicle fleet technician training programs.
Collaboration/Partnership Approaches	(1) Engage in internal partnerships within and across departments, such as multi-departmental funding applications for charging infrastructure, or sharing of BEV pilot program results to determine vehicles requirements and specifications (e.g., real-world range, real-world charging needs) ahead of large purchasing decisions involving many units. (2) Engage in external partnerships (e.g., other utilities in Ontario) for potential collaborations, such as joint specification writing and/or joint tenders and sharing of BEV pilot program results through working groups. (3) Leverage the knowledge gained on BEV transition (e.g., procurement of vehicles and charging infrastructure) through organizational memberships such as the Clean Air Partnership or the Canadian Utility Fleet Council (CUFC).
Risk/Change Management Approaches	(1) Develop BEV educational and outreach materials for employees and operators summarizing the reasons and benefits of transitioning to BEVs.

Area/ Topic	Recommendations
	(2) Invite frontline employees to take BEV test drives to familiarize them with fully-electric vehicles and charging, as well as to give them first-hand experience of improved performance (e.g., instant torque, little noise, regenerative braking). (3) Provide operators with a BEV orientation before releasing new models into the fleet to enable them to become familiar with the different driving experience (e.g., instant torque, little noise, regenerative braking), as well as to alleviate/eliminate any apprehension or uncertainties such as range anxiety. (4) As is recommended for the phasing in of BEVs, we recommend pilot projects for several BEV types as they become available (e.g., pickups, passenger minivans, etc.) to track range capabilities and cost savings and assess the units' performance for all seasons and varying weather conditions.

Section 1: Introduction and Background

Climate change is a critical and urgent global issue. The United Nations defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods[9]." The term includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer[10].

Greenhouse gases (GHGs) produced by human activity is the largest contributor to climate change. GHGs are gaseous compounds (such as carbon dioxide) that absorb infrared radiation, trap heat in the atmosphere, increasing global temperature and thus contributing to the greenhouse effect[11]. While there are several GHGs[12] to consider, when calculating emissions the most commonly used measure is carbon dioxide equivalent (CO_2e)[13]. This combines the effects of all the major GHGs into a single, comparable measure.

Over the past several decades, scientific evidence of climate change, also referred to as global warming due to the increasing temperatures of the global climate system, has been vast and unequivocal. Thus, the Paris Agreement (the Agreement, the Accord) was established with a goal of keeping global warming below two (2) degrees Celsius compared with preindustrial times. The Agreement entered into force on November 4th 2016. Canada is a signatory and, as so, has established aggressive carbon-reduction targets and plans.

In addition to climate change, emissions from engine exhausts also contribute to ground-level air pollution and human health risk. Criteria air contaminants (CACs) contribute to smog, poor air quality, and acidic rain. CACs include several gases, particulate matters and volatile organic compounds[14]. In scientific studies, CACs have been linked to increased risks of respiratory and cardiovascular diseases as well as certain cancers. The World Health Organization reports that in 2012 around seven million people died as a result of air pollution exposure; one in eight of total global deaths were linked to air pollution[15]. According to the American Medical Association, globally, an estimated 3.3

[9] Source: United Nations Framework Convention on Climate Change 1992: https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf
[10] Source: EPA. https://www3.epa.gov/climatechange/glossary.html
[11] Source: https://www.merriam-webster.com/dictionary/greenhouse%20gas
[12] GHGs include, but are not limited to carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), nitrogen trifluoride (NF_3), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs).
[13] "Carbon dioxide equivalent is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential. For example, the global warming potential for methane over 100 years is 21. This means that emissions of one million metric tonnes of methane is equivalent to emissions of 21 million metric tonnes of carbon dioxide." Source: https://stats.oecd.org/glossary/detail.asp?ID=285
[14] CACs include Total Particulate Matter (TPM), Particulate Matter with a diameter less than 10 microns (PM10), Particulate Matter with a diameter less than 2.5 microns (PM2.5), Carbon Monoxide (CO), Nitrogen Oxides (NOx), Sulphur Oxides (SOx), Volatile Organic Compounds (VOC), and Ammonia (NH3).
[15] Source: http://www.who.int/mediacentre/news/releases/2014/air-pollution/en/

million annual premature deaths (5.86% of global mortality) are attributable to outdoor air pollution[16], although ambient air pollution has been regulated under national laws in many countries.

Socially responsible institutional, commercial, and industrial fleets can play an important role in reducing GHG emissions and air pollution.

Fleet Sector Impact

Low-carbon transportation is essential to both short-term GHG and fuel-use reduction and long-term decarbonization of the economy. In 2020, the transportation sector accounted for about 25% of greenhouse gas (GHG) emissions in Canada, second only to the oil and gas sector[17]. Utilities can play a key role in cutting emissions by transitioning their fleets to low-carbon and/or electric vehicles, while saving fuel and maintenance costs.

The transition to battery-electric vehicles (BEVs) of all classes will be a game-changer as these vehicles take up more of the market in the next several years, both in terms of operational cost savings and the deep GHG emission reductions required to curb the most severe impacts of climate change. Significant and growing commitments to integrating BEVs into fleet operations will be a driving force in the transition to BEVs[18]. Moreover, continued improvements in range capability and charging infrastructure will accelerate the electrification of fleets.

About Richmond Sustainability Initiatives

Since 2005, Richmond Sustainability Initiatives – Fleet Challenge (RSI-FC) has collaborated with fleet managers, technology providers, subject matter experts, and auto manufacturers to find viable solutions, technologies, and best management practices for reducing operating costs and vehicle emissions. From the beginning, we have remained a self-supporting and independently funded program without commercial biases or influences, providing fleet review, strategies and management consulting services to dozens of leading private and public sector fleets in Canada and the United States.

Through the combination of our experience and the use of our Fleet Analytics Review™ (FAR) software tool, we are delivering an advanced Electric Vehicle Phase-in Plan for Toronto Hydro that is provides numerous electrification pathways based on the speed of BEV transition and BEV prices.

[16] Source: https://jamanetwork.com/journals/jama/article-abstract/2667043
[17] Source: https://climateactiontracker.org/countries/canada/
[18] Source: ChargePoint. Trends & Prediction in Fleet Electrification [pdf]. June 2020.

Background

Toronto Hydro owns and operates the electricity distribution system that provides electricity to approximately 785,000 customers in the City of Toronto, which has a population base of approximately 3.0 million people. The utility delivers about 17 per cent of the electricity consumed in the province of Ontario.[19]

The Electric Vehicle Phase-in Plan will help chart a path of environmental sustainability and the reduction of GHGs through an ambitious, yet feasible, roadmap – keeping in mind budget constraints, return-on-investment (ROI), availability of BEVs of various types, and procurement timelines.

Toronto Hydro has already deployed numerous BEVs into its fleet (Chevrolet Bolts). The Plan is the next logical step in these environmental initiatives; Fleet Management can utilize the scenario analysis provided in this report for fleet replacement strategies and long-term capital planning.

Vision, Goal, and Objectives

The vision for the Electric Vehicle Phase-in Plan is to assist Toronto Hydro in transitioning its fleet to battery-electric vehicles (BEVs) through a streamlined fleet asset management strategy and long-term capital budget plan. With this vision in mind, the goal is to provide an ambitious, yet feasible, roadmap for the utility to phase-in BEVs and achieve significant GHG emissions reductions in a fiscally responsible manner. To guide Toronto Hydro in achieving this goal, we have thoroughly analyzed the utility's in-scope fleet data and we have identified various paths for electrification with varying degrees of speed and implementation.

The objectives of the Electric Vehicle Phase-in Plan were to:

(1) Present findings of RSI-FC's Electric Vehicle Survey to gauge the current view and opinions of employees on battery-electric vehicles and charging requirements;

(2) Develop a fleet and GHG emissions baseline for current fleet assets;

(3) Data-model various fleet electrification pathways over a 15-year budget cycle and estimate their impacts (Operating expenses, Capital expenses, and GHG emission reductions) relative to the baseline;

(4) Data-model electric vehicle supply equipment (EVSE) requirements on a unit-by-unit basis and estimate charger costs over a 15-year budget cycle; and

[19] Source: https://www.torontohydro.com/about-us/company-overview

(5) Create a fleet electrification plan, both in terms of BEV phase-in and charging infrastructure, that is achievable, in consideration of the utility's fleet budget constraints – with a degree of ambition.

Section 2: Electric Vehicle Survey

Our organization recognizes the value of stakeholder engagement and user group participation in any go-forward plans under consideration by our clients. With that focus in mind, RSI-FC set out to gain staff perspectives and opinions from Toronto Hydro's Fleet user groups on electric vehicles and charging requirements.

RSI-FC understands the importance of hearing the opinions of *all* stakeholders, including both management and staff. It was clearly communicated to all survey recipients that their responses were confidential and anonymous; as so, they were encouraged to express their opinions freely.

We are aware that online surveys are not always the ideal method for collecting opinions and gathering information. It is known in the industry that people are often reluctant to provide their personal opinions in this manner; typically, survey response rates are known to only be in the 10 to 15% range. However, due to the Covid-19 pandemic, in-person meetings are not currently possible. Knowing that feedback from stakeholders is important for go-forward planning, as a workaround we opted to instead conduct a web-based online survey. During the last year and a half we have received some valuable feedback from online surveys, as it does give participants a sense of freedom to speak candidly and voice any concerns.

A unique survey was designed for management and drivers/operators to highlight differences in opinions and views, as well as to help inform our recommendations. In total, we received 66 responses (42 from management group and 24 from driver/operator group) out of 330 surveys sent to designated internal staff, which translates to an overall response rate of 20% – well above the typical industry range of 10-15%. We were pleased that responses were insightful and of high-quality, providing us with valuable feedback which we will outline and discuss in this section. Key figures of survey results can be found in *Appendix A*.

Breakdown of Participant Roles & Vehicles Driven

- For the management survey, about two thirds of respondents were either directors/managers or supervisors, with the remaining participants in various roles ranging from analysts to field operators. Over 40% of respondents drive either a cars or pickups, another 40% drive a van, and several respondents drive single bucket aerial trucks.

- For the driver/operator survey, there was a wide spectrum of respondents' roles ranging from certified crew leaders to technologists to mechanics. Over 40% of vehicles driven by respondents were pickups and passenger minivans, with the remaining covering a range of vehicle types from cars to cube vans to single/double bucket aerial trucks.

Views on Battery-Electric Vehicles

- There is strong agreement in both the management and driver/operator groups participants that BEVs can travel far enough to meet daily needs and are capable of performing job duties (mean scores ranging from 4.1/5 and 4.3/5).

- There is strong agreement in the management group that there is sufficient heating and cooling in BEVs (mean score of 4.0/5). However, the driver/operator group is generally undecided on this matter (mean score of 3.3/5).

- There is strong agreement in both groups that BEVs are safe to drive and charge, with some more hesitancy in driver/operator group (median scores of 5/5 and 4/5 in the management and driver/operator groups, respectively).

- Overall, both groups are undecided as to whether BEVs costs less to operate and will save money for Toronto Hydro (mean scores of 3.8/5 and 3.6/5 in the management and driver/operator groups, respectively).

- There is strong agreement in both groups that BEVs cause less pollution than standard gas and diesel vehicles, with slightly stronger agreement in the driver/operator group (mean scores of 4.1/5 and 4.3/5 in the management and driver/operator groups, respectively).

- In both groups, there is a lack of consensus and a wide range of opinions as to whether BEVs of the type Toronto Hydro requires are available now or will be available in the near future (mean scores of 3.7/5 and 3.6/5 in the management and driver/operator groups, respectively).

Views on Charging Requirements

- Overall, in both groups, there is a lack of agreement as to whether investing in Level 2 charging infrastructure would be sufficient for most of the BEV charging needs of Toronto Hydro (mean scores of 3.5/5 and 3.4/5 in the management and driver/operator groups, respectively).

- About 60% of respondents in both groups agree or strongly agree that investing in Level 3 charging infrastructure would be required to fulfil Toronto Hydro's BEV charging needs. Overall, there is slightly stronger agreement on this topic in the management group (mean score of 3.9/5 and 40% of respondents strongly agree) than in the driver/operator group (mean score of 3.8/5 and more than 40% of respondents undecided).

- In both groups, there is a lack of consensus and a wide range of opinions as to whether high-voltage safety awareness and/or training would be needed for operating and maintaining Toronto Hydro's electric vehicle charging stations (mean scores of 3.1/5 and 2.8/5 in the management and driver/operator groups, respectively).

Views on Change Management

- The majority of respondents in both groups agree that Toronto Hydro employees and operators would benefit from BEV educational and outreach materials (mean scores of 3.8/5 and 3.7/5 in the management and driver/operator groups, respectively), with stronger agreement in the management group (over 62% agree/ strongly agree vs. just under 55% in the driver/operator group).

- There is stronger agreement in the management group than the driver/operator group that Toronto Hydro operators would benefit from BEV test drives (mean scores of 4.2/5 and 3.8/5, respectively). Eighty (80) percent of management participants agree or strongly agree with this idea, versus under 60% in the driver/operator group.

- In both groups, there is strong agreement that operators would benefit from BEV orientation provided before releasing new models into the fleet (mean score of 4.0/5 for both groups). Seventy-five (75) percent of management participants and about 80% of driver/operator participants agree or strongly agree with this idea.

Comments & Concerns

At the end of the survey, participants were given the opportunity to provide their own comments in a "freestyle" section that allowed for additional thoughts and ideas on transitioning to electric vehicles.

There were several common thoughts and/or concerns from participants, including:

- Ensuring there is sufficient EV range in the winter for high-mileage vehicles.

- Ensuring there is a full charge to start the day, particularly for high-mileage vehicles in the winter when ranged is reduced.

- The benefit of Level 3 charging for particular applications, including vehicles taken home on standby as well as vehicles used in field operations.

- The benefit and successful application of electric light-duty vehicles (cars, pickups, and vans) in the fleet, but concern over the viability of larger electric trucks including bucket trucks and line trucks.

We have selected the following comments that were, overall, representative of participants' view on the matters of moving towards an electric fleet:

"As a utility, Toronto Hydro should be an early adopter of EV technology."

"I would love to see a shift in electric vehicles at Toronto hydro mainly, pickups, vans and small cars at the start and then move to a half and half system on our buckets and cranes"

"The only issue [with the Chevrolet Bolt] is with winter range which is approx 225k. If I take the vehicle home on Standby, I typically will have no range to do crew visits the following day and have enough range take it home again. There is also not enough time to charge it sufficiently. This is where I think a Level 3 charger might be of benefit."

"In general, I believe this is the right way to go. Only concern is that my team (metering) does a fair number of KMs per day. Need to ensure that even at -40, there is sufficient charge for the day and that overnight charging will consistently ensure the team starts with a full charge."

"YES electric vehicles and charging stations would be great, I think a job aid would be better than formal training"

"[EVs are] good to have but we will always need a good number of combustion engines. If there is an ice storm or other rolling blackouts, gas and diesel powered trucks will be invaluable"

Synopsis

Based on the results of this survey and participant comments, it is clear that Toronto Hydro Fleet's user-group stakeholders are, overall, very supportive of the transition to electric vehicles.

Although views are mostly similar, there are some differences in opinions between the management and driver/operator cohorts regarding views of electric vehicles. Generally, drivers/operators are more doubtful/unaware of the capabilities and benefits of modern-day electric vehicles.

Regarding charging requirements, both groups are generally undecided about the adequacy of Level 2 (slow) charging for the fleet, and feel more strongly about the use of Level 3 (fast) charging. RSI-FC's analysis of Toronto Hydro's charging requirements based on Level 2 charging (see *Section 7*) addresses this very concern.

In terms of change management approaches, survey results show that driver/operators are moderately supportive of BEV test drives but are highly in favour of BEV orientation, while managers are in strong support of both options. Efforts in familiarizing employees with driving and charging

BEVs would likely close knowledge gaps, hesitancies, and resistance towards this technology, allowing for a more seamless transition over the coming years.

Section 3: General Approach and Methodology

RSI-FC maintains that fleet asset management plans must be sustainable – both environmentally and financially. For this reason, RSI-FC's approach to developing Toronto Hydro's Electric Vehicle Phase-in Plan is based on data-modelling of the current situation, data-modelling of optimized unit lifecycles considering return-on-investment (ROI), and assessing a number of electrification pathways to find a viable and financially prudent approach for the utility to transition its fleet to BEVs.

To achieve optimal efficiency in completing this type of analysis, our team developed Fleet Analytics Review™ (FAR), a software tool designed specifically for complex green fleet planning and evaluation of short- to long-term fuel-reduction strategies, including BEV transition, both in terms of cost savings and GHG reductions.

About Fleet Analytics Review™

Fleet Analytics Review™ (FAR) is a user-friendly, interactive decision support tool. FAR was designed to aid our team and fleet managers in developing short- to long-term green fleet plans by calculating the impacts of vehicle replacement and fuel-reduction solutions on operating costs, cost of capital, and GHG emissions. Moreover, it is used for long-term capital planning (LTCP) through an approach that works to balance, or smoothen, annual capital budgets and avoid cost spikes if possible. For a detailed FAR description, please see *Appendix B*.

Using optimized economic lifecycles, fuel-saving options, including switching to BEVs, are modelled for units due for replacement to determine if they can deliver operating cost savings over subsequent fiscal years and, if so, the potential GHG emissions reductions. In FAR, operating costs include fuel costs, repair and maintenance costs, and the cost of capital of acquiring units based on their year-over-year book values.

Transitioning to BEVs is the ultimate GHG reduction strategy for a fleet. In our analysis for Toronto Hydro, we modelled tailpipe emissions reduction; therefore, switching a unit to battery-electric reduces fuel consumption by 100% applying this method. However, in terms of life cycle GHG emissions, BEVs are "fuelled" by electricity needed to charge the battery, which can indirectly use fossil fuel depending on the source of electricity.

FAR will be licensed in perpetuity to Toronto Hydro for its internal use post-project. The FAR model is dynamic, and users can easily run future scenarios (such as assessing different vehicle types, fuels, or technologies) to see how such decisions impact operating expenses – ahead of their implementation, thereby heading off potentially costly errors.

Steps to Producing Electric Vehicle Phase-in Plan

RSI-FC employs a multi-step approach in low-carbon, green fleet planning. In Toronto Hydro's Electric Vehicle Phase-in Plan, the steps included:

1) **Baseline Analysis.** At the outset, it is crucial to confidently know the current fleet baseline in terms of several key performance metrics including acquisition and operating costs, fuel economy, and GHG emissions. For this step, we complete a FAR baseline analysis.

   For Toronto Hydro, we received baseline data of the in-scope fleet from Fleet Management. The dataset provided to our team included a list of units, makes/models/years, asset values and ages, asset descriptions, fuel types, fuel costs, repair costs, and maintenance costs for a one-year review period (2019). We loaded this input data into FAR and completed baseline analysis.

2) **Lifecycle Analysis.** With RSI-FC's proprietary lifecycle analysis (LCA) software tool, our team inputs a fleet's historical data to calculate the optimal economic lifecycles for each vehicle category in the fleet.

   For Toronto Hydro, we completed an LCA study for all vehicle categories in 2017 to determine optimized economic lifecycles. With support from Toronto Hydro Fleet Management, optimized economic lifecycles determined from this study were applied to the 2020-21 FAR baseline.

3) **Business Case Optimization.** Once optimized lifecycles have been modelled in FAR, it often becomes very apparent that some vehicles deliver better return-on-investment (ROI) than others. One reason is that some vehicles that are due for replacement may have had lighter usage than other similar age units. For vehicles in better condition, service life can be extended to optimize the total cost of ownership (TCO). Lower ROI would result if a vehicle, still in good condition, was replaced prematurely; value will be lost. Fleet managers everywhere must make tough vehicle replace-or-retain decisions like this each year to optimize and stretch the use of available capital. Using RSI-FC's ROI-based approach to deferrals, year-over-year long term capital budgets can be better balanced.

   For Toronto Hydro, the approach used by RSI-FC's data analysts was to *defer* replacement of some vehicles to the ensuing capital budget years to ensure full value is received from each unit. Ideally, this step should be completed by Fleet staff based on vehicle condition assessments and to balance go-forward annual capital budgets. Without any knowledge of vehicle condition, for this step our team deferred any units which, based on the data provided, were shown to have lower operating costs (including cost of capital) than if replaced.

This step was intended to provide a benchmark for a balanced long-term capital budget if like-for-like replacements were to be made – as a comparison for long-term capital planning for BEV phase-in.

4) **Battery-Electric Vehicle Phase-in Planning.** Although there are numerous advantages of BEVs, few, if any fleets would – or could – replace all their internal combustion engine (ICE) units immediately with BEVs given capital budgets constraints and the fact that BEV offerings are quite limited at this time. This means that BEVs must be phased in over many years. For this reason, we data-model the gradual impacts of fleet BEV adaptation on a 15-year phased-in basis.

   Phasing in of BEVs should occur based on optimized economic lifecycles and balanced long-term budgets through business case optimization (see Step 3). In other words, the first units to be replaced with BEVs should be those that have been assessed as the optimal candidate vehicles that will deliver the best ROI. These are typically units with higher utilization and fuel consumption.

   However, given the currently limited availability of BEVs as well as the long procurement timelines once models do become available for purchase, BEV phase-in planning becomes a balancing exercise between: (1) extending the life of ICE vehicles until BEV counterparts are expected to arrive (i.e., in-service years); and (2) immediately replacing due units that have high utilization and/or relatively high repair costs with ICE vehicles.

   For Toronto Hydro, our team used FAR to conduct a granular, unit-by-unit assessment of BEV replacement – both as a short-term financial risk-reduction strategy and a long-term capital planning strategy. Based on baseline data provided, we decided (for modelling purposes only) which units to replace with ICE vehicles and which to replace with BEVs through extension of their lifecycles, keeping in mind the fiscal years for which the type/categories of BEVs are expected to be in-service based on procurement timelines.

   Given the higher acquisition costs of BEVs compared to ICE vehicles, which were applied to our modelling in consultation with Toronto Hydro Fleet Management, lower-mileage units are unlikely to deliver ROI if replaced with a BEV. Fortunately, these would also generally be the units that have a relatively small impact on GHG emissions reductions. However, ROI is dependent on BEV pricing outcomes. There is a strong likelihood that the acquisition cost of BEVs will decline with time as both supply increases and as battery technology continues to improve, and we have modelled this scenario for the utility's consideration.

5) **Electric Vehicle Supply Equipment Planning.** Our team developed an EVSE planning tool for Toronto Hydro to inform long-term capital planning (LTCP) for the utility's charging

infrastructure needs, based on Level 2 charging and battery capacity estimations. We also estimated the costs of electric vehicle chargers (not complete infrastructure) over the modelling period from 2022-2037, based on the current size and mileage of Toronto Hydro's fleet and a balanced, fleet-wide BEV phase-in.

RSI-FC's position is that fleets should not be keeping up with the demand for electric vehicle supply equipment (EVSE) based on the number of new BEVs added; rather, EVSE installation should be *outpacing* demand to allow for a smooth and seamless transition. Therefore, we have estimated the number of Level 2 chargers required to outpace the influx of new BEVs into Toronto Hydro's fleet.

Section 4: Baseline Analysis

A fleet baseline analysis provides a starting point for setting targets and measuring progress towards fuel- and GHG-emissions reduction. It is important that a baseline is as accurate as possible as it provides a snapshot of the current state of a fleet and is the foundation of a fleet management plan.

The Electric Vehicle Phase-in Plan is based on our team's detailed data analysis of one-year of historical data for 385 Toronto Hydro fleet vehicles as submitted by the utility. RSI-FC collected baseline data of Toronto Hydro's fleet from Fleet Management. The dataset provided to our team included a list of units, makes/models/years, asset values and ages, asset descriptions, fuel types, repair costs, and maintenance costs for a one-year review period (2019). Our team then loaded input data into our proprietary software, Fleet Analytics Review™ (FAR), and completed a baseline analysis.

RSI-FC diligently collected and analyzed vehicle data provided by Toronto Hydro and made careful estimations and assumptions where needed. Key fleet-wide results from the one-year review period (August 2020 to July 2021) are shown below:

- There were 211 gasoline-powered units, 160 diesel-powered units, 1 plug-in hybrid-electric (PHEV) units, and 13 battery-electric vehicle (BEV) units.
- All units were owned.
- The original purchase price for the fleet was $48,630,000.
- The current-day estimated replacement cost (like-for-like replacements) was $67,549,000.
- The estimated market/trade-in value was $22,359,540.
- The total cost of preventive maintenance (PM) was $481,389.
- The total cost of reactive repairs was $1,663,860.
- The estimated total cost of fuel was $757,168.
- The total cost of repairs and maintenance, fuel, capital, and downtime was $4,399,845.
- Total kilometres-travelled was 1,796,605.
- Total fuel used was 633,851 litres.
- Total tailpipe GHG emissions were 1,624 metric tonnes CO_2e.
- The average unit annual mileage was 4,667 km.
- The average fuel consumption for the entire fleet was 56.6 l/100km.
- The average unit age was 6.7 years.

The baseline analysis sets the foundation for the next stages of the Electric Vehicle Phase-in Plan, starting with long-term capital planning (LTCP) for like-for-like replacements to determine a capital budgeting benchmark. The next stage involved modelling several electrification pathways for Toronto Hydro's fleet to provide an ambitious, yet feasible, roadmap for the utility to phase-in BEVs and

achieve significant GHG emissions reductions in a fiscally responsible using a structured, methodical approach.

Section 5: Business Case Optimization and Capex Benchmarking

Providing capital to replace units each year with new vehicles is essential for any organization that relies on its fleet to provide its core services to customers. A guideline for fleet replacement is to invest capital at the rate of depreciation. For example, if vehicles are depreciated over ten years, then 10% of the total fleet replacement cost (current NPV) would be required each year to maintain the fleet's average age at the desirable level.

For Toronto Hydro, based on the current-day estimated replacement cost (like-for-like replacements) determined in the baseline analysis, about $6.8M would be required every year if vehicles are depreciated over 10 years. However, this guideline is only valid if performance indicators such as uptime and fuel-efficiency are satisfactory. If not, a one-time increase in spending would help bring the fleet's average age and performance up to an acceptable level.

Moreover, specific categories of vehicles have, on average, differing optimal lifecycles. Decisions to shorten or extend lifetimes of individual units are, of course, dependent on vehicle condition, mileage, and identification of "lemons" in a fleet. A lifecycle analysis (LCA) study conducted by RSI-FC in 2017 helped to provide Toronto Hydro with a data-driven method of optimizing lifecycles for vehicle categories.

To establish a benchmark for a balanced long-term capital budget if like-for-like replacements were to be made – as a comparison for long-term capital planning for BEV phase-in – our team conducted a Capex balancing exercise by deferring units shown to have low ROI if replaced prematurely.

2017 Lifecycle Analysis Summary

In 2017, a lifecycle analysis (LCA) study was undertaken by RSI-FC for each vehicle category at Toronto Hydro to determine optimized economic lifecycles. The LCA study took into consideration the cost of downtime (as caused by reduced reliability), the year-to-year "rollup" of weighted average cost of capital (WACC), inflation, worker cost/hour, salvage and market values, inflation, and average kilometres-driven data.

A discounted cash flow analysis was completed for each vehicle category to complete the LCA. Net present value (NPV) was calculated for outgoing cash flows (vehicle purchase cost, maintenance cost, the impact of downtime on driver productivity cost, improved fuel efficiency of a new vehicle compared to the old vehicle) and incoming cash flows (vehicle residual value) to calculate the total lifecycle cost for various vehicle retention periods.

With support from Toronto Hydro Fleet Management, optimized economic lifecycles determined from this study were applied to the 2020-21 baseline – serving as a starting point for the Electric Vehicle Phase-in Plan. The results from the 2017 study are summarized in *Table 3*.

Table 3: 2017 Lifecycle Analysis Results Applied to 2020-21 Baseline

Vehicle Category	Optimal Lifecycle Calculated through LCA (years)
Car	9
Cargo Minivan	7
Passenger Minivan	9
Full Size Van	10
Pickup	9
SUV	8
Cube Van	12
Single Bucket Aerial Device	12
Single Bucket Van Mount Aerial Device	11
Cable Truck	11
Crane Truck	10
Dump Truck	8
Line Truck	13
Double Bucket Aerial Device	14
Digger Derrick	13

Vehicle Condition Assessments

Replacement cycles should be considered a guideline only, as some vehicles in poor or unsafe condition may require replacement before the criteria are met. Conversely, some vehicles that exceed the criteria may be in good condition and may not warrant replacement. Fleet managers, of course, need to exercise judgment and fleet management principles in either advancing replacement or delaying replacement of individual vehicles case by case. A thorough ground-up and top-down physical assessment of each vehicle's condition, in conjunction with routine shop visits for preventive maintenance inspections, would serve to inform decisions around extending vehicle lifecycles during the waiting period for BEV models.

Recommendation

- In the context of BEV phase-in and determining which unit lifetimes to extend and which to not, our recommendation is to store vehicle condition information in Excel format or another database for easy access and tracking of summaries and/or analyses. A simple rating system such as a numerical 1 to 5 indexing where 1 = poor condition and 5 = good condition would greatly assist in determining the highest priority units for ICE replacement. If each vehicle's condition rating (1 to 5) was posted in each vehicle's profile in Excel or a software program, it could be easily accessed for capital budget planning.

Long-Term Capital Planning

After modelling the baseline with optimized economic lifecycles, the Fleet Analytics Review™ (FAR) software tool enables methodical, well-informed business decisions for long-term capital planning (LTCP) purposes.

Vehicle data provided by Toronto Hydro for the baseline year (2020-21) was input into FAR, and the tool calculated capital budgets for the ensuing fifteen years driven by vehicle lifecycles based on the optimized economic lifecycles that were calculated from the 2017 LCA study.

On a unit-by-unit basis, FAR calculates:

(1) Whether replacing units due for replacement would save Toronto Hydro operating expenses (Opex) or cost additional money; and
(2) The GHG-reduction impacts of vehicle replacements.

The tool also calculates and displayed the costs (operating and capital) and GHG impacts of those decisions for the fleet as a whole.

Typical of most fleets, year one of Toronto Hydro's LTCP showed a cost spike caused by previously deferred vehicles (see results in next sub-section). Replacement of some of these units can be again delayed because they are still in good serviceable condition, have low mileage, or perhaps have just received a costly refurbishment that will extend the unit's life. These decisions, which are typical for fleet managers everywhere that must adhere to a capital spending limit, can be aided by using FAR which displays to the user whether cost-savings are possible by replacing a unit.

In FAR, replacement of units shown not to provide return-on-investment (ROI) can be deferred to following years until replacement yields a net decrease in Opex or until replacement is deemed necessary from a financial risk reduction point-of-view – as units kept well beyond their optimal lifecycle have a greater chance of unexpected repair costs. Following this method, a fleet manager can balance go-forward annual capital expenses (Capex) and avoid year-over-year cost spikes. This

approach can keep the average age of the fleet at an acceptable level, provide the lowest cost and highest uptime, and reduce emissions through strategically acquiring new (lower emission) vehicles.

While historical data in FAR demonstrates whether a business case exists for vehicle replacement, the final step, of course, in LTCP depends on fleet management personnel's expertise through vehicle condition assessments, as explained earlier. *No software tool can supplant this crucial human role in capital budget planning.*

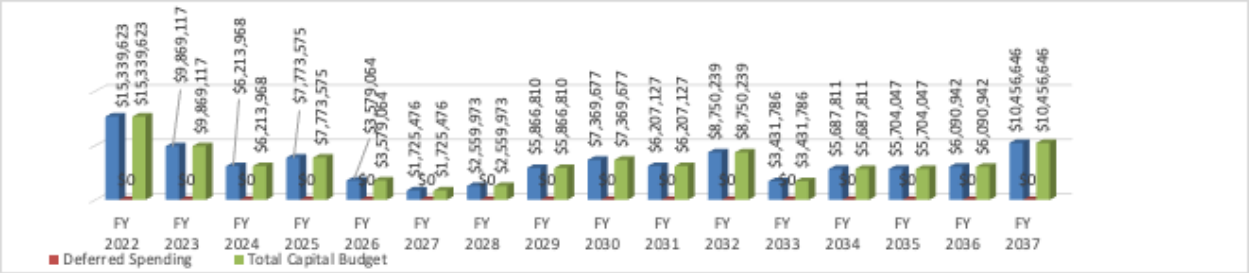
For modelling purposes only, our team conducted a Capex balancing exercise by deferring units shown to have low ROI if replaced prematurely. This established a benchmark for a balanced long-term capital budget if like-for-like replacements were to be made – as a comparison for long-term capital planning for BEV phase-in (covered in *Section 6*).

Optimized Economic Lifecycles – Results

FAR Scenario One modelled a 15-year budget cycle based on Toronto Hydro's optimized economic lifecycles determined in the 2017 LCA study.

As illustrated in *Figure 1* (below), it was estimated that, in 2022, $15.3 million would be required to replace all due or past-due units with new like-for-like vehicles (no BEVs at this stage). It should be noted that numerous vehicles in the Toronto Hydro fleet are *beyond the current planned age* for replacement – *significant "catch-up" is required to modernize the fleet.* In ensuing years, far fewer vehicles require replacement, bringing down capital spending to as little as $1.7 million in 2027. However, there is an uneven capital spend projected throughout the budget period.

Figure 1: Projected capital budget (blue), deferred spending (red), and total capital budget (green) for optimized economic lifecycles from 2022-2037



Balanced Capex – Results

Once optimized economic lifecycles were modelled, it became apparent that some vehicles deliver better ROI than others. Some vehicles in the fleet may have received lighter usage than other similar age units, which may have been worked harder. Vehicles in better condition and/or with lower mileage can have their service life extended to optimize their lifetime total cost of ownership (TCO).

Lower ROI would result if a vehicle, still in good condition, was replaced prematurely; value will be lost.

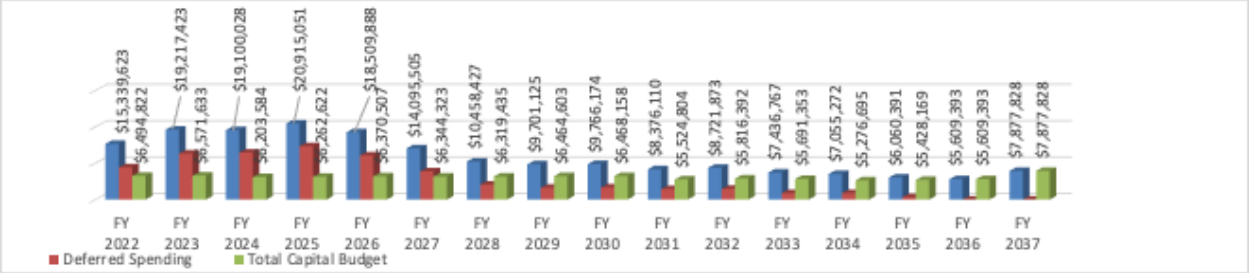
For FAR Scenario Two, the approach used by RSI-FC was to defer some vehicles to ensuing capital budget years to ensure full value is received from each unit. As third-party consultants without access to information to vehicle condition, and to reduce and apportion the required capital for vehicle replacement over a more extended period, we opted to defer using the following criteria:

(1) Units with low/no ROI
(2) Units that have most recently became due for replacement (to ensure past-due units get higher priority for replacement)
(3) Lower-accumulated mileage units (to ensure that higher-mileage units are replaced first)

Using this prioritization protocol, we selectively and strategically made deferrals over the budget cycle to maximize Opex benefits and balance Capex to the best of our ability. As a result, Capex is much more balanced over the budget cycle than FAR Scenario One.

As illustrated in *Figure 2* (below), the net result was an average annual capital budget of $6.2 million with annual amounts ranging from $5.3-7.9 million with clustering around $6-6.5 million, as compared to the much wider and more fluctuating range over the budget period for optimized economic lifecycles only as in FAR 1 (*Figure 1*, above).

Figure 2: Projected capital budget (blue), deferred spending (red), and total capital budget (green) for balanced Capex from 2022-2037



Recommendation

- Consider using RSI-FC's Fleet Analytics Review™ (FAR) software tool to extract maximum value from each vehicle by assessing whether cost-savings are possible by replacing a unit.

Section 6: Electric Vehicle Phase-in Planning

The primary objective of the Electric Vehicle Phase-in Plan was to analyze Toronto Hydro's in-scope fleet data and identify and assess electrification pathways with varying degrees of implementation and pricing outcomes.

RSI-FC first prepared the baseline from data provided by the utility for the review period (2019), including capital expenses (Capex) and operating expenses (Opex) for all units. From the baseline, we modelled a 15-year budget cycle (to 2037) for optimized economic lifecycles determined through lifecycle analysis (LCA), and then balanced Capex by deferring units shown to have low return-on-investment (ROI) if replaced prematurely. This established a data-driven benchmark for a balanced long-term capital budget if *like-for-like* replacements were to be made – as a comparison for long-term capital planning for BEV phase-in.

Starting from the baseline, we modelled a number of fleet electrification scenarios ranging from aggressive and over-budget to balanced and within budget – to demonstrate a spectrum of pathways. Although BEV phase-in is the most effective long-term GHG reduction strategy for a fleet, the reality is that there are currently higher upfront costs associated with the transition; therefore, it must be done in a fiscally responsible manner.

Based on our modelling, lower-annual mileage units at Toronto Hydro are unlikely to deliver ROI if replaced with a BEV at this time. To provide a viable BEV phase-in plan, our team strategically modelled the replacement of overdue lower-annual mileage units with internal combustion engine (ICE) vehicles in an effort to still achieve GHG emissions reductions while keeping within budget constraints. Moreover, we modelled replacement of overdue units that showed high usage and/or relatively high repair costs with ICEs as a financial risk-reduction strategy.

Overview of Battery-Electric Vehicles

Here, we provide an overview BEVs, including their benefits and expected market availability for different classes. More details on BEVs and charging can be found in *Appendix C*.

Why BEVs?

Air quality is a growing concern in many urban environments and has direct health impacts for residents. Tailpipe emissions from internal combustion engines are one of the major sources of harmful pollutants, such as nitrogen oxides and particulates. Diesel engines in particular have very high nitrogen oxide emissions and yet these make up the majority of the global fleet. As the world's urban population continues to grow, identifying sustainable, cost-effective transport options is becoming more critical. Battery-electric vehicles (BEVs) are one of the most promising ways of reducing harmful emissions and improving overall air quality in cities.

Globally, numerous jurisdictions have already legislated the end of the ICE – some as soon as 2030. On January 28, 2021, General Motors pledged to cease building gasoline and diesel cars, vans, and SUVs by 2035. Even more recently, on June 29, 2021, the Canadian government announced a mandatory target for all new light-duty cars and passenger trucks sales to be zero-emission by 2035, accelerating Canada's previous goal of 100 percent sales by 2040[20]. ICE vehicles purchased today for a fleet with a current-day value in the millions of dollars may be nearly worthless when ICEs become obsolete.

Fleet managers who operate BEVs will see reduced maintenance and fuel costs. BEVs have considerably fewer parts than internal combustion engine (ICE) vehicles. A drivetrain in an ICE vehicle contains more than 2,000 moving parts, compared to about 20 parts in an BEV drivetrain. This 99% reduction in moving parts creates far fewer points of failure, which limits and, in some cases, eliminates traditional vehicle repairs and maintenance requirements, creating immense savings for fleet managers. BEVs do not require oil changes or tune-ups, do not require diesel exhaust fluid (DEF), and their brake lining life is greatly extended over standard vehicles due to regenerative braking.

In recent years, BEV range has been considerably extended, thereby providing much wider BEV applications and reducing range anxiety. Today, many light-duty BEV models have EPA-estimated ranges exceeding 400 km, which provide much greater reliability when travelling longer distances.

The time required to charge BEVs is dependent on charging speed and battery size. For a battery-electric car or SUV, a full charge using a Level 2 charger takes several hours, but charging from a nearly depleted battery to 70% at a fast (Level 3) charging station can take only 30 minutes[21]. However, heavy-duty trucks charged between 50 and 100 kW (equivalent to DC fast charging) would potentially take several hours to charge[22] due to their much larger battery size.

Although recharging a BEV can take significantly longer than refuelling a conventional vehicle, most charging in a low-mileage fleet like Toronto Hydro can be done overnight in off-peak hours via Level 2 charging. Please see *Section 7* for details on RSI-FC's analysis of Toronto Hydro's charging requirements.

Battery-Electric Light-Duty Vehicles

There are multiple light-duty cars and SUVs currently on the market; current examples include the Nissan Leaf, Chevrolet Bolt (13 units currently owned and operated by Toronto Hydro), Kia Soul, and the Tesla Model 3. All with sufficient range for fulfilling daily duties, these vehicles have demonstrated that electrification is not only possible, but also convenient and within an acceptable and affordable

[20] Source: https://www.canada.ca/en/transport-canada/news/2021/06/building-a-green-economy-government-of-canada-to-require-100-of-car-and-passenger-truck-sales-be-zero-emission-by-2035-in-canada.html
[21] Source: https://www.autotrader.ca/newsfeatures/20180410/types-of-electric-vehicles-explained/
[22] Source: https://www.plugincanada.ca/electric-bus-faq/

price range, particularly when considering fuel and maintenance cost savings over the vehicle's lifetime.

The "workhorses" of utility fleets like Toronto Hydro are light-duty pickup trucks and vans. For Toronto Hydro's fleet, pickups and Class 1 and 2 vans comprise about 42% of the vehicles based on the data provided (84 pickups and 78 light-duty vans out of a total of 385 vehicles). Therefore, BEV options in the light-duty pickup and van categories have the potential to make a significant impact on the utility's fleet operating cost savings and GHG emissions reduction. At this time, there are no BEV pickups or vans available for purchase. However, several manufacturers, including General Motors and Ford, are preparing for BEV pickups and vans to enter the market in 2022.

Battery-Electric Trucks

Medium- and heavy-duty battery-electric trucks (BETs) are quickly being developed by many manufacturers. Almost all truck manufacturers have announced plans to launch battery-electric trucks in these classes soon, which will likely become available for purchase by 2023. However, several manufacturers are taking orders now, including Lion Electric, Tesla, and Navistar.

Like all BEVs, BETs offer a multitude of benefits with some additional ones given their size and load, including:

- Less noise pollution
- Zero tailpipe GHG emissions
- Oil-free operation with very few moving parts
- Simple, low-maintenance electric powertrain with few components
- Longer lasting brakes due to regenerative braking system
- Potential to significantly extend range due to high regenerative braking from carrying heavy loads[23]. The heavier the truck load, the greater the energy produced from regenerative braking.
- Overnight recharging when the vehicle is not in operation and when demand for electricity is lower, which reduces energy costs
- Massive savings potential in total energy costs and service costs

[23] Source: https://www.firstpost.com/tech/science/worlds-largest-electric-vehicle-is-a-110-tonne-dump-truck-that-needs-no-charging-7190131.html

BEVs – Feasibility Considerations

- Caution must be exercised to ensure longer charging times do not create operational challenges. However, most charging in a low-mileage fleet like Toronto Hydro can be done overnight via Level 2 charging. Please see *Section 7* for details on RSI-FC's analysis of Toronto Hydro's charging requirements.

- Extreme cold temperatures can significantly reduce range in BEVs due to heating of the cabin and heating of the battery itself[24]. Therefore, it is important to account for this when purchasing BEVs to ensure sufficient range is provided to cover a day's worth of routes in the heart of winter. However, in a low-mileage fleet like Toronto Hydro this would likely not pose an operational issue for most units. Please see *Section 7* for details on RSI-FC's analysis of Toronto Hydro's charging requirements.

- Power grid failure or local failure at a site/garage could pose a significant risk to Toronto Hydro's operations. To mitigate this risk, backup generators can deal with short power outages. For longer outages, larger generators would be needed, but this would come at a very expensive cost.[25]

BEV Phase-in Approaches

RSI-FC data-modelled several fleet electrification scenarios ranging from aggressive and over-budget to balanced and within budget – to provide a spectrum of options that Toronto Hydro can use to inform their purchasing decisions.

For each scenario, FAR calculated annual GHG emissions, operating costs, and capital requirements from 2022 to 2037 – providing multiple long-term capital planning (LTCP) outlooks based on the speed and degree of implementation of BEVs into Toronto Hydro's fleet. These "what-if" scenarios assess the potential outcomes of BEV phase-in for the same vehicles, the same number of vehicles, travelling the same number of kilometres as the baseline period.

For balanced scenarios considering budget constraints, our team used Fleet Analytics Review™ (FAR) to conduct a granular, unit-by-unit assessment of BEV replacement – both as a short-term financial risk-reduction strategy and a long-term capital planning (LTCP) strategy. Based on baseline data provided, we decided (for modelling purposes only) which units to replace with ICE vehicles and which to replace with BEVs through extension of their lifecycles, keeping in mind the fiscal years for which the type/categories of BEVs are expected to be in-service based on procurement timelines provided by Toronto Hydro (*Table 4*).

[24] Source: https://www.geotab.com/blog/ev-range/
[25] Source: https://www.plugincanada.ca/electric-bus-faq/

Table 4: Toronto Hydro procurement timelines for different vehicle types

Vehicle Type	Timeline from RFP Submission to Final In-service Date
Light-duty	~1 year
Medium-duty	~2 years
Heavy-duty	~3 years

For both the aggressive and balanced BEV phase-in scenarios, units due for replacement showing low ROI in our FAR modelling were deferred to subsequent fiscal years in an effort to minimize operating expenses (Opex) and optimize capital expenses (Capex). Moreover, for modelling purposes we opted to extend the optimal lifecycles for all light-duty vans to 12 years and pickups to 11 years – as a strategy employing a temporary pause (when appropriate) on replacing ICE van and pickups, which comprise a very large portion of Toronto Hydro's fleet, until equivalent BEV models are expected to be in-service.

Aggressive, Fleet-wide BEV Phase-in

The aggressive approach to BEV phase-in involved fleet-wide replacement with BEVs and shortened procurement timelines. For demonstration and comparative purposes, this scenario shows what a higher-pace transition would look like from a capital budgeting perspective with lower-than-expected market availability and/or wait times for new vehicles.

Expected BEV in-service years in our modelling, based on shortened procurement timelines than the ones provided by Fleet Management, are as follows:

- SUVs: orders placed immediately and models in-service 2022 onward (less than 1-year wait time)
- LD vans and pickups: orders placed in 2022 and models in-service 2023 onward (1-year wait time)
- MDVs: orders placed in 2023 and models in-service 2024 onward (1-year wait time)
- HDVs: orders placed in 2023 and models in-service 2024 onward (1-year wait time)

Balanced, Selective BEV Phase-in

The balanced approach to BEV phase-in involved more ICE replacements (for appropriate units, mainly HDVs) as well as in-service based on procurement timelines provided by Toronto Hydro. The purpose of this exercise was to align with Toronto Hydro's procurement timelines and stay within capital budget constraints while *still* achieving significant GHG emissions reductions by the end of the modelling period (i.e., 2030s).

Taking this approach, the budget is much more balanced year-over-year than the aggressive BEV phase-in approach, and does not require significantly more capital spending as compared to the like-for-like replacement benchmark (see results and comparisons in the next sub-section). This approach employs a strategy that calls for increased capital spending upfront (i.e., in the next few years) to modernize Toronto Hydro's fleet with like-for-like (i.e., ICE) replacements, which allows for balanced capital spending on BEVs down the road.

Expected BEV in-service years in our modelling, based on more cautious order dates for LD vehicles, as well as (longer) procurement timelines provided by Fleet Management, are as follows:

- SUVs: orders placed in 2022 and models in-service 2023 onward (1-year wait time)
- LD vans and pickups: orders placed in 2023 and models in-service 2024 onward (1-year wait time)
- MDVs: orders placed in 2023 and models in-service 2025 onward (2-year wait time)
- HDVs: orders placed in 2023 and models in-service 2026 onward (3-year wait time)

We made the presumption that fossil-fuelled vehicle replacements would be in-service over shorter timelines than BEVs at the beginning of the budget period – reasoning that some replacements have already been confirmed are thus "in queue." Otherwise, there would be a pent-up demand for overdue units in the short- to mid-term creating an unavoidable spike in Capex.

Although we have made every effort to ensure that the business assumptions and estimates employed in our analysis are as accurate as possible, we acknowledge that FAR is not intended to be accounting-accurate but rather provide Toronto Hydro a viable pathway for achieving electrification of its fleet in consideration of budget constraints and procurement timelines.

To select the units to replace with ICEs, we created a "decision matrix" containing key indicators from Toronto Hydro's fleet baseline data that helped to highlight which units were most suitable candidates for ICE replacement. These indicators include:

- Lifetime kms (flagged if greater than 120,000 km)

- Review period kms (flagged if less than 5,000 km; this would indicate low ROI with BEV replacement as well as low impact in terms of GHG reduction)

- Preventive Maintenance/reactive repair ratio (flagged if less than 0.25; this would give an indication of vehicle condition based on data only and flag potential cases where a unit should be replaced sooner)

- Lifecycle remaining (flagged if the unit is due for replacement before expected BEV in-service years)

- Lifecycle remaining plus 2-yr deferral (flagged if, with a 2-yr deferral, the unit is due *still* due before expected BEV in-service years)

The various "flags" allow for an informed, structured method of holistically deciding, for modelling purposes, which vehicles should be replaced with ICE units due to high usage and/or relatively high repair costs, and which vehicles should be replaced with ICE units simply because they have such low-kms and, therefore, have much less ROI and contribute relatively little GHG emissions. Of course, as described in *Section 5*, a physical assessment of each vehicle's condition would be required to inform decisions around which units to replace with ICE units and which to extend lifecycles during the waiting period for BEV models.

The overall purpose of completing and applying this exercise to the FAR modelling was to obtain results that stay within Toronto Hydro's budget while still achieving high GHG emissions reduction. It would be very possible to fully convert the fleet to electric by 2040 – or perhaps sooner – depending on BEV pricing outcomes, as will be outlined next.

BEV Pricing – Cautious

In discussion with Toronto Hydro Fleet Management and based on current MSRP ratios when comparing BEVs to conventional ICE vehicles, we have applied the following BEV/ICE acquisition cost ratios to our modelling:

- SUVs: 1.48
- Pickups: 1.74
- Full size vans: 1.66
- Medium-duty units: 1.75
- Minivans: 1.57 (since there is no EV option currently in the market, the ratio was estimated to be between SUVs and full size vans)
- Heavy-duty units: 2 (this is a cautious estimation that includes the cab/chassis and body portions)

We have applied these ratios to the entire modelled budget period for both the aggressive and balanced BEV phase-in scenarios as a cautious pricing approach that does not assume any future BEV price reduction.

Based on these BEV/ICE acquisition cost ratios, the current-day estimated BEV replacement cost for Toronto Hydro's fleet is $127.7M as compared to the current-day estimated like-for-like (i.e., ICE) replacement cost of $67.5M – about an 89% increase.

BEV Pricing – Sliding Scale

For both the aggressive and balanced BEV phase-in scenarios, we then applied a "sliding scale" for BEV price reduction (starting from the initial ratios listed above) to model potential outcomes for more optimistic pricing.

We believe that providing both cautious and optimistic pricing outcomes will provide Toronto Hydro with better value through a range of possibilities – as the current reality is that we cannot firmly predict future outcomes regarding BEV pricing.

However, there is reason to expect BEV prices to steadily decline in coming years as supply increases and battery technology improves. This is provided in a 2018 Bloomberg New Energy Finance report that modelled a costing outlook for electric buses vs diesel buses, and demonstrated cost parity by 2030 mainly due to future cost reductions of the battery pack[26]. With this information, it is conceivable that BEVs of all classes would follow suit.

In consideration of modelling constraints as well as gradual price reduction to better reflect what would be expected should BEVs steadily decline, the logic of the sliding scale is as follows:

- In 2022, status quo BEV/ICE pricing ratios (ratios listed above) as discussed and agreed upon with Toronto Hydro, have been applied to our modelling.

- BEV/ICE price parity is expected, for modelling purposes, to occur in one decade (10 years) starting from 2023 for all units; therefore, price parity would be reached by 2032 (2023+9yrs).

- For modelling purposes, BEV/ICE ratios are reduced at a fixed rate for each year of the 10-year period until price parity is achieved. For example, heavy-duty units (with an BEV/ICE cost ratio of 2) would have a ratio reduction of 0.1 per year until the BEV/ICE cost ratio is approximately 1 (i.e., BEV and ICE prices are approximately equal).

- Taking into consideration procurement timelines:
    - HDVs show approximate price parity in our modelling by 2032+3yrs=2035
    - MDVs show approximate price parity in our modelling by 2032+2yrs=2034
    - LDVs show approximate price parity in our modelling by 2032+1yrs=2033

- Taking into consideration procurement timelines:
    - HDV price reduction starts in 2023+3yrs=2026 (year that earliest models would be in-service) and ends in 2035. Approximate price parity is continued for the duration of the modelling.

[26] Source: Bloomberg New Energy Finance. Electric Buses in Cities: Driving Towards Cleaner Air and Lower CO_2 [pdf]. March 29, 2018.

- MDV price reduction starts in 2023+2yrs=2025 (year that earliest vehicles would be in-service) and ends in 2034. Approximate price parity is continued for the duration of the modelling)
- LDV price reduction starts in 2023+1yrs=2024 (year that earliest vehicles with price reduction would be in-service) and ends in 2033. Approximate price parity is continued for the duration of the modelling.

Given the complexity of the FAR, the method employed to practically apply a sliding scale to our modelling, provided that *initial* acquisition costs are raised by inflation each fiscal year, was to:

(1) Divide the replacement costs in a given year by the agreed-upon *initial* ratios; and

(2) Multiply the replacement costs by a reduced ratio that scales over time (as explained earlier) to yield a reduced cost every year until approximate price parity with ICE counterparts is reached after 10 years.

Multiplication factors for LD, MD, and HD units have been included for each fiscal year in FAR and applied to all respective annual replacement costs. The factors remain constant once approximate price parity is achieved (as noted above).

Applying the sliding scale to the balanced BEV phase-in scenario provides a more complete and reasonable picture of what a balanced phase-in may look like if prices come down (see results in next sub-section). With cautious pricing and a sliding scale applied to both the aggressive and balanced BEV phase-in approaches, we have provided a spectrum of BEV phase-in scenarios that can be used to better inform future vehicle purchasing decisions, including:

- FAR 3.1 – aggressive, fleet-wide BEV phase-in with cautious pricing
- FAR 3.2 – aggressive, fleet-wide BEV phase-in with sliding scale
- FAR 4.1 – balanced, selective BEV phase-in with cautious pricing
- FAR 4.2 – balanced, selective BEV phase-in with sliding scale

Balanced, Fleet-wide BEV Phase-in

For demonstration purposes only, we have included one additional FAR scenario (FAR 5) which is a balanced, nearly complete transition to BEVs with far fewer ICE replacements than FAR 4.1 and 4.2. Phasing in BEVs using this approach require lifecycles to be extended far longer than planned (for modelling purposes) in an effort to pause the purchase of ICE vehicles until BEV replacements are available. Although we have modelled this to demonstrate what a *balanced and near 100%* BEV phase-in may look like for Toronto Hydro's fleet, we do not recommend extending lifecycles to such degree from a financial risk-reduction perspective.

BEV Phase-in Scenario Results

Our modelling estimated annual capital costs as well as operating cost impacts and GHG emissions reductions relative to 2020-21 baseline. In *Table 5* (below), results are summarized and include average annual Capital expenses (Capex) over the budget cycle, average annual Operating expense (Opex) changes over the budget cycle relative to the baseline, and annual tailpipe GHG reduction by 2037 relative to the baseline. Due to the limited availability of BEVs in the short-term, we have modelled BEV phase-in over a 15-year budget period following the year 2022 (i.e., from 2023-2037).

Note: The significantly higher operating expenses shown in Table 5 are due to the significantly increased cost of capital for acquiring new vehicles based on year-over-year book values of units.

Table 5: Summary of fleet-wide results of scenario analysis over the period 2022-2037 relative to the 2020-21 baseline.

FAR #	FAR Scenario Description	Implementation Timing[27]	Average Annual Vehicle Replacement Capex[28] [29]($ millions)	Average Annual Opex[30] [31] Impacts Over Baseline ($ millions)	Annual Tailpipe GHG Reduction[32] Over Baseline (tonnes CO_2e)	Annual Tailpipe GHG Reduction Percentage Over Baseline
1	Optimized lifecycles	2022 - 2037	6.7	+0.94	41	2.5%
2	Optimized lifecycles + ROI (benchmarking scenario)	2022 - 2037	6.2	+0.89	37	2.3%
3.1	BEV phase-in: aggressive and cautious pricing	2022 - 2037	*10.7	+3.23	1,623	100%
3.2	BEV phase-in: aggressive and optimistic pricing (sliding scale)	2022- 2037	*7.6	+2.29 (**est.)	1,623	100%
4.1	BEV phase-in: balanced, cautious pricing, more ICE replacements	2022-2037	8.3	+1.77	1,146	71%
4.2	BEV phase-in: balanced, optimistic pricing (sliding scale), more ICE replacements	2022-2037	7.0	+1.49 (**est.)	1,146	71%
5	BEV phase-in: balanced, cautious pricing, few ICE replacements due to greatly extended lifecycles	2022-2037	9.8	+2.31	1,503	93%

* Note that both of these scenarios involve significant Capex "spikes" in the short- to medium-term.
* Estimated based on applying a sliding scale in BEV pricing.

The most aggressive fleet electrification scenarios have the potential to reduce Toronto Hydro's fleet tailpipe GHG emissions by **100% by 2034** – before the end of the modelling period. The more cautious and fiscally prudent scenarios have the potential to reduce Toronto Hydro's fleet tailpipe

[27] For data-modelling purposes, fleet-wide implementation is modelled over the period from 2022-2037 for the same types of vehicles, the same number of vehicles, travelling the same number of kilometres as the 2020-2021 baseline.
[28] Average annual Capital expenses (Capex) for the entire modelling period (2022-2037), including compounding inflation for each year at current rate of inflation.
[29] For BEV charging infrastructure, additional capital costs were estimated separately using an EVSE costing tool.
[30] Average annual Operating expenses (Opex) for the entire modelling period (2022-2037) , including compounding inflation for each year at current rate of inflation.
[31] For data-modelling purposes, Opex includes the annual cost of capital based on year-over-year book values of units.
[32] Annual GHG reduction by the end of the modelling period (2037) is relative to the 2020-2021 baseline.

GHG emissions by just over **70% by 2037** – with the potential to achieve even greater results should more ICE units be replaced with BEVs towards the end of the modelling period, depending on pricing outcomes for BEVs compared to ICEs.

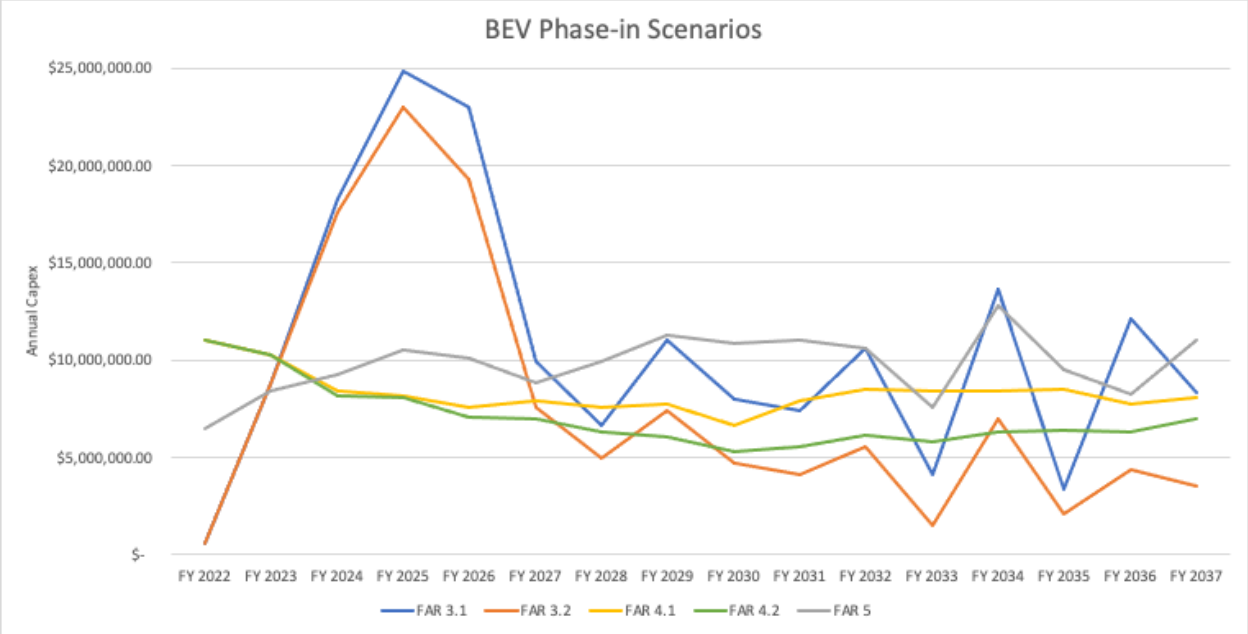
For the aggressive, fleet-wide BEV phase-in scenarios, average annual Capex is projected to be **$10.7M/yr** with cautious pricing (i.e., constant BEV/ICE ratios) and decrease to **$7.6M/yr** with the sliding scale in pricing. However, for both scenarios Capex is still very imbalanced and front-loaded (i.e., higher values in the short- to mid-term).

The balanced, selective BEV phase-in scenarios avoid annual Capex "spikes" and keep within annual budget constraints. Even with this approach, it will take significantly more capital to transition to BEVs based on current prices discussed with Toronto Hydro Fleet Management, with a modelled average annual Capex of **$8.3M/yr**. If price parity is gradually reached by the 2030s, average annual Capex is projected to decrease to **$7.0M/yr**. This value is approaching the projected annual Capex for like-for-like replacements of **$6.2M/yr**, although is based on a 70% GHG reduction achievement by 2037.

Note: Lower BEV prices over time mean that there is potential to achieve greater emissions reductions than what is modelled if ICE units, initially replaced with ICE units, are replaced with BEVs in their next replacement cycle.

In *Figure 3* (below), a breakdown of projected annual Capex based on the aggressive and balanced BEV phase-in approaches are shown as a time series from 2022-2037. Depicting the results graphically demonstrates year-over-year changes as well as differences in Capex variability between the scenarios.

Figure 3: BEV phase-in scenario results from 2022-2037



There are several features of the scenarios that become apparent when viewing *Figure 3*, as described below:

- The sliding scale in BEV pricing applied to FAR Scenarios 3.2 and 4.2 is demonstrated visually through lower annual Capex, starting in the year 2024, compared to FAR 3.1 and 4.1.

- The aggressive BEV phase-in scenarios (FAR 3.1 & 3.2) employ a strategy of deferring more units in the short-term, resulting in a pent-up demand for overdue units which are modelled to be replaced with BEVs. Consequently, there are significant Capex spikes modelled from years 2024-2027.

- The balanced BEV phase-in scenarios (FAR 4.1 & 4.2) employ a strategy that calls for increased capital spending upfront (i.e., in the next few years) for ICE units in greatest need of replacement, in an effort to modernize Toronto Hydro's fleet with like-for-like (i.e., ICE) replacements and allow for balanced, within-budget capital spending on BEVs down the road.

- FAR 5, the balanced *and* fleet-wide BEV phase-in scenario, employed a strategy of extending lifecycles far longer than planned in an effort to pause the purchase of ICE vehicles until BEV replacements are available. In addition to introducing financial risk through unexpected repair

costs and increased likelihood of serious failure, this approach results in at or over-budget spending in many years of the modelling period.

Section 7: Electric Vehicle Supply Equipment Planning

RSI-FC maintains the position that electric vehicle supply equipment (EVSE) should not be treated as a direct corporate vehicle capital expense, but rather as a facilities/properties capital expense. As per the feedback provided by Toronto Hydro Fleet Management, EV chargers are a Fleet expense and charging infrastructure development is the responsibility of Facilities.

With this in mind, we have developed an EVSE planning tool for Toronto Hydro, separate from Fleet Analytics Review™ (FAR), to inform long-term capital planning (LTCP) for the utility's charging infrastructure needs, based on Level 2 charging and battery capacity estimations described in this section. Our team has estimated the costs of electric vehicle chargers (not complete infrastructure) over the modelling period from 2022-2037, based on the current size and mileage of Toronto Hydro's fleet and a balanced, fleet-wide BEV phase-in.

EVSE & Asset Management

RSI-FC maintains that EVSE should be a capital asset paid for, owned, and managed from the budget of the corporate facilities/properties department. Therefore, the capital cost of charging equipment should not be directly posted to the fleet department; this aligns with Toronto Hydro's approach as per discussion with Fleet Management.

EVSE is an asset (an attribute/enhancement) that increases the market value of the facility/property where fleet vehicles are parked. Moreover, EVSE costs should be a capital expense for the facility's corporate "owner" (usually this is a facilities/properties department), not the vehicle's corporate "owner" (which is usually a fleet department). This is different than in the non-corporate world where the battery-electric vehicle (BEV) owner is often the same owner as the property owner, such as is the case for personal cars and homes. The benefit of this concept is that, unlike vehicles that depreciate quickly, facilities assets are generally depreciated over far longer periods – sometimes up to 20, 30 or more years. Long depreciation periods translate to lower annual costs, thereby making a better business case for electric vehicles.

Today, there is a lot of focus on asset management best practices for corporations, including the public sector. It is a contemporary asset management best practice that property-related costs, including capital and operating expenses, should be expense items managed by the responsibility centre that manages the asset, in this case the corporate facilities/properties department. The facilities/properties department can then apportion and transfer these costs to their internal users of each property, such as a fleet department.

In a "full cost recovery" business model as we espouse, the facilities/properties department must recover sufficient revenue to fully offset the costs of owning and managing the property, including the installation, use, and maintenance of EVSE.

Regarding the electricity needed to charge BEVs, we have included the cost of electricity as a "fuel" cost under operating expenses in FAR. However, the same asset management principles can be applied. In an ideal full cost recovery business model, the facilities/properties department would transfer electricity costs to its user departments for the amount used in each period. The EVSE would meter the amount of electricity used by each BEV – just like the amount of gas or diesel used by each internal combustion engine (ICE) vehicles is tracked with fuel pump meters.

EVSE Planning Tool

Capabilities

RSI-FC's EVSE planning tool is user-friendly, including programmable and automated formulas for determining charging requirements on a unit-by-unit basis. The planning tool:

- Lists units based on their stored locations.
- Is based on estimated daily kms-travelled by each unit, derived from kms-travelled during the review period divided by the number of working days in year.
- Is based on each unit having access to one charger every night during off-peak hours (7pm-7am).
- Allows programmable upper and lower estimates of range that can be adjusted up or down for data-modelling purposes, in consideration of heating/cooling in cold- or hot-weather conditions as well as on-board accessory electrical DC loads such as lights, laptops, etc., that may diminish available driving range.
- Calculates the daily charging time required to return to near-full charge for vehicles of all classes by allowing for programmable estimates of BEV battery capacity, charger current, and charger voltage.
- Calculates the nightly electrical demand in kWh and cost, assuming all units will charge each night during off-peak hours.
- Allows programmable acquisition costs for chargers (or chargers plus infrastructure if desired) for each unit.

The tool simplifies charging rate (kms of range added per hour) by estimating it to be constant for all battery charge levels. This is, strictly speaking, not entirely reflective of reality; charging rate slowly diminishes as battery levels approach 100%. However, applying a constant charging rate does provide a very reasonable approximation, especially considering that we have modelled daily charging requirements based on 90% maximum battery charge levels – as a best practice for optimizing battery life.

Charging rate is dependent on the battery capacity of a vehicle and varies significantly with different vehicle types and battery sizes. The tool allows the user to change the battery size on a unit-by-unit basis if needed (i.e., by comparing a make/model of BEV that is equipped with larger/smaller battery size than another make/model), which makes the calculator even more accurate.

Estimations

The inputs chosen in the EVSE tool are based on a number of estimations in terms of charging level and battery capacity for different unit types. These can be easily modified by the user according to the specific charging infrastructure installed as well as actual specifications for BEV replacement units. We have included the following estimations in our EVSE modelling:

- Battery size/capacity estimates were based on class/ vehicle type, including:
  - 60 kWh for cars
  - 80 kWh for SUVS, pickups, passenger minivans, Class 1/2a cargo minivans
  - 100 kWh for Class 2b vans
  - 150 kWh for MDVs (Class 3-6 units)
  - 300 kWh for HDVs (Class 7-8 units)

- Upper range estimates (i.e., *actual* driving distance, not advertised range) were based on class/ vehicle type, including:
  - 320 km for cars
  - 300 km for SUVs, pickups, passenger minivans, Class 1/2a cargo minivans
  - 280 km for Class 2b vans
  - 250 km for MDVs (Class 3-6 units)
  - 250 km for HDVs (Class 7-8 units)

- Lower range estimates were based on a 50% reduction of upper range estimates for all units.

- Charger current and voltage estimates were based on a lower-power Level 2 charger, as well as the amps of current allowed by most BEVs[33]) including:

[33] Source: (https://www.chargepoint.com/en-ca/resources/how-choose-home-ev-charger/#:~:text=Most%20EVs%20can%20take%20in,of%20range%20in%20an%20hour.)

  - Current: 32 amps
  - Voltage: 240 volts

- The charging rate (kms range added per hour) was estimated by dividing driving range by the time for full charge. The time for full charge (i.e., 0 to 100%) was estimated by dividing battery capacity by charging power (calculated from current and voltage) and adding a 10% inefficiency[34] [35].

- Return-to-base battery levels are based on a starting charge of 90%, as a best practice for optimizing battery life.

- The time available for overnight charging was estimated as 12 hours during off-peak hours (7pm-7am).

Flagged Units

Overall, based on our pragmatic analysis, the majority of units (381 out of 385 units) in Toronto Hydro's fleet would be capable of fully recharging during overnight off-peak hours with the use of lower-power Level 2 chargers. In fact, most units would be able to recharge is much less time than units are parked; the average time to recharge to 90% battery level for all 385 units is an estimated 2.7 hours.

Our team flagged any units that, based on low capacity Level 2 charging, would either: (1) risk too low of a return-to-base charge; or (2) require too much time to recharge during off-peak hours. These include:

- One pickup unit (0408V) estimated to finish the work day at less than 20% battery charge (starting from 90%). A potential solution is to purchase battery-electric pickups with larger batteries, and thus higher range capabilities, for relatively higher-mileage pickups like this unit.

- Four Class 8 single bucket units (0757V, 0387V, 0952V, & 0950V) estimated to require more than 12 hours to recharge to 90% battery level. A potential solution is to install higher-power chargers for relatively higher-mileage Class 8 units to increase the charging rate per hour.

Level 3 Charging

Level 3, direct-current (DC) fast chargers, which charge at much higher amperage and voltage than Level 2 chargers, are recommended in the case of time-dependent duties/responsibilities when

[34] Source: https://www.caranddriver.com/shopping-advice/a32600212/ev-charging-time/
[35] Source: https://www.inchcalculator.com/widgets/?calculator=electric_car_charging_time

overnight charging is not an option, as well as for emergency situations such as extreme weather events. Additionally, if a vehicle operator forgets to plug in their vehicle overnight, a Level 3 charger would be required to avoid and/or minimize the loss of productivity during work hours. It is important to note that DC fast charging installation requires a commercial electrician[36] and costs an estimated $50,000 - $200,000 for equipment and installation[37]; therefore, the need for Level 3 charging should be carefully assessed.

Given the fact that 86% of Toronto Hydro fleet vehicles are parked at three Work Centers – Commissioners Work Center, Rexdale Work Center, and Milner Work Center – our general recommendation is for two Level 3 chargers be installed at each of these main locations to as a risk management strategy for time-dependent and/or urgent situations as described above. However, without knowledge of the intricacies and specific use cases for each fleet vehicle, our secondary recommendation is to identify the most appropriate Work Centers for investment in higher-power charging, i.e., ones that consist of vehicles that may not always rely on overnight charging only.

EVSE Charger Costing Outlook

Our team estimated the costs of electric vehicle chargers (not infrastructure) over the modelling period from 2022-2037, based on a balanced, fleet-wide BEV phase-in taking FAR Scenarios 4.1 and 4.2 as the minimum speed of transition. Please see *Table 6* (overleaf) for details and a description of our approach/method and estimations below for Toronto Hydro's fleet.

To determine the number of Level 2 (L2) chargers required to be installed annually over the modelling period for a smooth transition of the entire Toronto Hydro fleet to BEVs, our approach/method and estimations were as follows:

- A fleet should not be keeping up with the demand for EVSE based on the number of new BEVs added; rather, EVSE installation should be *outpacing* demand to allow for a smooth and seamless transition. Therefore, we have estimated the number of L2 chargers required to outpace the influx of new BEVs into the fleet.

- The purchase of chargers ahead of the addition of BEVs also makes use of the delay in purchasing BEV pickups, vans, and medium- and heavy-duty (MHD) vehicles based on availability and procurement timelines – to optimize the use of capital investment in EVSE to ensure ample capacity for charging down the road.

- EVSE is based on the current size of Toronto Hydro's fleet.

[36] Source: https://calevip.org/electric-vehicle-charging-101
[37] Source: https://www.toronto.ca/wp-content/uploads/2020/02/8c46-City-of-Toronto-Electric-Vehicle-Strategy.pdf

- FAR Scenarios 4.1 and 4.2 (balanced, selective phase-in approach) were considered to establish the minimum speed of transition to BEVs; the number of chargers required to be installed for each fiscal year outpace the number of BEVs integrated into Toronto Hydro's fleet according to these scenarios.

- In addition to the previous bullet point, we have considered the number of chargers for a complete, fleet-wide transition to BEVs.

  FAR Scenarios 4.1 and 4.2 model a transition of about 73% of Toronto Hydro's fleet to battery-electric by the year 2033 – 282 battery-electric units, including the 13 Chevrolet Bolts currently in the fleet, out of a total of 385 units. After 2033, the number of BEVs added to the fleet reflects *second replacement cycles for existing BEVs*.

  However, for the purpose of modelling the phase-in of chargers for a fleet-wide adoption of BEVs, we have taken the number of BEVs added to the fleet after 2033 to demonstrate *new BEVs replacing ICE vehicles* – in anticipation of the complete electrification of Toronto Hydro's fleet by the mid- to late-2030s (see tan-coloured rows in *Table 6*).

- We have cautiously estimated the cost of chargers only to be $2500/charger. This cost does not include infrastructure which would vary according to the charger level.

Importantly, existing electrical capacity at sites may require substantial upgrades for charging multiple vehicles, and/or new or upgraded standby generators to provide for emergencies, both of which may significantly add to infrastructure costs (outside the scope of this report). A qualified electrical professional should be consulted to assess the situation and make recommendations.

Based on our EVSE analysis and taking the balanced BEV phase-in approach as a realistic and fiscally responsible strategy, Toronto Hydro's fleet would be 100% BEV-ready by 2034 – based on the current size of the fleet (385 vehicles, see *Table 6*). Given our estimations, this translates to an average annual charger cost (excluding infrastructure) of about $74,000 per year for the next 13 years.

Table 6: Fleet-wide EVSE long-term charger costing outlook

Year # of BEV Phase-in Plan	Year of BEV Phase-in	Location	Number of BEVs added to Fleet (per balanced phase-in plan)	Cumulative Number of BEVs added to Fleet (per balanced phase-in plan)	Number of BEVs Serviced by each Charger	Estimated Number of Chargers Required for Purchase (to outpace BEVs added)	Cumulative Number of Chargers Purchased	Estimated Cost per Charger	Total Annual Cost of Chargers	Cumulative Cost of Chargers
1	2022	All Fleet Parking Sites	1	1	1	30	30	$2,500	$75,000	$75,000
2	2023	All Fleet Parking Sites	9	10	1	30	60	$2,500	$75,000	$150,000
3	2024	All Fleet Parking Sites	41	51	1	30	90	$2,500	$75,000	$225,000
4	2025	All Fleet Parking Sites	12	63	1	30	120	$2,500	$75,000	$300,000
5	2026	All Fleet Parking Sites	20	83	1	30	150	$2,500	$75,000	$375,000
6	2027	All Fleet Parking Sites	22	105	1	30	180	$2,500	$75,000	$450,000
7	2028	All Fleet Parking Sites	48	153	1	30	210	$2,500	$75,000	$525,000
8	2029	All Fleet Parking Sites	38	191	1	30	240	$2,500	$75,000	$600,000
9	2030	All Fleet Parking Sites	16	207	1	30	270	$2,500	$75,000	$675,000
10	2031	All Fleet Parking Sites	37	244	1	30	300	$2,500	$75,000	$750,000
11	2032	All Fleet Parking Sites	27	271	1	30	330	$2,500	$75,000	$825,000
12	2033	All Fleet Parking Sites	8	279	1	30	360	$2,500	$75,000	$900,000
13	2034	All Fleet Parking Sites	13	292	1	25	385	$2,500	$62,500	$962,500
14	2035	All Fleet Parking Sites	17	309	1		385	$2,500	$0	$962,500
15	2036	All Fleet Parking Sites	15	324	1		385	$2,500	$0	$962,500
16	2037	All Fleet Parking Sites	34	358	1		385	$2,500	$0	$962,500

NRCan's Zero Emission Vehicle Infrastructure Program

The Government of Canada is committed to helping accelerate the decarbonization and electrification of our transportation sector, and charging infrastructure is a key component to achieving this. Natural Resources Canada (NRCan) has pledged to invest $130 million from 2019-2024 to further expand the country's charging network, particularly level 2 and higher stations, through its Zero Emission Vehicle Infrastructure Program (ZEVIP).

The funding is being delivered through cost-sharing contribution agreements for eligible projects, including:

- BEV charging infrastructure in parking areas intended for public use (e.g., service stations, restaurants, libraries, etc.);
- On-street charging infrastructure;
- Workplace charging infrastructure;
- On-road light-duty vehicle fleets;
- On-road medium- or heavy-duty vehicle fleets;
- Charging infrastructure for multi-unit residential buildings (MURBs); and
- Public transit charging infrastructure.

RFPs for ZEVIP are currently closed as per the program website[38]; however, we recommend that Toronto Hydro regularly checks for updates and openings to new funding application periods.

NRCan's contribution through this program will be limited to 50% of total project costs up to a maximum of $5M per project. The maximum funding and approximate costs for each type of charging infrastructure is shown in *Table 7* (directly taken from NRCan's website with costs and charging rates from the City of Toronto's Electric Vehicle Strategy Report[39]):

[38] Source: https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-transportation/zero-emission-vehicle-infrastructure-program/21876
[39] Source: https://www.toronto.ca/wp-content/uploads/2020/02/8c46-City-of-Toronto-Electric-Vehicle-Strategy.pdf

Table 7: Specifications for NRCan's Zero Emission Vehicle Infrastructure Program, plus approximate total costs and charging rates

Type of Infrastructure	Output	Maximum NRCan Funding	Total Costs (Equipment + Installation)	Approximate Charge Rate Per Hour (LD vehicles)
AC Level 2 (208/240V) Connectors	3.3 kW - 19.2kW	Up to 50% of total project cost, to a maximum of $5,000 per connector*	$5,000 - $10,000	40 km
DC Fast Charger	20 kW - 49 kW	Up to 50% of total project cost, to a maximum of $15,000 per fast charger	-	-
DC Fast Charger	50 kW and above	Up to 50% of total project cost, to a maximum of $50,000 per fast charger (50 kW-99 kW) and $75,000 per fast charger (100 kW and above)	$50,000 - $200,000	300+km

* To calculate the funding for level 2 chargers, each connector can count as a unit towards the minimum of 20 chargers if each connector can charge a vehicle at the same time.

Section 8: Recommendations & Additional Considerations

In this section, we provide our recommendations for the Electric Vehicle Phase-in Plan, in terms of both (1) capital planning for transitioning the fleet to electric and (2) electric vehicle supply equipment (EVSE) requirements. Moreover, we have included recommendations on collaboration/partnerships and risk/change management for creating a culture of receptiveness to innovation and forward thinking. We have also included considerations on batteries as well as additional fuel-reduction solutions.

Battery-Electric Vehicle Phase-In

(1) Through a lens of an aggressive BEV phase-in, allocate the majority of fleet capital spending on BEVs for appropriate vehicle categories as BEV models become available.

(2) Through a lens of a balanced, selective BEV phase-in and fiscal prudence, prioritize replacement of ICE units with BEVs *that would maximize ROI* – typically ones that have relatively high annual mileage.

(3) For units due for replacement that are still in good condition, conduct a temporary pause on purchasing new internal combustion engine (ICE) vehicles for the short term – 1-2 years for pickups, 2-3 years for medium- and heavy-duty vehicles (MHDVs) – while awaiting battery-electric vehicle (BEV) counterparts to become available and taking into consideration procurement timelines. Extend ICE lifecycle whenever possible.

(4) Employ a strategy that calls for increased capital spending upfront (i.e., in the next few years) for ICE units in greatest need of replacement, in an effort to modernize Toronto Hydro's fleet with like-for-like (i.e., ICE) replacements and allow for balanced, within-budget capital spending on BEVs down the road. Consider applying the decision matrix used by our team to determine which units to replace with ICE units in the short-term.

In the context of BEV transition planning, prioritizing units for immediate ICE replacement that have been kept (well) past their optimized economic lifecycle is a financial risk-reduction strategy. These units have the highest cost of continued ownership, are most likely to have unexpected repair costs, and are most likely to have a serious failure that requires more repair than the remaining values – potentially taking them out of service and dropping their salvage/resale value to (near) zero.

(5) Conduct pilot projects for several BEV types when they become available (e.g., pickups, passenger minivans, etc.) to track range capabilities and cost savings and assess the units' performance for all seasons and varying weather conditions.

(6) Assuming the pilot projects are successful, acquire BEVs in bulk to replace units that would provide the greatest ROI.

(7) Closely monitor the acquisition costs for BEVs and re-evaluate the business case (cost-benefit) for individual units as prices change/ decline.

(8) Consider purchasing plug-in hybrid vehicles (PHEVs) for lower-mileage units which would be able to fulfil daily duties on battery-power only and recharge overnight – essentially functioning like fully-electric vehicles.

Electric Vehicle Supply Equipment

(1) Over the next 10+ years, allocate capital towards chargers (and charging infrastructure, which is outside the scope of this study) required for the transition to BEVs for all vehicle categories.

(2) Based on our analysis of Toronto Hydro's charging requirements, 381 out of 385 units would be capable of fully recharging during overnight off-peak hours with the use of lower-power Level 2 chargers. Therefore, our recommendation is to focus on Level 2 charging for every unit on a nightly basis, and evaluate higher-power charging (Level 3) for higher-mileage units.

(3) Our general recommendation is for two Level 3 chargers be installed at each of the main Work Centers (Commissioners Work Center, Rexdale Work Center, and Milner Work Center) to as a risk management strategy for time-dependent and/or urgent situations. However, without knowledge of the intricacies and specific use cases for each fleet vehicle, our secondary recommendation is to identify the most appropriate Work Centers for investment in higher-power (Level 3) charging, i.e., ones that consist of vehicles that may not always rely on overnight charging only.

(4) Monitor upcoming funding opportunities from NRCan's Zero Emission Vehicle Infrastructure Program (ZEVIP), which may greatly offset the capital costs required to install charging infrastructure (outside the scope of this report).

(5) Assess existing electrical capacity at facilities to determine whether substantial upgrades for charging multiple vehicles are required, as well as standby generator capacities (outside the scope of this report). A qualified electrical professional should be consulted to assess the situation and make recommendations.

(6) Explore supplying power to each site/garage on two separate feeds from the grid to reduce the risk of local failure taking power away from the whole site[40].

[40] Source: https://www.plugincanada.ca/electric-bus-faq/

(7) To mitigate the risk of power grid failure or local failure at a site/garage, ensure backup generators have sufficient capacity to deal with short power outages, and assess the need for higher-capacity generators for longer outages.

(8) Explore solar energy technology options to supply energy for EV charging to reduce GHG emissions that may be produced from the electricity supply used for charging. Our recommendation is to pursue rooftop (as opposed to canopy) solar energy systems, as this provides renewable energy for the entire building/facility as opposed to charging stations only – which more holistically achieves GHG emissions reductions and allows for additional benefits such as vehicle-to-grid (V2G) technology and battery energy storage (see more details in next sub-section).

(9) Provide or expand on current high-voltage safety awareness and/or skills training to include operating and maintaining Toronto Hydro's electric vehicle charging stations, and closely monitor the launch of new electric vehicle fleet technician training programs. A pilot for a new EV Maintenance Training Program for automotive technicians was successfully completed at BCIT and is available to the public[41]. There is also an Electric Vehicle Technology Certificate Program offered by SkillCommons, managed by the California State University and its MERLOT program, which offers free and open learning materials on electric vehicle development, maintenance, alternative/renewable energy, and energy storage[42].

Collaboration/Partnership Approaches

With the transition to BEVs in the early stages and expected to gain significant momentum in the short- to mid-term, we recommend that Toronto Hydro strengthen current partnerships and establish new partnerships – both internal and external – to leverage knowledge and resources and better prepare for the transition by undertaking the following actions:

(1) Engage in internal partnerships within and across departments, such as multi-departmental funding applications for charging infrastructure, or sharing of BEV pilot program results to determine vehicles requirements and specifications (e.g., real-world range, real-world charging needs) ahead of large purchasing decisions involving many units.

(2) Engage in external partnerships (e.g., other utilities in Southern Ontario) for potential collaborations, such as joint specification writing and/or joint tenders and sharing of BEV pilot program results through working groups.

[41] Source: https://commons.bcit.ca/news/2019/12/ev-maintenance-training/
[42] Source: http://support.skillscommons.org/showcases/open-courseware/energy/e-vehicle-tech-cert/

(3) Leverage the knowledge gained on BEV transition (e.g., procurement of vehicles and charging infrastructure) through organizational memberships such as the Clean Air Partnership or the Canadian Utility Fleet Council (CUFC).

Risk/Change Management Approaches

(1) Develop BEV educational and outreach materials for employees and operators summarizing the reasons and benefits of transitioning to BEVs, in terms of the environment (improved air quality and greatly reduced lifecycle GHG emissions), reduced fuel and maintenance expenses (the business case), improved performance (e.g., instant torque, little noise, regenerative breaking), greater reliability due to fewer moving parts than internal combustion engine (ICE) vehicles, and continuously expanding charging infrastructure. This should include dispelling myths about BEVs, such as potential negative and/or false perceptions on battery safety, battery life, battery end-of-life, and vehicle performance – facilitating a cultural shift from fossil-fuelled vehicles to clean, zero-tailpipe emission BEVs.

(2) Invite frontline employees to take BEV test drives to familiarize them with fully-electric vehicles and charging, as well as to give them first-hand experience of improved performance (e.g., instant torque, little noise, regenerative braking).

(3) Provide operators with a BEV orientation before releasing new models into the fleet to enable them to become familiar with the different driving experience (e.g., instant torque, little noise, regenerative braking), as well as to alleviate/eliminate any apprehension or uncertainties such as range anxiety.

(4) As is recommended for the phasing in of BEVs, we recommend pilot projects for several BEV types as they become available (e.g., pickups, passenger minivans, etc.) to track range capabilities and cost savings and assess the units' performance for all seasons and varying weather conditions.

Additional Considerations

Battery Replacement, Energy Storage, and Battery Disposal

Global lithium-ion battery demand has risen dramatically over the last ten years, and this is expected to only be the "tip of the iceberg" as we are only at the beginning of the electric vehicle revolution.

Most, if not all, battery-electric vehicle (BEV) manufacturers have an eight-year or 100,000 mile (160,000 km) warranty on their batteries – whichever one (i.e., vehicle age or distance travelled) comes first[43]. However, the current prediction is that a BEV battery will last from 10-20 years,

[43] Source: https://www.myev.com/research/ev-101/how-long-should-an-electric-cars-battery-last

depending on usage, before it needs to be replaced[44]. Consumer Reports estimates that the average BEV battery pack's lifespan is around 200,000 miles (320,000 km), which is nearly 17 years of use if driven 12,000 miles (19,200 km) per year. As a comparison, the average annual mileage for all Toronto Hydro fleet vehicles is under 5,000 km. Therefore, in most cases, BEVs will reach their end-of-life before there is a need for battery replacement.

When battery capacity falls below 80%, drivers may start to see a decline in range[45] – which would most likely occur at or after the typical vehicle replacement age because battery degradation is a very gradual process[46]. Once the BEV battery capacity becomes undesirable for powering a vehicle, it can be used to power a building by contributing to a battery storage system, which stores energy from a battery that can be used at a later time[47]. For example, if a building is powered by renewable energy such as wind or solar, an "old" BEV battery can be used to store energy produced while the wind is blowing or the sun is shining, and then release the stored energy during low-wind periods or at night. This method of generating electricity has multiple benefits, including:

- An effective way of continuing the life of an old BEV battery;
- Reducing energy used from the grid, thereby reducing energy costs; and
- Increasing energy security when using renewables, which have variable energy outputs, by releasing stored energy during off-peak times.

When batteries reach the end of their working life, they can be recycled, which typically involves separating out valuable materials such as cobalt and lithium salts, stainless steel, copper, aluminium, and plastic. Currently, about half of the materials in a BEV battery pack are recycled, but with BEVs expected to undergo an explosion in popularity over the next decade or so, car manufacturers are looking to improve this[48]. Moreover, battery recycling companies have emerged with the growing need for electric vehicle battery recycling, as well as due to the shortage of domestic critical raw materials including lithium, cobalt, and nickel[49].

End-of-lifecycle lithium-ion batteries are first brought to facilities, known as "spokes," which physically separate materials (e.g., shredded metals, mixed plastics, etc.) – much like municipal material recycling facilities (MRFs). These separated materials are then brought to centralized locations, known as "hubs," where battery-grade end products, i.e., the original raw materials (metals) are produced. In May 2020, the lithium-ion battery recycling company Li-Cycle opened a

[44] Source: https://www.edfenergy.com/electric-cars/batteries
[45] Source: https://www.edfenergy.com/electric-cars/batteries
[46] Source: https://www.myev.com/research/ev-101/how-long-should-an-electric-cars-battery-last
[47] Source: https://www.edfenergy.com/electric-cars/batteries
[48] Source: https://www.edfenergy.com/electric-cars/batteries
[49] Source: Li-Cycle Corporate Presentation, July 21 [non-confidential]

"spoke" facility in Kingston, Ontario with a capacity to process 5,000 tonnes of lithium-ion batteries per year. [50]

Utilities like Toronto Hydro will have the option of packaging and coordinating the shipment of end-of-lifecycle electric vehicle batteries to battery recycling companies, with preliminary cost estimates of 1-2 CAD per kilogram – depending on the size of the battery pack and the cathode materials.

Hybrid-Electric Vehicles

As discussed with Toronto Hydro Fleet Management, there are plans for increasing the number of hybrid units into the fleet with hybrid SUVs, pickups, and vans. Purchasing hybrid vehicles is an effective interim solution considering there is (1) currently limited and/or no BEV availability in the market for these vehicle types and (2) expected long procurement timelines for upcoming BEV models.

Hybrid Electric Vehicles (HEVs) use two or more distinct types of power, such as an internal combustion engine (ICE) and a battery-powered electric motor as the modes of propulsion, albeit with very limited range when in electric mode. When an HEV accelerates using the ICE, a built-in generator creates power which is stored in the battery and used to run the electric motor at other times. This reduces the overall workload of the ICE, significantly reducing fuel consumption and extending range. Examples of HEVs include the Toyota Prius and Ford Fusion Hybrid. [51]

Plug-In Hybrid Electric Vehicles (PHEVs) use rechargeable batteries, or another energy storage device, that can be recharged by plugging into an external source of electric power. PHEVs can travel considerable distances in electric-only mode, typically more than 25 km and up to 80 km for some models, due to their much higher battery capacity than HEVs. When the battery power is low (usually ~80% depleted), the gasoline ICE turns on and the vehicle functions as a conventional hybrid. Such vehicles typically have the same range as their gasoline counterparts. Examples of PHEVs include the Chevrolet Volt and Toyota Prius Prime.[52]

Given that Toronto Hydro is a very low-mileage fleet, it is conceivable that many PHEVs would be able to fulfil daily duties on battery-power only and recharge overnight – essentially functioning like fully-electric vehicles.

Feasibility Considerations

- Given the combination of an internal combustion engine (ICE) and a battery-powered electric motor in HEVs, there is little or no preparation required ahead of acquiring these vehicles,

[50] Source: Li-Cycle Corporate Presentation, July 21 [non-confidential]
[51] Source: https://www.autotrader.ca/newsfeatures/20180410/types-of-electric-vehicles-explained/
[52] Source: https://www.autotrader.ca/newsfeatures/20180410/types-of-electric-vehicles-explained/

making these attractive purchasing options while BEV supply and charging infrastructure catch up to demand.

- PHEVs may be plugged into a level one or two charger (120 V outlet or 240 V outlet, respectively), with the later achieving a much faster charging speed. However, if a charger is not readily available, the ICE will allow the vehicles to act as regular hybrids, eliminating any range anxiety.

Best Management Practices

Toronto Hydro may want to implement and/or improve its best management practices (BMPs) while transitioning its fleet to battery-electric – as interim solutions to reducing fuel usage and costs as well as GHG emissions. Summaries of the BMPs we are recommending as additional considerations are summarized below. For a complete description of all BMPs researched by RSI-FC, please see *Appendix D*.

Light-Weighting

Lighter vehicles consume less fuel, produce less emissions, and can carry larger payload. However, light-weighting may overstress some vehicles, increasing maintenance demand and lifecycle cost; therefore, fleet must exercise caution before choosing which vehicles to proceed with a light-weighting enhancement.

Low-Rolling Resistance Tires

Rolling resistance is the energy lost from drag and friction of a tire rolling over a surface[53]. The phenomenon is complex, and nearly all operating conditions can affect the final outcome. For heavy trucks, an estimated 15-30% of fuel consumption is used to overcome rolling resistance.

A 5% reduction in rolling resistance would improve fuel economy by approximately 1.5% for light and heavy-duty vehicles. Installing low-rolling resistance (LRR) tires and/or auto-inflation systems can help fleets reduce fuel costs. It important to ensure proper tire inflation in conjunction with using LRR tires.

Tires and fuel economy represent a significant cost in a fleet's portfolio. In Class 8 trucks, approximately one-third of fuel efficiency comes from the rolling resistance of the tire. The opportunity for fuel savings from LRR tires in these and other vehicle applications is substantial.

According to a North American Council for Freight Efficiency (NACFE) report, the use of LRR tires, in either a dual or a wide-base configuration, is a good investment for managing fuel economy.

[53] Source: https://afdc.energy.gov/conserve/fuel_economy_tires_light.html

Generally, the fuel savings pay for the additional cost of the LRR tires. In addition, advancements in tire tread life and traction will reduce the frequency of LRR tire replacement.

Anti-Idling Policy and Technologies

Idling in a utility fleet is unavoidable for reasons including cab climate control for workers as well as for vehicles equipped with power takeoff (PTO) driven ancillary equipment, such as aerial devices, digger-derricks and cranes. That said, *avoidable and unnecessary* idling is not acceptable.

An idling-reduction policy is a way to motivate fleet drivers to limit unnecessary idling. However, for an idling-reduction policy to be successful continuous enforcement such as spot-checks and fuel use tracking must be present. An idling-reduction policy could be used as an overarching commitment to idling reduction that is carried out though driver training and motivation sessions, rather than an initiative on its own.

There are several idling-reduction technologies available that can aid in idle reduction, including auxiliary power units (APU), stop/start devices, auxiliary cab heaters, battery backup systems, and block heaters/ engine preheaters. Their functionality, potential, and costs vary considerably and are described in *Appendix D* (FAR models a cost of $5,000 for all vehicle categories). To reap the most benefits of any idling-reduction technology, installation should always be accompanied by behavioural solutions of driver training and motivation.

Driver Eco-Training

Driver training to modify driver behaviours and ongoing motivation to continue good behaviours are crucial components of successful idling-reduction programs. While most drivers understand the vehicle idling issue, many continue their inefficient practice of excessive idling due to lack of knowledge and/or motivation.

Driver training can be used to optimize the use of idle reduction technologies. The technologies can reduce idling but the drivers have the ability to override the technologies. Proper training can aid in utilizing the technologies to their full potential.

Further, driver training can promote good practices while on the road including progressive shifting, anticipating traffic flow, and coasting where possible.

Route Planning/Optimization and Trip Reduction

In addition to enhanced vehicles specifications and improved driver behaviours, fuel consumption and exhaust emissions can be further reduced through route planning/optimization and trip reduction.

Route planning software can be used optimize multi-stop trips. It can also be used for idling reduction initiatives by integrating GPS tracking software to monitor driver activity in real-time. Moreover, reporting and analytics features within route planning software can help with identifying when a fleet vehicle requires maintenance to ensure optimal fuel efficiency and thus minimize cost and emissions.[54]

Google™ Maps recently announced their mapping/guidance systems will soon feature and advise drivers of the lowest GHG-emission routes to their destinations. By embracing this technology where possible/practical in Toronto Hydro's fleet, and perhaps combining its use with a corporate policy or directive for employees to minimize their trips where possible, emissions (and costs) could be minimized.

[54] Source: https://blog.route4me.com/2020/05/carbon-emissions-reduction-route-optimization-helps-cut-tons-carbon-emissions/

Section 9: Overview and Discussion

In Toronto Hydro's Electric Vehicle Phase-in Plan, we presented:

(1) Findings of RSI-FC's Electric Vehicle Survey to gauge the current view and opinions of employees on battery-electric vehicles and charging requirements;

(2) Key results of the 2020-21 fleet and GHG emissions baseline for current fleet assets;

(3) Modelling results for various fleet electrification pathways over a 15-year budget cycle including their impacts on Operating expenses, Capital expenses, and GHG emission reductions relative to the baseline;

(4) Modelling results for electric vehicle supply equipment (EVSE) requirements on a unit-by-unit basis and an estimation of charger costs over a 15-year budget cycle; and

(5) Recommendations for a balanced, structured BEV phase-in as well as charging infrastructure planning.

Capex Benchmarking

Based on optimized economic lifecycles, it was estimated that, in 2022, $15.3 million would be required to replace all due or past-due units with new like-for-like vehicles (no BEVs at this stage). It should be noted that numerous vehicles in the Toronto Hydro fleet are beyond the current planned age for replacement – *significant "catch-up" is required to modernize the fleet.*

Starting with optimized economic lifecycles and then selectively and strategically making deferrals over the 15-year budget cycle to maximize Opex benefits, or return-on-investment (ROI) resulted in a much more balanced Capex over the 15-years. The net result was an average annual capital budget of $6.2 million with annual amounts ranging from $5.3-7.9 million with clustering around $6-6.5 million, as compared to the much wider and more fluctuating range over the budget period for optimized economic lifecycles only.

This step was intended to provide a benchmark for a balanced long-term capital budget if like-for-like replacements were to be made – and as a comparison for long-term capital planning for BEV phase-in.

Synopsis of Electric Vehicle Phase-in Plan

Starting from the baseline, we modelled a number of fleet electrification scenarios ranging from aggressive and over-budget to balanced and within budget – to demonstrate a spectrum of

pathways. Although BEV phase-in is the most effective long-term GHG reduction strategy for a fleet, the reality is that there are currently higher upfront costs associated with the transition; therefore, it must be done in a fiscally responsible manner.

Based on our modelling, lower-mileage units at Toronto Hydro are unlikely to deliver ROI if replaced with a BEV at this time. Fuel cost savings, for many units, are not great enough to offset the increased cost of capital due to relatively low mileage. Of course, the higher the kilometres travelled, the stronger the business case for BEVs becomes. There is a strong likelihood that the acquisition cost of BEVs will decline with time as both supply increases and battery technology continues to improve, and we have modelled this for Toronto Hydro's consideration.

BEV Phase-in Approaches and Scenario Results

The aggressive BEV phase-in approach employs a strategy of deferring more units in the short-term, resulting in a pent-up demand for overdue units which are modelled to be replaced with BEVs. Consequently, there are significant Capex spikes in the short- to medium-term.

To provide a balanced and viable BEV phase-in plan, our team strategically modelled the replacement of overdue lower-mileage units with internal combustion engine (ICE) vehicles in an effort to still achieve significant GHG emissions reductions while keeping within budget constraints. Moreover, we modelled replacement of overdue units that showed high usage and/or relatively high repair costs with ICEs as a financial risk-reduction strategy.

The balanced BEV phase-in approach employs a strategy that calls for increased capital spending upfront (i.e., in the next few years) for ICE units in greatest need of replacement, in an effort to modernize Toronto Hydro's fleet with like-for-like (i.e., ICE) replacements and allow for balanced, within-budget capital spending on BEVs down the road.

The aggressive fleet electrification scenarios have the potential to reduce Toronto Hydro's fleet tailpipe GHG emissions by **100% by 2034** – before the end of the modelling period. The more cautious and fiscally prudent scenarios have the potential to reduce Toronto Hydro's fleet tailpipe GHG emissions by just over **70% by 2037** – with the potential to achieve even greater results should more ICE units be replaced with BEVs towards the end of the modelling period, depending on pricing outcomes for BEVs compared to ICEs.

For the aggressive, fleet-wide BEV phase-in scenarios, average annual Capex is projected to be **$10.7M/yr** with cautious pricing (i.e., constant BEV/ICE ratios) and decrease to **$7.6M/yr** with the sliding scale in pricing. However, for both scenarios Capex is very imbalanced and front-loaded (i.e., higher values in the short- to mid-term).

The balanced, selective BEV phase-in scenarios avoid annual Capex "spikes" and keep within annual budget constraints. Even with this approach, it will take significantly more capital to transition to BEVs based on current prices discussed with Toronto Hydro Fleet Management, with a modelled average annual Capex of **$8.3M/yr**. If price parity is gradually reached by the 2030s, average annual Capex is projected to decrease to **$7.0M/yr**.

For units due for replacement that are still in good condition, we are recommending a temporary pause on purchasing new internal combustion engine (ICE) vehicles for the short term – 1-2 years for pickups, 2-3 years for medium- and heavy-duty vehicles (MHDVs) – while awaiting battery-electric vehicle (BEV) counterparts to become available and taking into consideration procurement timelines.

Our position is that fleets should re-consider buying new fossil-fuelled units, when possible, because ICE vehicles will quickly become an outdated and archaic technology, and there will soon be BEV replacement options. The purchase of new ICE vehicles now, whether gasoline or diesel, means that a fleet, like Toronto Hydro's fleet, will commit to using new fossil-fuelled vehicles for approximately the next decade when zero tailpipe emissions BEVs are just around the corner.

A phased-in approach is recommended for Toronto Hydro to transition to a BEV fleet for fiscal responsibility reasons, in addition to this being the only option for fleets over the next few years. Utility replacement cycles are long-term – up to 10 or 12 years – or more for some vehicles. Therefore, a BEV phase-in plan over the long term is needed for a balanced approach to capital spending.

EVSE Planning

Over the next 10+ years, we recommend allocating capital towards chargers (and charging infrastructure, which is outside the scope of this study) required for the transition to BEVs for all vehicle categories.

Based on our analysis of Toronto Hydro's charging requirements, 381 out of 385 units would be capable of fully recharging during overnight off-peak hours with the use of lower-power Level 2 chargers. Therefore, our recommendation is to focus on Level 2 charging for every unit on a nightly basis, and evaluate higher-power (Level 3) charging for higher-mileage units.

It is also critical to assess existing electrical capacity at facilities to determine whether substantial upgrades for charging multiple vehicles are required (outside the scope of this report). A qualified electrical professional should be consulted to assess the situation and make recommendations.

High-Impact BEV Options

The “workhorses” of utility fleets like Toronto Hydro are light-duty pickup trucks and vans. For Toronto Hydro’s fleet, pickups and Class 1 and 2 vans comprise about 42% of the vehicles based on the data provided (84 pickups and 78 light-duty vans out of a total of 385 vehicles). At this time, there are no BEV pickups or vans available for purchase. However, several manufacturers, including General Motors and Ford, are preparing for BEV pickups and vans to enter the market in 2022. Therefore, BEV options in the light-duty pickup and van categories have the potential to make a relatively early and significant impact on the utility’s fleet operating cost savings and GHG emissions reduction – ahead of the introduction of medium- and heavy-duty battery-electric trucks.

Appendix A: Electric Vehicle Survey Results

Views on Battery-Electric Vehicles

Figure 4: Views on range capabilities – management group

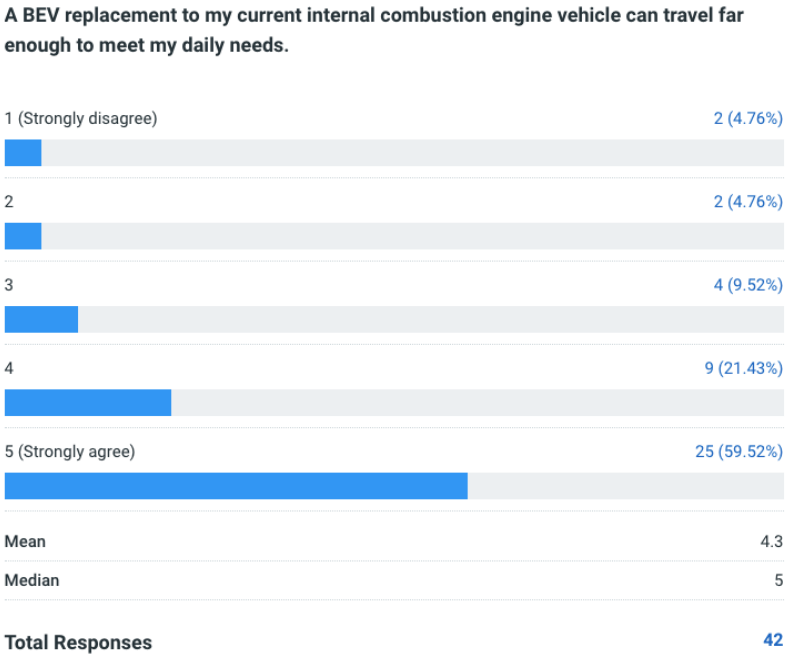


Figure 5: Views on range capabilities – driver/operator group

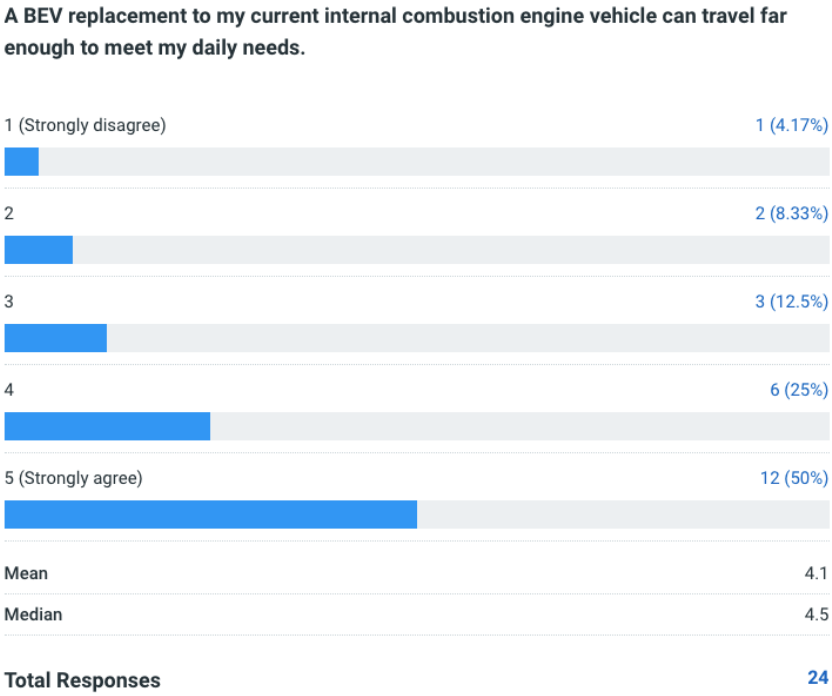


Figure 6: Views on air conditioning – management group

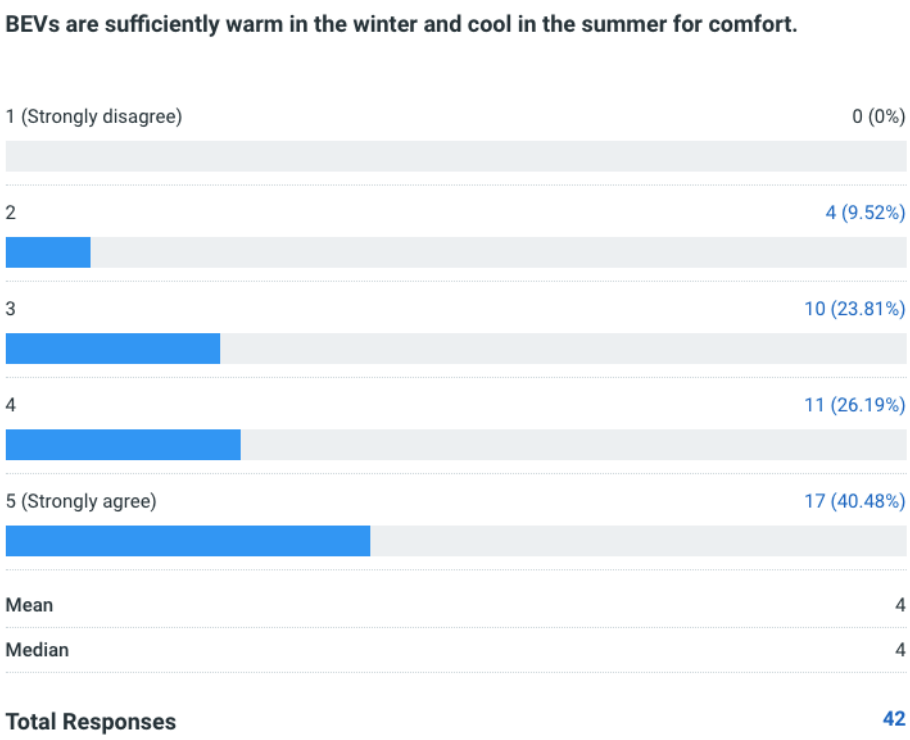


Figure 7: Views on air conditioning – driver/operator group

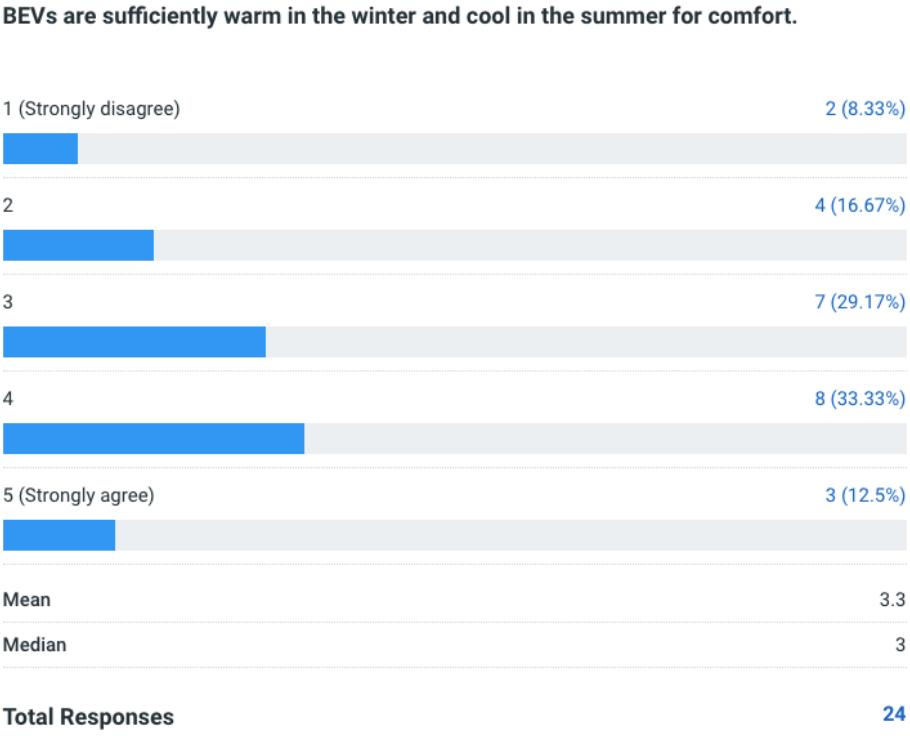


Figure 8: Views on safety – management group

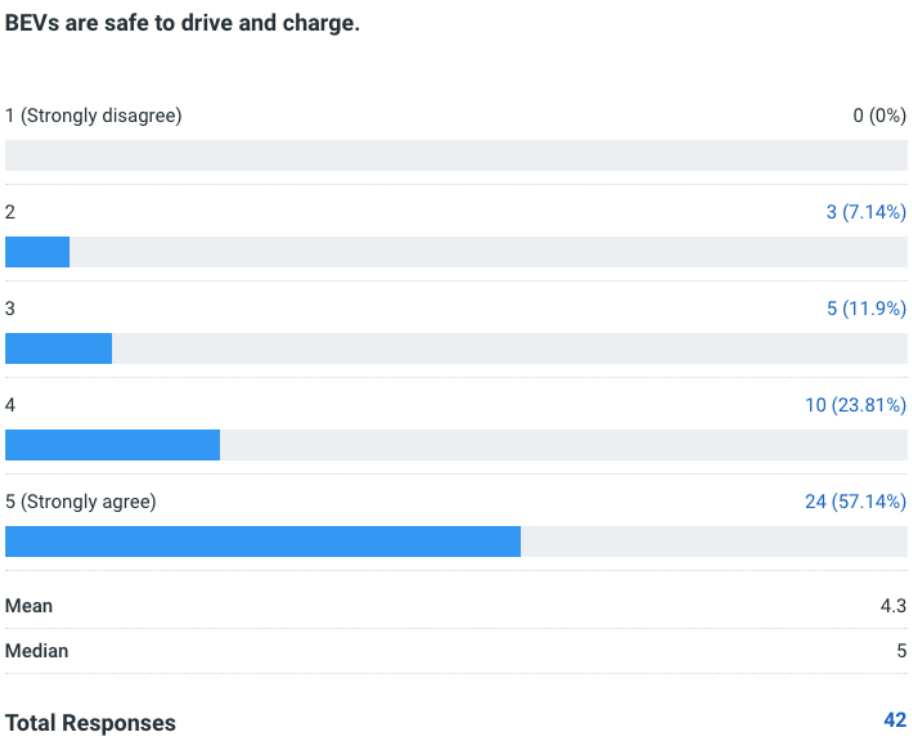


Figure 9: Views on safety – driver/operator group

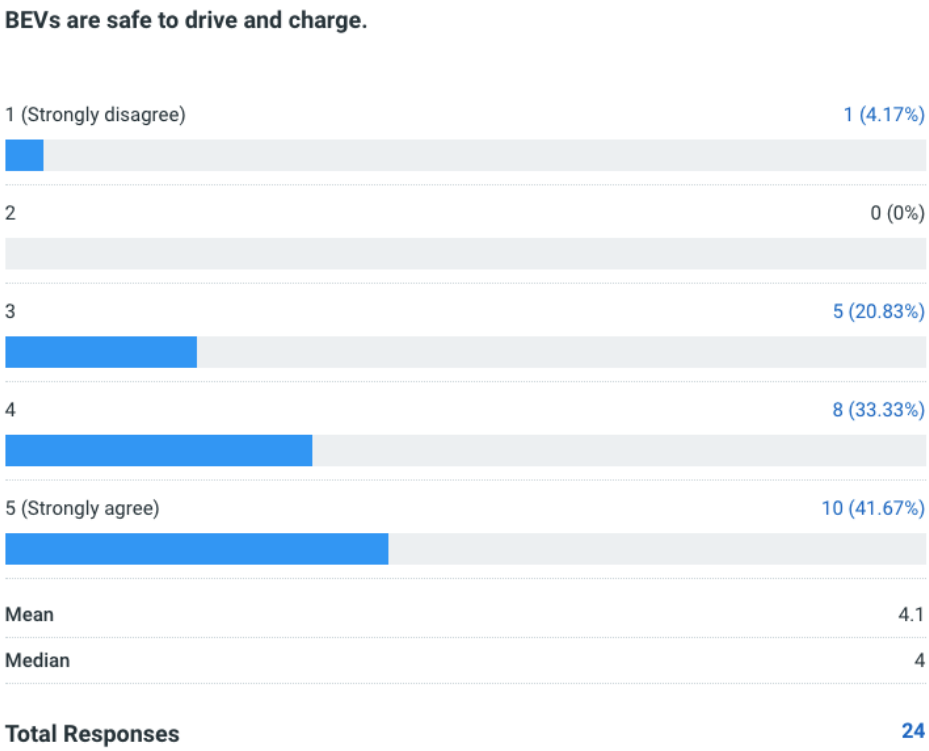


Figure 10: Views on costs – management group

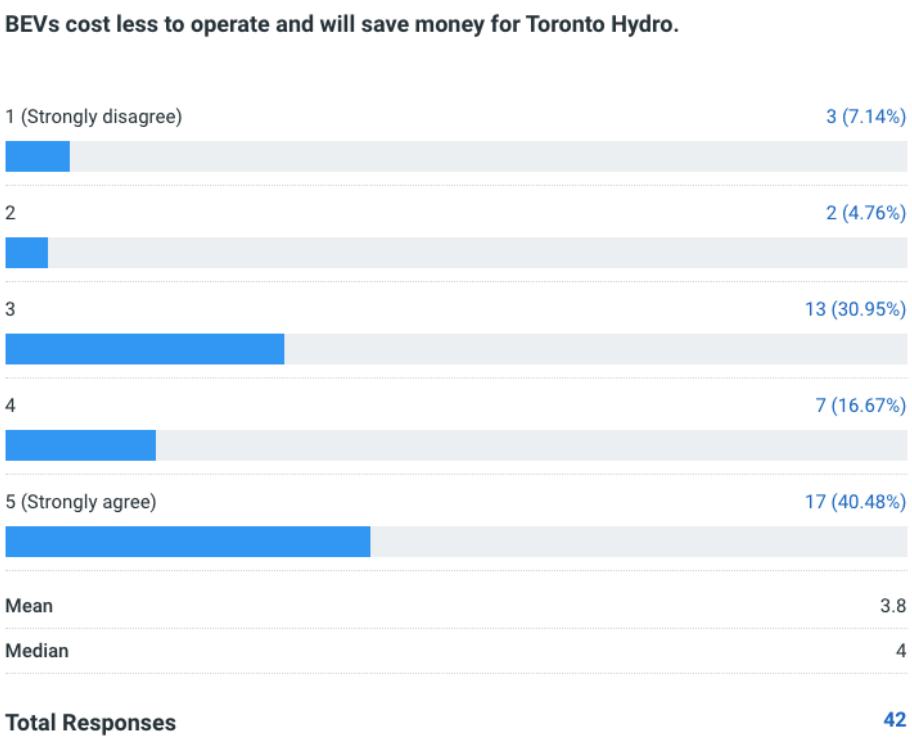
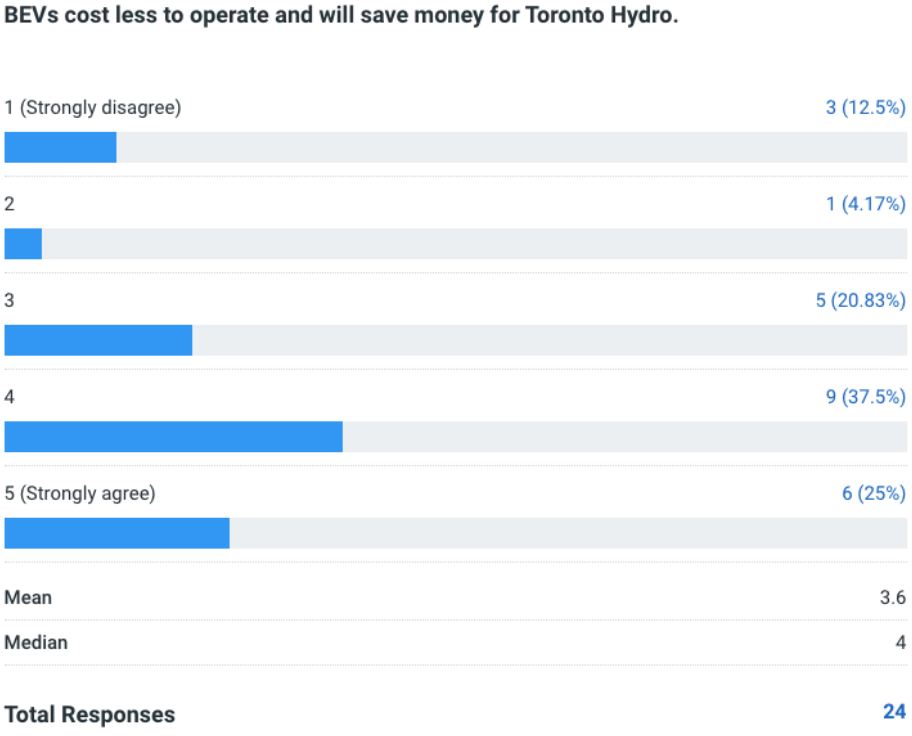


Figure 11: Views on costs – driver/operator group



Views on Charging Requirements

Figure 12: Views on Level 2 charging – management group

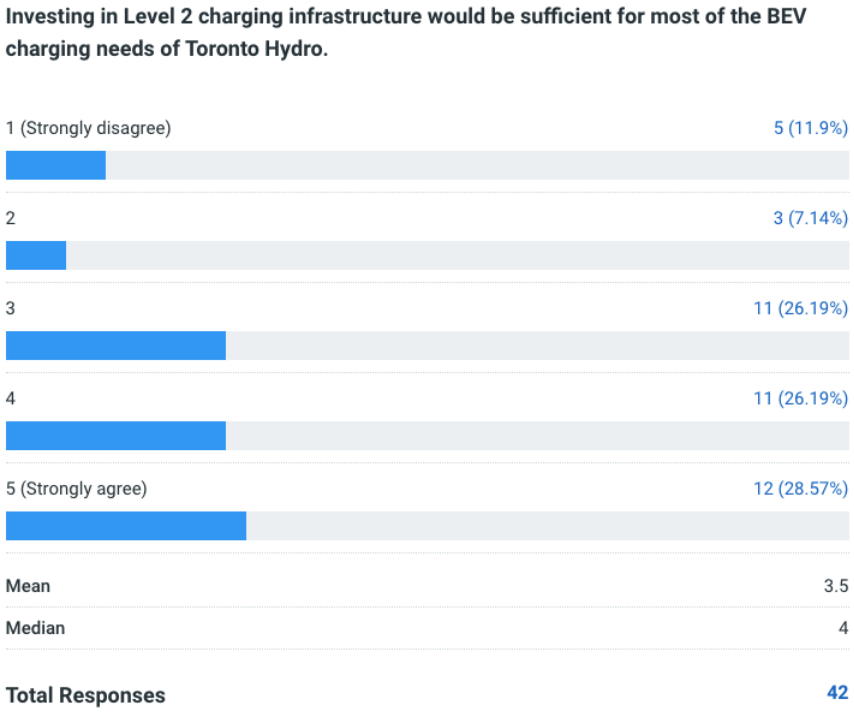


Figure 13: Views on Level 2 charging - driver/operator group

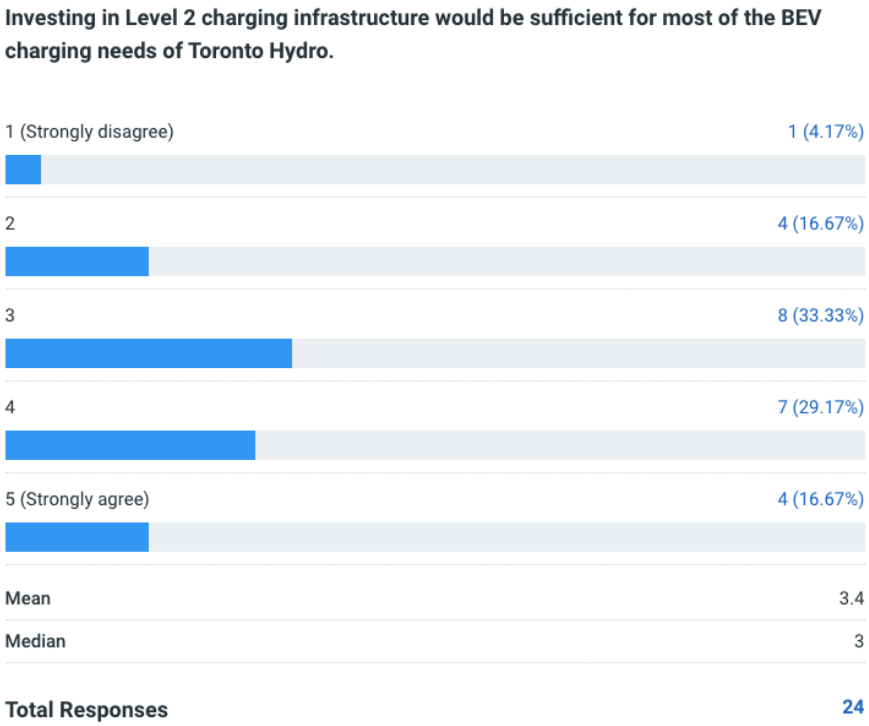


Figure 14: Views on Level 3 charging – management group

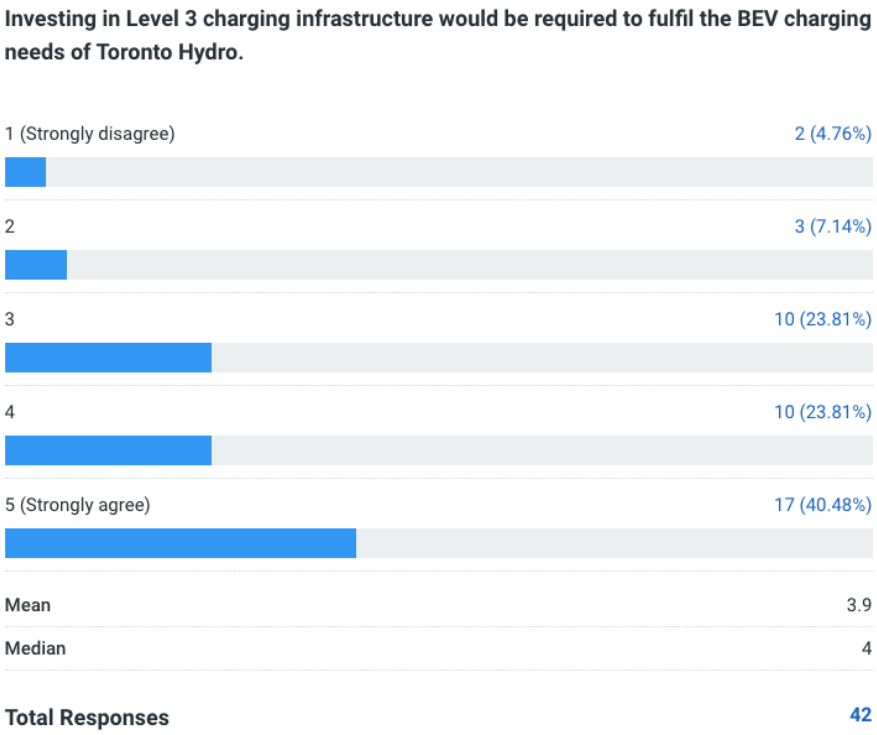
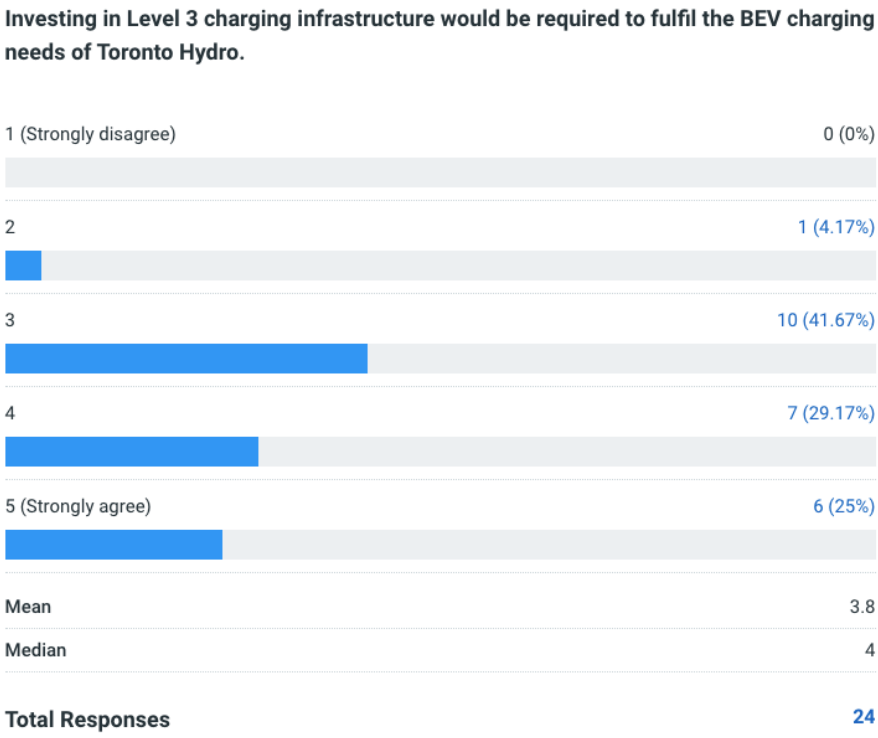


Figure 15: Views on Level 3 charging – driver/operator group



Views on Change Management

Figure 16: Views on test drives – management group

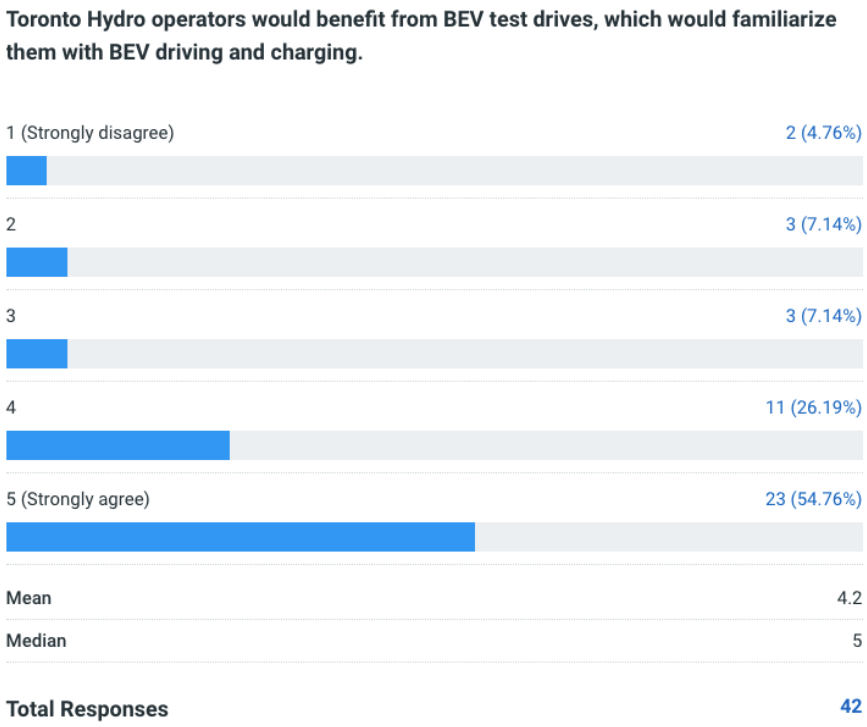


Figure 17: Views on test drives – driver/operator group

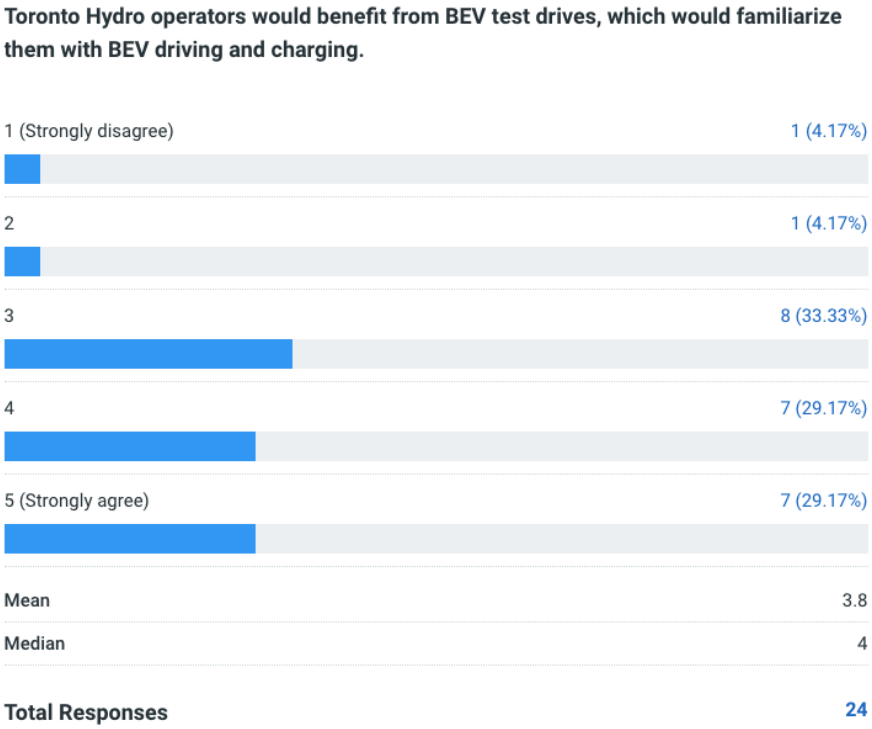


Figure 18: Views on orientation – management group

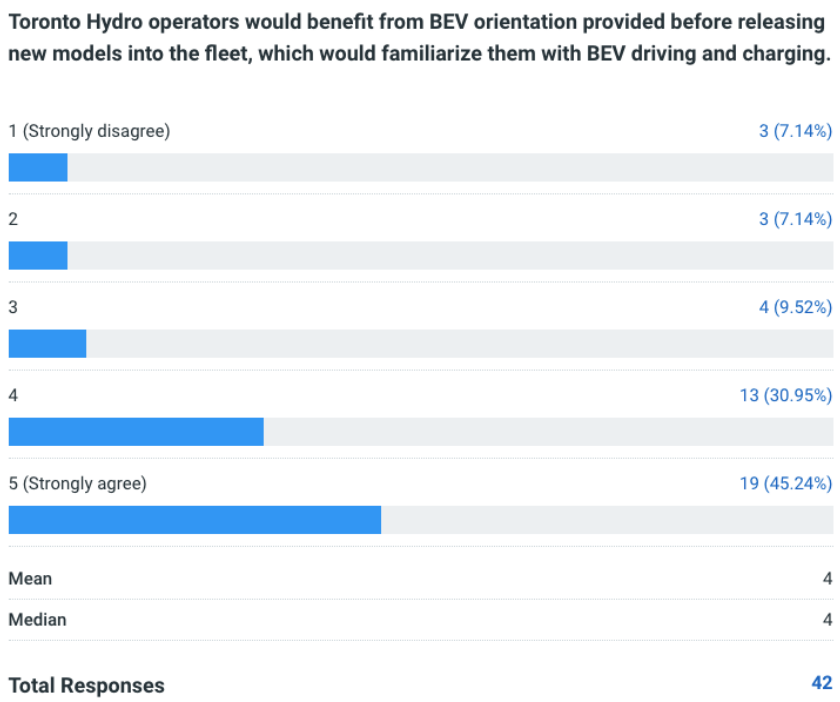
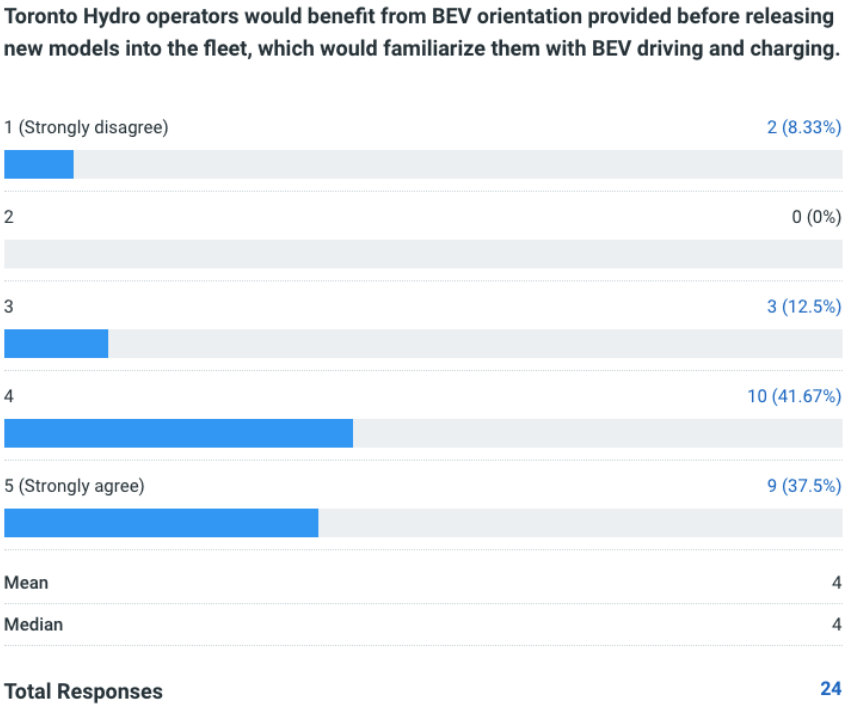


Figure 19: Views on orientation – driver/operator group



Appendix B: Fleet Analytics Review™

Fleet Analytics Review™ (FAR) is a user-friendly, interactive decision support tool designed to aid our team and fleet managers in developing short- to long-term green fleet plans by calculating the impacts of vehicle replacement and fuel-reduction solutions on operating costs, cost of capital, and GHG emissions. Moreover, it is used for long-term capital planning (LTCP) through an approach that works to balance, or smoothen, annual capital budgets and avoid cost spikes if possible.

FAR is a complex, sophisticated MS Excel software developed by the RSI-FC team in 2016. Since its inception, FAR has been used by our team as the foundational analysis platform for our work in helping fleets with green fleet planning and the transition to low-carbon fuels/technologies.

Clients to date for which reports were completed using FAR include:

- Municipality of Strathroy-Caradoc (2021)
- City of Brampton (2021)
- City of Hamilton (2021)
- City of Kawartha Lakes (2020)
- Durham Region (2020)
- Town of Gander (2020)
- Town of Whitby (2020)
- Town of Aurora (2019)
- NW Natural Gas Distribution, Portland, OR, USA (2018)
- The County of Middlesex Centre (2017)
- The Region of Peel (2017)
- The Town of Enfield, CT, USA (2017)
- Toronto Hydro-Electric System Limited (2017)
- Winnipeg Airport Authority (2017)
- Greater Toronto Airport Authority (2016)
- Oxford County (2016)
- The City of Vaughan (2016 - 2018)

Purpose

The core functionality of the FAR software is to calculate the financial and GHG reduction impacts of vehicle replacements, operational improvements, and low-carbon fuels/technologies for a fleet.

In the context of assessing fleet modernization, FAR is especially useful in calculating the operating expense (Opex) impacts of vehicles being retained in the fleet beyond their viable age and with diminishing salvage values. Aged, older-technology vehicles consume more fuel, produce more

GHGs, usually cost more to operate, are less reliable, and may also present a safety risk. FAR automatically calculates and quantifies these impacts in a defensible business case format.

For fuel-reduction solutions under consideration by fleet management as a means of saving fuel costs and avoiding GHGs, including best management practices (BMPs), alternate or renewable fuels (natural gas, propane, biodiesel, etc.), and EVs (battery-electric, plug-in hybrid, or hybrid), FAR calculates the cost-benefit of the investment in vehicle upgrades, vehicle conversion costs, fuelling infrastructure, or EV charging infrastructure, i.e., whether these solutions would yield a net operating cost reduction, unit-by-unit and fleet-wide.

Approach

The FAR software tool employs a holistic approach – all relevant factors and controllable expenses are considered in its analysis. The data points in our approach include energy equivalency factors of each alternative fuel type (compared to a fossil diesel fuel baseline), vehicle upgrade costs, alternately-fuelled vehicle acquisition (or vehicle retrofit) capital costs, vehicle maintenance considerations (higher or lower maintenance demand), fuel system/charging infrastructure capital costs, and any additional expenses for storage, handling & dispensing the fuel(s). All of these factors are modelled within the context of planned vehicle lifecycles – a total cost of ownership (TCO) approach.

The FAR process uses historical cost metrics and vehicle operating data (i.e., miles/km-driven, fuel usage, repair and maintenance costs, unit age, cost of capital, downtime, residual value, etc.) to establish not only the fleet's fuel usage and GHG emissions baseline, but also financial and service levels (i.e., utilization, availability/uptime) performance.

FAR highlights "exception" units, vehicles that are performing in a sub-standard way in terms of cost and performance, thus potentially enabling management to identify the reason(s) and take appropriate action(s).

Go-Forward Fuel-Reduction Solutions

With the FAR baseline established, the software is used to analyze go-forward fuel-reduction solutions. FAR takes into consideration the Opex implications and determines whether Opex reductions will offset any capital expenses (Capex) including vehicle upgrades, vehicle conversions, "up-charges" for premium vehicles (e.g., EVs), and investment in infrastructure.

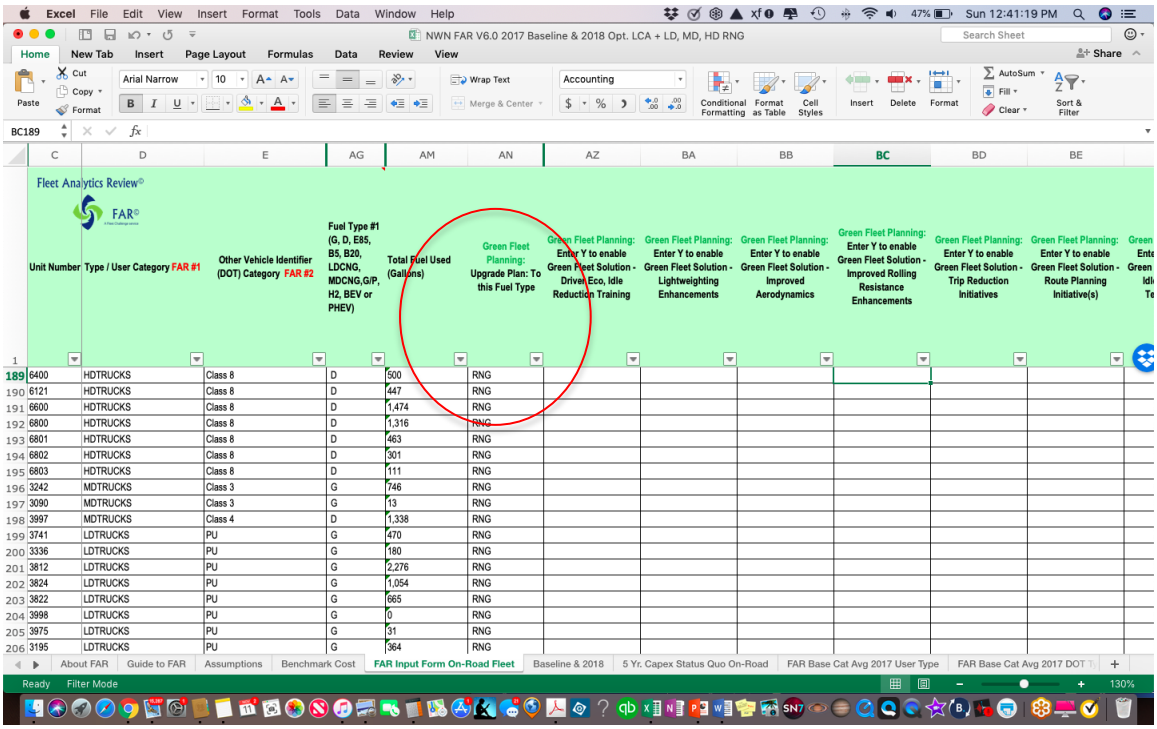
The FAR analysis includes, but is not limited to:

- The fuel usage and cost differential (+ or -) for the fuel type selected vs the current type (if applicable)
- The energy-efficiency difference
- The unit cost of upgrade for the fuel-saving technology
- The unit cost of conversion to the selected fuel type
- The cost of fueling infrastructure for the selected fuel type apportioned evenly to the chosen vehicles for the fuel-switch
- The cost of charging infrastructure for EVs apportioned evenly to the chosen vehicles to be replaced
- The cost of capital for vehicle replacement for the selected fuel type

FAR then calculates whether a cost-savings or return-on-investment (ROI) would result within the remaining lifecycle for each of the vehicles selected for the vehicle upgrade or fuel switch.

Figure 20 shows a sample screen capture from FAR demonstrating the FAR fuel-switching capabilities. In this example, the user is switching several light-, medium-, and heavy-duty trucks from their current fuel source to renewable natural gas (RNG), and this is accomplished simply by selecting the vehicle(s) to be evaluated and then choosing (in this example) RNG from a drop-down list.

Figure 20: Sample Screen Capture of FAR Showing Fuel-Switching Options



FAR is user-friendly and intuitive; it is based on standard off-the-shelf MS Excel. It is dynamic, and users can run future scenarios (such as assessing different vehicle types, fuels, or engine/drivetrain combinations) to see how such decisions impact Opex ahead of their implementation, thereby mitigating risk and heading off potentially costly errors.

Recent Enhancements and Upgrades to FAR™

FAR V30.5 (beta) features upgrades and enhancements to the functionalities of the FAR tool. These include:

Fuel-Efficient Green Fleet Planning Tools – Fuel Switching. FAR now includes several powerful "Green Fleet Planning" tools. One of these tools is used to estimate the financial and GHG impacts of switching vehicle fuels from fossil-based (gas or diesel) to alternate or renewable fuels or BEVs.

In the Input Form, FAR analysts may make choices as to fuel-switching (for example, changing all gas or diesel-powered vehicles in specific categories to E85, B5-B100 biodiesel, hybrid, plug-in hybrid, battery-electric, CNG, or even hydrogen fuel cells). FAR calculates the net cost and GHG reduction of the fuel-switch being considered, taking into consideration not just the fuel/electricity costs, but the change in fuel efficiency, as well infrastructure costs such as installing a CNG fueling station, electric vehicle chargers, etc.

Enhanced Vehicle Replacement Cost-Benefit Analysis. Comparisons and analysis regarding either (a) aging a vehicle (or vehicles) that are now due for replacement for another year or (b) going ahead and replacing the vehicle(s) is now based on the actual average historical peer fleet cost data from our proprietary municipal fleet database.

In FAR, when a vehicle is due for replacement, it calculates the annual cost for a new replacement vehicle (including the capital, fuel, repairs, PM, and downtime) and then compares that amount to the actual average cost for a similar vehicle —that is one-year older (from our peer fleet database). FAR now displays the cost-benefit of replacing each unit that is due for replacement in the 5+ year Capex plan tab – in blue font each vehicle that will save Opex if it is replaced, and red font if it will incur more Opex. This marks a significant change in FAR and eliminates all guesswork or sketchy assumptions and supplants it with real peer fleet operating cost data by model year and vehicle categories we have collected since 2006.

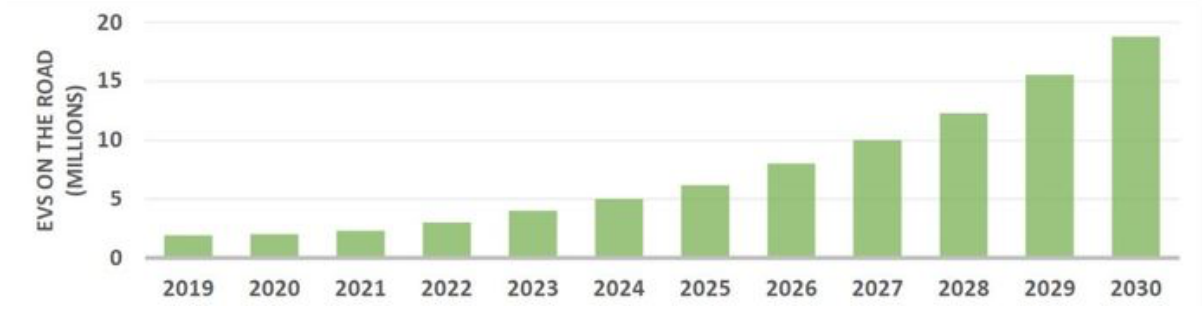
Fuel-Usage and GHG Reduction for New Vehicles. For each vehicle that is due for replacement, FAR now shows the potential fuel-usage and GHG reduction.

Appendix C: Details on Electric Vehicle Technologies

Over the past decade, electric transportation technologies including hybrid-electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and battery-electric vehicles (BEVs), have been rapidly developing and quickly gaining popularity in the market. Electric vehicle (EV) technologies offer significantly reduced or no tailpipe emissions and vastly improved energy efficiency.

Today, EVs have reached their tipping point and sales are booming while the public vehicle charging infrastructure rapidly grows. Demand for EVs accelerated during the 2010s and is expected to continue accelerating during the 2020s, as shown in *Figure 21* for the United States.

Figure 21: Forecasted EV Growth in US (Source: Edison Electric Institute)



For fleet managers looking to reduce their annual fuel budget and corporate emissions, battery-electric, hybrids, and plug-in hybrids are a good option. Savvy fleet managers will seek applications where the type of vehicle used will deliver sufficient fuel cost savings to offset their additional cost of capital and, after the vehicles are fully depreciated (usually ~5 years), deliver net cost savings until the end of their economic lifecycle (often ~10 years).

There are a number of light-duty electric vehicle technologies currently available in the market. They include:

- Mild Hybrid Electric Vehicles (MHEVs), which are equipped with internal combustion engines (ICEs) and a motor-generator in a parallel combination allowing the engine to be turned off whenever the vehicle is coasting, braking, or stopped and which restart quickly. MHEVs use a smaller battery than full hybrid electric vehicles (HEVs, see below) and do not have an exclusively electric mode of propulsion; rather, the motor-generator has the ability to both create electricity and boost the gas engine's output, resulting in better performance and reduced fuel use. Examples of MHEVs are the Honda Insight and the 2019 Ram 1500. [55]

[55] Source: https://www.autotrader.ca/newsfeatures/20180410/types-of-electric-vehicles-explained/

- **Hybrid Electric Vehicles (HEVs)**, which use two or more distinct types of power, such as an ICE and a battery-powered electric motor as the modes of propulsion, albeit with very limited range when in electric mode. When an HEV accelerates using the ICE, a built-in generator creates power which is stored in the battery and used to run the electric motor at other times. This reduces the overall workload of the ICE, significantly reducing fuel consumption and extending range. Examples of HEVs include the Toyota Prius and Ford Fusion Hybrid. [56]

- **Plug-In Hybrid Electric Vehicles (PHEVs)**, which use rechargeable batteries, or another energy storage device, that can be recharged by plugging into an external source of electric power. PHEVs can travel considerable distances in electric-only mode, typically more than 25 km and up to 80 km for some models, due to their much higher battery capacity than hybrids. When the battery power is low (usually ~80% depleted), the gasoline ICE turns on and the vehicle functions as a conventional hybrid. Such vehicles typically have the same range as their gasoline counterparts. Examples of PHEVs include the Chevrolet Volt and Toyota Prius Prime.[57]

- **Battery-Electric Vehicles (BEVs)**, or all-electric vehicles, which are propelled by one or more electric motors using electrical energy stored in rechargeable batteries. BEVs are quieter than ICE vehicles and have no tailpipe emissions. In recent years, BEV range has been considerably extended, thereby providing much wider BEV applications and reducing range anxiety. Today, many BEV models have EPA-estimated ranges exceeding 400 km, which provide much greater reliability when travelling longer distances. Recharging a BEV can take significantly longer than refuelling a conventional vehicle, with the difference depending on the charging speed. For a light-duty vehicle, a full battery charge using a Level 2 charger takes several hours, but charging from a nearly depleted battery to 70% at a fast (Level 3) charge station can take only 30 minutes[58]. Examples of light-duty BEVs include the Nissan Leaf, Chevrolet Bolt, Kia Soul, and Tesla Model 3.

While commercial battery-electric (BEV) pickups, trucks and vans are still limited/ have not yet arrived in the market, options are expected to become more plentiful in the next few years. Medium and heavy-duty battery-electric trucks are quickly being developed by many manufacturers. Demand for those offered by Tesla, Volvo, Freightliner, and others exceeds current supply and will soon be available for fleet purchase. Battery-electric buses and refuse trucks are currently available for purchase.

[56] Source: https://www.autotrader.ca/newsfeatures/20180410/types-of-electric-vehicles-explained/
[57] Source: https://www.autotrader.ca/newsfeatures/20180410/types-of-electric-vehicles-explained/
[58] Source: https://www.autotrader.ca/newsfeatures/20180410/types-of-electric-vehicles-explained/

Plug-in hybrid electric vehicles would also be an excellent solution for a low-mileage, return-to-base fleet like Toronto Hydro. PHEVs have a much larger all-electric range as compared to conventional first-generation hybrid vehicles, and they eliminate any range anxiety that may be associated with all-electric vehicles because the combustion engine works as a backup when the batteries have become depleted. For fleet vehicles that return to base each night, PHEVs (as well as BEVs) are ideal for overnight, Level 2 charging. It is entirely conceivable that low-mileage PHEVs could be driven every day almost entirely on electric power, functioning like fully-electric vehicles.

Zero Emission Battery-Electric Vehicles

There is no question that BEVs are taking over traditional internal combustion engine (ICE) vehicles in a big way. Some jurisdictions have already legislated the end of ICEs. If they haven't done so already, fleet managers should start making plans for BEVs now.

While their upfront costs will be higher, BEVs have increasingly proven to be a viable solution to rising fuel costs and emissions. Since BEVs have few moving parts, tune-ups or oil changes are never required, and they seldom, if ever, require brake relining due to regenerative braking. And, best of all, they burn zero fuel.

Since the release of the first mass-produced BEV, the Nissan Leaf, which debuted in 2010 with an EPA range estimated at only 73 mi or 117 km[59], there has been a surge in lithium-ion battery production leading to a drastic decline in prices. Today, several more affordable BEV models have ranges exceeding 400 km, which provide much greater reliability when travelling longer distances. For example, the 2020 Tesla Model 3 Standard Plus has an EPA-estimated range of 402 km[60], while the 2020 Chevrolet Bolt has an EPA-estimated range of 417 km[61].

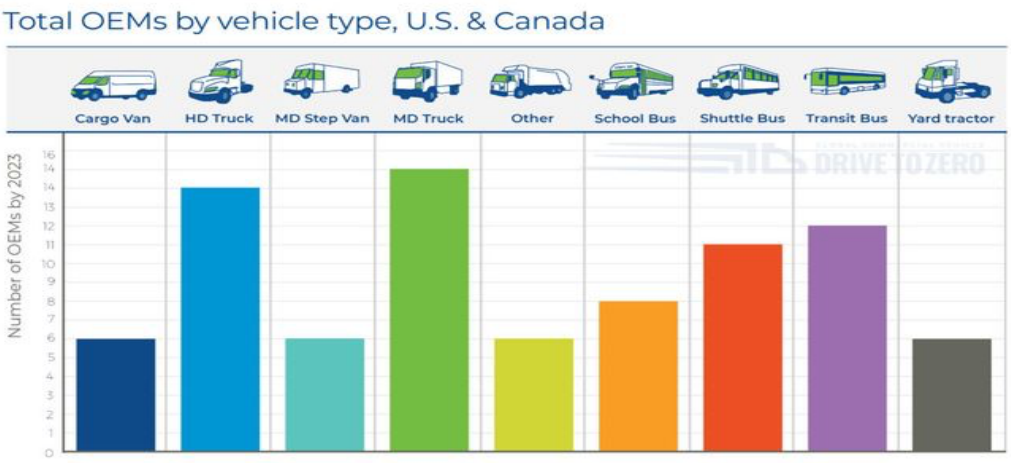
There has also been significant expansion in charging infrastructure through publicly available charging stations. As of early 2020, there were nearly 5,000 charging outlets across Canada, and Natural Resources Canada is investing $130 million from 2019-2024 to further expand the country's charging network, making range anxiety even less of a barrier to BEV ownership.

In addition to battery-electric pickups that are soon to emerge, battery-electric buses and emerging battery-electric medium- and heavy-duty trucks such as those planned by Tesla, Volvo, Freightliner, and other manufacturers are attracting considerable interest because of their the elimination of tailpipe GHG and CAC emissions, in addition to the potential for significant maintenance and fuel cost savings. In *Figure 22*, we see that the OEMs are quickly ramping up with other types of

[59] Source: https://www.mrmoneymustache.com/the-nissan-leaf-experiment/
[60] Source: https://www.tesla.com/en_ca/model3
[61] Source: https://www.chevrolet.com/electric/bolt-ev

commercial EV trucks (medium- and heavy-duty truck categories) that are suited for municipal work environments and utilities.

Figure 22: Total EV OEMs by 2023 (Source: Calstart)



Fleet managers who operate battery-electric trucks and buses can see massive savings in maintenance and fuel costs. BEVs have considerably fewer parts than internal combustion engine (ICE) vehicles. A drivetrain in an ICE vehicle contains more than 2,000 moving parts, compared to about 20 parts in an BEV drivetrain. This 99% reduction in moving parts creates far fewer points of failure, which limits and, in some cases, eliminates traditional vehicle repairs and maintenance requirements, creating immense savings for fleet managers. BEVs do not require oil changes or tune-ups, have no diesel exhaust fluid (DEF), and their brake lining life is greatly extended over standard vehicles due to regenerative braking. Though each fleet's electrification journey will be different, the transition to electric power can offer significant cost reductions over the long term.

A new study[62] quantified what commercial EV-makers have been saying for years: electric trucks and buses are a triple win. They save money for fleet operators, and reduce both local air pollution and GHG emissions. The study, which was commissioned by the National Resources Defense Council (NRDC) and the California Electric Transportation Coalition, and conducted by the international research firm ICF, looked at the value proposition for fleet operators of battery-electric trucks and buses (BETs).

Today, BETs have an upfront price premium compared to legacy diesel trucks and buses. However, the costs of battery packs and other components are rapidly falling, and the study found that, by

[62] Source: Posted January 2, 2020 by Charles Morris (https://chargedevs.com/author/charles-morris/) & filed under Newswire (https://chargedevs.com/category/newswire/), The Vehicles (https://chargedevs.com/category/newswire/the-vehicles/)

2030 or earlier, electric vehicles will offer a lower total cost of ownership (TCO) for nearly all truck and bus classes, even without incentives.

In *Table* 8, we provide a summary of the strengths and weaknesses of BEVs.

Table 8: Strengths and Weaknesses of BEVs

Strengths	Weaknesses
- Well-designed, no noise, few moving parts, long warranties - Little/no maintenance - Government grants and incentives may be available - Effectively eliminates need for idling-reduction initiatives - Very positive driver feedback - Very positive public opinions - Potential for significant lifecycle GHG emissions, depending on electricity source	- High capital cost particularly for battery-electric trucks/buses - Limited availability of new battery-electric trucks - Potentially significant capital costs required for charging infrastructure, particularly if 480V (DCFC) charging equipment is installed - Existing electrical capacity at facilities may require significant upgrades for charging multiple vehicles - Potential driver range anxiety that may require a change management approach - Although unlikely, potential for costly battery replacements in aged BEVs

Air Quality and Upstream Emissions

Air quality is a growing concern in many urban environments and has direct health impacts for residents. Tailpipe emissions from internal combustion engines are one of the major sources of harmful pollutants, such as nitrogen oxides and particulates. Diesel engines in particular have very high nitrogen oxide emissions and yet these make up the majority of the global bus fleet. As the world's urban population continues to grow, identifying sustainable, cost-effective transport options is becoming more critical.

Battery-electric vehicles (BEVs) require electricity to recharge the batteries; therefore, electricity is effectively a "fuel" in these types of vehicles. Battery-electric vehicles (BEVs) may be defined as zero emissions vehicles (ZEVs) since the California Air Resources Board (CARB) defines a ZEV as a vehicle that emits no exhaust gas from the onboard source of power[63]. However, CARB's definition accounts for pollutants emitted at the point of the vehicle operation and the clean air benefits are usually local. Depending on the source of the electricity used to recharge the batteries, air pollutant emissions are shifted to the location of the electricity generation plants. For example, if electricity used for charging vehicles comes primarily from "dirty" sources such as coal, lifecycle vehicle emissions will result.

[63] Source: California Air Resources Board (2009-03-09). "Glossary of Air Pollution Terms: ZEV"

From a broader perspective, to have almost none or zero well-to-wheel emissions, the electricity used to recharge the batteries must be generated from renewable or clean sources such as wind, solar, hydroelectric, or nuclear power. In other words, if BEVs are recharged from electricity generated by fossil fuel plants, they cannot truly be considered as ZEVs. Upstream emissions should be considered when evaluating the effectiveness of ZEVs in reducing emissions. Generally, when considering upstream emissions from electricity supply, BEVs still emit more than 50% less GHG emissions than their gasoline or diesel counterparts[64], and in some cases emit over 80% less in a grid composed of mostly renewable electricity[65]. This level of emissions reduction is what cities need in order to collectively achieve the "deep decarbonization" necessary to mitigate the most serious impacts of climate change.

Charging Technologies

The time it takes to charge a BEV is dependent on a multitude of factors, including:

- The type (level) of charger used (i.e., Level 1, 2, or 3);
- The vehicle's technology (i.e., the maximum amount of current allowed by the vehicle, in amps);
- Battery capacity (generally increases with vehicle size);
- Driving range (dependent on battery capacity and vehicle size)
- Starting charge level (charging rate slowly diminishes as battery levels approach 100%)

The charging rate is expressed in kilometers/miles of range per hour of charging. It is estimated by dividing driving range by the time for a full charge (i.e., 0 to 100%) and is dependent on the battery capacity of a vehicle, varying significantly with different vehicle types and battery sizes (see *Table 9*, below). The time for a full charge is estimated by dividing battery capacity, in kWh, by charging power (calculated from current and voltage) and adding a 10% inefficiency[66] [67].

Characteristics of the varying levels of chargers ranging from Level 1-3 are shown for LD vehicles in *Table 9*[68]:

[64] Source: https://www.eei.org/issuesandpolicy/electrictransportation/Pages/default.aspx
[65] Source: https://blog.ucsusa.org/rachael-nealer/gasoline-vs-electric-global-warming-emissions-953
[66] Source: https://www.caranddriver.com/shopping-advice/a32600212/ev-charging-time/
[67] Source: https://www.inchcalculator.com/widgets/?calculator=electric_car_charging_time
[68] Source: https://calevip.org/electric-vehicle-charging-101

Table 9: Characteristics of BEV charging levels for different vehicle classes

BEV Charging Levels	Outlet Voltage	Amperage	Added Range Per Hour		
			LD	MD	HD
Level I	120V	12-16 amps	5-10 km	< 5 km	< 2 km
Level II	240V	16-40 amps	22-56 km	10-25 km	5-12 km
Level III	480+V	100+ amps	>200 km	> 70 km	> 35 km

Level 1 chargers can be plugged right into a standard outlet. They are the most economical option for private owners; however, at such a low charging rate it is usually not practical to use Level 1 chargers exclusively. For example, it would take about 40 hours to fully charge a light-duty BEV with a range of 400 km starting at 20% battery (80 km range remaining).

Level 2 chargers are common in private households as well as public spaces such as mall parking lots. They incur an installation cost but are similar to common 240V installations such as the outlets that power clothes dryers. For a light-duty BEV with a range of 400 km and at 20% battery (80 km range remaining), it would take about eight hours to fully charge. Level 2 charging is usually done overnight during the off-peak period. Installing Level 2, 240V chargers, including the wiring infrastructure involved, typically range in cost from around $1,500-10,000, depending on electrical system requirements. The vast majority of the time, BEV owners only need a Level 2 charger; the exception is when travelling longer distances and/or not returning-to-base at the end of the work day. Another possible exception is for heavy-duty vehicles that take longer to charge due to their battery size. For these applications, much faster charging rates are required through Level 3 charging.

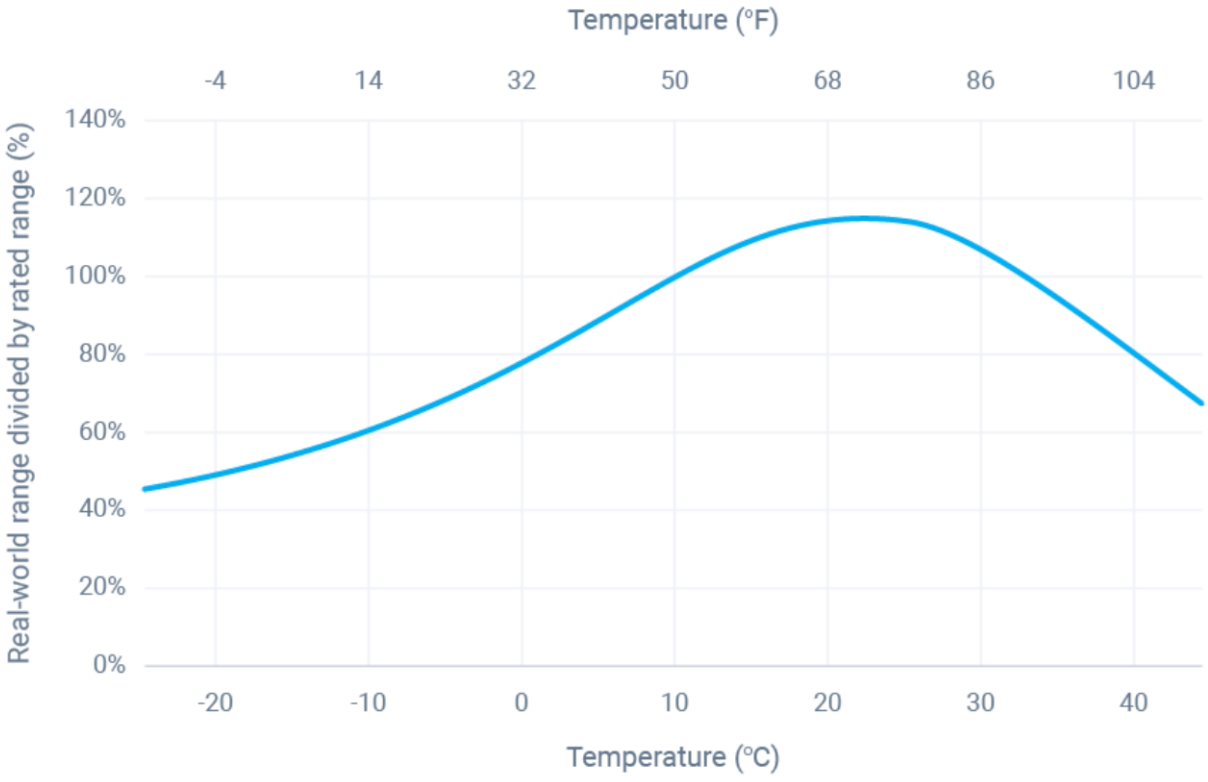
Level 3, or direct current fast chargers (DCFCs), requiring inputs of 480+ volts and 100+ amps (50+ kW)[69], are specialized systems designed to quickly charge vehicles and provide flexibility to owners travelling longer distances or in need of a partial quick charge. For a light-duty BEV with a range of 400 km and at 20% battery (80 km range remaining), it would typically take less than one hour to fully charge. Installations of DCFCs require a commercial electrician due to the electrical load and wiring requirements[70]. The costs for installing a Level 3 DCFC vary greatly. Costs for a fast-charging station are dependent on the electrical supply available at the chosen charging site, site preparation costs including trenching, cable runs, and many other installation considerations. Equipment and installation costs for DC fast charging stations can range from $50,000 to $200,000[71].

[69] Source: https://calevip.org/electric-vehicle-charging-101
[70] Source: https://calevip.org/electric-vehicle-charging-101
[71] Source: https://www.toronto.ca/wp-content/uploads/2020/02/8c46-City-of-Toronto-Electric-Vehicle-Strategy.pdf

Impact of Temperature on Battery Performance

Canadians enjoy the ebbs and flows of seasonality and extreme temperatures. BEV range is adversely affected by cold and hot temperatures because of auxiliary heating and cooling – that is, heating/cooling the vehicle cabin, and heating/cooling the battery itself to maintain optimal performance. Batteries are susceptible to temperature fluctuations which hinder, but in some cases helps, range. For example, on a typical winter day in central Canada with a temperature at -15°C, range can drop by over 50% of the EPA estimated range, meaning that a BEV with a range of 400 km will only be able to drive 200 km (*Figure 23*, below). Conversely, at temperatures in the low-twenties, range can significantly exceed the EPA-estimated range given that other conditions are optimal (e.g., starting temperature, terrain, and driver habits). With some preparation and knowledge, owners and operators of BEVs can mitigate the effects of temperature on performance by pre-conditioning their vehicle (i.e., warming up or cooling down before use) as well as keeping their vehicle plugged in when temperatures are extreme; this allows the system to maintain battery temperature controls and also prolongs battery life.[72]

Figure 23: The Effects of Temperature on BEV Range



[72] Source: https://www.geotab.com/blog/ev-range/

Training Options and Recommendations

While there is a paucity of BEV technician training in Canada, due to the rapid onset of electric mobility we suspect that reality will soon change. A pilot for a new EV Maintenance Training Program for automotive technicians was successfully completed at BCIT and is available to the public[73].

There is an Electric Vehicle Technology Certificate Program offered by SkillCommons, managed by the California State University and its MERLOT program, which offers free and open learning materials electric vehicle development, maintenance, alternative/renewable energy, and energy storage[74]. There is also a Hybrid and Electric Vehicles course offered at Centennial College in Toronto, which appears to focus more on hybrid systems than fully electric vehicles[75].

Before BEVs are deployed in a fleet to any great extent, we recommend high-voltage training for technicians. Published high-voltage guidelines specific to vehicle technicians servicing BEVs are not readily available through traditional sources. However, we suggest that anyone working with high voltage in any format, including BEVs, should be provided guidance on applying Occupational Health & Safety Management System fundamentals. This includes a "plan, do, check, and act" philosophy while working with energized electrical equipment[76]. Such training is available for non-electrical workers from Lineman's Testing Laboratories (LTL) of Weston, Ontario. LTL offers an awareness-level course for non-electrical workers which is claimed by the company to provide a basic-level understanding of workplace electrical safety.

Aside from awareness training, fleet technicians should also have access to, and be trained on the use of, electrical-specific personal protective equipment (PPE). Such PPE would include tested and certified non-conductive gloves as well as non-conductive tools and equipment as a last line of defence, ensuring all such gear is appropriately used and maintained. Protective gloves and other PPE, as well as non-conductive tools, must be re-tested periodically to ensure safety.

BEV Summary

For light-duty vehicles and buses, and soon for medium- to heavy-duty trucks, BEVs have excellent potential for a fleet due to the following:

- Significant lifecycle GHG emissions reductions

[73] Source: https://commons.bcit.ca/news/2019/12/ev-maintenance-training/
[74] Source: http://support.skillscommons.org/showcases/open-courseware/energy/e-vehicle-tech-cert/
[75] Source: https://db2.centennialcollege.ca/ce/coursedetail.php?CourseCode=CESD-945
[76] Source: https://training-ltl.ca/

- Significant reduction in operational costs due to elimination of fuel consumption, low costs for electricity, and minimal maintenance costs

- Relatively low charging infrastructure costs in comparison to infrastructure costs for other fuel-reduction / emission-reducing technologies such as compressed natural gas (CNG)

In planning for BEV phase-in, it would be prudent to consider installing at least one Level 3, direct current fast charger (DCFC) for high-mileage units and/or units that do not return-to-base on a regular basis. Moreover, such a fast charger would enable fleet management staff to relatively quickly charge their vehicles in situations where plugging in for overnight charging may not been possible or for emergency situations. For heavy-duty BEVs, it is important to consider that, depending on available amperage, a full charge may take several hours even with DCFCs.

Evaluation of the fleet to identify vehicles that have a potential for a replacement with a BEV should be completed. Furthermore, change management is recommended to be part of the transition process to help drivers accept and adapt to BEVs and overcome any lingering range anxiety.

Appendix D: Details on Best Management Practices

Here, we provide further details on many of the best management practices (BMPs) modelled in FAR, which have been researched by RSI-FC, and are effective interim solutions to reducing fuel usage and costs as well as GHG emissions.

Best management practices include: (1) enhanced vehicle specifications – vehicle choice and/or vehicle upgrades – which lower fuel consumption, lower GHG emissions, and improve overall performance; (2) proper maintenance procedures including tire inflation systems; and (3) fleet operational improvements including:

- Idling reduction initiatives
- Driver training to educate drivers on efficient driving practices
- Ongoing feedback and motivation to maintain good driving habits
- Route planning and optimization, including trip reduction, minimization, or elimination

Enhanced Vehicle Specifications at a Glance

There are a number of vehicle specifications that can aid in fuel-use and emissions reductions. *Table 10* lists sample vehicle specifications and their respective impacts.

Table 10: Strengths and Weaknesses of Enhanced Vehicle Specifications

Specification	Strengths	Weaknesses
Smaller Vehicles	Consume less fuel and thus have reduced emissions	Might not always be suitable for the job
Lighter Vehicles	Consume less fuel, produce less emissions, and can carry larger payload (e.g., if a truck is lighter by "x" pounds/kg, it can carry a commensurately increased payload), which increases efficiency	Light weighting may overstress some vehicles, increasing maintenance demand and lifecycle cost
Aerodynamically Designed Vehicles	Reduces fuel consumption and emissions	Minimal effectiveness in urban setting, high cost, increased maintenance demand for some solutions

Specification	Strengths	Weaknesses
Low Rolling Resistance (LRR) Tires and Wide-base Tires	Reduces fuel consumption and emissions, reduce frequency of tire replacement	Potential for on-road service issues, axle loading restrictions in some jurisdictions with wide-base tires
Electronically Controlled, Programmable Diesel Engines	Allow tailoring/minimizing power and torque needs, road speed, and idle time limits therefore reducing fuel consumption and emissions	Seldom give problems, however when they do, often require specialized and costly diagnostic skills (might need to be outsourced) with potentially protracted downtime
Idling-Reduction Devices	Reduces idle time and therefore lowers fuel use and emissions	Actual idling reduction benefits are dependent on the use of technologies by drivers, some who resent intervention by such devices; some may feel devices could cause a safety concern

Fleet Downsizing

Getting a fleet's "house in order" should include shedding any under-utilized vehicles, so that stranded capital tied up in low-usage units can be re-applied to fleet modernization and new electric vehicles (EVs). When exception data demonstrates that a vehicle's usage has been less than the organization's acceptable minimum threshold, the vehicle is incurring cost without serving a purpose. Hence, the vehicle is a liability, unless it has some redeeming value, i.e., a special-purpose or backup vehicle for emergencies, or a unit reserved for peak periods.

Low-usage units should be routinely and regularly reviewed to determine if there are more cost-effective ways of accomplishing the corporate end-goal. If a specific vehicle is used infrequently, management should be empowered to consider creative solutions for a less costly travel mode, e.g., an inter-departmental vehicle sharing arrangement, a 3rd party service-provider, video conferencing, use of employee's vehicles, etc.

A fleet's first step in cost reduction is to reduce the total number of low-utilization vehicles. Management should undertake a review to determine if some vehicles can be eliminated through early decommissioning.

Right-Sizing

In days past, some fleet managers subscribed to the adage "identify the size of truck you really need for the job — and then buy one bigger." Today, we know this is anachronistic thinking that led to fleets with oversized vehicles, poorer fuel economy, and higher operating costs and GHG emissions.

Instead, savvy fleet managers are leaving the old approach behind and employing the correct and most efficient approach, which is to right-size fleet vehicles – that is, correctly specify the size of vehicle for the job at hand, which leads to lower overall operating costs.

Job Suitability

The types of vehicles and the equipment staff members are fitted should be aligned with the vocational and load requirements. For example, a passenger sedan would be completely unsuitable for plowing snow or carrying loads of anything other than people. Rather, fleet vehicles types are matched specifically to the tasks at hand; in this case, a light-duty truck would be required for snow removal in, for example, parking lots.

Choose the Size Down When Appropriate

Downsizing is a recommended best management practice which results in a lower total cost of ownership (TCO). An example is acquiring light-duty (Class 2a) vans and pick-ups as opposed to heavier-duty units (Class 2b), which have higher acquisition and maintenance costs.

Another example is with heavy-duty units; selecting a single-axle plow-dump unit, which has inherently lower operating costs than a tandem-axle unit, is recommended when appropriate (i.e., when the specific task at hand, or job suitability, is fulfilled by either unit).

Accounting for Limited Space

Limited space for roads, as a result of urban development and densification, may lead to an increased number of traffic roundabouts. Roundabouts pose unique problems for snowplows as well as refuse and recycling trucks because of tight turning movements and lack of adequate space to maneuver. Single axle units are shorter in overall length and, therefore, turn in a smaller radius than tandem or tridem axle units. They also cost less to acquire and maintain. The disadvantages are that single axle trucks may have less traction/control in slippery conditions and have less load-

carrying capacities, such as salt/sand or waste (less productivity). However, in urban, low-speed, traffic-congested environments with limited space, such as roundabouts, single axle plows or refuse/recycling trucks will have an advantage over multi-axle units. In this example, it is important to weigh the pros and cons for different sized vehicles; when space is tight, it is often recommended to go smaller when it is safe (i.e., at low speeds) and productivity is acceptable.

Right-Sizing Summary

In summary, it is important for a fleet to consider the following in regard to right-sizing:

- Ensure that fleet vehicles are matched specifically to the tasks at hand (i.e., are job suitable) in terms of both vocation and load requirements.
- When multiple sized units fulfil a task equally well, choose the size down.
- When space is limited, it is often best to choose smaller units, given that it is safe to do so and that the productivity level is acceptable.

Low-Rolling Resistance Tires

Rolling resistance is the energy lost from drag and friction of a tire rolling over a surface[77]. The phenomenon is complex, and nearly all operating conditions can affect the final outcome. With the exception of all-electric vehicles, it is estimated that 4%–11% of light-duty vehicle fuel consumption is used to overcome rolling resistance. All-electric passenger vehicles can use approximately 23% of their energy for this purpose. For heavy trucks, this can be as high as 15%–30%.

A 5% reduction in rolling resistance would improve fuel economy by approximately 1.5% for light and heavy-duty vehicles. Installing low-rolling resistance (LRR) tires can help fleets reduce fuel costs. It is also important to ensure proper tire inflation (see sections below).

Tires and fuel economy represent a significant cost in a fleet's portfolio. In Class 8 trucks, approximately one-third of fuel efficiency comes from the rolling resistance of the tire. The opportunity for fuel savings from LRR tires in these and other vehicle applications is substantial.

According to a North American Council for Freight Efficiency (NACFE) report, the use of LRR tires, in either a dual or a wide-base configuration, is a good investment for managing fuel economy. Generally, the fuel savings pay for the additional cost of the LRR tires. In addition, advancements in tire tread life and traction will reduce the frequency of LRR tire replacement.

[77] Source: https://afdc.energy.gov/conserve/fuel_economy_tires_light.html

Automatic Tire Inflation Systems

Proper tire inflation pressure is critical to the optimal operation of a commercial vehicle. Underinflated tires result in decreased fuel efficiency and increased tire wear[78]. A 0.5-1.0% increase in fuel consumption is seen in vehicles running with tires underinflated by 10 psi. Appropriate pressure reduces tire wear, increases fuel efficiency, and leads to fewer roadside breakdowns due to tire failures. An example of an automatic tire inflation system (ATIS) is shown in *Figure 24*.

Figure 24: Automatic Tire Inflation System (courtesy NACFE)



In the U.S., a large truckload carrier with 5,000 tractors and 15,000 trailers averaging 124,000 miles a year on tractors and 41,000 miles on trailers, conducted a fuel economy test with 60 trucks pulling trailers without tire inflation systems and 75 trucks matched with trailers with the systems installed. The results of the test showed a 1.5% improvement in fuel consumption for trucks with ATIS.

Tire Inflation with Nitrogen

Nitrogen is said to permeate tire walls up to four times slower than air. Tires will lose one to two psi over one month versus the six months it takes a nitrogen-filled tire to lose that same amount of pressure. As a result, the time spent adjusting the tire pressure is reduced.

Supporters of nitrogen for tire inflation claim better tire pressure retention. This is believed to result in:

- A smoother ride
- Improved steering and braking
- Reduced risk of blowouts by as much as 50 percent[79]
- Increased tires tread life by up to 30 percent, improving the tire's life and its grip to the road[80]
- Reduced fuel consumption by up to 6%[81]

[78] Source: https://nacfe.org
[79] Source: http://www.gonitrotire.com
[80] Source: http://www.gonitrotire.com
[81] The fuel consumption reduction estimates vary considerably. Enviro-fleets, A guide to helpful resources, June 2010, report an improvement of up to 10%, but the industry standard is between 3% and 6%.

It must be noted that it is not the nitrogen itself that improves the fuel efficiency, but rather the enhanced retention of inflation pressure over time[82]. Reduced tire pressure leads to increased fuel consumption. Therefore, if vehicle tire pressure is well monitored, there might not be a fuel consumption benefit of using nitrogen.

Idling Reduction

Idling reduction is an important concern for all leading fleets that are looking to optimize costs and reduce the environmental impact. Utility fleet vehicles left idling for no apparent reason are seen by the public as being wasteful and polluting. These negative messages are potentially damaging to the reputation of any utility.

Fuel consumption from idling of heavy-duty vehicles is significant. While we acknowledge there are times when idling is simply unavoidable, the U.S. Department of Energy estimates that unnecessarily idling heavy-duty vehicles wastes from half to one U.S. gallon (1.89 to 3.79 liters) or more per hour. Some fleets idle 30 to 50% or more of their operating time[83]. These are several main approaches to idling reduction, including:

- Idling-reduction policy
- Driver training and motivation
- Idling-reduction awareness and fact-based training
- Incentive programs
- Ongoing driver education
- The use of idling reduction devices, including:
    - Auxiliary power units (APU)
    - Stop/start devices
    - Auxiliary cab heaters
    - Battery backup systems
    - Block heaters / engine preheaters

Idling-Reduction Policy

An idling-reduction policy is a way to motivate fleet drivers to limit unnecessary idling. However, for an idling-reduction policy to be successful continuous enforcement such as spot-checks and fuel use tracking must be present. An idling-reduction policy could be used as an overarching commitment to idling reduction that is carried out though driver training and motivation sessions, rather than an initiative on its own.

[82] Source: NHTSA Report, 2009: https://one.nhtsa.gov/DOT/NHTSA/NRD/Multimedia/PDFs/.../2009/811094.pdf
[83] Source: FC Best Practices Manual 2008

When Engine Idling is Unavoidable

There are times when idling is unavoidable. These include:

- Cab heating/ventilation and air conditioning (HVAC)
- Power for critical equipment (such as the use of a PTO for ancillary equipment)
- Maintaining brake air pressure (MD and HD trucks)

It is important to differentiate between *unnecessary* idling and idling that is *unavoidable* due to operational requirements. The focus of all idling-reduction initiatives should be to reduce and, ideally, eliminate *unnecessary* idling and to explore alternatives of how to limit idling for operational purposes with solutions that do not impede with operations, but offer environmental and economic benefits.

Idling Reduction Devices

There are several idling-reduction technologies available that can aid in idle reduction. Their functionality, potential, and costs vary considerably and are described in *Table 11.* To reap the most benefits any idling-reduction technology, installation should always be accompanied by behavioural solutions of driver training and motivation.

Table 11: Idling Reduction Devices and Their Associated Costs

Technology	Description	Cost Estimates
Auxiliary Power Units (APU)	An APU consists of a small engine that provides power to heat and cool the cab, as well as to power accessories, heat the engine, and charge the start battery. DC-powered APU systems are also available.	APUs can cost anywhere from ~$8,500 to ~$10,000. Annual maintenance cost is estimated as high as $500.
Stop/Start Devices (Idle-Stop systems)	A stop/start system automatically shuts down and restarts the internal combustion engine to reduce the amount of time the engine spends idling. This technology is particularly useful for vehicles that spend significant amounts of time waiting at traffic lights or frequently come to a stop in traffic jams.	Stop/start devices typically are part of OEM hybrid vehicle systems, but more recently has also been introduced in regular combustion engine vehicles to reduce fuel consumption. Such devices can also be purchased separately (offered by companies like Bosch that also manufacturers OEM devices)

Technology	Description	Cost Estimates
		and their costs average at about $300-$350.
Auxiliary Cab Heaters	There are two types: (1) Gas- or diesel-fired auxiliary air heater: In most cases, it is fitted in the cab, drawing in cab air through a blower and heating it. (2) Gas- or diesel-fired auxiliary coolant heater: It is installed in a vehicle's engine compartment and enables the vehicle's own coolant circuit to work without the use of the entire engine. Such water-based auxiliary heaters use small amounts of fuel to heat up the liquid in the air-exchange system and provide warm air in the cabin. Compared to air-based auxiliary heaters, the advantage of water-based auxiliary heaters is that they also warm the engine in the process (similarly to block heaters), thus enhancing starting performance. Auxiliary coolant heaters are manufactured by companies like Webasto and Espar.	~$1,250 +
Battery Backup Systems	A battery backup system powers electric devices (emergency lights, etc.) without drawing power from the primary battery. The system consists of adding an isolator and an additional battery to a vehicle's electric system. When the vehicle is off, the isolator prevents power being drawn from the primary battery and instead uses the alternate battery to power any electronic systems. When the vehicle is running, both batteries are recharged; charging to the start battery is prioritized and it is charged first.	The system costs between $400-$600 plus the price of a battery which varies based on the required capacity.

Technology	Description	Cost Estimates
Block Heater / Engine Preheater	Engine block heaters use power from electrical outlets in corporate facilities, where vehicles are parked overnight to heat the engine block. The block heater on timer can be set to switch-on a few hours before the vehicle is used to warm up the engine block. This decreases required warm-up idling time. This is a very low-cost option, and a necessity in Canadian winters; however, it is limited to reducing warm-up idling only.	Block heaters cost between $70 and $150 and have a negligible annual maintenance cost.

Emissions Reduction Potential

Despite the wide selection of idling reduction solutions, when it comes to internal combustion engines, there is no technology that completely eliminates CO_2 and other emissions. Only battery-electric and hydrogen fuel cell vehicle technologies can eliminate tailpipe emissions. Idling-reduction initiatives can be helpful in reducing unnecessary idling in the short and medium term, and as a segue to gradual transition to electric trucks and, potentially, hydrogen fuel cells in the long-run.

Driver Training and Motivation

Idling-Reduction Training and Incentives

Driver training to modify driver behaviours and ongoing motivation to continue good behaviours are crucial components of successful idling-reduction programs. While most drivers understand the vehicle idling issue, many continue their inefficient practice of excessive idling due to lack of knowledge and/or motivation.

Driver training can be used to optimize the use of idle reduction technologies. The technologies can reduce idling but the drivers have the ability to override the technologies. Proper training can aid in utilizing the technologies to their full potential.

In addition to establishing corporate idling reduction policies, behaviour-based approaches for idling reduction include:

- Idling-reduction training for drivers; and
- Incentive programs to encourage drivers to limit idling.

For best results, these approaches should be used in conjunction. Regardless of the approach, the greatest impact pledges of idling-reduction should be made in a public forum. Moreover, idling-reduction targets should be customized as various fleet vehicles may have different operating requirements and will benefit from targets that accurately reflect their work environment. Beginning from a measured starting point, progress should be evaluated at regular intervals to modify and adapt the approach if progress is not occurring.

Driver Eco-Training

Driver eco-training should be fact-based and aimed at increased awareness and promotion of good practices. Typically, eco-training courses address the following areas:

- Progressive shifting (or use of automated transmissions)
- Starting out in a gear that doesn't require using the throttle when releasing the clutch
- Shifting up at very low RPM
- Block shifting where possible (e.g., shifting from third to fifth gear)
- Maintaining a steady speed while driving
- Using cruise control where appropriate
- Anticipating traffic flow
- Coasting where possible
- Braking and accelerating smoothly and gradually
- Avoiding unnecessary idling

Driver eco-training programs vary considerably. They can be organized as short (typically an hour long) information sessions/workshops or can be considerably longer and involve more hands-on activities. Extended training can vary in length from a half to a full day, or can also be scheduled into shorter sessions over a period of time.

Online Training

Online training courses are gaining popularity thanks to their flexibility. This trend has accelerated due to the Covid-19 pandemic and the need for social distancing measures. It is strongly recommended that discussion sessions among the drivers be organized to review training topics to deepen their understanding and provide a forum for questions and concerns. The individual responsible for the idling reduction incentives program could facilitate such sessions.

In-Person Training

In-person driver eco-training courses vary greatly in length, depth, and format. These courses offer a more personalized approach, facilitate immediate discussion, and typically allow for practical application. For best results, eco-training could be combined with professional driver improvement training.

NRCan SmartDriver Training Series

SmartDriver provides free, practical training to help Canada's commercial and institutional fleets lower their fuel consumption, operating costs, and harmful vehicle emissions. Fleet energy-management training that helps truckers, transit operators, school bus driver, and other professional drivers is claimed by NRCan to improve fuel efficiency by up to 35 percent. RSI-FC highly recommends NRCan's SmartDriver training: https://www.nrcan.gc.ca/energy-efficiency/energy-efficiency-transportation/greening-freight-programs/smartdriver-training-series/21048

Continuous Motivation

Studies have demonstrated that driver training benefits, although significant, are likely to diminish over time. Ongoing feedback and motivation is recommended as a preventive measure. This can include:

(1) Tracking Idling to Provide Feedback to Drivers

- Monitoring the progress of any initiative is crucial not only to determine the impact, but to also provide feedback to the drivers to provide them the opportunity to modify their behaviour.

- Practices that track and report fuel consumption establish a valuable monitoring basis. Knowledge and comprehensive factual information can help build a stronger business case and "buy-in" for idling reduction.

- Telematics technologies help managers and drivers track idling and provide measurable data to manage goals. Such technologies, however, can be expensive as they typically use GPS systems and OBD monitoring devices.

(2) Implementing a Corporate Idling Reduction Policy

- It is our opinion that in most cases drivers want to "do the right things." By ramping up communications about excessive idling and instituting a clear idling policy, a reduction of unnecessary idling will likely result.

(3) Ongoing Information Campaigns and Reminders

- In general, information campaigns are low-cost, easy to manage, and lead to a more knowledgeable and receptive public. To raise awareness of the issues these can be initiated even before driver training commences. Numerous resources that address idling awareness issues are available free of charge and ready to implement.

(4) Non-Monetary Incentives Programs

- There are a few approaches that can aid in motivating drivers to continue to apply the skills gained during eco-training. Competition among departments/teams to reduce idling can be an effective approach. Periodic recognition of high-performers can be either public or private. An example of a non-monetary reward might be the donation to a charity in the amount of the lowest idling department's fuel cost savings.

Summary and Potential Impact

Driver training is an initiative that attempts to change an individual's behaviour and thus the results are hard to predict and the variance is large. A multitude of aspects, such as the current level of driver education and driving practices, the level of idling, corporate culture and policy, and individual receptiveness and willingness to change will influence results. It is estimated that driver training has a potential to reduce vehicle fuel consumption by anywhere from 3% to 35%, with the typical results between 5% and 10%.

Route Planning and Optimization

In addition to vehicle upgrades, proper maintenance, driver training, and continuous motivation to maintain good driving habits, a fleet can further minimize fuel consumption and exhaust emissions through route planning and optimization. Route planning software can be used optimize multi-stop trips. There are different software available for categories in both public and private fleets (e.g., service dispatch software, courier software, trucking software, etc.)[84].

Route planning software used for delivery services ensures the minimum driving time for multi-stop trips by using advanced algorithms to arrive at the optimal route that provides the highest collective reduction in total driving time and, consequently, fuel consumption. This can also mean fewer vehicles and less traffic on the road at one time.[85]

[84] Source: https://www.capterra.com/route-planning-software/
[85] Source: https://blog.route4me.com/2020/05/carbon-emissions-reduction-route-optimization-helps-cut-tons-carbon-emissions/

Route planning software can also be used for idling reduction initiatives by integrating GPS tracking software to monitor driver activity in real-time. Moreover, reporting and analytics features within route planning software can help with identifying when a fleet vehicle requires maintenance to ensure optimal fuel efficiency and thus minimize cost and emissions.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-267

References: Exhibit 2B, Section E8.3, Pages 3-4

EB-2018-0165, Decision and Order, December 19, 2019, Page 104

Preamble:

In reference 2 the OEB directed Toronto Hydro "to provide more detailed cost benefit analysis between EV, hybrid and combustion engines for its fleet program for future rebasing applications. In addition, the OEB directs Toronto Hydro to develop utilization measures beyond fleet use in standard hours." In response to the cost benefit analysis, Toronto Hydro's evidence stated that various phasing and cost options were analyzed for electrifying its fleet and the results of this analysis informed Toronto Hydro's procurement strategy for Evs and hybrid vehicles.

QUESTION (A):

a) Please provide a copy of the analysis done to assess the costs and benefits between Evs, hybrids and combustion engine vehicles and the results of this analysis.

RESPONSE (A):

Please refer to Toronto Hydro's response to 2B-Staff-266(a).

QUESTION (B):

b) Please explain Toronto Hydro's proposal for developing utilization measures beyond fleet use in standard hours.

RESPONSE (B):

Please refer to Toronto Hydro's response to 2B-Staff-266(b).

QUESTION (C):

c) Please indicated the number of units and associated percentage of internal combustion engines vehicles to be replaced by Evs.

RESPONSE (C):

Toronto Hydro will replace 115 of 264 (approximately 44%) internal combustion engine ("ICE") units from 2025 to 2029 with electric/hybrid vehicles, depending on market availability and vehicle suitability.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-268

Reference: Exhibit 2B, Section E8.3, Page 7

Exhibit 2B, Section E8.3, Page 2

QUESTION (A):

a) Please provide Toronto Hydro's fleet asset management plan.

RESPONSE (A):

Toronto Hydro's Fleet Asset Management strategy is explained in subsection E8.3.1.1 of Exhibit 2B, Section E8.3.[1]

QUESTION (B):

b) Please provide several representative examples of life cycle analyses for short term (0-2 year) turnover assets, and long-term turnover (2-7years) assets.

RESPONSE (B):

Longer-term asset planning (2-7 years) relies primarily on the Life Cycle Analysis ("LCA") for forecasting purposes; this is also referred to as the "first step" in subsection E8.3.1.1 of Exhibit 2B, Section E8.3.[2] Short-term asset planning (0-2 years) happens as the vehicle gets closer to replacement period; this is referred to as the "second step" in subsection E8.3.1.1 of Exhibit 2B, Section E8.3.[3] This planning step takes into account the condition of the vehicle, end-user feedback, and utilization to determine if a replacement is required.

[1] At p. 2-3.
[2] At p. 2.
[3] *Ibid*.

For example, When the initial planning was completed in 2017/2018 for dump trucks, Toronto Hydro had six 2009 model units in its fleet planned for replacement in 2023 (3 units) and 2024 (3 units) according to the LCA. The LCA for this type of vehicle recommended replacement between 8-12 years.

Prior to initiating competitive bidding for these vehicles, Toronto Hydro determined that 2 of the vehicles were no longer required and would not be replaced, and that the condition of the remaining four vehicles was still rated as fairly good condition. As such, the utility determined to defer the replacements into 2025-2026 and review again at a later date. There was also consideration given for the specialized nature of these vehicles (used in very specific applications), feedback from end-users, and the relatively low mileage.

As another example, the LCA for 9 sports utility vehicles ("SUVs") units indicated a replacement after 8 years. Toronto Hydro had deferred their purchase with a batch of SUVs replaced in 2021; however, subsequent condition assessments for these units indicated that they would need to soon be replaced due to deteriorating conditions. These were ultimately replaced in 2022 (3 units) and 2023 (6 units).

QUESTION (C):

c) Are corrosion related impacts a major driver of fleet turnover?

   i. If yes, what actions does Toronto Hydro take to mitigate corrosion related impacts to its fleet?

RESPONSE (C):

As discussed on page 7 of Exhibit 2B, Section E8.3, corrosion can pose safety and reliability risks, lead to vehicles being decommissioned earlier than expected, and typically impacts vehicles that are near end of life. Vehicles receive rust proofing inhibitor prior to delivery from the vendor when they are purchased. Toronto Hydro is currently evaluating 3 methods of corrosion prevention for future implementation. A test group of 18 vehicles have been designated for evaluation. Six

vehicles will receive one of the following rust proofing methods: electronic module, one-time rust proofing application, and yearly rust proofing application until end of life to determine the most effective method.

QUESTION (D):

d) What fleet vehicles does Toronto Hydro outsource?

i. For outsourced fleet vehicles, do the forecast capital costs for the test period include outsourcing costs?

ii. For outsourced fleet vehicles, please provide benefit-cost analysis.

RESPONSE (D):

Toronto Hydro does not outsource any vehicles.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-269

Reference: Exhibit 2B, Section E8.3, p. 4

Preamble:

Toronto Hydro writes that "In view of the size and dense urban nature of its service territory, Toronto Hydro estimates that all vehicle types (ICE, EV, and hybrid) would perform at the same level of reliability."

Question (A):

a) Please provide several representative examples of when the above statement would and would not be true in the Toronto Hydro service territory for heavy-duty vehicles.

RESPONSE (A):

As discussed in Exhibit 2B, Section E8.3,[1] Toronto Hydro is currently exploring the procurement of fully electric heavy-duty vehicles in small numbers and on a pilot basis. The market availability of these types of vehicles remains relatively low and further field experience is required to analyze the reliability and performance of these units under normal and emergency operating conditions. Nonetheless, given its relatively small service territory at approximately 631 kilometre squares[2] and low vehicle travel times, Toronto Hydro estimates that hybrid and electric vehicles will have sufficient range and battery capacity to perform at the same level as internal combustion engine vehicles. The utility will continue to monitor and evaluate the field performance of all hybrid and electric heavy-duty vehicles as needed.

Question (B):

[1] At page 5, lines 1-7.
[2] Exhibit 1B, Tab 1, Schedule 1, Table 1 at p. 8.

b) How will Toronto Hydro ensure that its EV fleet maintains its ability to be dispatched during prolonged power outages?
   i. What are the limitations of the selected strategy with regards to the geographic extent and duration of power outages?

RESPONSE (B):

Toronto Hydro plans to keep its battery hybrid and electric vehicles at full charge when not in use to ensure effective operation at the beginning of prolonged power outages. The utility already has a number of charging infrastructure in operation at its work centres and plans to continue investing in such infrastructure, including Level 3 chargers, as part of the capital expenditures outlined in Exhibit 2B, Section E8.2. Toronto Hydro has contingency plans in place to ensure that electric vehicle charging infrastructure at its facilities will continue to operate during prolonged power outages and will continue to explore alternative methods to ensure business continuity, such as external charging infrastructure, mobile charging technologies, and other power sources.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-270

Reference: Exhibit 2B, Section E8.3, Page 12

Question (A):

a) Please reconcile the apparent change in Heavy-Duty vehicle unit cost between 2025 and 2027 (year 2025, 13 vehicles to be replaced at a cost of $7M, and in 2027, 23 vehicles to be replaced at a cost of $7.7M)?

RESPONSE (A):

Unit costs within the heavy-duty category vary widely depending on the specific vehicles being replaced, as this category includes a very diverse range of vehicles such as crane trucks, derricks, single and double bucket trucks, cube trucks, etc. In addition, progress payments for heavy-duty vehicles that require significant equipment fitting and customization can cause variations in unit costs over multi year delivery cycles.

QUESTION (B):

b) Please provide total number of assets owned by Toronto Hydro under each of the categories of Heavy Duty, Light Duty and Equipment.

RESPONSE (B):

There are currently 149 heavy-duty vehicles, 210 light-duty vehicles, and 69 equipment units in Toronto Hydro's fleet.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-271

Reference: Exhibit 2B, Section E8.3, p. 18

QUESTION (A):

a) Please provide the benefit-cost analysis that shows that option 2 "sustainment" is the preferred solution of the three options considered.

    i. If a benefit-cost analysis was not performed please provide the quantitative analysis justifying the selection of the preferred solution.

RESPONSE (A):

The options analysis in Exhibit 2B, Section E8.3, subsection E8.3.5 "Options Analysis / Business Case Evaluation ("BCE")" details the benefits and costs that informed Toronto Hydro's selection, including estimated costs, average fleet age, and greenhouse gas emissions under each option.[1] Please also refer to Toronto Hydro's response to 2B-SEC-59.

[1] Exhibit 2B, Section E8.3, Table 8 at p. 18.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-272

Reference: Exhibit 2B, Section E8.4, Pages 18, 19

Preamble:

With respect to hardware volumes that are proposed to be replaced.

QUESTION (A):

a) Please provide the percentage and number of units indicated in Table 5 that fall within the 4, 5, 6 and 7 year age buckets.

RESPONSE (A):

As of 2024, the units for the 2020-2024 rate period are aged as follows.

Table 1: Unit Ages for the 2020-2024 Rate Period

Asset Category	IT Hardware	4 years		5 years		6 years		7 years	
		Units	%	Units	%	Units	%	Units	%
Core Backend Infrastructure Assets (Capacity)	*Unix Virtual Servers*	168	33%	153	30%	36	7%	15	3%
	Linux x86 Virtual Servers	111	35%	105	33%	25	8%	6	2%
	Windows Virtual Servers	967	40%	870	36%	121	5%	121	5%
Endpoint Assets (Units)	*Personal Computing Devices*	577	25%	138	6%	46	2%	-	0%
	Printers & Plotters	36	20%	22	12%	9	5%	-	0%

QUESTION (B):

b) Please also indicate the percentage of hardware that is still operational, and vendor supported.

RESPONSE (B):

Table 2: Percentage of Hardware Operational and Vendor Supported

Asset Category	IT Hardware	Operational & vendor support available
Core Backend Infrastructure Assets (Capacity)	*Unix Virtual Servers*	92%
	Linux x86 Virtual Servers	95%
	Windows Virtual Servers	89%
Endpoint Assets (Units)	*Personal Computing Devices*	98%
	Printers & Plotters	100%

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 2B-STAFF-273

Reference: Exhibit 2B, Section E8.4, Page 24

Preamble:

With regards to the $11.5M proposed in spending under Regulatory Compliance.

QUESTION (A):

a) Please provide the list of regulatory compliance initiatives that occurred during the 2020-2024 period, the total capital cost of each, and the capital cost of each that is potentially recovered through a revenue recovery mechanism other than existing rates (for example, a DVA).

RESPONSE (A):

Toronto Hydro provides a table below with the Regulatory Initiatives occurring during 2020-2024 below.

Regulatory Initiatives	**Description**	**Project capital cost (2020-2024), $ Millions[1]**	**Funding Source**
Customer Choice	Providing residential and small business customers the choice between Time-of-Use ("TOU") and Tiered prices (EB-2020-0152)	$0.8	DVA
Ultra Low Overnight TOU	Implementation of the Ultra Low Overnight ("ULO") pricing option for eligible customers on the Regulated Price Plan ("RPP") (O. Reg. 393/07)	$2.2	DVA

[1] Includes 2020-2023 actuals and 2024 bridge.

Centralize Billing Solution for Bi-directional Smart Metering Data	Collection, management and improved utilization of smart metering data for behind-the-meter distributed energy resources (ERO#: 019-6521)	$0.8	Rates
COVID-19 Energy Assistance Program ("CEAP")	COVID-19 relief for eligible residential and small business customers (EB-2020-0162/0185)	$0.6	Rates
Green Button	Implementation of the Green Button data standards and customer access platform (EB-2021-0183)	$2.4	DVA
OEB customer service rules	Implementation of requirements relating to Phase 1 of the OEB's Customer Service Rules Review (EB-2017-0183)	$1.1	Rates
Transition to Utility Work Protection Code	Implementation of changes required for Toronto Hydro's transition to the Utility Work Protection code	$2.8	Rates
TOTAL IT/OT Regulatory Compliance COST		**$10.7**	

QUESTION (B):

b) Please provide a list of incremental regulatory compliance initiatives that Toronto Hydro expects to comply with over the next five years, and their associated costs.

RESPONSE (B):

As regulatory compliance initiatives are triggered by third party requirements and can be announced at any time, Toronto Hydro cannot predict the specific incremental regulatory compliance initiatives that it will be required to comply with in the next 5 years. However, as outlined on page 24 of Exhibit 2B, Section E8.4, Toronto Hydro anticipates undertaking

approximately six regulatory compliance initiatives in the 2025-2029 rate period with an estimated total cost of $11.5 million, based on the utility's historical experience and costs in the 2020-2024 rate period, as discussed in the response to subpart (a).

QUESTION (C):

c) Why are these incremental initiatives necessary beyond current regulatory program spending?

RESPONSE (C):

The incremental initiatives funding is required to meet new compliance-related initiatives, beyond current regulatory requirements. Please refer to lines 1-11 of page 14 of Exhibit 2B, Section E8.4 for a discussion of the non-discretionary nature of these expenditures given the legislative and regulatory requirements and public policy-driven changes mandated by the Government of Ontario, the OEB, and other authorities.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-15

Reference: Exhibit 2A, Tab 4, Schedule 2

QUESTION (A):

a) Please provide the Standardized Labour Rate calculation for the Power Line Technician for each of the years 2020-2025.

RESPONSE (A):

Please see Table 1 below for the calculation of Standard Labour Rate ("SLR") for the Power Line Technician position for 2020-2025:

Table 1: Standard Labour Rate ("SLR") Calculation

	Actual				Bridge	Forecast
	2020	**2021**	**2022**	**2023**	**2024**	**2025**
Total Compensation Costs ($ Millions) **(A)**	$10.1	$8.5	$9.7	$7.9	$12.4	$12.4
Total Working Hours	149,982	123,809	131,662	105,387	162,440	155,556
Less: Leaves	(25,773)	(21,275)	(22,625)	19,005	(32,760)	(31,680)
Less: Time not spent working on a specific operating or capital project	(10,488)	(8,658)	(9,207)	7,448	(20,755)	(19,881)
Total Available Hours **(B)**	113,722	93,876	99,831	78,934	108,925	103,995
Standard (Hourly) Labour Rate (A/B)	**$88.82**	**$90.62**	**$97.64**	$100.18	**$113.41**	**$119.20**

QUESTION (B):

b) The on-cost rate for Material Handling is calculated by dividing procurement and warehousing related operating expenses that meet the capitalization criteria as described in Toronto Hydro's Capitalization Policy with the dollar value of material moving through the warehouse in a given year. Please provide the calculation for the years 2020 to 2029.

RESPONSE (B):

Please see Table 2 below for the calculation of material handling on-cost rate for 2020-2029.

Table 2: Material Handling On-cost ($ Millions)

	Actual				Bridge	Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Eligible procurement and warehousing related operating expenses	$13.2	$12.9	$14.2	$18.4	$19.1	$21.7	$23.7	$25.1	$25.7	$27.3
Material throughput	$110.3	$122.7	$141.5	$164.7	$143.3	$165.1	$174.1	$182.8	$177.6	$183.6
Material Handling On-Cost Rate (Exhibit 4, Tab 2, Schedule 13, Table 3)	**12.0%**	**10.5%**	**10.0%**	**11.2%**	**13.3%**	**13.2%**	**13.6%**	**13.8%**	**14.5%**	**14.9%**

QUESTION (C):

c) Please explain the increase in Material Handling On Costs over 2025-2029 compared to 2021 actuals.

RESPONSE (C):

The increase in material handling on-cost over 2025-2029 compared to 2021 is driven by the increases in dollar value of material moving through the warehouse in a given year of the capital plan, increase in procurement and warehouse related operation expenses that meet the capitalization criteria, and a new contract setting process to competitively source procurement and warehouse services in 2025.

Toronto Hydro's 2025-2029 capital expenditure plan is forecasted to be a 38 percent[1] increase over the current 2020-2024 period. To support this growth, additional resources are required to process material movements required to execute this work. As described in Exhibit 4, Tab 2, Schedule 13, page 17, more resources are needed to process purchase orders, conduct efficient competitive sourcing at the most favorable acquisition cost, collaborate with business units, and mitigate material supply risks to support grid modernization and electrification initiatives. With the current service contract expiring at the end of 2024, new rates for the 2025-2029 forecast period will be instated and are assumed to be a reflection of the current global inflationary pressure resulting from major world events in the 2020-2024 rate period.

[1] See Toronto Hydro's response to 2A-Staff-104, Appendix A for the latest Capital Expenditure plan

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-16

References: Exhibit 2B, Section A, Page 7

Preamble:

With respect to Figure 2:

QUESTION (A):

a) Please provide the calculation for 26% of Assets at End of Useful Life by 2023.

RESPONSE (A):

Toronto Hydro calculates the percentage of Assets Past Useful Life ("APUL") by comparing the asset population age demographics with the useful life for each asset class. See Toronto Hydro's response to interrogatory 1B-PP-9 for how the utility defines useful life.

If the asset is in-service and has an age at or greater than its useful life, then Toronto Hydro considers the asset as operating beyond its useful life. Toronto Hydro then divides this population by the total demographics to determine the proportion that is at or past useful life. To ensure the metric is not dominated by lower-cost, higher-volume assets, Toronto Hydro translates the asset volumes to dollars by applying a representative unit cost for each respective asset class.

The denominator used to calculate the percentage of assets past useful life is approximately $10.6 billion and the value of assets at end of useful life is approximately $2.7 billion. This results in the 25 percent of assets at end of useful life by 2023.

QUESTION (B):

b) Please provide the calculation for 11% of Assets To Reach Useful Life by 2030.

RESPONSE (B):

Toronto Hydro uses the same approach described in the response to part (a) to calculate the proportion of the asset demographic population that will reach useful life by 2030. Following this approach, the percentage of APUL by 2030 is 36 percent and Toronto Hydro took the difference between the population of APUL by 2030 and the population of APUL by 2023 to get the 11 percent.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-17

Reference: Exhibit 2B, Section A, Page 24

With respect to Figure 6, please provide the following:

QUESTION (A):

a) 2021: Revision of Standard Design Practices Document

RESPONSE (A):

The Standard Design Practices (SDP) document is a comprehensive internal design requirement document spanning 418 pages. It encompasses a multitude of company-specific information, procedures, configurations, contacts, frameworks, and preferences for Toronto Hydro's operations. At the reference noted above, the SDP is merely mentioned as part of an overall chronology of planning milestones. The production of the SDP in its entirely provides limited probative value relative to the expenditures sought as part of the DSP. Furthermore, its disclosure gives rise to public safety issues since disclosure could provide individuals with insights into system configuration and protocols, potentially leading to illegal access to the grid and/or theft (power or equipment). Misuse or misinterpretation of the content could result in public safety risks, legal complications, and potential damage. As a result, Toronto Hydro respectfully declines to produce the SDP.

QUESTION (B):

b) 2022: Grid Modernization Roadmap

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-48.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-18

Reference: Exhibit 2B, Section A, Page 24

Toronto Hydro is working to introduce an initiative which considers Probability of Failure and Consequence of Failure measures to its existing ACA measures.

QUESTION (A):

a) Please provide the start date and forecast end date of this initiative.

RESPONSE (A):

Toronto Hydro completed development of the Probability of Failure variables in December 2023, for the initial purpose of integrating these values into the Engineering Asset Investment Planning ("EAIP") tool. The calculation of Consequence of Failure is in progress as part of value framework development for the EAIP project. Please see 2B-AMPCO-20 for more information.

The utility plans to continue evolving and enhancing its Condition-Based Risk Management ("CBRM") framework (which includes the ACA methodology), and as part of this effort intends to explore the development of asset class risk matrices, which will combine asset health and criticality indices (i.e., consequence of failure) into an expanded view of asset risk demographics.[1]

QUESTION (B):

b) Please provide the % completion rate to date for this initiative.

[1] Details of Toronto Hydro's Quantified Risk-Based Analysis is explained in Exhibit 2B Section D3.2.1.3

RESPONSE (B):

The calculation of Probability of Failure is 100% complete. See response to part (a) regarding Consequence of Failure.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-19

References: Exhibit 2B, Section A, Page 24

Preamble: Toronto Hydro is in the process of developing a detailed AM Capabilities roadmap.

QUESTION (A):

a) Please provide the start date and forecast end date of this initiative.

RESPONSE (A):

Please refer to Exhibit 2B, Section D1 at pages 14-16, for more information on the status and direction of Toronto Hydro's asset management road-mapping activities. Exhibit 2B, Section D5.2.3 provides additional information on the utility's strategic objectives for asset analytics and decision-making for 2025-2029. Toronto Hydro finalized these objectives as part of the integrated planning process that produced the 2025-2029 Distribution System Plan, and a number of initiatives intended to advance these objectives are currently embedded within the organization's broader technology and product roadmaps.

The utility plans to ramp-up the next phase of its ISO 55001 gap closure efforts in the second half of 2024, and as part of that effort will undertake the process of consolidated a detailed AM Capabilities roadmap. The utility's goal is to have a draft roadmap in place by the end of 2024, with finalization occurring in early 2025.

QUESTION (B):

b) Please provide the % completion rate to date for this initiative.

RESPONSE (B):

Toronto Hydro estimates that progress toward a detailed roadmap is at approximately 30-40 percent.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-20

Reference: Exhibit 2B, Section A, Page 24

Preamble: Toronto Hydro is implementing Phase 3 of the EAIP Solution.

QUESTION (A):

a) Please provide the start date and forecast end date of this initiative.

RESPONSE (A):

Toronto Hydro has been in the process of implementing an Engineering Asset Investment Planning ("EAIP") solution in multiple phases, and is currently in Phase 3 of the project. Phase 3 started in June 2023, and Toronto Hydro forecasts it will be completed by the end of June 2024. After the system is implemented as part of Phase 3 Go-Live, Toronto Hydro expects to integrate the solution as part of its asset management processes, which includes the Investment Planning Portfolio Reporting ("IPPR") process and Execution Work Program ("EWP") development. Once this is complete (targeted by the end of 2024), the system will be considered fully operationalized.

QUESTION (B):

b) Please provide the % completion rate to date for this initiative.

RESPONSE (B):

The percent completion to date for Phase 3 of EAIP is 70 percent. Toronto Hydro's progress on the overall EAIP project is 85 percent.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-21

Reference: Exhibit 2B, Section A, Page 24

Please provide the start date and forecast end date for ISO 55001 Certification and the % completion rate to date for this initiative.

RESPONSE:

Toronto Hydro aims to achieve ISO 55001 certification within the 2025 to 2029 rate period. The current aspiration is to certify by the end of 2026 (which would put the utility on a recertification schedule of 2029). However, the specific timing for ISO 55001 certification remains under detailed assessment (a refreshed roadmap is under development as part of planning for the next stages of the project). The ultimate certification date will be influenced by several factors, including:

- Given the nature of the project (i.e., management system gap closure and transformation), there will be continuous refinements to the scope of work. As the project progresses, the specific minimum actions required, as well as Toronto Hydro's decisions to go beyond those minimum efforts for certain dimensions of the AM System, will evolve.
- Availability of resources, as many individuals supporting the ISO deliverables will be taking on responsibility in addition to their existing roles.
- In the event of an unsuccessful certification attempt, Toronto Hydro will need to prepare to recertify; it is not uncommon for utilities to undertake multiple certification attempts, or (more commonly) to push out the timeline for a certification audit based on a preliminary third-part assessment of audit preparedness.
- Beyond the preparation and completion of deliverables, Toronto Hydro has to ensure the improvements are successfully embedded into the Asset Management System and sustainable over the long-run. The utility is conscious of the fact that a rushed, bare

minimum approach to achieving certification may not result in sustained benefits in the long-run.

Toronto Hydro needs to achieve an overall score of 3.0 (45%) on the ISO maturity scale. An assessment performed in December 2023 indicates a modest increase in the overall score for Toronto Hydro in 2020, from 2.56 to 2.69 (38% to 40%). Please refer to 2B-SEC-34 for more details on the updated gap assessment.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-22

Reference: Exhibit 2B, Section A, Page 24

QUESTION (A) AND (B):

a) Please provide Figure 6 to show the Planned Enhancements of the AM Process (2025-2029).

b) For each of the Planned Enhancements please provide the start and end dates and % completion to date.

RESPONSE (A) AND (B):

Toronto Hydro does not have an exhaustive list of planned Asset Management System enhancements with firm timelines for the entire 2025-2029 period. The utility adopts an agile approach to initiative planning and execution in this area, recognizing that continuous improvement in asset management involves many complimentary and interdependent initiatives moving in parallel.

As discussed in response to 2B-AMPCO-19, the utility is currently developing a longer-term AM Capability Roadmap which will aide in the prioritization and execution of the various strategic AM capability-related objectives outlined in Sections D1 and D5 of Exhibit 2B.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-23

Reference: Exhibit 2B, Section A, Page 37

Toronto Hydro maintains a strategic approach by utilizing a combination of internal and external resources to execute its extensive capital and maintenance programs.

QUESTION (A):

a) Please provide the % of internal and external resources for each of the years 2020 to 2024 allocated to capital programs and maintenance programs.

RESPONSE (A):

Please see Table 1 below for percentage of internal and externally contracted costs for capital programs and Table 2 for the percentage of internal and external costs for maintenance programs. In responding to this interrogatory it is Toronto Hydro's understanding that by "maintenance programs", AMPCO meant Preventative and Predictive Overhead Line Maintenance, Preventative and Predictive Underground Line Maintenance, Preventative and Predictive Station Maintenance Program, and Corrective Maintenance. Additionally, Toronto Hydro notes that beside internal and external costs, other costs for capital and maintenance programs primarily include material purchased which is excluded from Tables 1 and 2 below.

Table 1: 2020-2024 Percentage (%) of Internal and External Capital Costs

	Actual				Bridge
	2020	**2021**	**2022**	**2023**	**2024**
Internal Costs (Labour + Vehicles)	18%	16%	13%	15%	16%
External Costs	55%	60%	58%	54%	56%

Table 2: 2020-2024 Percentage (%) of Internal and External Maintenance Costs

	Actual				Bridge
	2020	**2021**	**2022**	**2023**	**2024**
Internal Costs (Labour + Vehicles)	34%	31%	29%	29%	29%
External Costs	59%	62%	65%	65%	64%

QUESTION (B):

b) Please provide the resource assumptions (internal and external) for 2025-2029.

RESPONSE (B):

Program work is assigned to internal crews until available hours for work are balanced to assigned work. Once internal crews are balanced, remaining work is assigned to contracted resources. Please see Exhibit 4, Tab 4, Schedule 3 for details of Toronto Hydro's internal hiring projections and plans, including the outsourcing strategy at pages 30-31. Please refer to 2B-SEC-55 part (b) and 4-AMPCO-82 parts (b) and (c) for further information.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-24

Reference: Exhibit 2B, Section C

QUESTION (A):

a) Please update Figures 10 and 11 with 2023 data.

RESPONSE (A):

Please see Toronto Hydro's response to Interrogatory 2B-SEC-35 part (a).

QUESTION (B):

b) With respect to Tables 4-6, please provide the data for Defective Equipment only by equipment type for the years 2018-2023.

RESPONSE (B):

Please see Tables 1-3 below.

Table 1: Number of Interruptions - Defective Equipment by Equipment Type (Excluding MEDs)

	2018	2019	2020	2021	2022	2023
Overhead Conductor	43	28	32	32	65	89
Overhead Insulator	10	12	10	17	13	10
Overhead Pole	35	27	29	26	30	50
Overhead Switch	33	26	32	45	53	48
Overhead Transformer	31	26	33	25	64	51
Station Equipment	10	9	5	8	8	8
Underground Cable	198	137	146	156	198	134
Underground Switch	17	15	12	23	7	18
Underground Transformer	62	42	32	24	41	51

	2018	2019	2020	2021	2022	2023
Various	2	8	3	8	5	2
Grand Total	441	330	334	364	484	461

Table 2: Number of Customer Interruptions - Defective Equipment by Equipment Type (Excluding MEDs)

	2018	2019	2020	2021	2022	2023
Overhead Conductor	24,029	20,578	39,288	30,694	22,115	29,852
Overhead Insulator	4,055	16,198	18,687	21,974	14,013	7,028
Overhead Pole	25,618	51,750	30,604	41,700	20,778	47,327
Overhead Switch	32,357	12,822	57,321	45,740	52,626	10,571
Overhead Transformer	2,617	1,615	6,340	2,448	7,643	11,641
Station Equipment	13,166	11,456	5,281	5,166	9,652	4,185
Underground Cable	144,022	105,187	125,225	162,647	198,958	103,757
Underground Switch	31,738	19,427	9,096	24,905	3,930	11,790
Underground Transformer	30,188	31,924	15,922	14,091	27,773	34,275
Various	274	8,517	869	5,620	2,448	33
Grand Total	308,064	279,474	308,633	354,985	359,936	260,459

Table 3: Number of Customer Hours Interrupted - Defective Equipment by Equipment Type (Excluding MEDs)

	2018	2019	2020	2021	2022	2023
Overhead Conductor	26,964	20,732	34,050	27,610	13,427	25,153
Overhead Insulator	9,423	13,003	11,783	22,584	8,888	5,053
Overhead Pole	18,343	26,875	12,818	31,454	9,433	17,451
Overhead Switch	17,863	10,431	30,283	21,581	27,976	5,798
Overhead Transformer	5,532	2,002	3,212	2,465	8,588	7,808
Station Equipment	18,190	28,609	4,816	12,286	10,636	7,096
Underground Cable	126,109	82,260	168,502	112,949	157,462	106,930
Underground Switch	23,974	19,825	5,081	34,583	2,121	6,162
Underground Transformer	20,586	17,893	9,991	6,293	10,707	16,231
Various	1,467	9,820	811	4,492	16,746	36
Grand Total	268,452	231,449	281,347	276,297	265,983	197,717

QUESTION (C):

c) With respect to the Cause Code Major Event Days (MEDs), please provide the Number of Interruptions, Number of Customer Interruptions, and Number of Customer Hours Interrupted for each of the years 2018-2023.

RESPONSE (C):

Please see Table 4 below.

Table 4: MED Number of Interruptions, Customer Interruptions, and Customer Hours Interrupted

Year	Number of Interruptions	Number of Customer Interruptions	Number of Customer Hours Interrupted
2018	266	427,761	1,365,533
2019	0	0	0
2020	41	54,253	97,477
2021	0	0	0
2022	92	145,313	469,876

QUESTION (D):

d) In excel, please provide in excel the Number of Interruptions, Number of Customer Interruptions, and Number of Customer Hours Interrupted for each of the years 2018 to 2023 for Overhead Equipment, Underground Equipment, Station Equipment and Various.

RESPONSE (D):

Please refer to tab 'Q.D' of Appendix A to this response.

QUESTION (E):

e) Please define Various in Figure 20 and Figure 21.

RESPONSE (E):

Various refers to interruptions where multiple assets (more than one) failed concurrently. As such, the equipment failures may be attributed to more than one equipment category (e.g. Overhead, Underground, or Station Equipment).

QUESTION (F):

f) In excel, please provide the Number of Interruptions, Number of Customer Interruptions, and Number of Customer Hours Interrupted for each of the years 2018 to 2023 for Overhead Transformers, Overhead Switches, Poles and Pole Hardware, Overhead Insulators, Overhead Conductors.

RESPONSE (F):

Please refer to tab 'Q. F' Appendix A to this response.

QUESTION (G):

g) In excel, please provide the Number of Interruptions, Number of Customer Interruptions, and Number of Customer Hours Interrupted for each of the years 2018 to 2023 for Underground Cables and Cable Accessories, Underground Switches, Underground Transformers.

RESPONSE (G):

Please refer to tab 'Q. G' Appendix A to this response.

QUESTION (H):

h) In excel, please provide the data in part c) and f), separately for the Horseshoe Area and Downtown and provide excel versions of the data.

RESPONSE (H):

Please refer to tab 'Q. H' Appendix A to this response.

QUESTION (I):

i) Please provide the total number of customers and the number of customers in the Horseshoe Area and Downtown for each of the years 2018 to 2023.

RESPONSE (I):

Please see Table 5 below for the total number of customers served (12-month average), from 2018 to 2023. Toronto Hydro does not have a system to track the total number of customers served separately by the Horseshoe Area and Downtown Core for reliability reporting purposes. As of the time of preparing this response, the utility estimates that 66 percent of its customers are served by the Horseshoe system, while 34 percent are served by the Downtown system.

Table 5: Total Number of Customers Served

Year	Total Number of Customers Served (Average)
2018	764,126
2019	769,120
2020	773,593
2021	776,908
2022	783,097
2023	787,012

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-25

References: Exhibit 2B, Section C, Page 14

Preamble: Table 3 provides a percentage breakout of SAIFI (Excluding MEDs) by outage cause for 2018-2022.

Please provide the % Contribution to SAIFI by outage cause for each of the years 2018-2023.

RESPONSE:

Please see Table 1 below for a percentage breakout of SAIFI, excluding Major Event Days ("MEDs"), by outage cause.

Table 1: SAIFI Contribution by Cause Code (Excluding MEDs) – 2018-2023

Major Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	0.1%	0.0%	0.2%	0.0%	0.7%	0.0%
Adverse Weather	8.9%	8.5%	3.8%	9.0%	4.4%	9.1%
Defective Equipment	27.2%	28.0%	24.6%	29.6%	28.2%	23.4%
Foreign Interference	9.2%	9.5%	13.2%	12.5%	10.7%	12.8%
Human Element	2.4%	4.7%	2.2%	4.5%	0.9%	2.9%
Lightning	0.2%	0.4%	0.0%	2.8%	0.3%	0.4%
Loss Of Supply	23.2%	16.3%	12.2%	5.7%	14.7%	12.7%
Scheduled Outage	0.7%	1.2%	0.5%	0.7%	2.7%	3.4%
Tree Contacts	8.9%	7.3%	10.3%	9.9%	8.0%	9.5%
Unknown	19.3%	24.1%	33.0%	25.2%	29.3%	25.8%

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-26

Reference: Exhibit 2B, Section D1, Page 12

Please complete the following table:

Performance Measures	Forecast End of 2024	Actual End of 2024	Forecast End of 2029
Box Framed Poles			
Remaining on the System			
Non-Energy Mitigating Cable Chamber Lids in High Risk Locations			
Rear Lot Customers on System			
Direct-buried Cable on system (km)			
Network Modernization (% of submersible units)			
PCB-contaminated Oil Spills			
Lead Cable Remaining on System (km)			

RESPONSE:

Please see Table 1 below. Toronto Hydro assumes that "Actual End of 2024" is a typo and intended to be "Actual End of 2023."

1 **Table 1: Key Performance Measure Actual 2023 and Forecast 2024 and 2029**

Performance Measures	Forecast End of 2024	Actual End of 2023	Forecast end of 2029
Box Framed Poles remaining on the system	491	574	0
Non-energy Mitigating Cable Chamber Lids in High-Risk Locations	8794	8974	5994
Rear Lot Customers on System	6,609	6,869	5,142
Direct-buried Cable on System (km)	642	N/A[1]	460
Network Modernization (% of submersible units)	70%	N/A[1]	80%[2]
PCB Contaminated Oil Spills	0	N/A[1]	0
Lead Cable Remaining on System (km)	1162	1200	972[2]

[1] See 1B-SEC-23

[2] Forecast takes into account planned and reactive replacement of deteriorated units, and units that are being added/replaced due to loading considerations (i.e., customer connections). Based on recent historical performance and assuming the proposed investment plan is approved, assumed 2% increase in submersible unit count between 2025-2029 resulting in 80% submersible units by the end of the rate period.

[2] Forecast based on historical rate of PILC and AILC removal (2018-2023)

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-27

Reference: Exhibit 2B, Section D1, Page 21

Preamble:

As part of the IPPR process, Toronto Hydro monitors and reports on the progress of capital programs, which includes program level expenditures, project-specific execution status and project expenditures.

Over the period 2020-2023, please provide the list of material projects/programs that performed poorly over 2020-2023, explain why and provide the key lessons learned for execution of the 2025-2029 portfolio.

RESPONSE:

Toronto Hydro does not have a definition for "poor performing" programs/projects. Project costs and program completion rates may vary from initial estimates and plan lines due to myriad factors, including unforeseen challenges during execution.

All projects are reviewed at a project level for adherence to plan. As mentioned in Exhibit 2B, Section D1.2.3, Toronto Hydro monitors changes to projects through a change management and governance process. This process includes the change request process, project variance analysis, and numerous metrics to drive process adherence and continuous improvement. For further details on the project variance analysis process refer to the response to interrogatory 2B-AMPCO-29 part (d).

Toronto Hydro's integrated, portfolio-based forecasting and planning processes focus on delivery over the five years of the utility's Distribution System Plan period, allowing for adjustments to be

made when the utility finds that long-term program execution is not on track. Additionally, part of the Investment Planning and Portfolio Reporting ("IPPR") process is to review spend variances of 10% and $1 million (over or under) from the previous year in order review common drivers, emerging issues, and process adherence, and to encourage continuous improvement at all stages of planning and execution. Portfolio targets may be adjusted based on new findings and emerging requirements as part of the IPPR process. As work is being executed, the work mix can be adjusted for multiple reasons such as resource availability, changes in priority, or emerging urgent work. All of these processes provide continuous feedback to the planning teams on lessons learned during execution that are then reviewed and considered as part of future work planning, and Toronto Hydro expects these improvements to benefit execution of the 2025-2029 portfolio.

One recent process improvement included updating the checklist that planners use to ensure inclusion of all expected costs. This list is updated based on execution variances and challenges identified through the project variance analysis process. The utility has also introduced additional review steps to confirm inclusion of all expected costs in estimates during the hand-off from planning to program management. Another improvement based on recent experience is an ongoing review of the material management process and its alignment with the project execution process. This review has identified the need to start the procurement process earlier in the planning process, for key material with long lead times (>1 year), in advance of the formal design phase to reduce cycle time for project execution.

Toronto Hydro also expects its implementation of an Engineering Asset Investment Planning ("EAIP") tool will improve transparency and reporting with respect to project portfolios and create new opportunities to enhance program execution effectiveness in the 2025-2029 period. Please see Exhibit 2B, Section D1, page 14 for more information.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-28

Reference: Exhibit 2B, Section D1, Page 23

AMPCO seeks to further understand how Toronto Hydro prioritizes projects comparatively at the project and portfolio level. Is this a manual or automated process? How did Toronto Hydro optimize its project portfolio?

RESPONSE:

Details on Toronto Hydro's project prioritization are discussed in Exhibit 2B, Section D1.2.1.4, page 23, and Exhibit 2B, Section D1.2.3, page 25. This process is currently manual and is managed as part of Toronto Hydro's Program Management and Execution process, particularly the Execution Work Program ("EWP") as discussed in Exhibit 4, Tab 2, Schedule 9, Section 8.

The development of the EWP is iterative in nature and involves continuous coordination between program managers and system planners to ensure alignment with strategic objectives. Planning teams assign priority levels to their projects that are then considered along with factors such as project labour requirements, schedules and resources to determine the prioritized mix of projects to be executed in a given year. As part of the forecasting process high and medium priority projects are assigned for execution ahead of low priority projects. The EWP forecasting process includes a daily consolidation of inputs from all operations teams to provide visibility on the project selection alignment to the portfolio targets and inclusion of all high priority projects. This consolidation is reviewed throughout the EWP forecasting process with key stakeholders to adjust and align the forecast selection to the portfolio targets as closely as possible while still considering program execution constraints.

Toronto Hydro's process for project prioritization is anticipated to evolve once its new EAIP optimization tool has been embedded as part of its business planning process.

Note that Toronto Hydro's 2025-2029 investment plan is not based on project details.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-29

Reference: Exhibit 2B, Section D1, Pages 25-26

At D1.2.3 Toronto Hydro explains its Project Management and Execution process. Toronto Hydro monitors changes to projects through a change management and governance process. This process includes monthly executive performance reporting, key program status reporting, change request process management, project variance analysis, and numerous metrics to drive process adherence and continuous improvement. Depending on the magnitude of a required change to a project's cost, schedule, or scope of work, the change may require a detailed assessment of alternatives and formal approval from senior management and the executive team before proceeding.

QUESTION (A):

a) Please complete the following table:

	2020-2024	2025-2029
# Projects		

RESPONSE (A):

Over the 2020-2024 rate period, Toronto Hydro expects to execute approximately 2700 projects. Toronto Hydro's DSP is planned on a programmatic (rather than project-level) basis. As such, 2025-2029 project details are not available.

QUESTION (B):

b) Please provide the key internal document that governs Toronto Hydro's project management process.

RESPONSE (B):

The Project Planning Process (PPP), which documents the overall life cycle for capital execution projects, is attached as an appendix to this response. For more information on Program Management and Support Segment, see Exhibit 4, Tab 2, Schedule 9 at section 8.

QUESTION (C):

c) Please provide an example of a monthly executive performance report.

RESPONSE (C):

Executive oversight of the capital program occurs through the monthly Investment & Operations Planning (IOP) management process which centers around a monthly meeting with all executives and senior leaders responsible for the planning and execution of the capital and operations work program. The mentioned report refers to the presentation that is given at this monthly governance meeting where numerous topics related to the execution of the work program are thoroughly canvassed and discussed. These topics include, but are not limited to: (i) monthly and year to date results, and annual outlooks for the work program; (ii) material availability and resource balancing considerations; (iii) work reprioritization as needed to manage execution challenges and deliver the work program; (iv) lessons learned and continuous improvement initiatives; (v) design readiness, schedule adherence and other process-related considerations); (vi) macro-level emerging issues that may pose an overall risk to the program (e.g. COVID, inflation, supply chain interruptions). Toronto Hydro declines to provide an example of a monthly IOP report, as without aforementioned context of the monthly review meeting, this report provides no probative value to deciding the issues in this proceeding. The governance process is described above and Toronto Hydro witnesses who have experience with this process are available to answer further questions at the Technical Conference.

QUESTION (D):

d) Please provide an example of a project variance analysis.

RESPONSE (D):

A Project Variance Analysis (PVA) is used to review the specific types of cost variance (e.g. labour, material, vehicle, other) on planned capital work and the reasons for the variance which can include but are not limited to changes in scope of work, site related and coordination issues, external and regulatory factors (road restrictions, permitting), material costs. Please find attached a template of the PVA document.

QUESTION (E):

e) Please explain what triggers a Project Variance Report. Please provide the number of Project Variance Reports over 2020-2023.

RESPONSE (E):

A Project Variance Analysis is triggered by a variance that is more than +20% or (-15%).[1] Table 2 provides the number of PVAs over 2020-2023.

Table 2: Number of Project Variance Reports

	2020	2021	2022	2023
Number of PVAs	144	129	121	169

QUESTION (F):

f) Please provide the % of Planned Capital Projects Completed on Time or Early for each of the years 2020-2023 and provide the calculation.

RESPONSE (F):

Please see the table below.

[1] This threshold aligns with the AACE International Recommended Practice No. 18R-97. Cost Estimate Classification System – As applied in Engineering, Procurement, and Construction for the Process Industries

Table 3: Percent of Projects Completed Early/On-Time.

Year	# of Projects Completed	# of Projects Completed Early/On time	% of Projects completed Early/On time
2020	274	252	92%
2021	286	264	92%
2022	286	227	79%
2023	314	248	79%

In 2022, Toronto Hydro began tracking completions against a project list that is defined in January of each new year, as opposed to tracking completion against the mid-year re-forecast. This change was made to improve overall adherence to the forecasted plan lines. As a result of this change the reported completion rate for 2022 and 2023 is lower than in previous years.

QUESTION (G):

g) Please provide the % of Planned Capital Projects Completed on or below Budget for each of the years 2020 to 2023 and provide the calculation.

RESPONSE (G):

Please see table below.

Table 4: Percent of Planned Capital Projects Completed On or Below Budget

Year	# of Projects Completed	# of Projects Completed On/Below Budget	% of Projects completed On/Below Budget
2020	274	195	71%
2021	286	213	74%
2022	286	224	78%
2023	314	234	75%

QUESTION (H):

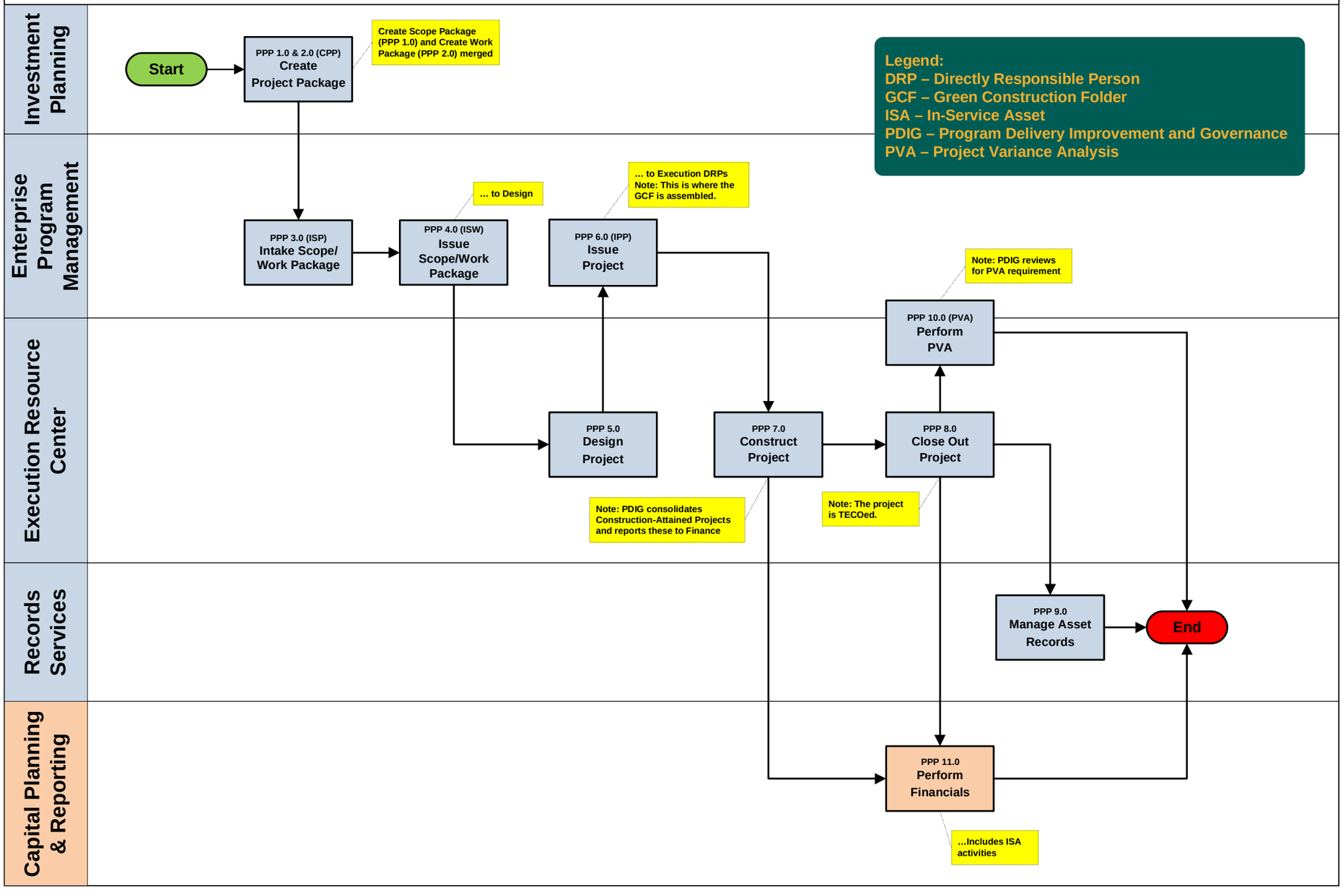
Please provide a list of projects 2020-2023 that required formal approval from senior management and the executive team before proceeding.

RESPONSE (H) :

All projects are approved by the senior management team and overseen by the executive team through the governance process set out in part (c).

Project Planning Process (PPP) Level 2 Process Map

As at April 28, 2022 (v3.0)



TORONTO HYDRO

Summary Report

WBS Element Lev	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Descrip	Construction Attaine	WBS Responsible Cost Cente	Designer Project DR	Construction DR
							#

Cost Category	Planned Cost (DSAP)	Planned Cost (C	Actual Cost	Variance (% Actual of Estimat	Total Project Varianc

Gap Analysis Required on: _____

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: _____

Project Execution Supervisor S

_____

Name:

Date:

TORONTO HYDRO

Labour Variance Report

Company code	WBS Element L1	WBS Element L1 Description	WBS Element L2	WBS Element L2 Description	WBS Element L3	WBS Element L3 Description	PM Order	Activity Type	Planned Labour Hours (DSAP)	Planned Labour Hours (CHKL)	Actual Hours	Labour Variance

TORONTO HYDRO

Material Variance Report

WBS Element L1	WBS Element L1 Description	WBS Element L2	WBS Element L2 Description	WBS Element L3	WBS Element L3 Description	PM Order	Material	Material Description	Estimated Quantity (DSAP)	Estimated Quantity (CHKL)	Actual Quantity	Returned Quantity	Net Quantity	Material Variance Qty
								Sum:	1,118		1,530		1,530	-412
								Total Material Variance % (Qty)						-36.85%

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible	Designer Project DRP	Construction DRP

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimat	Total Project Varianc
External					
Labour					
Material					
Vehicle					
Total:					

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g.,Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	Externaland Regulatory Factors (City's restriction,policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note:Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If nededed, please discuss with your Supervisor.)		
Options / Solutions	♦	
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g.,Scope change $ (re - phased); contingencies not accounted for)	
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)	
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)	
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)	
	☐	Externaland Regulatory Factors (City's restriction,policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)	
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)	
	☐	Overtime (No provision for overtime work)	
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)	
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)	
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)	
Root Cause Details (Note:Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If nededed, please discuss with your Supervisor.)			
Options / Solutions	♦		
Recommendation	♦		
Implementation Plan	♦		
	♦	**Planned Date of Implementation**	
	♦	**Actual Date of Implementation**	
Analysis Completed			
All Implementations Completed			

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g.,Scope change $ (re - phased); contingencies not accounted for)	
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)	
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)	
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)	
	☐	Externaland Regulatory Factors (City's restriction,policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)	
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)	
	☐	Overtime (No provision for overtime work)	
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)	
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)	
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)	
Root Cause Details (Note:Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If nededed, please discuss with your Supervisor.)			
Options / Solutions	♦		
Recommendation	♦		
Implementation Plan	♦		
	♦	**Planned Date of Implementation**	
	♦	**Actual Date of Implementation**	
Analysis Completed			
All Implementations Completed			

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-30

Reference: Exhibit 2B, Section D1, Page 27

Toronto Hydro tracks Program Accomplishments as an Outcome Measure.

QUESTION (A):

a) Please discuss if Toronto Hydro tracks Program Accomplishments at the segment/program level or portfolio level, or both.

RESPONSE (A):

Toronto Hydro tracks program accomplishments at the segment/program level, and these can be aggregated to higher levels of reporting if needed.

QUESTION (B):

b) Please discuss if each program has a specific and unique outcome measure that is formally tracked. If yes, please provide the Program Accomplishments for each segment in E5 to E8.

RESPONSE (B):

Toronto Hydro's use of the term "program accomplishments" refers to volumetric accomplishments of work and project-based milestones, whereas "outcome measures" refers to performance outcomes. Where appropriate (e.g., compliance-driven programs), Toronto Hydro may treat program accomplishments as the performance outcomes for the program (e.g., box-framed poles eliminated). Program accomplishments and outcome measures allow Toronto Hydro to monitor the performance of its investment program, and to determine to what extent projects have contributed to expected outcomes, including risk reduction.

Each program has a unique set of accomplishments to be tracked (e.g., pole replacements) along with one or more outcome measures that may be unique to the program (e.g., benefits achieved from Network Condition Monitoring & Control investments)[1] or shared with other programs (e.g., SAIDI/SAIFI).

Toronto Hydro has included program accomplishment and outcome measures throughout its evidence, including within the detailed program evidence found in Exhibit 2B (Sections E5-E7). Outcome measures that are influenced by multiple programs are discussed in Sections D2, C, and E2 of Exhibit 2B and in Exhibit 1B, Tab 3, Schedule 2 (e.g., overall asset condition demographics by asset class; SAIDI/SAIFI results, oil spills, etc.).

[1] Exhibit 2B, Section E7.3

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-31

Reference: Exhibit 2B, Section D1, Page 28

AMPCO seeks to understand if new and revised standards is a significant driver of costs over 2025-2029.

If material, please provide the number of new and revised standards over 2020-2023 and the impact on costs.

RESPONSE:

Toronto Hydro confirms that new and revised standards are not a significant driver of costs over the 2025-2029 period.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-32

References: Exhibit 2B, Section D2, Page 16

Please complete the following Table:

THESL System	2017	2022	2029
% Underground			
% Overhead			

RESPONSE:

Please see Table 1 below. These values are based on the length of cables and wires (i.e., linear assets) within each system. Toronto Hydro cannot project a forecast for 2029 due to the complex nature of the distribution system and the various factors that may impact the mix of overhead versus underground system over time, such as the volume and type of customer connection demand, externally initiated relocations, resiliency investments, and rear lot conversions.

Table 1: Underground and Overhead Percentages of Linear Assets

Toronto Hydro System	2017	2022	2029
Underground	45%	46%	n/a
Overhead	55%	54%	n/a

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-33

References: Exhibit 2B, Section D2

Please list any third-party asset studies undertaken over the period 2020-2024 and include the scope of work and summarize any conclusions and recommendations.

RESPONSE:

Please see Table 1 below. For the purpose of this interrogatory response, Toronto Hydro is interpreting "asset" studies as any study or report undertaken to assess its major electrical assets within its Distribution System Plan over the 2020-2024 period. For benchmarking studies conducted by third parties, please refer to Toronto Hydro's response to interrogatory 1B-SEC-5.

Table 1: Third-Party Asset Studies Undertaken over 2020-2024

Study	Scope	Conclusions and Recommendations
AMI 2.0 Technology Assessment Report	Conducted by Util-Assist to provide a summary of current market offerings from leading AMI vendors.	With current AMI technology rapidly end-of-life in Ontario, an investment in AMI 2.0 is needed as part of the regular asset lifecycle management. Current economic and market conditions have provided a strong incentive for AMI vendors to improve the value proposition of the technology.
AMI 2.0 Strategy Document	Conducted by Ernst & Young to provide consulting services focused on meter technology and Advanced Metering Infrastructure (AMI) upgrades from a strategic perspective, including opportunities, use case prioritization and deployment strategies.	Provided AMI 2.0 Use Cases, **illustrated case studies from utilities across the globe with respect to how AMI has been used to enable business capabilities, and** recommended an AMI 2.0 roadmap.

Study	Scope	Conclusions and Recommendations
AMI 2.0 Program Outline	Conducted by Ernst & Young to provide results of working sessions with Toronto Hydro stakeholders to consider key aspects of an AMI program, as Toronto Hydro prepares for replacing their current fleet of smart meters.	Provided AMI 2.0 Use Cases to be established in the near term and implementation timelines, major program components of an AMI program, and consideration for various solution components based on AMI vendor selection.
P-225000-XS175001 Windsor TS: A5-6WR Switchgear Replacement Feasibility Study Report	Conducted by WSP in 2023 to provide assessment of Toronto Hydro's Transformer Station switchgear A5-6WR replacement located at Windsor TS.	With latest information provided by switchgear manufacturers, it is feasible to install ABB or Powell proposed switchgear for Windsor TS A5-6WR replacement.
P-260006-ZZ999001 Danforth MS: A1-2DA Replacement Feasibility Study Report	Conducted by WSP in 2023 to provide assessment of Toronto Hydro's Transformer Station switchgear A1-2DA replacement located at Danforth MS.	With latest information provided by switchgear manufacturers, it is feasible to install ABB or Powell new switchgear for Danforth TS A1-2DA replacement.
P-260008-ZZ999001 High Level MS: A7-8H Replacement Feasibility Study Report	Conducted by WSP in 2023 to provide assessment of Toronto Hydro's Transformer Station switchgear A7-8H replacement located at High Level MS.	It is feasible to install new ABB switchgear or Powell switchgear in A1-2H area to replace the existing switchgear A7-8H of High-Level MS. With Option C of new switchgear installation, ABB switchgear could have 18 feeder positions and Powell switchgear could have 20 feeder positions.
Feasibility Report Wiltshire TS - A5-6WA Switchgear Replacement Feasibility Study Report	Conducted by SNC Lavalin in 2023 to provide assessment of Toronto Hydro's Transformer station switchgear A5-6WA replacement located at Wiltshire TS.	Both solutions i.e. Powell's Floor mounted switchgear and ABBs Raised platform switchgear are technically compliant to Toronto Hydro requirements. However, Powell's Floor mount switchgear solution may be a practical solution considering that it provides choice of maximum number of feeders while offering low price as compared to ABB. It is recommended to continue to contact the manufacturers to make sure the proposed switchgear meet Toronto Hydro requirement and then select a most suitable switchgear for new switchgear installation for Wiltshire A.

Study	Scope	Conclusions and Recommendations
Distribution Asset Failure Curve Study	Conducted by Hatch to explore the potential for advancing asset failure curves from an industry consensus-based approach to a more data-driven approach, leveraging advanced statistical methods.	Produced a range of failure curves for a selection of asset classes.
Preventative Maintenance Optimization Overhead Switches	Conducted by METSCO Energy Solutions Inc. in 2022 to review Toronto Hydro's existing preventative maintenance practices for overhead three-phase gang-operated and SCADA-mate switches to identify opportunities for improvement.	Recommended a variable cycle for Toronto Hydro's switches based on their risk category.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-34

Reference: Exhibit 2B, Section D2, Page 18

Toronto Hydro identified around 45,000 deficiencies each year through planned inspections, responding to equipment failures and power interruptions, or through the course of day-to-day work. The total number of deficiencies are higher compared to the last rate application partially due to the inclusion of deficiencies corrected on site, which were not counted in the previous DSP.

Please provide the number of deficiencies excluding deficiencies corrected on site.

RESPONSE:

The number of deficiencies identified each year excluding deficiencies corrected on site is around 38,000.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-35

References: Exhibit 2B, Section D2, Page 17

Preamble:

With respect to Table 1:

QUESTION (A):

a) Please provide the data in the Priority Deficiencies (Number assigned) column excluding deficiencies corrected on site.

RESPONSE (A):

The priority deficiencies provided in Table 1 of Exhibit 2B, Section D2 exclude deficiencies corrected on-site.

QUESTION (B):

b) Please provide the underlying data and calculations in Table 1, including assumptions.

RESPONSE (B):

Each of the asset management performance indicators in Table 1 of Exhibit 2B, Section D2 were calculated as described in Table 1 below.

1 **Table 1: Calculation of Asset Management Performance Indicators**

AM Performance Indicators	Underlying Data and Calculation
Oil Deficiencies	• *Data*: Inspection Records • The number of assets with an oil leak identified during inspections are aggregated by sub-system
Priority Deficiencies	• *Data*: Inspection Records and Work Request Data • Priority Deficiencies are determined by aggregated the deficiencies, for which work requests were issued and priorities assigned (such as P1, P2, P3), by sub-system.
Customer Hours of Interruption	• *Data*: ITIS Data • Defective Equipment outage incidents and corresponding total number of customer hours interrupted are aggregated by sub-system.
Customer Interruptions	• *Data*: ITIS Data • Defective Equipment outage incidents and corresponding total number of customers interrupted are aggregated by sub-system.
Condition	• *Data*: Asset Registry and Inspection Records • The number of assets in HI4 or HI5 are divided by the total population of the assets with health scores by sub-system.
Oil Containing PCBs	• *Data*: Asset Registry and Inspection Records • The number of assets containing or at-risk of containing PCBs were aggregated by sub-system.
Age	• *Data*: Asset Registry • The number of assets that are at or past Useful Life by sub-system.
Legacy Assets	• *Data*: Asset Registry • The remaining inventory of the asset or configuration type in the distribution system.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-36

Reference: Exhibit 2B, Section D2

QUESTION (A):

a) For each of the asset types in Figures 15, 19, 20, 25 and 29, please provide in excel the number of failures for each of the years 2018 to 2023.

RESPONSE (A):

Please see Appendix A of this interrogatory response for number of failures in the 2018-2020 period.

Toronto Hydro has interpreted this question as requesting condition-based failure data. Toronto Hydro comprehensively gathered condition-based failure data to derive Probability of Failure ("PoF") parameters. The study involved collecting data based on the failure modes as defined in Exhibit 2B, Section D3, Appendix C, page 14. Toronto Hydro undertook this initiative in 2021 for the primary purpose of determining the average number of failures for asset classes with an asset condition assessment methodology. The dataset acquired for this exercise does not extend beyond 2020.

Please refer to Toronto Hydro's response to Interrogatory 2B-Staff-134 for the process used to collect the number of failures. Collecting accurate and complete asset-specific failure data from operational records is a significant and resource-intensive undertaking. This is especially true for Incipient and Degraded failure modes, which rely upon records from corrective fieldwork that

require significant filtering, data cleansing, and data blending efforts. For this reason, Toronto Hydro does not update failure records for all failure modes on an annual basis.[1]

QUESTION (B):

b) For each asset type in part a), please provide in excel the percentage of failures in assets past useful life for the period 2020-2023.

RESPONSE (B):

Please see Appendix A. This information is provided on a best-efforts basis. Due to data limitations, there are some gaps in Toronto Hydro's ability to link specific failure events to asset condition at the time of failure. Note that the percentage of failures past useful life is dependent on the relative age distribution observed within each asset class.

QUESTION (C):

c) For each asset type in part a), please provide in excel the percentage of failures in assets with a Health Index of HI4 or HI5 for the period 2020-2023.

RESPONSE (C):

Please see Appendix A. For a more meaningful and comprehensive view of the relationship between condition and failure refer to 2B-STAFF-134, Table 1.

[1] Note that in a number of locations in the pre-filed evidence and the interrogatory responses, Toronto Hydro is providing failure-related data that includes the years 2021 and later. To be clear, this data is generally limited to Outage failures (i.e., asset failures that resulted in a recorded outage event) or failures estimated from Reactive Capital data.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-37

Reference: Exhibit 2B, Section D2, Appendix A

Please provide any costs over the test period resulting from Stantec's Climate Change Vulnerability Assessment Update.

RESPONSE:

There are no costs forecast over the 2025-2029 period resulting from Stantec's Climate Change Vulnerability Assessment Update.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-38

References: Exhibit 2B, Section D3, Page 9

For each of the asset types in Figures 15, 19, 20, 25 and 29 in 2B-D2, please provide in excel the total number of deficiencies (P1 + P2 + P3) for each of the years 2020 to 2023, including and excluding asset deficiencies corrected onsite.

RESPONSE:

Please see Appendix A to this response, '2B-AMPCO-38_App A_Deficiencies.xlsx'. The priority deficiencies provided in this file exclude deficiencies corrected on-site. The "Find-it and Fix-it" approach is for non-critical deficiencies that are identified and feasible to repair on site. Toronto Hydro does not create a notification for this type of work, which helps eliminate additional travel time for a different crew to complete the repair.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-39

References: Exhibit 2B, Section D3, Page. 9

QUESTION (A):

a) With respect to Figure 2, please provide the total number of Work Requests split between Capital Work and Non-Capital Work for each of the years 2020-2023.

RESPONSE (A):

Please see Table 1 below.

Table 1: Capital and Non-Capital Work Requests (Excluding Cancellations)

TYPE OF WORK	2020	2021	2022	2023
CAPEX (Capital Work)	1,582	984	1,284	772
OPEX (Non-Capital Work)	6,500	10,327	11,707	13,074

QUESTION (B)

Please provide the number of Work Requests cancelled each year.

RESPONSE (B):

b) Please see Table 2 below for the number of Work Requests cancelled each year.

Table 2: Number of Work Requests Cancelled 2020-2023

	2020	2021	2022	2023
Cancellations	9,633	9,349	7,262	9,973

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-40

Reference: Exhibit 2B, Section D3 p.28

Please map the assets in Table 8 to the following Categories: Overhead, Underground, Station and Network.

RESPONSE:

Please see the table below.

Table 1: Assets by Category

Overhead	Underground	Station	Network
• Overhead Gang-Operated Switches • SCADA-Mate Switches • Wood Poles	• Submersible Transformers • Vault Transformers • Padmount Transformers • Air-Insulated Padmount Switches • SF6-Insulated Padmount Switches • SF6-Insulated Submersible Switches • Air-Insulated Submersible Switches • Cable Chambers • ATS Vaults • CLD Vaults • CRD Vaults • Submersible Switch Vaults • URD Vaults	• Station Power Transformers • Airblast Circuit Breakers (MS & TS) • Air Magnetic Circuit Breakers (MS & TS) • 4 kV Oil Circuit Breakers (MS) • KSO Oil Circuit Breakers (TS) • SF6 Circuit Breakers (TS) • Vacuum Circuit Breakers (MS & TS)	• Network Protectors • Network Transformers • Network Vaults

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-41

Reference: Exhibit 2B, Section D3, Page 28

With respect to Table 7, please provide Toronto Hydro's optimal timing to address assets in each Health Index band.

RESPONSE:

Toronto Hydro does not prescribe optimal replacement timing to Health Index bands as this would be an oversimplification of the asset management decision-making process. Asset health scores are one of several important factors that influence the pacing and prioritization of planned asset replacements. Asset criticality, for example, is equally important. An asset with an HI4 health score that is situated on the main trunk of a feeder (e.g. a wood pole carrying multiple trunk circuits) is likely to be a higher priority for planned replacement than an asset with an HI4 health score situated on a fuse-protected lateral section of a feeder (e.g. a wood pole that is carrying only a secondary service line).

When it comes to determining the appropriate size of the long-term capital expenditure plan, Toronto Hydro leverages Health Index demographics to inform estimation of the minimum necessary pacing of asset replacement required to manage the condition of a given asset population in alignment with outcome objectives. Please see response to 2B-SEC-44 for more information.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-42

Reference: Exhibit 2B, Section D3, Page 54

The IPPR process also creates a feedback loop that provides information about program level completion and historical work executed in each program. Information is reported on an individual project basis and includes the project's total spending and assets replaced or installed in any particular program.

Where applicable, for each of the segments in E5 to E8, please provide the actual asset units replaced and installed over 2020-2024 compared to forecast.

RESPONSE:

Please see Appendix A to this response for the forecast and actual units replaced and installed over 2020-2024 compared to forecast for each of the applicable segments in E5 to E8.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-43

References: Exhibit 2B, Section D3, Appendix A

QUESTION (A):

a) With respect to Tables 3-5, please add the asset population to the Table and update the excel versions.

RESPONSE (A):

Please see Tables 1-3 for the revised tables and 2B-AMPCO-43 Appendix A to this response for the excel versions.

1 **Table 1: Summary of Health Index Distribution and Asset Populations as of year end 2017**

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
Cable Chambers	11,111	8,112	1,162	1,350	398	89
4kV Oil Circuit Breaker	187	36	4	123	24	0
AirBlast Circuit Breaker	234	15	9	206	1	3
Air Magnetic Circuit Breaker	556	145	90	247	21	53
Oil KSO Circuit Breaker	40	10	7	11	11	1
SF6 Circuit Breaker	160	130	6	18	3	3
Vacuum Circuit Breaker	668	578	46	13	2	29
Network Protectors	1,690	1,086	185	319	74	26
Overhead Gang operated Switches	969	854	27	76	3	9
Air Insulated Padmount Switch	572	404	20	73	30	45
SF6 Insulated Padmount Switch	410	402	0	2	0	6
SCADAMATE Switches	1,119	1,084	1	26	0	8
Air Insulated Submersible Switch	868	755	79	27	7	0
SF6 Insulated Submersible Switch	396	353	14	7	3	19
Station Power Transformers	242	83	77	61	13	8
Network Transformers	1,822	1,334	255	166	60	7
Padmount Transformers	6,617	5,547	656	283	113	18
Submersible Transformers	8,902	7,816	588	271	172	55
Vault Transformers	11,831	6,807	4,315	450	214	45
Underground Vaults (Combined)	1316	1017	186	72	12	29
ATS Vaults	8	8	0	0	0	0
CLD Vaults	21	21	0	0	0	0
CRD Vaults	10	9	0	1	0	0
Network Vaults	545	322	120	63	11	29
Submersible Switch Vaults	120	115	5	0	0	0
URD Vaults	612	542	61	8	1	0
Wood Poles	107,068	63,526	7,354	29,779	5,687	722

1 **Table 2: Summary of Current Health Index Distribution and Asset Populations as of year end 2022**

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
Cable Chambers	10,657	6,640	1,346	2,079	462	130
4kV Oil Circuit Breaker	58	4	0	53	0	1
AirBlast Circuit Breaker	156	2	1	137	8	8
Air Magnetic Circuit Breaker	494	61	47	357	2	27
Oil KSO Circuit Breaker	23	1	13	9	0	0
SF6 Circuit Breaker	133	121	6	2	4	0
Vacuum Circuit Breaker	825	803	12	10	0	0
Network Protectors	1,728	1,342	129	233	21	3
Overhead Gang operated Switches	868	659	98	88	10	13
Air Insulated Padmount Switch	480	359	4	64	24	29
SF6 Insulated Padmount Switch	680	663	0	0	1	16
SCADAMATE Switches	1,170	1,078	9	66	4	13
Air Insulated Submersible Switch	977	720	183	67	7	0
SF6 Insulated Submersible Switch	487	437	18	15	7	10
Station Power Transformers	173	87	66	12	8	0
Network Transformers	1,718	1,370	244	61	40	3
Padmount Transformers	7,011	5,142	1,085	527	233	24
Submersible Transformers	9,161	8,120	699	162	133	47
Vault Transformers	11,497	6,799	3,869	571	247	11
Underground Vaults (Combined)	1183	870	164	49	53	47
ATS Vaults	7	5	1	0	1	0
CLD Vaults	22	20	2	0	0	0
CRD Vaults	11	8	3	0	0	0
Network Vaults	470	225	110	44	46	45
Submersible Switch Vaults	73	70	3	0	0	0
URD Vaults	600	542	45	5	6	2
Wood Poles	106,386	68,288	7,566	21,073	8,950	509

Table 3: Summary of Future Health Index projected for year end 2029 with Asset Populations

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
Cable Chambers	10,657	6,015	1,026	2,503	535	578
4kV Oil Circuit Breaker	58	4	0	29	24	1
AirBlast Circuit Breaker	156	2	0	97	43	14
Air Magnetic Circuit Breaker	494	11	50	41	361	31
Oil KSO Circuit Breaker	23	1	0	8	14	0
SF6 Circuit Breaker	133	93	28	4	2	6
Vacuum Circuit Breaker	825	786	17	10	12	0
Network Protectors	1,728	1,298	40	56	187	147
Overhead Gang operated Switches	868	517	106	111	91	43
Air Insulated Padmount Switch	480	320	18	13	16	113
SF6 Insulated Padmount Switch	680	663	0	0	0	17
SCADAMATE Switches	1,170	724	65	69	149	163
Air Insulated Submersible Switch	977	667	53	152	90	15
SF6 Insulated Submersible Switch	487	419	26	9	6	27
Station Power Transformers	173	82	11	60	12	8
Network Transformers	1,718	1,243	111	215	87	62
Padmount Transformers	7,011	4,451	542	887	595	536
Submersible Transformers	9,161	7,330	642	635	240	314
Vault Transformers	11,497	5,220	1,668	3,595	587	427
Underground Vaults (Combined)	1183	848	101	83	52	99
ATS Vaults	7	4	1	1	0	1
CLD Vaults	22	20	0	2	0	0
CRD Vaults	11	8	3	0	0	0
Network Vaults	470	207	92	34	47	90
Submersible Switch Vaults	73	68	4	1	0	0
URD Vaults	600	541	1	45	5	8
Wood Poles	106,386	60,308	8,350	5,570	24,464	7,694

QUESTION (B):

b) Page 5: Please provide the Summary of Current Health Index Distribution as of year end 2023 and include asset population in the Table.

RESPONSE (B):

Please see Table 4 below.

Table 4: Summary of Current Health Index Distribution and Asset Populations as of year end 2023

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
Cable Chambers	10,752	6,715	1,385	2,072	482	98
4kV Oil Circuit Breaker	58	4	0	53	0	1
AirBlast Circuit Breaker	156	2	1	137	8	8
Air Magnetic Circuit Breaker	494	61	47	357	2	27
Oil KSO Circuit Breaker	23	1	13	9	0	0
SF6 Circuit Breaker	133	121	6	2	4	0
Vacuum Circuit Breaker	825	803	12	10	0	0
Network Protectors	1,738	1,393	94	229	20	2
Overhead Gang operated Switches	827	569	118	118	9	13
Air Insulated Padmount Switch	484	343	24	66	22	29
SF6 Insulated Padmount Switch	711	694	0	0	0	17
SCADAMATE Switches	1,132	1,035	25	59	5	8
Air Insulated Submersible Switch	1,002	730	192	70	10	0
SF6 Insulated Submersible Switch	488	451	18	5	8	6
Station Power Transformers	177	93	57	19	8	0
Network Transformers	1,687	1,362	270	32	21	2
Padmount Transformers	7,116	5,224	1,105	579	194	14
Submersible Transformers	9,157	8,219	726	88	96	28
Vault Transformers	11,454	5,422	5,206	581	244	1
Underground Vaults (Combined)	1228	909	183	43	74	19
ATS Vaults	7	5	1	0	1	0
CLD Vaults	25	25	0	0	0	0

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
CRD Vaults	19	9	7	1	2	0
Network Vaults	508	243	139	39	68	19
Submersible Switch Vaults	76	71	3	1	1	0
URD Vaults	593	556	33	2	2	0
Wood Poles	108,213	70,008	7,728	21,711	8,343	423

QUESTION (C):

c) Page 4: The footnote to Table 3 states that Wood Pole results are re-calculated based on the refinement to the Wood Pole asset model highlighted in Table 1.

Please provide the condition results for wood poles before the noted recalculation.

RESPONSE (C):

Please see Table 5 below.

Table 5: Wood Pole Health Index Distribution as of end of 2017 Before Recalculation

Asset Class	Health Score				
	HI1	HI2	HI3	HI4	HI5
Wood Poles	68,425	5,777	20,915	10,877	1,074

QUESTION (D):

d) Page 6: Please confirm Table 5 is based on the future, projected for year end 2029, based on no investment. If yes, please provide the Summary of Future Health Index projected for year-end 2029 taking into account the planned investments for 2025-2029.

RESPONSE (D):

Confirmed. Please see Toronto Hydro's response to interrogatory 2B-SEC-44.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-44

Reference: Exhibit 2B, Section D5, Page 19

Please provide costs for the Intelligent Grid Programs in Table 2 for the years 2020-2024.

RESPONSE:

Please see table below.

Table 1: 2020-2024 Intelligent Grid Programs Expenditures ($ Millions)

Program	2020-2024 Total[1]
Network Condition Monitoring and Control (NCMC)[2]	56.8
Stations Digital Relays[3]	7.7
AMI 2.0[4]	87.4
SCADA Switches & Reclosers[5]	19.9
FLISR	4.2
ADMS	
Overhead and Underground Sensors	n/a - new program for 2025-29
Online Cable Monitoring	n/a - new program for 2025-29
Transformer Monitoring	n/a - new program for 2025-29

[1] Includes actuals and bridge.
[2] Please refer to Exhibit 2B, Section E7.3 Table 5 for more information.
[3] Please refer to Exhibit 2B, Section E6.6 Table 49 for more information.
[4] Please refer to Exhibit 2B, Section E5.4 Table 4 for more information.
[5] Please refer to Exhibit 2B, Section E7.1 Table 6 for more information. SCADA switches and reclosers are part of Contingency Enhancement.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-45

Reference: Exhibit 2B, Section D5, Page 34

Please provide costs for the Grid Readiness in Table 3 for the years 2020-2024.

RESPONSE:

Please see table below.

Table 1: 2020-2024 Grid Readiness Expenditures ($ Millions)

Program	2020-2024 Total[1]
Grid Protection Monitoring and Control[2]	11.2
Renewable Energy Storage Systems[3]	1.2
Flexibility Services[4]	2.0
AMI 2.0 for DER Monitoring[5]	87.4
Energy Centre Enhancement for Leveraging DERs	1.0
Energy Centre Enhancement for Monitoring and Forecasting	n/a - new program for 2025-29
Enhancing DER Connection Process	n/a - new program for 2025-29
Hosting and Load Capacity Analysis	n/a - new program for 2025-29
GIS Asset Tracking	n/a - new program for 2025-29
Low Voltage Level Forecasting	n/a - new program for 2025-29

[1] Includes actuals and bridge.
[2] Please refer to Exhibit 2B, Section 5.5, Table 4 for more information.
[3] Please refer to Exhibit 2B, Section 7.2, Table 16 for more information.
[4] Please refer to Exhibit 2B, Section 7.2, Table 7 (OPEX) for more information.
[5] These costs encompass the complete Metering program for 2020-24. Please refer to Exhibit 2B, Section E5.4, Table 4 for more information.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-46

Reference: Exhibit 2B, Section D5, Page 34

Toronto Hydro provides some examples of potential Innovation pilot projects.

QUESTION (A) :

a) Please explain how Toronto Hydro will determine the selection of Innovation pilot projects without duplicating existing or planned work by others.

RESPONSE (A):

Through ongoing research and regular engagement with customers, stakeholders, experts and utility peers, Toronto Hydro intends to make every reasonable effort to ensure it is leveraging and building on innovative work that has been carried out by others in the sector. However, it is important to note (as explained in pages 6 and 7 of the reference evidence), that new distribution capabilities cannot be readily integrated with Toronto Hydro's unique distribution system characteristics without a thorough analysis and testing of impacts. This analysis must typically be undertaken as part of a pilot project to assess the following types of parameters: functional compatibility with existing core technology, feasibility of integration with existing control systems; compliance with minimum safety, operating, and cyber security standards; and financial viability and sustainability. Adopting the innovative solutions implemented by utilities in other jurisdictions is not a "cut-and paste" exercise; it requires further in-depth exploration and testing or piloting to assess the parameters identified above.

QUESTION (B) AND (C):

b) Has Toronto Hydro investigated potential external funding opportunities for Innovation? Please discuss.

c) Has Toronto Hydro investigated potential cost sharing Innovation partnerships? Please discuss.

RESPONSE (B) AND (C):

As noted in Exhibit 1B, Tab 4, Schedule 2 at page 10, Toronto Hydro intends to continue to explore opportunities to leverage external funding and cost-sharing partnerships where possible, including with organizations such Natural Resources Canada. For more information about historical efforts to secure external funding for innovation please refer to the response to interrogatory 1B-Staff-10.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-47

Reference: Exhibit 2B, Section D6, Page 1

The primary objectives of the Facilities Asset Management Strategy (the "Strategy") are to maintain the safety, reliability, and functionality of stations and work centres.

Please provide a copy of the Strategy.

RESPONSE:

The document entitled "Facilities Asset Management Strategy" filed in Exhibit 2B, Section D6 constitutes the strategy.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-48

Reference: Exhibit 2B, Section D7

QUESTION (A):

a) Please provide the specific accomplishments over 2020-2025 to be achieved under Toronto Hydro's Net Zero by 2040 strategy and the corresponding costs.

RESPONSE (A):

During the current rate period, Toronto Hydro accomplished a 25% reduction of Scope 1 emissions relative to 2019 levels, achieved through the initiatives outlined in the following table.

Table 1: Accomplishments under Toronto Hydro's Net Zero by 2040 Strategy for 2020-2025

Initiative	Corresponding costs (approximates):
Optimization of building automation systems	$0.9 million
Using lower emission biofuels	No additional cost compared to using diesel with no biofuel added.
Introducing electric vehicles	Average incremental cost per heavy duty unit: $340,000 Average incremental cost per light duty unit: $24,000
Optimizing vehicle use	No additional cost as this involves optimizing the use of already purchased vehicles.
Using anti-idling technology	$60,000
Reactively replaced Natural Gas HVAC units with hybrid electric or electric (where applicable)	Incremental cost of $300,000

QUESTION (B):

b) Please provide a copy of Toronto Hydro's Net Zero by 2040 strategy.

RESPONSE (B):

The document entitled "Net Zero 2040 Strategy" filed in Exhibit 2B, Section D7 constitutes the strategy.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-49

Reference: Exhibit 2B, Section E5.1, Page 18

Please provide a breakdown of the number of customer connections by customer type for each of the years 2020-2029.

RESPONSE:

Please see Table 1 below. Toronto Hydro notes that the connection type is based on size, required demand load, geographical location, and the available infrastructure in the area, and as such volumes vary year-to-year (as described in Exhibit 2B, Section E5.1, p.7). The 2025-2029 capital expenditure forecast was developed based on historical data; therefore, Toronto Hydro is unable to provide the requested information for 2024-2029.

Table 1: Number of Customer Connections by Type

	2020	2021	2022	2023
Low Voltage New	2,545	2,245	2,290	2,329
Low Voltage Upgrades	2,224	2,687	2,970	3,043
High Voltage	87	132	111	163
Total	**4,856**	**5,064**	**5,371**	**5,535**

Note: High Voltage is inclusive of both new connections and upgrades

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-50

Reference: Exhibit 2B, Section E6.1

QUESTION:

Please complete the following Table:

Area Conversions	2020-2024	2025-2029
Rear Lot Conversion (# of Customers)		
Rear Lot Conversion (# Poles Replaced)		
Box Construction (# Poles Replaced)		
Box Construction (# Transformers Replaced)		
Box Construction (# Switches Replaced)		
Box Construction (Overhead Primary Conductors)		

RESPONSE:

Please see Table 1 below. Toronto Hydro notes that the 2020-2024 number of customers for the Rear Lot program has increased slightly due to having a more refined customer count following project detailed design and attainment. For Rear Lot number of poles replaced, Toronto Hydro has not provided any numbers because, in most cases, poles in rear lot areas are not removed or replaced through Rear Lot Conversion projects. The poles in these areas are predominantly owned by a third party, e.g. Bell, and usually have third-party assets attached to them. In the limited

instances where the poles are owned by Toronto Hydro, they still have third-party attachments and therefore cannot be removed. In these cases, at the end of the project Toronto Hydro removes any primary or secondary distribution assets from the poles and transfers the ownership of these poles to the third party.

Toronto Hydro notes that the number of poles for Box Construction have shifted between the 2020-2024 and 2025-2029 periods due to changes in the execution schedule as discussed in Toronto Hydro's response to interrogatory 2B-Staff-201. Toronto Hydro further notes that there has been a net increase of 317 poles converted over the 2020-2023 period increase, which is due to the latency in recording in-service additions from completed projects.

Table 1: Rear Lot and Box Construction Conversion Data and Forecasts

Area Conversions	2020-2024	2025-2029
Rear Lot Conversion (# of Customers)	736	1,467
Rear Lot Conversion (# Poles Replaced)	N/A	N/A
Box Construction (# Poles Replaced)	2,701	2,665
Box Construction (# Transformers Replaced)	1,183	1,459
Box Construction (# Switches Replaced)	548	591
Box Construction (Overhead Primary Conductors)	70 kms	72 kms

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-51

References: EB-2018-0165, Exhibit 2B, Section E6.1, Page 21

Preamble:

With respect to Rear Lot Conversion, Toronto Hydro applied an average cost of $0.036 million per customer plus inflation and engineering and support costs in developing the segment cost forecasts for the 2020-2024 period.

Please provide the actual average cost per customer over the 2020 to 2023 period and show the calculation.

RESPONSE:

Please see Table 1 below. The actual average cost per customer over the 2020 to 2023 period was $0.052 million. Toronto Hydro calculated the average cost by dividing the total cost of all fully completed (i.e. both civil and electrical) rear lot projects during the period, $31,427,781, by the total number of customers converted in those same projects, 599.

Table 1: Calculation of 2020-2023 Rear Lot Cost per Customer

Project Name (Area)	Phase	Cost	# of Customers	Cost/Customer ($)
Jamestown	1	$5,123,552	122	$41,996
Jamestown	2	$4,168,160	63	$66,161
Jamestown	3	$5,112,480	90	$56,805
Thorncrest	9	$4,358,001	83	$52,506
Thorncrest	10	$6,200,180	118	$52,544
Thorncrest	11	$6,465,408	123	$52,564
Total		**$31,427,781**	**599**	**$52,467**

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-52

Reference: EB-2018-0165, Exhibit 2B, Section E6.1, Page 25

Preamble:

With respect to Box Construction, Toronto Hydro used the average cost of $0.029 million per pole plus inflation and engineering and support costs to derive the forecast costs for 2020-2024.

Please provide the actual average cost per pole over the 2020 to 2023 period and show the calculation.

RESPONSE:

The actual average cost per pole over the 2020-2023 period is $0.0457 million and it is calculated by dividing $102.2 million (total spend over the 2020-2023 period) by 2,238 poles (total poles converted over the 2020-2023 period). In Exhibit 2B, Section E6.1 at page 26, Toronto Hydro noted an average cost of $0.0398 million per pole, which was calculated based on projects completed over the 5-year period from 2018-2022. Based on the latest 5-year period (i.e. 2019-2023), the average cost per pole is $0.0438 million. Cost increases are mainly due to factors such as inflation and the increasing complexity of the projects as outlined in Exhibit 2B, Section E6.1.4 at page 26, which make both design and execution more challenging.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-53

Reference: EB-2018-0165, Exhibit 2B, Section E6.1, Page 26

Preamble: When planning box construction conversion projects, Toronto Hydro considers reliability, third party scheduling conflicts and the planned decommissioning of municipal stations. Table 12 provides a list of the eight remaining stations carrying box construction lines, the conversion date and the projected costs.

QUESTION (A):

a) Please update Table 12.

RESPONSE (A):

Please see Table 1 below for the update to Table 12 from EB-2018-0165, Exhibit 2B, Section E6.1.

Table 1: Update to Remaining Stations with Box Construction

Station	Conversion	Station-related or External Dependencies	Projected/ Actual Costs ($M)[1]
Sherbourne MS	2021-2026	Station Decommissioning	21.7
University MS	2021-2029	City of Toronto, Station Decommissioning	25.1
Spadina MS	2022-2026	Metrolinx, Station Decommissioning	37.45
Chaplin MS		Metrolinx, Station Decommissioning	
Strachan MS[2]	2017-2026	Hydro One, Station Decommissioning	21.0
Defoe MS[2]		Metrolinx, Station Decommissioning	
High Level MS	2021-2029	Hydro One, Station Decommissioning	70.5

[1] Excludes inflation and other allocations.
[2] For the Defoe-Strachan area, while all box-framed poles will be removed, full voltage conversion will not be completed until after 2029 due to a number of internal and external dependencies and those costs are not included in the table.

QUESTION (B):

b) Please identify where Toronto Hydro coordinated the elimination of box construction with the station and external dependencies in Table 12 over 2020-2024.

RESPONSE (B):

Please refer to Table 1 in the response to part (a) where Toronto Hydro has also updated the table with respect to its coordination of the elimination of box construction with station and external dependencies.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-54

Reference: Exhibit 2B, Section E6.1 p.18

The evidence states "Based on asset condition assessment, 9 percent of the wood poles have material deterioration and are in poor condition and this percentage is expected to increase to approximately 35 percent by 2029 without any investments. As with age, when considering box-framed poles on their own, these percentages increase: to 15 percent HI4 or HI5 as of 2022 and 61 percent by 2029 (without investment)."

Please provide the data for box-framed poles for 2029 including planned investments.

RESPONSE:

With planned investments, all box-framed poles are expected to be removed by the end of 2026. Please refer to Figure 15 in Exhibit 2B, Section E6.1.4 at page 25 for the box-framed pole conversion plan.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-55

Reference: Exhibit 2B, Section E6.1, Page 20

QUESTION (A) AND (B):

a) With respect to Table 10 Status of 2020-2024 DSP Planned Projects, please provide the cost for each of the completed phases.

b) Please provide the projected costs of projects/phases with completion dates of 2023 and 2024.

RESPONSE (A) AND (B):

Please see Table 1 below, which includes the cost for each of the completed phases (including any completed in 2023) and projected costs for projects/phases with completion dates in 2024. Toronto Hydro has also updated the number of customers for all completed projects based on more recent information obtained through detailed design.

Table 1: Status and Costs for 2020-2024 DSP Planned Projects

Rear Lot Area	Phases	Cost	Number of Customers (2020-2024 Planned)	Number of Customers	Conversion Status
Thorncrest	Phase 9	$4,358,001	618	83	Completed
	Phase 10	$6,200,180		118	Completed
	Phase 11	$6,465,408		123	Completed
	Phase 12	N/A		139	Deferred
Jamestown	Phase 1	$5,123,552	258	122	Completed
	Phase 2	$4,168,160		63	Completed
	Phase 3	$5,112,480		90	Completed
Markland Woods	Phase 6	N/A	300	167	Deferred
	Phase 7	N/A		118	Deferred

Rear Lot Area	Phases	Cost	Number of Customers (2020-2024 Planned)	Number of Customers	Conversion Status
Martin Grove Gardens	Phases 1 to 5	$7,187,979	452	137	2024
	Phases 6 to 9	N/A		170	Deferred

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-56

Reference: EB-2018-0165, Exhibit 2B, Section E6.1, Page 14

The evidence states "Rear Lot projects include the replacement of PCB at-risk transformers. Through the Area Conversion program, Toronto Hydro is proposing to eliminate approximately 100 PCB at-risk transformers by 2024 as part of the planned projects in the rear-lot system.

Please provide the number of PCB at-risk transformers replaced by 2024.

RESPONSE:

As of the end of 2023, Toronto Hydro has replaced 45 PCB at-risk transformers through Rear Lot projects and is forecasting the removal of four additional PCB at-risk transformers in 2024. The reduction in the number of PCBs units replaced through Rear Lot projects compared to the 2020-2024 distribution system plan forecast is driven by the deferral of rear lot projects (see Exhibit 2B, Section E6.1 at pages 20-21. Toronto Hydro also notes that any PCB at-risk transformers in rear lots not replaced through Rear Lot projects will be or already have been replaced through other capital programs by the end of 2025.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-57

Reference: EB-2018-0165, Exhibit 2B, Section E6.1, Page 19

Preamble:

Toronto Hydro indicates there are currently 400 PCB at-risk transformers on box construction feeders. This accounts for a third of the transformers on box construction feeders as of 2017. The Box Construction Conversion segment will eliminate an estimated 325 PCB at-risk transformers by 2024 through the planned projects.

Please provide the number of PCB at-risk transformers replaced over 2020-2024.

RESPONSE:

As of the end of 2023, Toronto Hydro has removed an estimated 301 PCB at-risk transformers from Box Construction feeders and forecasts the removal of 30 additional PCB at-risk transformers from Box Construction feeders in 2024.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-58

Reference: Exhibit 2B, Section E6.2

QUESTION (A):

a) Page 11 Figure 5: Please provide a table that sets out the number of equipment failures for each of the years 2013 to 2023 for UG Transformer, Underground Cable and Underground Switch in the Horseshoe area.

RESPONSE (A):

In the process of preparing this interrogatory response, Toronto Hydro identified an error with the referenced figure. The original figure consists of data for both the Horseshoe and Downtown systems. Figure 1 below shows the corrected figure (i.e., for Horseshoe only), and Table 1 provides the requested breakdown of the corrected dataset, including 2023. Note that this figure is based on outages caused by asset failures and does not address failures that resulted in repair or replacement without causing an outage.

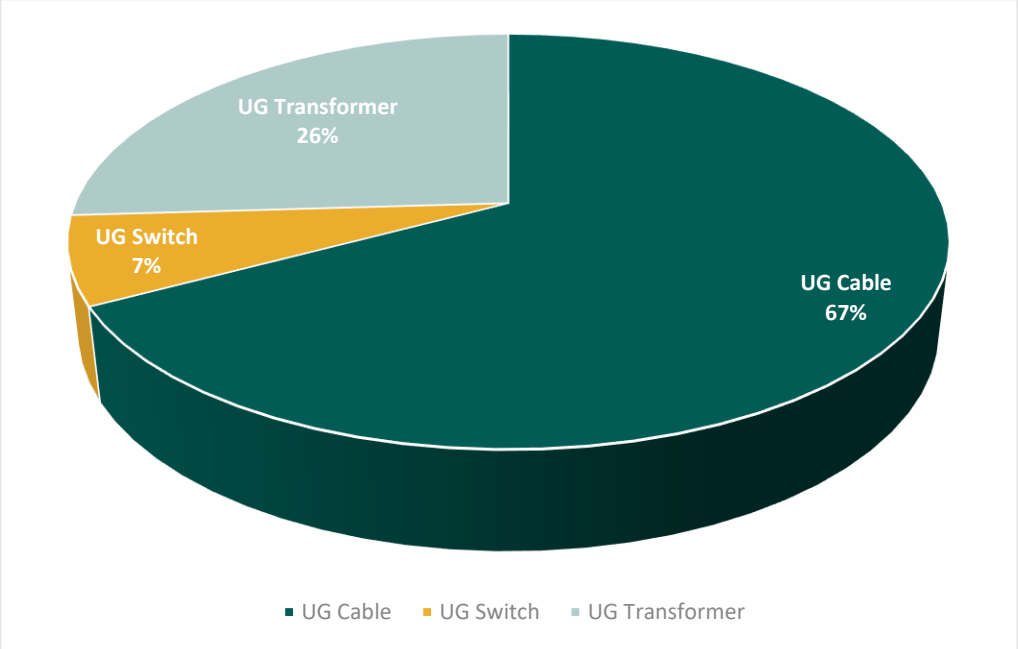


Figure 1: Underground ("UG") Equipment Failures in Underground Horseshoe System by Asset Type from 2013 to 2022

Table 1: Outages due to Defective Equipment in Horseshoe area

Assets	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
UG Cable	206	221	166	150	137	142	79	99	111	157	107
UG Switch	15	13	17	17	14	16	13	11	23	7	15
UG Transformer	74	93	68	71	61	61	41	29	22	39	49

QUESTION (B):

b) Page 28: Do Table 6 and Figure 28 reflect the Horseshoe area? If not please provide for the Horseshoe area.

RESPONSE (B):

Table 6 and Figure 28 in Exhibit 2B, Section E6.2 reflect only the Horseshoe area.

QUESTION (C):

c) Page 31: The forecasted volumes are estimates based on a preliminary selection of areas targeted for complete rebuilds on 27.6 kV feeders, rebuilds with voltage conversion, and spot replacements.

Please provide the preliminary selection of areas.

RESPONSE (C):

Figure 2 below shows the preliminary areas for rebuilds along with locations of remaining transformers with at least material deterioration as of 2029 that will not be part of planned area rebuilds.

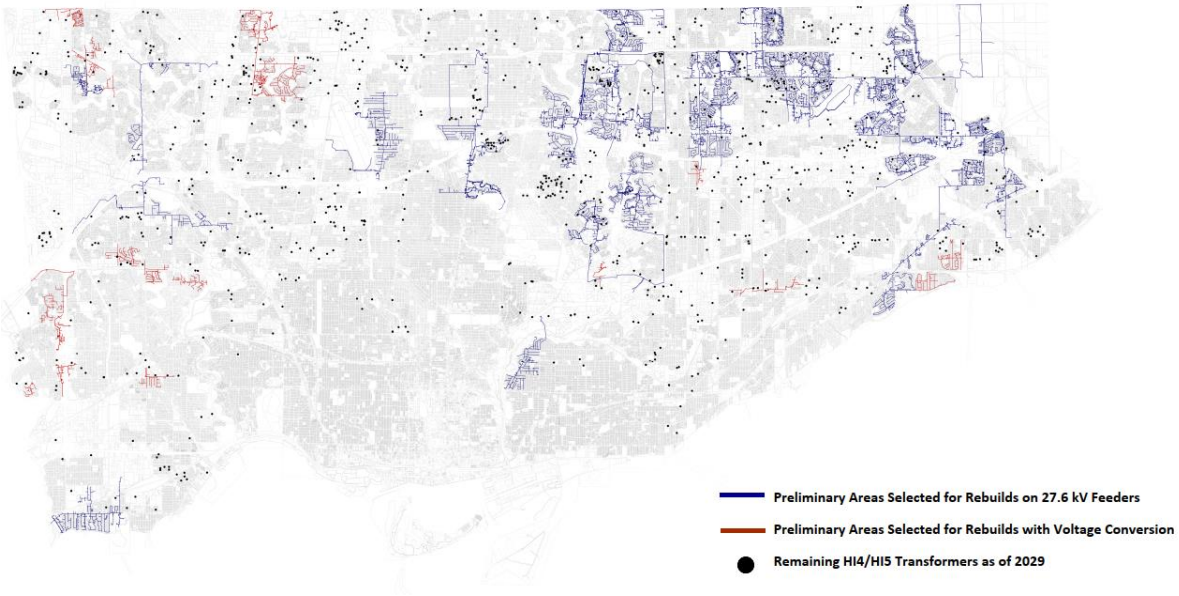


Figure 2: Map of Preliminary Areas Selected for Rebuilds

QUESTION (D):

d) Page 32: Please provide the number of transformer spot replacements for each of the years 2013 to 2023.

RESPONSE (D):

Please see Table 2 below. Toronto Hydro does not have records of how many transformers were replaced specifically using a spot replacement approach prior to 2022.

Table 2: Transformers Replaced under Spot Replacement Projects

	2022	**2023**
Number of Spot Replacements	160	207

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-59

Reference: Exhibit 2B, Section E6.3

QUESTION (A):

a) Please add 2023 data to the following: Figure 15, Figure 21, Figure 22, and Figure 36.

RESPONSE (A):

Please see Figures 15, 21, 22, and 36 from Exhibit 2B, Section E6.3 updated with 2023 information below.

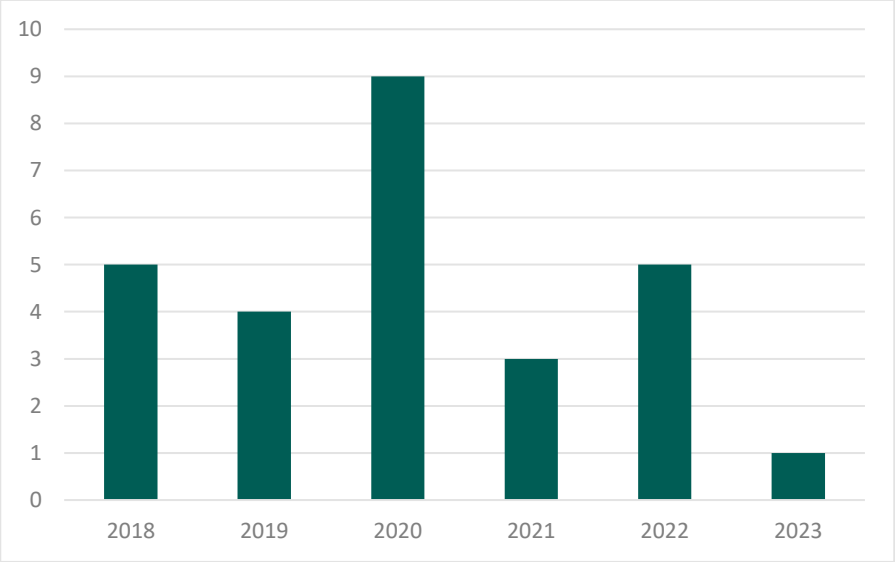


Figure 15: Number of Lid incidents

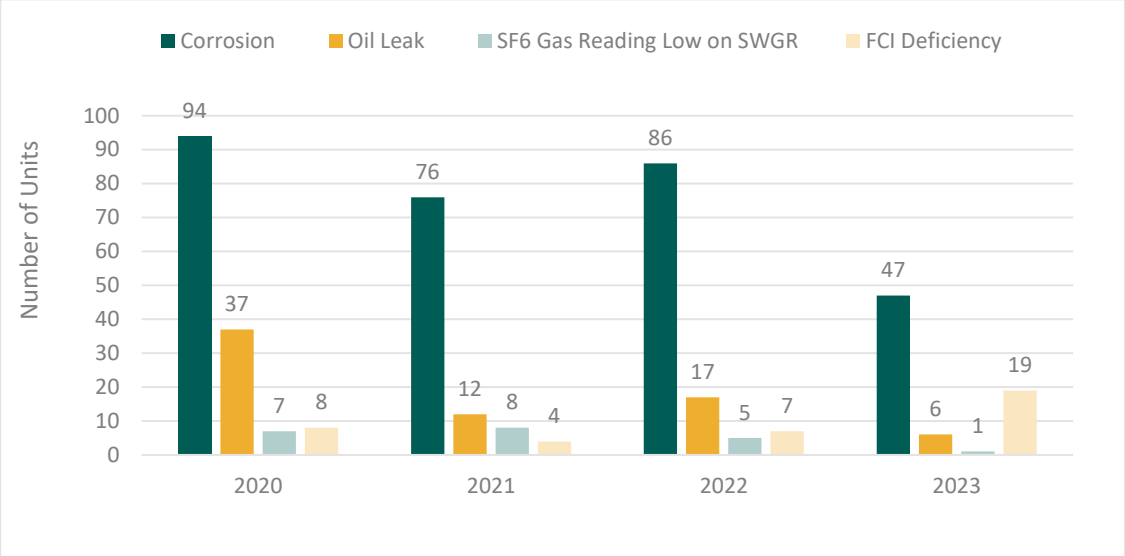


Figure 21: URD Electrical Deficiencies

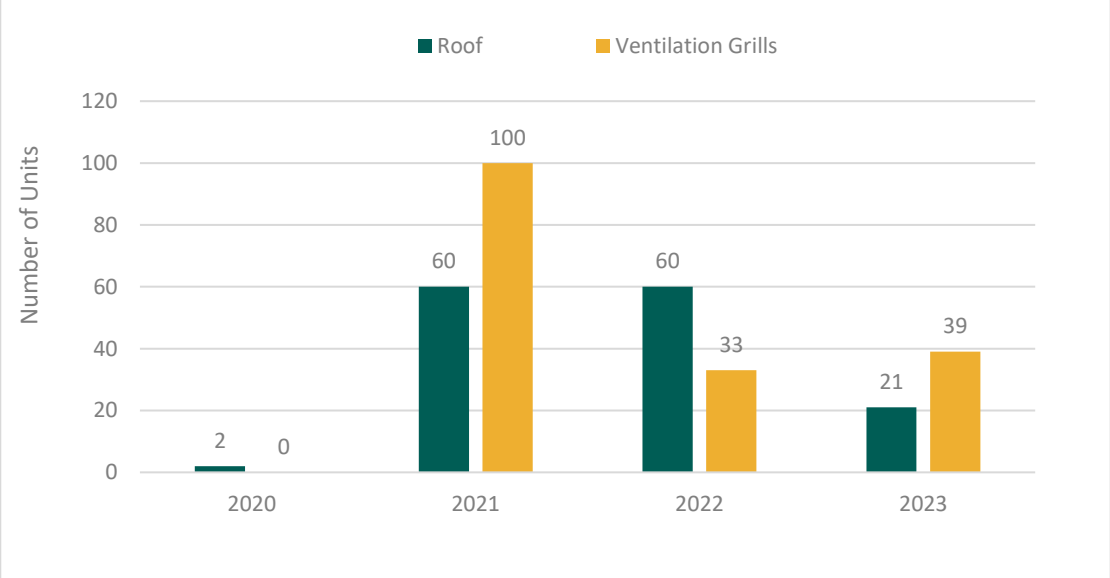


Figure 22: URD Civil Deficiencies

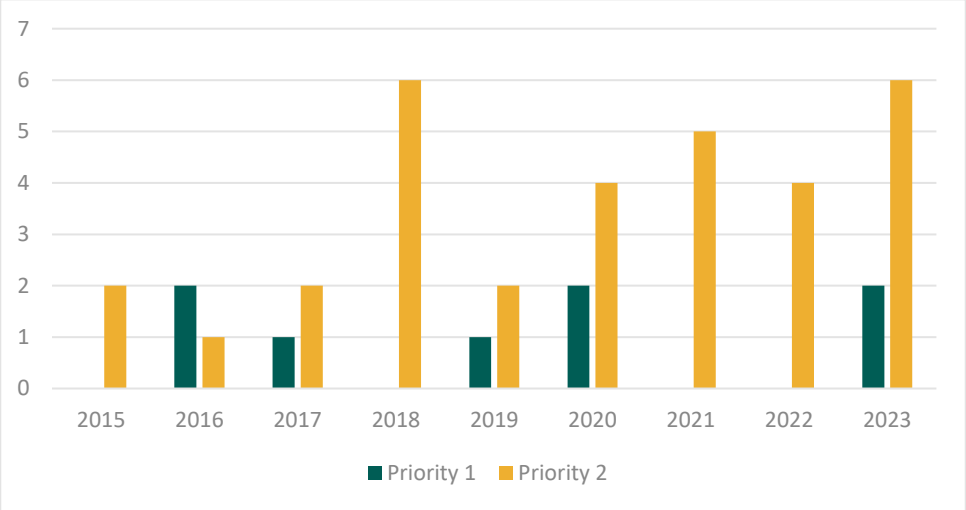


Figure 36: Underground Switchgear Related Work Requests (High Priority Requests)

QUESTION (B):

b) Please provide the number of interruptions on the URD System for each of the years 2018 to 2023.

RESPONSE (B):

Please see Table 1 below.

Table 1: Number of Sustained Interruptions on URD feeders (2018-2023)

2018	2019	2020	2021	2022	2023
5	3	6	2	6	4

QUESTION (C):

c) Page 34: Please provide Figure 35 for the Downtown area.

RESPONSE (C):

The Underground System Renewal – Downtown program (Exhibit 2B, Section E6.3) addresses underground distribution assets in the Downtown core (pre-amalgamation). As such, the data in the referenced Figure provides the asset condition assessment ("ACA") for the Downtown Area.

QUESTION (D):

d) Page 34: Please provide Figure 36 for the Downtown area and include 2023 data.

RESPONSE (D):

As noted in part (c), the referenced figure provides data for the downtown area. Please refer to part (a) of this interrogatory response for an updated Figure 36 with 2023 actuals.

QUESTION (E):

e) Page 37: Please provide the number of interruptions, customer interruptions (CI) and customer hour interruptions (CHI) for both PILC cable and AILC cable for each of the years 2018 to 2023.

RESPONSE (E):

Toronto Hydro is unable to provide the breakdown requested by cable type. The majority of the downtown underground system contains combinations of PILC, XLPE, TRXLPE and AILC cable. Due to this complexity, it is not possible to breakdown outage incidents by type. However, Toronto Hydro is able to provide reliability data for defective cable as shown in the table below.

Table 2: Reliability Performance for Defective Equipment – Downtown Cables (2018-2023)

Year	Number of Interruptions	Customer Interruptions (CI)	Customer Hours Interrupted (CHI)
2018	56	26,002	39,730
2019	58	21,216	36,212
2020	47	22,965	56,003
2021	45	9,374	16,069
2022	40	16,998	43,587
2023	27	20,105	51,197

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-60

References: Exhibit 2B, Section E6.5

QUESTION (A):

a) Please add 2023 data to Figure 2, Figure 5, Figure 6, Figure 9, Figure 15, and Figure 20.

RESPONSE (A):

Please see Figures 1-6 below for the updated figures.

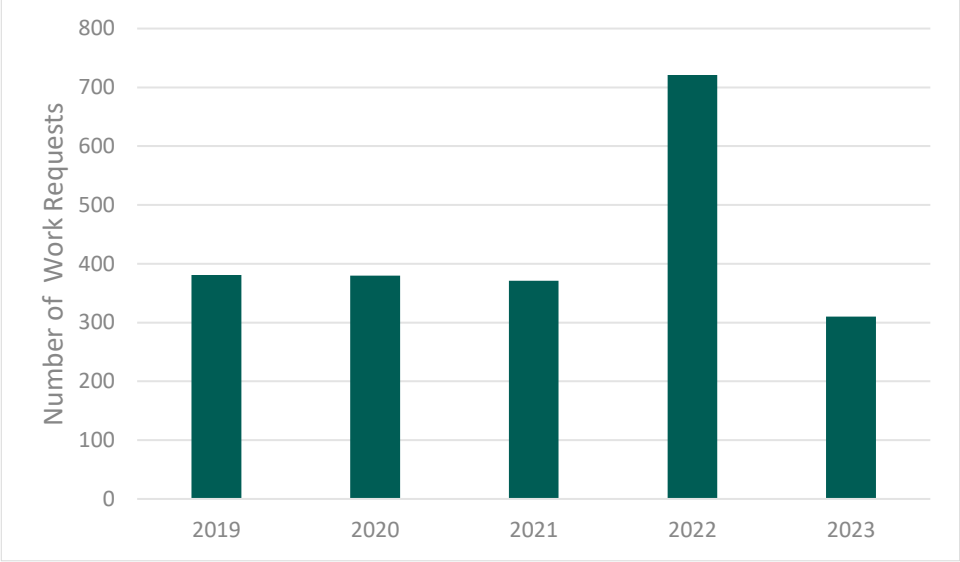


Figure 1: Reactive Work Requests to Replace Overhead Assets from 2019-2023

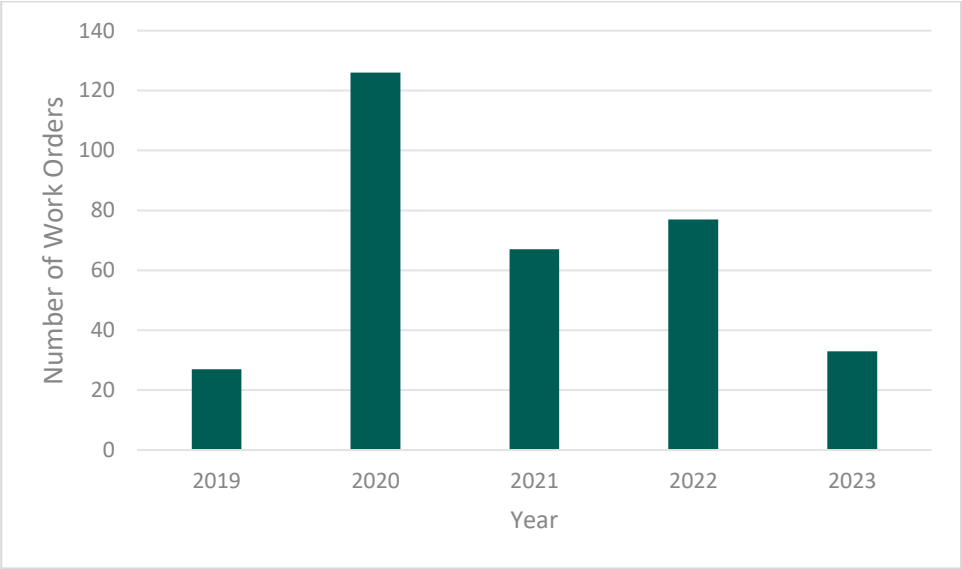


Figure 2: Reactive Work Requests for Pole-top Transformer Replacement

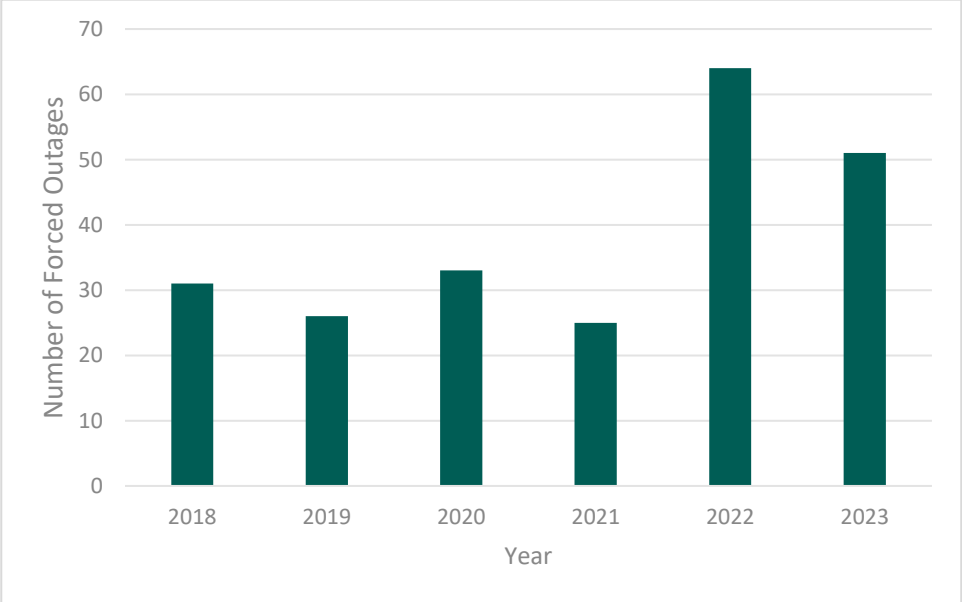


Figure 3: Forced Outages for Pole-top Transformers

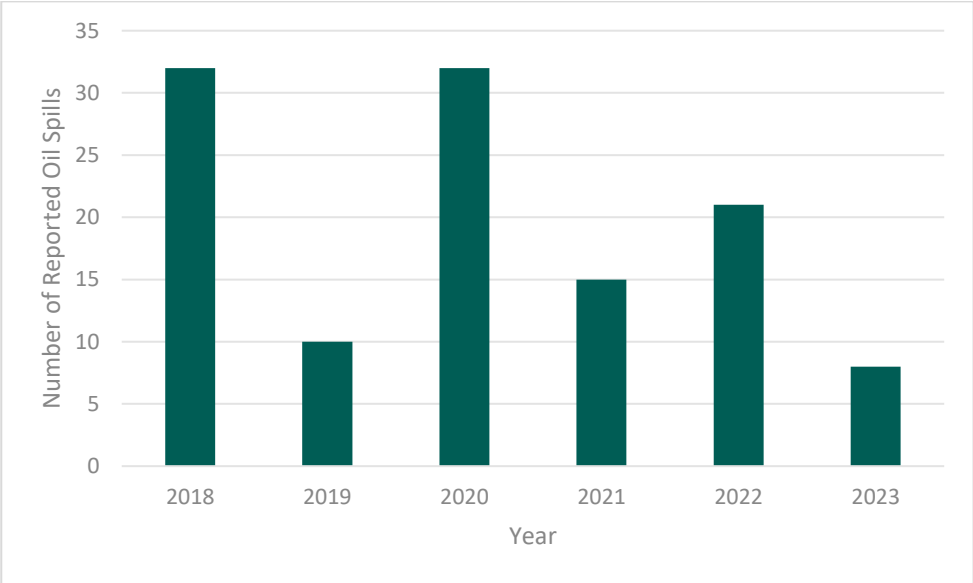


Figure 4: Number of Reported Pole-top Transformer Oil Spills

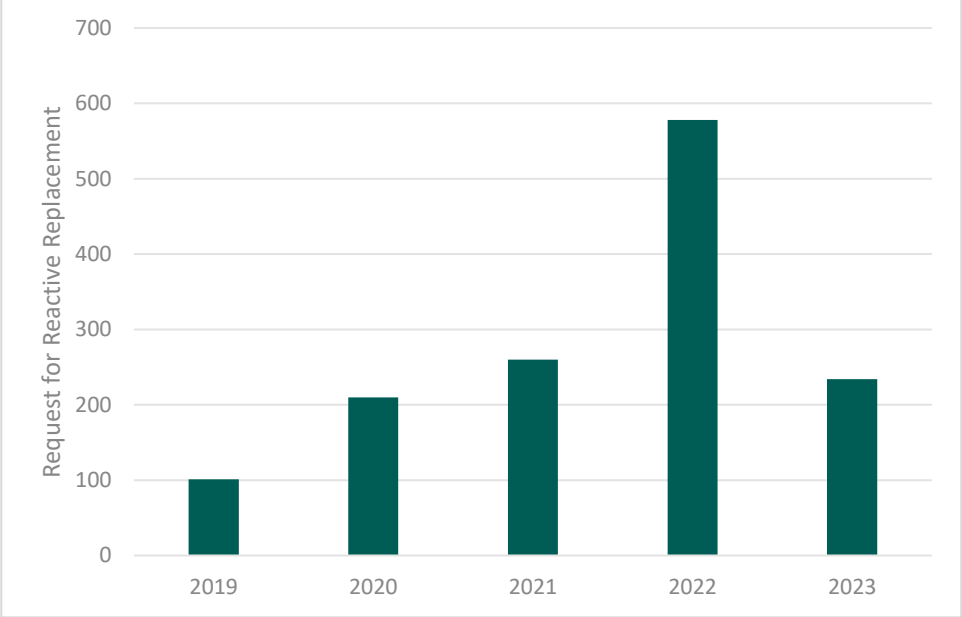


Figure 5: Reactive Work Requests for Pole replacement

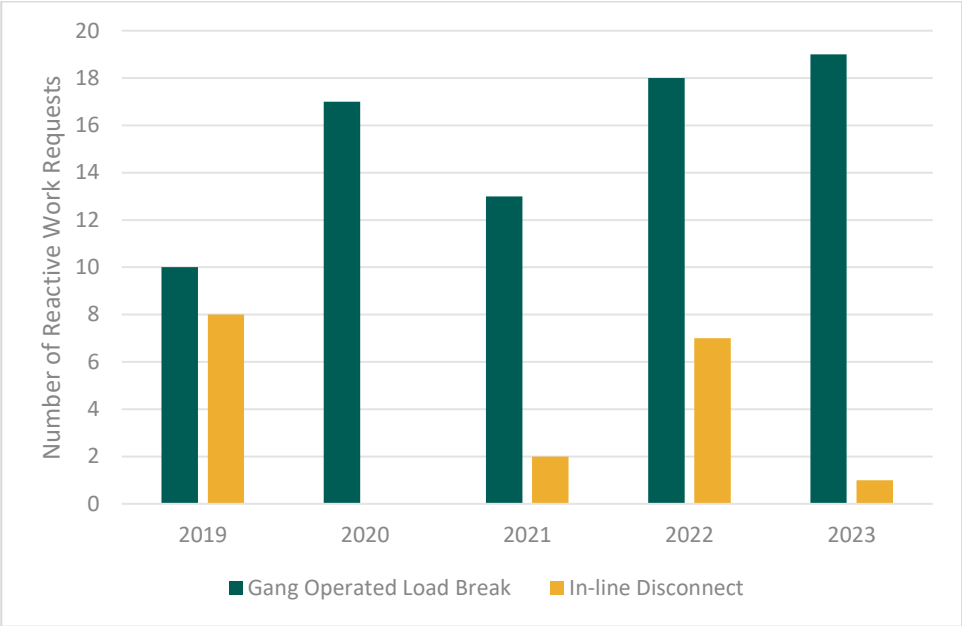


Figure 6: Reactive Work Requests for Overhead Switches

QUESTION (B):

b) Please provide the number of outages on the Overhead System for each of the years 2013 to 2023.

RESPONSE (B):

Please see Figure 7 below for the number of forced outages on the Overhead System over 2013-2023.

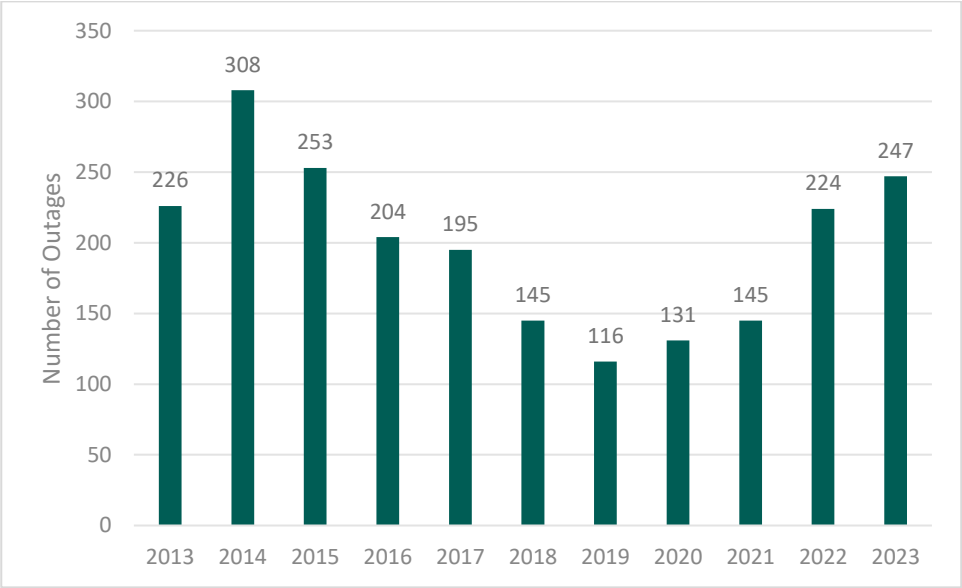


Figure 7: Forced Outages on the Overhead System 2013-2023

QUESTION (C):

c) Please provide the number of outages for Pole-top Transformers, Poles and Pole Accessories, Overhead Switches and Conductors for each of the years 2018 to 2023.

RESPONSE (C):

Please see Figures 8-11 below for the number of outages over 2018-2023 for the listed assets.

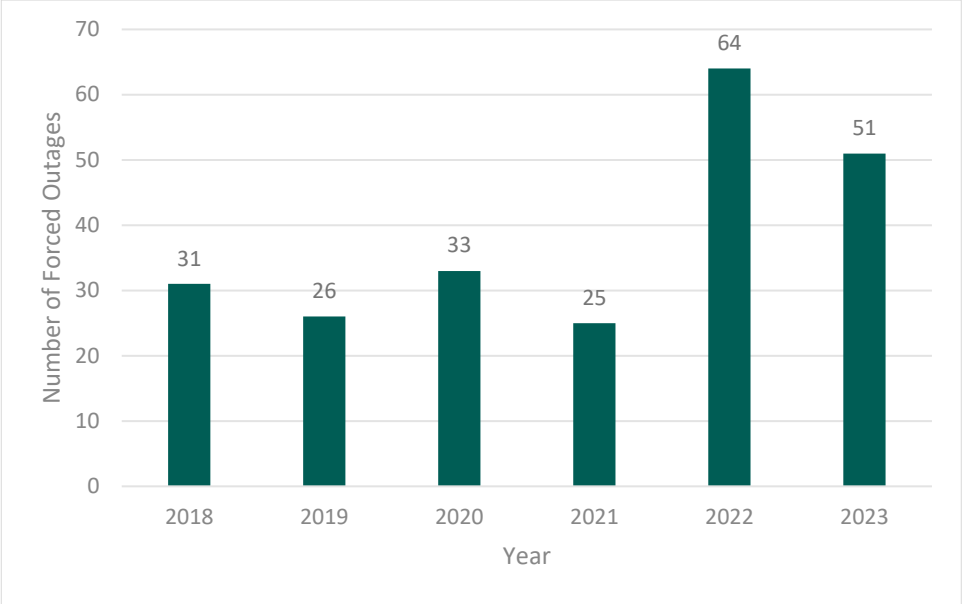


Figure 8: Forced Outages for Pole-Top Transformers 2018-2023

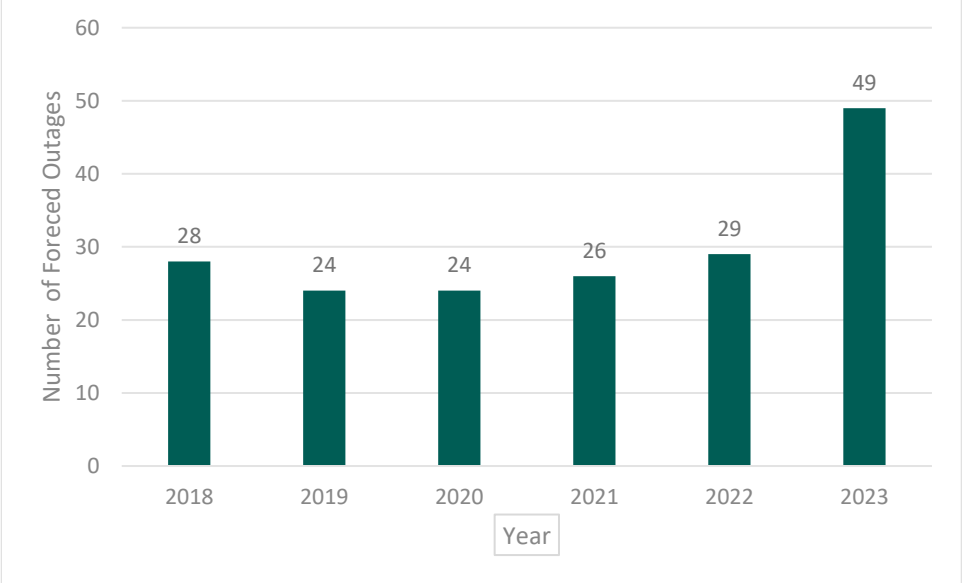


Figure 9: Forced Outages for Pole and Pole Accessories 2018-2023

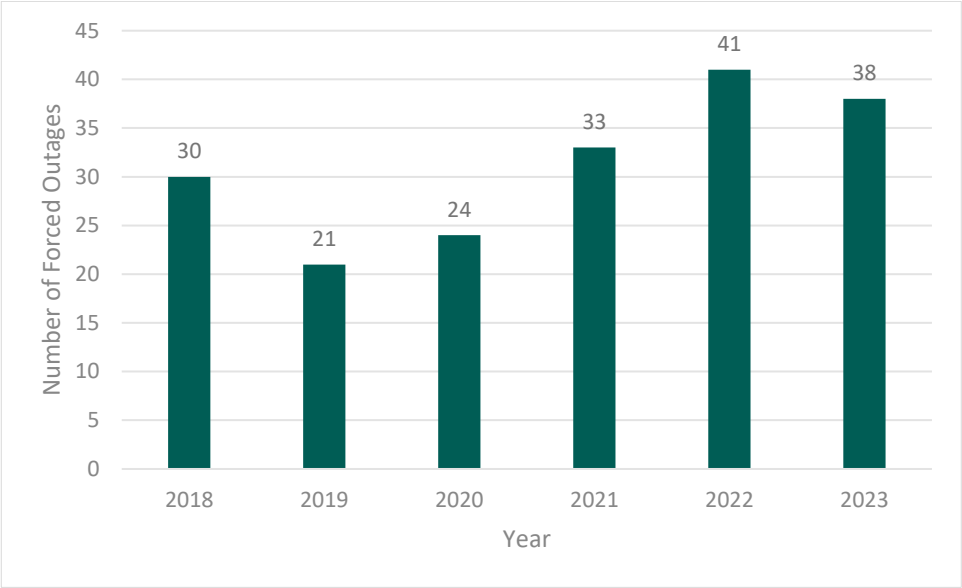


Figure 10: Forced Outages for Overhead Switches 2018-2023

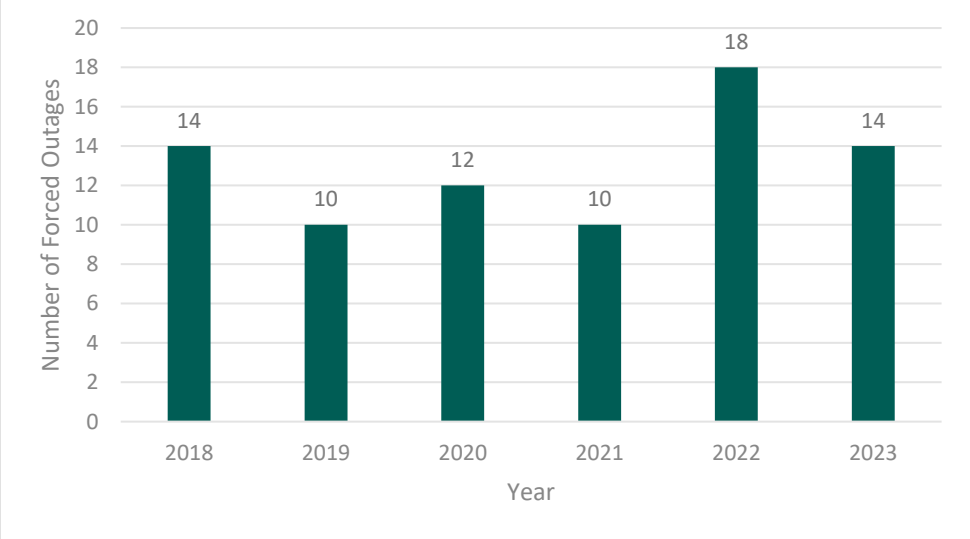


Figure 11: Forced Outages for Overhead Primary Conductors 2018-2023

QUESTION (D):

d) Page 38: The total number and timing of the areas targeted will depend on the specific locations and required scope and level of investment for projects selected (which have not

yet been determined). Please discuss when the targeted areas will be determined.

RESPONSE (D):

Toronto Hydro will determine the targeted areas at the time of scoping, which is 12-18 months prior to construction. Please see Exhibit 2B, Section E6.5 at pages 28-33 for a high-level targeting and prioritization of feeders.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-61

REFERENCE: Exhibit 2B, Section E6.6, p. 42

QUESTION:

For each of the segments in Table 24, please provide a table that sets out the total quantity of assets by asset type replaced for each of the years 2020-2029.

RESPONSE:

Please see Table 1 below updated to 2023 actuals and 2024 bridge.

Table 1 – Total Number of Assets by Asset Type for 2020-2029

Asset by Type	Actuals				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
TS Switchgear	-	1	1	1	-	1	1	2	-	3
TS Outdoor Breakers	2	-	3	5	2	2	2	2	4	2
TS Outdoor Switch	3	6	18	23	19	6	15	10	16	16
MS Switchgear	2	5	1	-	1	2	2	2	3	3
MS Power Transformer	1	4	2	-	2	3	3	3	3	3
MS Primary Supply	1	-	1	-	2	-	-	1	-	-
TS RTU	2	2	2	1	5	4	3	4	4	4
MS RTU	17	6	11	8	5	2	3	3	3	3
TS Relay	2	4	-	12	28	26	24	26	22	23
MS Relay	-	-	-	-	-	19	23	26	27	35
Copper	3	1	2	9	2	-	-	-	-	-
Battery Units	16	8	10	15	7	12	9	12	11	11
Charger Units	15	8	8	5	5	1	2	2	2	1
Sump Pump Installations	-	1	-	-	-	1	-	-	1	1
Station Service Transformer	3	-	1	1	1	1	1	-	1	-
AC Panels	1	-	-	-	-	1	1	1	1	1

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-62

References: Exhibit 2B, Section E6.7

QUESTION (A):

a) Page 1: Please provide the number of major asset failures by asset type by year for the each of the years 2020 to 2023 addressed under the Reactive and Corrective Capital.

RESPONSE (A):

Please see Table 1 below.

Table 1: Major Asset Failures by Major Asset Type Addressed by Reactive and Corrective Capital

Major Asset	2020	2021	2022	2023
Overhead Switches	70	69	63	67
Underground Switchgear	21	25	17	13
Overhead Transformers	135	67	96	41
Poles	170	206	558	224
Underground Cables	28	16	11	6
Underground Transformers	712	260	297	209

QUESTION (B):

b) Page 8: Please provide the number of interruptions, CI and CHI for each of the assets in Table 4 for each of the years 2018-2023.

RESPONSE (B):

Please see Tables 2-7 below.

Table 2: 2018 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	33	980	541
Underground Switchgear	17	1,867	1,410
Overhead Transformers	31	84	178
Poles	35	732	524
Underground Cables	198	727	637
Underground Transformers	62	487	332

Table 3: 2019 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	26	493	401
Underground Switchgear	15	1,295	1,322
Overhead Transformers	26	62	77
Poles	27	1,917	995
Underground Cables	137	768	600
Underground Transformers	42	760	426

Table 4: 2020 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	32	1,791	946
Underground Switchgear	12	758	423
Overhead Transformers	33	192	97
Poles	29	1,055	442
Underground Cables	146	858	1,154
Underground Transformers	32	498	312

Table 5: 2021 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	45	1,016	480
Underground Switchgear	23	1,083	1,504
Overhead Transformers	25	98	98
Poles	26	1,604	1,210
Underground Cables	156	1,043	724
Underground Transformers	24	587	262

Table 6: 2022 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	53	993	528
Underground Switchgear	7	561	303
Overhead Transformers	64	119	134
Poles	30	693	314
Underground Cables	198	1,005	795
Underground Transformers	41	677	261

Table 7: 2023 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	48	220	121
Underground Switchgear	18	655	342
Overhead Transformers	51	228	153
Poles	50	947	349
Underground Cables	134	774	798
Underground Transformers	51	672	318

QUESTION (C):

c) With respect to Figure 6, please provide the underlying data and include 2023 data.

RESPONSE (C):

Please see Table 8 below.

Table 8: Reactive Capital Work Requests Issued by System Type[1]

	Overhead	Stations	Underground
2019	377	65	1174
2020	356	20	971
2021	415	30	486
2022	693	5	550
2023	311	26	432

QUESTION (D):

d) Page 12: Please provide the total number of deficiencies (P1+P2+P3) by major asset type by year for the each of the years 2020 to 2023 addressed under Reactive and Corrective Capital.

RESPONSE (D):

Please see Table 9 below.

Table 9: Number of Deficiencies by Major Asset Type and Priority Addressed by Reactive and Corrective Capital

Major Asset	Priority	2020	2021	2022	2023
Overhead Switches	**P1**	32	17	15	20
	P2	26	38	29	28
	P3	12	14	19	19
	Total	**70**	**69**	**63**	**67**
Underground Switchgear	**P1**	2	8	3	4
	P2	10	6	11	5
	P3	9	11	3	4

[1] In drafting this response, Toronto Hydro discovered that it had provided incorrect values for 2022 in Figure 6 of Exhibit 2B, Section E6.7. The correct numbers are included in this table.

Major Asset	Priority	2020	2021	2022	2023
	Total	**21**	**25**	**17**	**13**
Overhead Transformers	**P1**	11	7	14	18
	P2	64	40	22	12
	P3	60	20	60	11
	Total	**135**	**67**	**96**	**41**
Poles	**P1**	17	13	23	25
	P2	102	88	131	41
	P3	51	105	404	158
	Total	**170**	**206**	**558**	**224**
Underground Cables	**P1**	13	10	5	3
	P2	11	5	6	3
	P3	4	1	0	0
	Total	**28**	**16**	**11**	**6**
Underground Transformers	**P1**	184	46	37	39
	P2	145	72	80	64
	P3	383	142	180	106
	Total	**712**	**260**	**297**	**209**

QUESTION (E):

e) Please provide the number of P4 deficiencies for each of the years 2020-2023 and the number addressed under Reactive Capital 2020-2024.

RESPONSE (E):

Please see Table 10 below. Toronto Hydro did not address any P4 deficiencies under Reactive Capital over 2020-2023 (work requests are not issued for P4 deficiencies) and does not have a forecast of the number of P4 deficiencies for future years.

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Table 10: Reactive P4 Deficiencies over 2020-2023

P4 Deficiencies (Reactive)	2020	2021	2022	2023
	62	49	23	11

QUESTION (F):

f) Page 13: Please provide Table 7 for 2020-2024.

RESPONSE (F):

Please see Table 11 below.

Table 11: Reactive Meter Replacement Costs (2020-2024)

	2020	2021	2022	2023	2024	Total
Meter Replacement (Units)	5,351	3,707	2,848	4,438	4,895	21,239
Meter Replacement Costs ($ Millions)	2.82	2.76	3.18	3.92	3.96	16.64

QUESTION (G):

g) Page 14: Please add 2023 data to Table 8, Figure 14,

RESPONSE (G):

Please see Table 12 below.

Table 12: Number of FESI-7 feeders compared to Total Number of Feeders

	2018	2019	2020	2021	2022	2023
# FESI-7 feeders	17	7	9	10	27	27
Total # feeders	1521					
% FESI-7/total	1.12%	0.46%	0.59%	0.66%	1.78%	1.78%

In regards to Figure 14, please refer to Toronto Hydro's response to Interrogatory 2B-Staff-239 part (c) for an updated figure showing data for 2023.

QUESTION (H):

h) Please identify the FESI-7 Feeders in each of the years 2018 to 2023.

RESPONSE (H):

Please see Table 13 below for the feeders identified as FESI-7 at the end of each year 2018-2023.

Table 13: FESI-7 Feeders 2018-2023

2018	2019	2020	2021	2022	2023
NAE5-2M3	34M4	51M32	80M9	51M29	51M21
88M11	NAR26M36	88M16	80M21	11M14	NT63M6
NAR43M23	NAR43M23	55M28	35M9	NAR43M29	34M2

2018	2019	2020	2021	2022	2023
85M25	35M10	88M43	SS68-F7	NA502M22	R30M9
XGF3	NAH9M23	34M2	A22L	85M8	NAR43M27
53M10	A12L	NAR43M29	35M2	ZJF2	38M7
80M1	NAR43M32	SS68-F6	55M8	YBF1	34M1
34M4		NAR43M31	35M10	NAR43M23	NAH9M30
NAR26M36		80M21	NAH9M30	NAR26M34	NAH9M26
34M6			NA47M14	A13L	35M4
NAR26M34				80M1	NA502M29
NAR43M31				85M5	A14L
51M26				NA47M14	NT47M1
34M2				35M2	NAR43M32
55M28				34M6	55M23
51M27				35M10	NAR43M23
35M10				11M26	NAR43M28
				A21L	80M3
				NAR43M21	NAR43M30
				34M7	34M6
				38M7	55M8
				11M13	NAR43M31
				NAR43M32	NA502M23
				85M24	35M5
				NAH9M30	R29M3
				SS58-F3	35M8
				11M19	55M7

QUESTION (I):

i) Please identify the FESI-6 Large Customer Feeders in each of the years 2018 to 2023.

RESPONSE (I):

Please see Table 14 below for the feeders identified as FESI-6 Large Customer at the end of each year 2018-2023.

Table 14: FESI-6 Large Customer Feeders between 2018-2023

2018	2019	2020	2021	2022	2023
34M4	NAR43M23	NAR43M30	NAR43M30	NAR43M23	NAR43M23
85M25	NAR26M36	NAR26M36	NAR43M28	NAR26M36	NAR43M30
NAR26M34	34M4	34M4	NA47M14	34M6	NAR43M28
NAR26M36	NAR43M21	34M7	80M9	NA47M14	34M6
34M6	NAH9M23	85M25	NT47M7	34M7	55M23
NAR43M23		51M32		55M23	85M25
51M27		88M43		NAR43M21	88M12
85M27		53M28		88M12	35M4
NAH9M27		NAE5-1M24		11M14	NAR43M27
NAR43M21		R30M4		85M8	51M21
				51M26	NT47M1
				85M23	55M7
					NAH9M26
					NAR43M32
					80M3
					NT63M6
					11M13
					51M6
					NAE5-2M3
					NAR43M26
					R30M10

QUESTION (J):

j) In addition to FESI-7 and FESI-6 Large Customer metrics, Toronto Hydro has begun to track a new metric, Customers Experiencing Multiple Sustained and Momentary Interruptions, or CEMSMI-10. Please provide the methodology to calculate the metric and provide the calculation using available data.

RESPONSE (J):

Toronto Hydro utilizes Ion meters to identify instances when large critical customers experience poor reliability (including power quality). The Ion meter registers events every time the associated customer experiences a momentary or sustained interruption. Upon accumulation of any

combination of 10 momentary or sustained outages by an Ion meter, the associated customer is included in the CEMSMI-10 metric. The metric score is computed based on the aggregate number of customers reaching the 10-outage threshold divided by the total count of customers utilizing Ion meters at the start of the year.

For example, Customer 'A' with an Ion meter experiences 5 momentary interruptions and 3 sustained interruptions for a total of 8 interruptions. This does not meet the threshold of 10 and they are, therefore, not counted as a CEMSMI-10 customer. Customer 'B' with an Ion meter experiences 6 momentary interruptions and 5 sustained interruptions for a total of 11 interruptions. This surpasses the threshold of 10 interruptions and they are, therefore, counted as a CEMSMI-10 customer. At the end of the reporting period, the metric score is calculated by dividing the total number of customers exceeding the 10-interruption threshold (in this example, 1) by the population size (in this case, 2), resulting in a CEMSMI score of 50 percent in this hypothetical scenario with 2 Ion metered customers. Note that customers with new Ion meters do not contribute to the CEMSMI-10 calculation until the start of the following year in which it was installed.

$$CESMSI - 10 = \frac{\sum(Customer\ ION\ Meters \geq 10\ Momentary\ and\ Sustained\ Outages)}{\sum(Active\ Customer\ ION\ Meters)} * 100$$

QUESTION (K):

k) Page 18: Figure 11 shows the breakdown of asset types replaced under the WPF segment between 2020-2022. Please provide the number of assets replaced under the WPF segment for each of the years 2020 to 2023 for all six asset types included in Figure 11.

RESPONSE (K):

Please see Table 15 below.

Table 15: Breakdown of Assets Replaced Under the WPF Segment 2020-2023[2]

Asset Type	2020	2021	2022	2023
Switch	45	115	124	376
Insulator	65	4	62	46
Underground Transformer	39	65	0	0
Pole	0	1	63	116
Switchgear	23	2	1	0
Overhead Transformer	0	0	8	23
Underground Cable	0	0	2	2

QUESTION (L):

l) Page 23: Please add the numerical values to Figure 15.

RESPONSE (L):

Please see Table 16 below for the numerical values.

Table 16: Actual and Forecast Reactive Capital Work Requests

Year	Actual	Projection
2019	1909	-
2020	1582	-
2021	984	-
2022	1284	-
2023	1193	-
2024	-	1215
2025	-	1279
2026	-	1287
2027	-	1266
2028	-	1271
2029	-	1272

[2] During drafting of this response Toronto Hydro discovered that the number of underground transformers replaced over 2020-2022 as indicated in Figure 11 in Exhibit 2B, Section E6.7 was incorrect. The correct numbers are reflected in this table.

QUESTION (M):

m) Please provide the WPF addressed for each of the years 2020 to 2029.

RESPONSE (M):

Please see Table 17 below for the Worst Performing Feeders addressed over 2020-2023. Due to the reactive and dynamic nature of this program in addressing deficiencies and trends as they emerge, Toronto Hydro is unable to forecast information for future years.

Toronto Hydro notes that the specific feeders it addresses through the Worst Performing Feeder segment in each year are driven by a rolling 365-day view of FESI-6 and FESI-7 feeders, which can change on a daily basis. The feeders listed in Tables 13 and 14 in parts (h) and (i) are just a snapshot of that view at the end of each year. Furthermore, the Worst Performing Feeder segment is not the only contributor to mitigating worst performing feeders. For example, Toronto Hydro may issue work requests for deficiencies with high risk of imminent failure so they can be addressed on a more urgent basis through the Reactive Capital segment or Corrective Maintenance (Exhibit 4, Tab 2, Schedule 4). In addition, Toronto Hydro may address some of the larger or more widespread issues through planned renewal programs or in some cases assets on worst performing feeders may have already been included in the scope of existing projects.

Table 17: Worst Performing Feeders Addressed 2020-2023

2020	2021		2022	2023	
26-M21	26-M34	85-M7	26-M36	11-M13	47-M8
26-M34	29-M5	88-M46	26-M22	11-M14	51-M21
26-M36	38-M1	DB-F4	30-M8	11-M19	53-M10
30-M2	47-M1	E5-1M24	35-M2	11-M28	53-M25
34-M1	47-M17	E5-2M3	35-M9	30-M2	53-M26
34-M2	47-M3	E5-2M5	38-M21	30-M9	53-M5
34-M4	47-M6	H9-M29	43-M23	34-M2	53-M6
35-M10	502-M21	JG-F2	43-M26	34-M6	55-M2
502-M23	502-M22	PJ-F2	43-M28	35-M10	55-M22
502-M26	502-M23	YB-F1	43-M29	35-M2	55-M25
502-M28	502-M24		43-M32	35-M24	55-M28

2020	2021		2022	2023	
53-M24	502-M29		47-M18	35-M3	55-M32
53-M4	51-M24		51-M24	35-M5	63-M6
53-M9	51-M3		55-M2	35-M7	80-M1
55-M21	51-M6		55-M8	35-M8	80-M29
55-M24	53-F6		80-M23	38-M12	80-M6
55-M3	53-M1		80-M5	38-M20	80-M9
63-M5	53-M10		80-M8	38-M24	85-M24
80-M8	53-M24		85-M34	38-M6	85-M5
85-M30	53-M25		85-M7	38-M7	85-M9
85-M32	53-M26		E5-M21	43-M21	E5-2M3
85-M6	53-M27		E5-M22	43-M23	E5-2M4
E5-1M21	53-M28		E5-2M6	43-M24	E5-2M5
E5-2M6	53-M5		SG-F2	43-M26	E5-2M6
E5-2M9	55-M2			43-M29	E5-2M8
H9-M32	55-M29			43-M30	E5-M24
	55-M30			43-M32	E5-M26
	55-M7			47-M13	E5-M29
	63-M12			47-M14	FK-F3
	63-M4			47-M17	GE-F3
	63-M8			47-M6	VA-F3
	80-M29			47-M7	

QUESTION (N):

n) With respect to Reactive Capital spend, please provide the total number of assets replaced by major asset type for each of the years 2020-2023.

RESPONSE (N):

Please see Table 18 below.

Table 18: Assets Replaced under Reactive Capital by Major Asset 2020-2023

Major Asset	2020	2021	2022	2023
Overhead Switches	565	451	447	389
Underground Switchgears	66	55	28	50
Overhead Transformers	434	337	253	250
Poles	287	309	336	466
Underground Cable (km)	34	20	32	25
Underground Transformers	852	308	226	217

QUESTION (O):

o) Please provide the percentage of Reactive Capital spend in the Downtown area for each of the years 2020-2023.

RESPONSE (O):

Please see Table 19 below.

Table 19: Percentage of Reactive Capital Investments in Downtown Area 2020-2023

	2020	2021	2022	2023
Downtown Percentage	21%	32%	26%	31%

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-63

Reference: Exhibit 2B, Section E7.1, Page 25

For each expenditure segment in Table 6, please provide the volume of work for each of the years 2020-2029.

RESPONSE:

Please see Table 1 below.

Table 1: Actual and Forecast Volumes Installed

	Actual				Bridge	Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Contingency Enhancement										
SCADA Switches	7	5	8	5	7	61	88	64	37	49
Reclosers	-	-	-	-	26	44	44	44	44	44
Undersized circuit replaced (km)	10.9	7.9	-	4.5	3.6	5	3	21	20	21
Downtown Contingency										
Station Ties	-	-	1	-	-	1				
Customer-Owned Substation Protection										
Switch Units	-	16	7	24	-	-	-	-	-	-

Toronto Hydro is unable to provide specific units for System Observability investments as the Request for Proposal process is ongoing and the number of units is dependent on the technology and vendor selected.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-64

Reference: EB-2018-0165 Exhibit 2B, Section 8.3, Page 10

Table 5 provides Life Cycle Analysis Replacement Criteria. Please advise of any updates to the data.

RESPONSE:

Since EB-2018-0165, there were no updates made to Toronto Hydro's fleet life cycle analysis replacement criteria.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-65

Reference: EB-2018-0165 Exhibit 2B, Section 8.3, page 12

QUESTION (A):

a) Please update Tables 6 and 7 with actuals/updated forecast.

RESPONSE (A):

Table 6: Replacement Costs for Heavy Duty Vehicles for the 2020 to 2024 Period ($ Millions)

Description	2020		2021		2022		2023		2024		Total
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	Cost
Cube Van	3	$0.7	0	-	0	-	0	-	6	$ 1.6	**$2.3**
Van with Aerial Device	0	-	3	$0.5	0	-	0	-	0	-	**$0.5**
Line Truck	1	$0.3	2	$ 0.4	0	-	2	$ 0.4	1	$ 0.2	**$1.3**
Single Bucket Truck	5	$1.6	0	-	0	-	1	$0.9	8	$ 4.5	**$7.0**
Double Bucket Truck	0	-	5	$2.2	5	$2.2	5	$2.4	19	$ 9.1	**$15.9**
Cable Truck	0	-	0	-	0	-	0	-	0	-	**-**
Small Crane Truck	0	-	0	-	0	-	0	-	0	-	**-**
Large Crane Truck	0	-	0	-	0	-	0	-	0	-	**-**
Small Derrick Truck	0	-	0	-	0	-	0	-	0	-	**-**
Large Derrick Truck	1	$0.4	0	-	0	-	0	-	5	$ 2.9	**$3.3**
Dump Truck	0	-	0	-	0	-	0	-	0	-	**-**
Pickup	0	-	0	-	1	$0.1	0	-	0	-	**$0.1**
Total	**10**	**$ 3.0**	**10**	**$ 3.1**	**6**	**$ 2.3**	**8**	**$ 3.7**	**39**	**$ 18.3**	**$30.4**

Table 7: Replacement Costs for Light Duty Vehicles for the 2020 to 2024 Period ($ Millions)

Description	2020		2021		2022		2023		2024		Total Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Sports Utility Vehicle	0	-	17	$0.8	3	$0.2	6	$0.3	0	-	**$1.3**
Pickup Truck	18	$1.0	0	-	9	$0.7	17	$1.3	7	$0.7	**$3.7**
Minivan - Passenger	0	-	0	-	0	-	0	-	0	-	**-**
Minivan - Cargo	0	-	0	-	20	$1.6	0	-	9	$0.9	**$2.5**
Full Size Van - Cargo	0	-	0	-	19	$1.6	1	$0.1	5	$0.7	**$2.4**
Car	0	-	5	$0.3	0	-	0	-	0	-	**$0.3**
Total	**18**	**$1.0**	**22**	**$1.1**	**51**	**$4.1**	**24**	**$1.7**	**21**	**$2.3**	**$10.2**

QUESTION (B):

b) Please provide Tables 6 and 7 with 2025-2029 data.

RESPONSE (B):

Table 6: Replacement Costs for Heavy Duty Vehicles for the 2025 to 2029 Period ($ Millions)

Description	2025		2026		2027		2028		2029		Total Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Cube Van	1	$ 0.7	0	-	17	$ 4.0	4	$1.8	5	$1.0	**$ 7.5**
Van with Aerial Device	3	$ 1.5	0	-	0	-	0	-	0	-	**$ 1.5**
Line Truck	0	-	0	-	0	-	0	-	0	-	**-**
Single Bucket Truck	0	-	2	$ 0.8	2	$ 0.8	5	$2.0	7	$2.8	**$6.4**
Double Bucket Truck	0	-	3	$ 1.5	1	$ 0.8	2	1.6	0	-	**$3.9**
Cable Truck	0	-	0	-	0	-	0	-	0	-	**-**
Small Crane Truck	0	-	1	$ 0.5	0	-	0	-	0	-	**$0.5**
Large Crane Truck	1	$ 1.0	4	$ 2.0	0	-	0	-	0	-	**$3.0**
Small Derrick Truck	0	-	0	-	0	-	0	-	0	-	**-**
Large Derrick Truck	1	$ 1.0	3	$1.6	3	$ 1.6	0	-	0	-	**$4.2**
Dump Truck	4	$ 2.0	0	-	0	-	0	-	0	-	**$2.0**
Pickup	0	-	0	-	0	-	0	-	0	-	**-**
Total	**10**	**$6.2**	**13**	**$6.4**	**23**	**$7.2**	**11**	**$5.4**	**12**	**$3.8**	**$29.0**

1 **Table 7: Replacement Costs for Light Duty Vehicles for the 2025 to 2029 Period ($ Millions)**

Description	2025		2026		2027		2028		2029		Total Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Sports Utility Vehicle	0	-	7	$ 0.5	0	-	0	-	17	$1.4	**$1.9**
Pickup Truck	9	$ 1.1	0	-	0	-	12	$1.8	18	$2.4	**$5.3**
Minivan - Passenger	6	$ 0.7	0	-	0	-	0	-	0	-	**$ 0.7**
Minivan - Cargo	2	$ 0.2	12	$ 1.7	0	-	0	-	0	-	**$ 1.9**
Full Size Van - Cargo	0	-	7	$ 1.1	2	$ 0.3	0	-	5	$0.8	**$2.2**
Car	0	-	0	-	8	$ 0.6	0	-	0	-	**$0.6**
Total	**17**	**$ 2.0**	**26**	**$ 3.3**	**10**	**$ 0.9**	**12**	**$1.8**	**40**	**$4.6**	**$12.6**

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-66

Reference: Exhibit 2B, Section E8.3

QUESTION (A):

a) Please provide the total number of vehicles in Toronto Hydro's fleet for the years 2018 to 2029 broken down by heavy duty vehicles and light duty vehicles.

RESPONSE (A):

The total number of vehicles in Toronto Hydro's fleet for the year 2018 to 2029 broken down by heavy duty ("HD") and light duty ("LD) vehicles is available in Table 1.

Table 1: Toronto Hydro Fleet Breakdown – 2018 to 2029

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Light Duty	259	231	228	220	208	215	212	211	211	210	210	210
Heavy Duty	204	185	178	166	170	151	148	150	150	152	153	153

QUESTION (B):

b) Please provide the number of EV and hybrid vehicles in the fleet at the end of 2023.

RESPONSE (B):

At of the end of 2023, Toronto Hydro's fleet included 15 fully electric vehicles and 58 hybrid and plug-in hybrid vehicles.

QUESTION (C):

c) Please provide the number and cost of EV and hybrid vehicles to be added for each year 2024-2029.

RESPONSE (C):

Please see Table 2.

Table 2: Replacement Costs for EV and Hybrid Vehicles for the 2024 to 2029 Period ($ Millions)

Description	2024		2025		2026		2027		2028		2029		Total Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
EV	12	1.4	20	4.5	26	2.6	12	2.8	17	3.3	40	4.0	**18.6**
Hybrid	14	1.3	8	3.1	0	0	0	0	0	0	0	0	**4.4**
Total	**26**	**2.7**	**28**	**7.6**	**26**	**2.6**	**12**	**2.8**	**17**	**3.3**	**40**	**4.0**	**23.0**

QUESTION (D):

d) Please provide the average age of the fleet for each of the years 2020 to 2029 assuming planned investments.

RESPONSE (D):

Please see Table 3.

Table 3: Toronto Hydro Fleet Age – 2020 to 2029

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Average Age	7.9	6.8	5.7	5.4	4.9	5.0	4.8	5.3	5.9	5.4

QUESTION (E):

e) Please provide the average age of each heavy duty and light duty vehicle type for each of the years 2020 to 2029 assuming planned investments.

RESPONSE (E):

Please see Table 4.

Table 4: Toronto Hydro Average Vehicle Age – 2020 to 2029

Description	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Heavy Duty	**8.2**	**8.1**	**9.1**	**9.6**	**9.2**	**6.8**	**6.7**	**6.5**	**5.7**	**5.8**
Cable truck	11.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane truck	10.3	11.2	12.2	13.2	14.2	10.2	11.2	3.3	4.3	3.4
Cube van	7.1	7.6	8.6	9.3	10.3	8.1	8.1	9.1	3.5	3.2
Digger derrick	9.7	9.8	10.8	11.8	12.8	7.2	8.2	6.8	4.3	4.2
Double bucket	10.8	10.2	11.2	10.6	7.1	4.8	5.2	5.0	5.6	6.6
Dump truck	11.0	12.0	13.0	14.0	15.0	16.0	1.0	2.0	3.0	4.0
Line truck	7.4	4.8	5.8	6.8	3.2	4.2	5.2	6.2	7.2	8.2
Single bucket	4.8	5.2	6.2	7.2	8.2	6.2	7.0	7.2	8.2	7.9
Single bucket-van mount	9.5	10.5	11.5	12.5	13.5	9.0	3.0	4.0	5.0	6.0
Light Duty	**6.4**	**5.4**	**6.4**	**4.9**	**4.8**	**4.5**	**4.7**	**4.7**	**5.3**	**5.8**
Car	5.5	1.8	2.8	3.8	4.8	5.8	6.8	7.8	3.3	4.3
Cargo minivan	5.1	5.8	6.8	7.1	4.5	3.2	4.2	3.0	4.0	5.0
Full-size van	6.8	7.4	8.4	5.2	5.9	4.8	5.8	4.7	5.1	6.1
Passenger minivan	4.5	5.5	6.5	7.1	5.4	6.4	1.8	2.8	3.8	4.8
Pick-up	6.8	5.9	6.9	4.5	5.0	4.6	4.4	5.4	6.4	6.1
SUV	7.8	3.1	4.1	2.4	3.4	4.4	5.4	4.7	5.7	6.7

QUESTION (F):

f) For each vehicle replaced 2020-2029, please provide the age and mileage (km) for each vehicle and other criteria that Toronto Hydro used to determine need for replacement.

RESPONSE (F):

The criteria for vehicle replacement are explained in pages 2-3 of Exhibit 2B, Section E8.3, subsection E8.3.1.1, “Toronto Hydro's Fleet Asset Management Strategy”. Please refer to the appendix to this interrogatory response for a list of all vehicles decommissioned during 2020-2029,

along with their age, recommended lifecycle analysis ("LCA") age, and mileage when decommissioned (in kilometres). Toronto Hydro also notes that over the 2020-2024 rate period the number of fleet vehicles will experience a net reduction, as the utility is not replacing all vehicles that are decommissioned.

QUESTION (G):

g) Please provide a copy of Toronto Hydro's Fleet Asset Management Strategy.

RESPONSE (G):

Please refer to Toronto Hydro's response to 2B-Staff-268(a).

QUESTION (H):

h) Please provide the vehicle replacement rate for the years 2020 to 2029.

RESPONSE (H):

Please see Table 5.

Table 5: Toronto Hydro Vehicle Replacement Rate – 2020 to 2029

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Replacement Vehicles	69	56	39	36	36	33	39	34	23	62
Total Number of Vehicles	406	386	378	366	360	361	361	362	363	363
Replacement rate	17%	15%	10%	10%	10%	9%	11%	9%	6%	17%

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-67

Reference: Exhibit 2B, Section E8.4

Please provide the following metrics for each for each of the years 2025-2029.

QUESTION (A):

a) IT Spend as a % of Revenue

RESPONSE (A):

Revenue is comprised of three items, Distribution Revenue, Energy Sales and Revenue Offsets. Of the three, Toronto Hydro has a forecast of Distribution Revenue and Revenue Offsets[1]. The Energy Sales are not published for the 2025 – 2029 time period. Therefore, the calculation presented below is based on IT Operational and IT Capital spend as a percentage of Distribution Revenue and Revenue Offsets.

We have included the IT spend as a % of Distribution Revenue and Revenue Offsets for 2017 and 2022 below because a Gartner IT Benchmark study was completed for those years.

Table 1: IT Spend as % of Distribution Revenue & Revenue Offset

Year	2017	2022	2025	2026	2027	2028	2029
IT Spend as a % of Distribution Revenue and Revenue Offset	12.8%	13.4%	12.1%	12.0%	12.0%	10.8%	10.6%

[1] Exhibit 3, Tab 2, Schedule 2 Appendix H

Toronto Hydro would also caution that the metrics in the table above not be compared to the IT Spend as a % of Revenue metric presented in page 4 of the Toronto Hydro Enterprise IT Cost Benchmark and Functional Maturity Assessment, submitted as part of 2B-D8, Appendix A. The metrics provided in the table below are derived from Distribution Revenue and Revenue Offsets alone whereas the Revenue metric on page 4 of the Toronto Hydro Enterprise IT Cost Benchmark and Functional Maturity Assessment also includes revenue from passthrough costs (e.g., commodity and transmission charges).

QUESTION (B):

b) IT FTEs as a % of Employees

RESPONSE (B):

The Gartner definition of IT FTE includes insourced IT full time employees and external staff augmentation or contractors. Therefore, the IT FTE used in this calculation would not be the same as the IT FTE reflected in the pre-filed evidence.

Table 2: IT FTEs as % of Employees

Year	2017	2022	2025	2026	2027	2028	2029
IT FTEs as % of Employees	15.4%	19.1%	19.1%	19.0%	18.8%	18.8%	18.7%

The metrics reported above consider IT FTEs as the sum of insourced IT full time employees and external IT staff augmentation or contractors.

QUESTION (C):

c) IT Spend as a % of Operating Expense

RESPONSE (C):

Please note that Toronto Hydro's Operating Expense used in the calculations to derive the below metrics does not include Energy Purchases.

We have included the IT spend as a % of Operating Expense for 2017 and 2022 below because a Gartner IT Benchmark study was conducted for those years.

Table 3: IT Spend as a % of Operating Expense

Year	2017	2022	2025	2026	2027	2028	2029
IT Spend as a % of Operating Expense	20.1%	19.7%	19.6%	19.6%	19.3%	17.9%	17.4%

Toronto Hydro would caution that the metrics in the table above are not to be compared to the IT Spend as a % of OpEx metric presented in page 4 of the Toronto Hydro Enterprise IT Cost Benchmark and Functional Maturity Assessment, submitted as part of 2B-D8, Appendix A. The metrics provided in the table below are derived from Operating Expense alone.

RESPONSES TO BUILIDING AND OPERATORS MAINTENANCE ASSOCIATION INTERROGATORIES

INTERROGATORY 2B-BOMA-1

Reference: Exhibit 2B, Section D4, page 4 of 18, Section D4.1.1.3 Hyperscale Data Centre Demand Driver Analysis

Preamble:

In the referenced evidence, Toronto Hydro identified hyperscale data centre connections as a new driver of significant peak demand growth over the 2025 to 2029 period.

QUESTION:

Does Toronto Hydro expect all these hyperscale data centres will be connected as "Large User" (i.e. the Large User Rate Class)? If not, what other rate classes will these hyperscale data centres go to?

RESPONSE:

Customers with an account where demand load is 5000 kW and above are typically classified as Large Users as per the 2006 Electricity Distribution Rate Handbook. The initial classification is generally based upon the customer service and metering configuration, and is applied per account. If a hyperscale data centre project has a peak demand load of 20MW, for example, and it is configured with a single service, single or multiple meters (e.g., Class 5 meters) all under one account, this would be classified as a "Large User". In cases where the demand load is less than 5000 kW the connecting hyperscale data centre project would be classified as a Class 4 customer.

RESPONSES TO BUILIDING AND OPERATORS MAINTENANCE ASSOCIATION INTERROGATORIES

INTERROGATORY 2B-BOMA-2

Reference: Exhibit 2B, Section D4, Appendix A, page 2 of 12, Section 1 - Public Policies and Objectives, lines 6 to 8

Preamble:

In the referenced evidence, Toronto Hydro identified "City of Toronto's Toronto Green Standard" as one of the policies that drives its Future Energy Scenarios and stated that:

"….The most recent version all but eliminates the use of natural gas in new buildings."

QUESTION:

How does the "City of Toronto's Toronto Green Standard" policy impact Toronto Hydro's 2025 to 2029 commercial load forecast? Please quantify the impact on both the kWh and kW forecast.

RESPONSE:

Assuming the term "commercial load forecast" pertains to Toronto Hydro's distribution revenue load forecast, Toronto Hydro did not utilize the Toronto Green Standard in formulating its load and billing demand forecast for this rate application. Toronto Hydro through its Future Energy Scenarios work did have regard for the Toronto Green Standard and the broader City of Toronto Net Zero 2040 Strategy. To the extent that those municipal policies lead to a variance in distribution revenue due to greater building electrification or greater energy efficiency, those revenue variances would track to the Demand Related Variance Account (revenue variance subaccount).

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-4.1

Reference: Exhibit 2B, Section D3, Appendix D, Nexant Report, Toronto Hydro-Electric Service Limited: 2018 Value of Service Study, Page 6, 1 Executive Summary, 1.1 Response to Survey and Table 1-1: Total Number of Completed Surveys by Customer Class.

Preamble:

"The primary objective of the VOS study was to estimate system-wide outage costs by customer class. The VOS analyses are based on data from three separate surveys (one for each customer class) conducted between January and April 2018. The responses were used to estimate the value of service reliability for each customer segment, using procedures that have been developed and validated over the past 25 years by the Electric Power Research Institute (EPRI) and other parties."

QUESTION (A):

a) The quoted paragraph mentions the primary objective of the study. What were other objectives?

RESPONSE (A):

As part of the study, other objectives included:

- Determining a breakdown of the results at greater granularity levels (where feasible), through geographic, usage, time intervals, or other relevant segmentations;
- Gaining an understanding of customers' perception of their reliability experience and reliability preferences; and
- Impact of renewables and electric vehicles on both event and duration costs.

QUESTION (B):

b) Please confirm that the study found that customers who have higher electricity costs have higher outage costs

RESPONSE (B):

The study found that larger users had higher outage costs. The only exception is the 8-hour duration scenario, where the cost per average kW and cost per unserved kWh were found to be highest for Small/Medium Business customers (Tables 1-3 and 1-4 in the referenced study).

QUESTION (C):

c) Considering that the study was conducted four years ago, have any changes occurred since then that would affect the results?

RESPONSE (C):

The energy economy is always changing to some degree, and Toronto Hydro expects the complexity and pace of change to increase in the future. Since the study was performed, the world has gone through a number of major changes, including a pandemic and its lasting effects on the economy. Despite these changes, Toronto Hydro believes the study results remain reasonable for the applications in which they are deployed. It is important to note that Toronto Hydro generally relies on the blended values from this study, which reduces the significance of any relative shift in outage cost between customer classes. Furthermore, the primary way in which the utility has applied these blended rates is as a means of assigning economic value to outages for assessing benefits and risk values in dollar terms. These analyses are usually broad-based and high-level in nature and are not overly sensitive to moderate changes in the absolute value of blended outage costs.

Toronto Hydro does not believe that it is appropriate to update Value of Service assumptions often. This is both because Value of Service studies are expensive and because a lack of consistency in

value framework inputs such as Customer Interruption Costs can be destabilizing and inefficient in the context of long-term asset management planning and decision-making.

QUESTION (D):

d) The paragraph mentions costs and value. Based on Nexant's use of the two words is cost an objective measure and is value a subjective measure? Please discuss.

RESPONSE (D):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. Toronto Hydro notes that the consultant firm changed owners and the authors of the report do not provide consulting services on behalf of consulting firm's successor.

Nexant used established and objective approaches to ascertain customer interruption cost estimates, which ultimately allow Toronto Hydro to develop an understanding of the value of service reliability to its customers.

QUESTION (E):

e) Considering the very small sample sizes for Small/Medium Business and Large Commercial & Industrial customer classes what confidence should the OEB have in the results of the study?

RESPONSE (E):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. Toronto Hydro notes that the consultant firm changed owners and the authors of the report do not provide consulting services on behalf of consulting firm's successor.

Toronto Hydro believes that the OEB should place a high degree of confidence in the results of the study. Nexant relied on experts with extensive experience in value of service studies to establish the approaches and sample sizes to allow Toronto Hydro to understand the costs of interruptions

to its customers. They also relied on proven statistical methods to stratify these samples accordingly. Nexant confirmed within the report that the studies are valid and representative at the system level, as indicated in the report: "The study results are valid but obtaining results by smaller geographic regions within the service territory (as with residential customers) was not feasible". Per the above, given the lower response rate, Nexant was not able to stratify results to lower levels of granularity (such as geographic separations) and these results carry wider confidence interval bands in comparison to residential customer results. Toronto Hydro believes that the responses and resulting values are reflective of its customer population.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-4.2

Reference: Exhibit 2B, Section D3, Appendix D, Nexant Report, Toronto Hydro-Electric Service Limited: 2018 Value of Service Study, Page 7, 1.2 Outage Cost Estimates, Table 1-2: Cost per Outage Event Estimates by Customer Class

Preamble:

"Cost per outage event is the average cost per customer incurred from each outage duration. Given the dynamic survey instrument design which accounted for historical outage onset times, these values represent the average outage cost across all time periods."

QUESTION (A) AND (B):

a) How were the costs determined? Did customers provide their own estimates of cost per event to Nexant or did Toronto Hydro provide the costs to Nexant?

b) The quoted paragraph suggests that the time of day and outage duration were averaged out. Please explain how this was done.

RESPONSE (A) AND (B):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. Toronto Hydro notes that the consultant firm changed owners and the authors of the report do not provide consulting services on behalf of consulting firm's successor. However, the utility notes that Section 3 – Survey Methodology (page 18 of the report) provides a detailed description of the survey implementation approach by customer class, survey instrument design, sample design and data collection procedures for each customer class. As noted in Section 3.1, the estimated costs were derived on the basis of data that Nexant collected directly from customers. The survey instruments used by Nexant for the different classes of customers are shown in Appendix B, C, and D of the report.

Section 4 – Outage Cost Estimation Methodology (page 24 of the report) provides an overview of the outage cost estimation methodology and describes the six metrics that were derived from the responses.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-4.3

Reference: Exhibit 2B, Section D3, Appendix D, Nexant Report, Toronto Hydro-Electric Service Limited: 2018 Value of Service Study, Page 38, 6. Small & Medium Business Results

Preamble:

"Table 6-1 summarizes the survey response for SMB customers. With 245 total completed surveys, customer response was below the overall sample design target of 800. The study results are valid but obtaining results by smaller geographic regions within the service territory (as with residential customers) was not feasible and the confidence bands are wider than they otherwise would have been if the targets had been reached. The original sample design had a sample draw of 3,200 customers for an expected response rate of 25 percent. Once the customers in the first sample draw had been contacted and it was clear that the response rate was below target, Nexant worked with THESL to boost responses by increasing incentives from $50 to $100 and adding 3,200 customers to the sample. Even with the increased incentives, the response rate remained low. It was similar across the four usage categories, ranging only from 3.5 percent to 4.2 percent."

QUESTION (A) – (B):

a) How was the sample design target of 800 customers determined?

b) How was the original sample design of 3,200 customers determined?

RESPONSE (A) – (B):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. Toronto Hydro notes that the consultant firm changed owners and the authors of the report do not provide consulting services on behalf of consulting firm's successor.

However, the utility notes that Section 3.2 of the Survey Methodology (page 20 of the report) provides an overview of the sample design methodology.

QUESTION (C):

c) The quoted paragraph indicates that another 3,200 were added to the sample for a total of 6,400 customers. Were all of these customers randomly selected?

RESPONSE (C):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. However, to the best of Toronto Hydro's knowledge, the additional 3,200 customers were added based on the same approach as the original 3,200 customers and selected randomly.

QUESTION (D):

d) Of the 6,400 customers contacted, only 245 customers responded to the survey. Considering the low response rate and the diversity of small and medium customers, are the results representative of the entire population of small and medium business customers of Toronto Hydro?

RESPONSE (D):

Please see Toronto Hydro's response to interrogatory 2B-CCMBC-4.1 part (e).

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-4.4

Reference: Exhibit 2B, Section E1, Pages 4 and 5, Table 3: Investment Category Trigger Drivers

Preamble:

"System Access - Customer Service requests - Toronto Hydro strives to connect demand and DER customers to its system as efficiently as possible in alignment with its obligation under the Distribution System Code. This obligation holds unless it poses safety concerns for the public or employees or compromises the reliability of the distribution system. In situations where the existing infrastructure falls short of enabling a connection, the utility undertakes system expansions or enhancements to accommodate the customer's needs."

"System Service - Capacity Constraints - Expected load changes can impact service consistency and demand requirements for the system. To address this, Toronto Hydro proactively adjusts and expands its infrastructure to optimize reliability and meet evolving customer needs."

QUESTION (A):

a) Please explain the decision-making process that Toronto Hydro uses to identify capacity constraints, particularly as they relate to large condominium developments at Yonge and Eglinton, Yonge and St. Clair, Bayview and Eglinton and Mount Pleasant and Eglinton.

RESPONSE (A):

In the development of its System Peak Demand Forecast for the 2025-2029 period, Toronto Hydro through its Development Planning team, considered the impact of the Secondary Plans for several large projects, which include the Municipal Energy Plans for the redevelopment of Downsview, Port Lands, and Scarborough Golden Mile. For more details, please refer to Exhibit 2B, Section D4.

QUESTION (B):

b) Does Toronto Hydro charge developers of such large condominium developments to pay a contribution for the cost of expanding infrastructure to relieve capacity constraints? If the answer is yes, how is the amount of contribution determined? If the answer is no, please explain why not.

RESPONSE (B):

Customer connections are evaluated in accordance with *Distribution System Code* Section 3 Connection and Expansions subject to connection asset and expansion asset requirements in order to connect the customer. Where system expansion is required to connect the customer, Toronto Hydro uses the OEB's economic evaluation model (as described in Appendix B of the *Distribution System Code)*. This evaluation determines the amount of capital contribution that will be required by the customer for the expansion work.

QUESTION (C):

c) Please file Toronto Hydro's policies for dealing with customer service requests and the requirements for contributions from customers.

RESPONSE (C):

Toronto Hydro's policies dealing with the requirements for contributions from customers are outlined in Toronto Hydro's Conditions of Service (January 1, 2024) Section 2.1.2 Expansions / Offer to Connect. The requirements outlined within this section are compliant with *Distribution System Code* Section 3, Connection and Expansions. This section also outlines the business processes used by Toronto Hydro, including notification and timing provisions.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-5

Reference: Exhibit 2B, Section 5.1, Page 7

Preamble:

"These connections primarily relate to larger residential and commercial developments. These customers typically engage Toronto Hydro years before service is expected to be required. Figure 3 provides a year-over year comparison of the volume of new formalized high voltage requests that Toronto Hydro receives on an annual basis. High voltage connections increased by 27.6 percent for the period 2020 to 2022. As per section 7.2.2 of the DSC, these service requests must be completed within ten business days from the day on which all applicable service conditions are satisfied, or at a later date as agreed to by the customer and distributor."

QUESTION (A):

a) Did Toronto Hydro perform an economic evaluation of each of these high voltage connections as required by Appendix B of the DSC?

RESPONSE (A):

Toronto Hydro performed economic evaluations for these connecting customers in accordance with Distribution System Code Section 3. Economic evaluations are performed on projects that require expansion work.

QUESTION (B) and (C):

b) What was the cost of these connections in each of the three years?

c) What was the total amount of contributions collected from these customers in each of the three years?

RESPONSE TO (B) AND (C):

Table 1 provides High Voltage connection gross costs, and capital contribution by year:

Table 1: High Voltage Connection Amounts by Year – 2020 to 2022

Amount ($M)	2020	2021	2022
Gross Costs	90.3	113.6	116.3
Recoveries	61.7	38.7	57.7

Note: Capital contributions are recognized only when construction spend for a project begins, not when the offer to connect is executed.

QUESTION (D):

d) Did the cumulative increase in load as a result of this connections use up available capacity that required investments to increase capacity in subsequent years? If the answer is no, please discuss the amount of excess capacity on the Toronto Hydro system. If the answer is yes, please provide the costs of capacity expansion that was and will be required in 2023, 2024, 2025 and subsequent years as a result of the high voltage connections in 2020, 2021, and 2022.

RESPONSE (D):

The cumulative increase in load as a result of connections did result in capacity constraints at either the stations or regional level. The Load Demand program is used to alleviate emerging capacity constraints to efficiently connect customers to Toronto Hydro's distribution system. See Exhibit 2B, Section E5.3 for more details on the Load Demand program. Where the Load Demand program cannot effectively manage the constraints alone, the Stations Expansion program addresses the capacity needs. See Exhibit 2B, E7.4 for the required investments to increase capacity during the 2025-2029 period.

Toronto Hydro anticipates that the number of customer service requests and the size of the requested connections will continue to trend up to accommodate growing residential and commercial needs in the 2025-2029 period. See Exhibit 2B, E5.1 for more information on the Customer Connections program.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-6

Reference: Exhibit 2B, Section D2, Appendix A, Page 6
Table 2: Climate parameters and data sources used in the 2015 Study and the current (2022) study

Preamble:

"Annual probabilities were estimated for the baseline period (1981-2010), the 2030s (2021-2050) and the 2050s (2041-2070), by dividing the number of event occurrences, by 30 years. The annual probabilities were then translated to study period probabilities by estimating the likelihood of occurrence over a 28-year period (from 2022 to 2050). Because seven years have passed since the 2015 Study (study period from 2015 to 2050), the length of the study period has changed, which influences the climate parameter probability of occurrence."

QUESTION (A):

a) Why were annual probabilities estimated for the baseline 1981 to 2010 period since actual experience is known?

RESPONSE (A) FROM STANTEC:

On further reflection, the word "estimated" is better replaced by the word "calculated" when referring to the historical period (1981-2010) as it better reflects the procedures for evaluating probability scores. Probability scores are calculated using actual observational data based on records from Pearson International Airport, with contributions from Buttonville and Toronto Island Airports, following the same methodology as in the 2015 study. For more information, see the complete description as explained in Appendix C, section 3.1.2.

QUESTION (B):

b) Please compare and discuss the estimated probabilities for the 1981 to 2010 period with actual experience for the same period.

RESPONSE (B) FROM STANTEC:

As noted in response (A), the word "estimated" should be replaced with the word "calculated" when considering the historical period of 1981-2010. All historical values are calculated for the referenced time periods. For further information on calculation procedures, see Appendix C, section 3.1.2.

QUESTION (C):

c) Please compare and discuss the probabilities of occurrences predicted by the 2015 Study with actual experience since then.

RESPONSE (C) FROM STANTEC:

As shown in Appendix A of the report, there are minor differences in the calculated frequencies for some parameters in the historical and future projected periods. As detailed in the table, minor differences are found for days of 35°C or greater (0.75 days per year versus 0.80 days per year in 2015 versus 2022), snowfall days with 10cm (1.5 days per year versus 1.4 days per year), snowfall days with 5cm (5.0 days per year versus 5.2 days per year), extreme rainfall days with 100 mm in <1 day + antecedent (0.04 days per year versus 0.02 days per year), and lightning (1.12 to 2.24 flashes per year per km^2 versus 1.43 flashes per year per km^2). In most cases, these minor differences did not have any impact on the rated probability scores, outside of lightning, which was scored at a probability of 1 in the 2022 study rather than a range of 0 to 2 in the 2015 study. For further information, consult Appendix A in the 2022 report.

QUESTION (D):

d) Has Stantec used the same data as the 2015 Study extended by 7 years?

RESPONSE (D) FROM STANTEC:

The scope of work for the 2022 study by Stantec was to consult updated climate change modeling information available from the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment report (AR6) and supporting 6th Coupled Model Intercomparison Project (CMIP6). The 2015 study utilized projections from the IPCC Fifth Assessment Report (AR5) and the 5th Coupled Model Intercomparison Project (CMIP5). For more details see Section 2.1.1 and 2.1.2 of the 2022 Study.

QUESTION (E):

e) Of the climate parameters listed in Table 6, none deal with low temperature. Please explain why low temperature is not listed as a climate parameter.

RESPONSE (E) FROM STANTEC:

The scope of the 2022 study was to provide updates to the same parameters selected by AECOM in the 2015 study and not add any additional parameters. Stantec was not part of the decision-making process for the 2015 study that selected parameters. In the 2015 study, only one low temperature related parameter (Frost) was selected due to the potential for frost heaving issues but was deemed to be low risk (see Appendix C, Section 5.1).

QUESTION (F):

f) The table indicates that different data sources were used for some of the Climate Parameters in the 2022 Study than in the 2015 Study. For example, for the High Winds climate parameter Cheng et Al. (2012) was used in the 2015 Study but Cannon et Al (2020) was used in the 2022 Study. Please explain how and why data sources were selected and used by Stantec.

RESPONSE (F) FROM STANTEC:

As seven years have passed following the completion of the 2015 study, scientific datasets, papers, have seen improvements in the methodology used for estimating climate change effects on extremes, particularly complex parameters such as wind and freezing rain. Stantec conducted a fulsome review of relevant literature along with updated analytical techniques to revisit how projected future conditions may have changed. For example, the Cannon et al. (2020) study used in the 2022 study was not available when the initial study was completed and provides a detailed analysis of how climatic design data relevant to users of codes and standards might change as the climate warms. While the reference documents have changed and given more detail into how events might manifest in a warming climate, many of the underlying probability scores have not changed, as shown in Appendix A and noted in Section 3.2 of the 2022 report.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-7

References: **Exhibit 2B, Section D2, Appendix A, Stantec, Climate Change Vulnerability Assessment Update, Page 7, Table 3: Probability score classes applied in this study and the 2015 Study (from Engineers Canada, 2011), Table 4: Updates to climate parameter probabilities, and Page 9.**

Preamble:

"There is a decrease in the estimated number of days with maximum temperatures exceeding 40°C in the 2030s and 2050s, compared to the 2015 Study. As a result, the estimated probability of 40°C temperatures occurring over the study period is about 90% and is classified as a probability score of 6, a decrease from the 2015 Study score of 7."

QUESTION (A):

a) What was the probability of Days > 40°C in the 2015 Study?

RESPONSE (A) FROM STANTEC:

As shown in Appendix A of the 2022 study, the 2015 study historical frequency of >40°C events was ~0.01 per year, based on data from Toronto City Center station, resulting in a PIEVC probability score of 1. Projected frequency in the 2015 study ranged from 0.3 to 2 days per year in the 2030 and 2050s period and 1-7 days per year in the study period, resulting in PIEVC probability scores of 4-7 and 7 for the 2030s and 2050s and study period, respectively.

QUESTION (B):

b) Were there any Days > 40°C were experienced in Toronto since 2015? Please provide dates and the duration in hours of > 40°C.

RESPONSE (B) FROM TORONTO HYDRO:

There have not been any Days > 40°C in Toronto since 2015.[1]

QUESTION (C):

c) Do all areas of Toronto experience the same temperature or are some areas, such as near Lake Ontario cooler?

RESPONSE (C) FROM TORONTO HYDRO:

Toronto does experience varying temperatures across the city and can be evaluated through the various different weather stations across Toronto made available by the Canada's Environment and Natural Resources, see https://www.canada.ca/en/services/environment/weather.html.

[1] Government of Canada, Weather, Climate and Hazard: https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-8

Reference: Exhibit 2B, Section D2, Appendix A, Stantec, Climate Change Vulnerability Assessment Update, Page 20

Preamble:

"The only climate parameter probability scores that changed as a result of this analysis include extremely hot days (>40°C), and 25mm freezing rain events, both of which are projected to occur less frequently over the study period than was estimated in the 2015 Study. Though these decreases resulted in a downgrading from high to medium risk for multiple infrastructure asset classes, we do not recommend relaxing any of the adaptation measures provided in the 2015 Study.

Please confirm that the 2022 Study by Stantec did not find any increase in risk of incidents of severe weather events.

RESPONSE FROM STANTEC:

As the study only evaluated the material change in risk score for hazards where probability scores changed as part of the assessment, no other changes to overall risk scores for any other hazard were observed. As noted in Section 6 of the report and shown in Appendix A and Appendix B, the only parameters that have shown a change in probability are extremely hot days (>40°C) and 25mm freezing rain events. The 2022 study did not show any increased probability of events, however, many of the probability scores were already at the maximum value (score of 7). Some parameters see an increase in frequency in the 2022 study. For example, days above 35°C increase in the 2050s for the 2022 study (9.2 days) compared with the 2015 study (8 days). Similarly, other temperature related parameters see similar increases as well. While the probability scores do not change, the exposure to more days for these thresholds is increased in the 2022 study.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY EXHIBIT 2B-DRC-7

Reference: Exhibit 2B, Section E5.1 (Customer Connection program)

Preamble:

THESL's investment plan and Capital Expenditure Plan provide that the connection of DER facilities under the Customer Connection program supports the achievement of the public objectives with respect to facilitating innovation and supporting DER integration within Ontario's electricity system.

QUESTION (A):

a) Please provide any and all analysis, reports, studies, presentations, data or other documentation with respect to past and forecast (2023-2029) DER uptake in THESL's service territory.

RESPONSE (A):

Toronto Hydro's DER forecast is outlined in Exhibit 2B, Section E3.2 at page 3 and Exhibit 2B, Section E5.1.3.2, page 14 and relies on Toronto Hydro's historical DER connection trends, project pipeline, economic environment; and energy policies at the time of the forecast.

QUESTION (B):

b) Do you accept that the services THESL provides to support the adoption and integration of DERs and EVs influence customer behaviour and adoption of these technologies. If yes, please discuss how THESL perceives its impact on customer demand in relation to the services THESL provides related to DERs and EVs. If not, please discuss why THESL does not believe that its DER- and EV-related services and programs do not influence customer behaviour and adoption.

RESPONSE (B):

Toronto Hydro will continue to support and facilitate the connection of DERs and EVs to the distribution system. Additionally, THESL is making efforts to increase capacity of the system to connect DERs (please reference Exhibit 2B Section E5.5 for more details).

Toronto Hydro accepts that support of DER and EV programs is integral to customer adoption of these technologies. While it is the customer's choice to opt-in to DER and EV technologies, Toronto Hydro recognizes its efforts towards enabling these investments has a favorable impact on customer demand.

QUESTION (C):

c) Please indicate whether THESL considers EVs to be DERs and discuss the related implications for THESL's distribution system and system capacity.

RESPONSE (C):

Toronto Hydro considers EVs to be net new loads on the distribution system during the rate period.. Within the Innovation Program of the Grid Modernization Strategy, Toronto Hydro plans for an EV Load Management project that investigates technical hardware and control technologies to enable demand response events with electric vehicles. Further information of the pilot project can be referenced in Exhibit 2B, Section D5.

QUESTION (D):

d) Please provide any and all analysis, reports, studies, presentations, data or other documentation with respect integrating DERs as a driver of THESL's investment plan.

RESPONSE (D):

As part of its 2025-2025 Distribution System Plan ("DSP"), Toronto Hydro's intends to undertake a number of investments to enable the connection of DERs to the grid. These investments include the Customer Connections (Exhibit 2B, Section E5.1),Generation Protection, Monitoring and

Control (Exhibit 2B, Section E5.1), Non-Wires Solutions (Exhibit 2B, Section E7.2), and Stations Expansion (Exhibit 2B, Section E7.4) programs to support the safe, timely and cost efficient connection of DERs to the grid, in accordance with the utility's generation connections forecast.

QUESTION (E):

e) Please list any other common constraints to DER installation and comment on any improvements THESL has implemented over the past five years to address these constraints.

RESPONSE (E):

Short circuit capacity constraints, anti-islanding condition for DERs, as well as system thermal limits and load transfer capabilities affect the distribution system's ability to accommodate DERs. These are described in Exhibit 2B, Section E3.3 at pages 9-13. Details regarding Toronto Hydro's investments over the 2020-2024 period to address these constraints are provided in the Generation, Protection, Monitoring and Control program (Exhibit 2B, Section E5.5.4).

QUESTIONS (F) TO (H):

f) Please comment on whether there are areas within THESL's larger distribution system that are worse for the constraints listed in d) above than in other areas.

g) Please indicate the areas in THESL's service territory that are expected to be areas of significant DER growth over the next five years.

h) Please indicate and provide comment on areas of THESL's service territory that have are currently unable to meet DER installation demand and comment whether these areas will continue to be unable to meet demand or whether there are new areas anticipated to be unable to meet demand over the next five years and beyond. In your response, please comment on how this is expected to vary by neighbourhood.

RESPONSE (F) TO (H):

Exhibit 2B, Section E3.3 provides details regarding the constraints listed in (e) above.

QUESTION (I):

i) Please comment on known barriers to EV adoption in THESL's service territory, including for multi-unit rental residential, and how the Application seeks to address these barriers and ensure equitable access to charging infrastructure for all customers.

RESPONSE (I):

Toronto Hydro works directly with its customers and stakeholders to address barriers that are within the utility's jurisdiction. Toronto Hydro ensures equitable access to charging infrastructure by responding to customer requests for service expansion requests. In the event that a service upgrade is required at a customer's service address, Toronto Hydro will work with the customer and their contractor through the connections process.

A 2019 report produced by Pollution Probe outlines 14 barriers to EV charging installation in multi-unit residential buildings [https://www.pollutionprobe.org/wp-content/uploads/2023/11/ZEV-Charging-in-MURBs-and-for-Garage-Orphans-1.pdf]

QUESTION (J):

j) Does THESL have any programs to support the upgrading of supply infrastructure to enable EV charging infrastructure when THESL is planning expansion or upgrades? If yes, please provide details. If no, please discuss what types of programs could be developed to support proactive and future infrastructure upgrades to enable equitable access to EV charging infrastructure.

RESPONSE (J):

As noted in its response to part (c), Toronto Hydro considers EVs to be distribution loads. Through its capacity plan outlined in Exhibit 2B, Section D4,[1] the utility's investments over the 2025-2029 period are intended to ensure that the distribution system is adequately sized to deliver reliable electricity to its customers and enable customers to install their EV charging infrastructure. These

[1] Updated January 29, 2024

include the Customer Connections (Exhibit 2B, Section E5.1), Load Demand (Section E5.3),[1] and Stations Expansion (Section E7.4)[1] programs.

QUESTION (K):

k) Please provide THESL's views on any barriers to EV adoption for residents of multi-unit complexes in THESL's service area. Among any other views, please provide specific comment on whether multi-unit residential complexes represent one of the more challenging venues for EV adoption, and whether THESL agrees that addressing those challenges should be prioritized. Please explain THESL's position on each of these points.

RESPONSE (K) :

Please see response to part (i).

QUESTION (L):

l) Please describe any ongoing activities or initiatives proposed by THESL that can help to address challenges specific to EV transition in multi-unit residences by way of proactive infrastructure upgrades or future upgrades. Please include any planned or anticipated initiatives at the system-wide level in addition to any more localized initiatives.

RESPONSE (L):

Please see response to part (j).

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-8

Reference: Exhibit 2B, Section E8.3

Exhibit 4, Tab 3, Schedule 18

Preamble:

THESL indicates that it is seeking to transition its commercial fleet to low or zero emission technology, including increasing the rate of EVs.

QUESTION (A):

a) Please provide any and all reports, working papers, analysis or other materials that have been prepared (in draft or in final form) in connection with the transitioning of THESL's commercial fleet to low or zero emission technology.

RESPONSE (A):

Please refer to the following documents:

- Electric Vehicle Phase-In Plan by Richmond Sustainability Initiatives, which will be appended to Toronto Hydro's response to interrogatory 2B-Staff-266;[1] and
- THESL Fleet Benchmarking Findings and Recommendations and Electric Vehicle Addendum by Metsco in Appendices A and B to Toronto Hydro's response to interrogatory 1B-SEC-5.

QUESTION (B):

b) The federal government provides financial incentives for qualified zero emission vehicles purchased or enhanced capital cost allowance deductions.

[1] Toronto Hydro is in the process of obtaining disclosure consent from the consultant that authored the report referenced, and will file the report as an appendix to 2B-Staff-266 as soon as reasonably possible.

i. Please advise whether THESL's planned fleet renewal investments qualify for any federal financial incentives and/or enhanced capital cost allowance deductions.

ii. Please advise whether the capital expenditure figures reported reflect federal financial incentives and/or enhanced capital cost allowance deductions.

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 1-Staff-97, part (h). For an overview of funding that Toronto Hydro leveraged in the 2020-2024 rate period, please see Toronto Hydro's response to interrogatory 3-DRC-14(c).

QUESTION (C):

c) Please complete the following chart indicating the breakdown of vehicle type in THESL's current vehicle fleet:

Vehicle Type	Fully Electric	Hybrid	Non-EV/Hybrid	Total
Heavy Duty Vehicles				
Medium Duty Vehicles				
Light Duty Vehicles				

RESPONSE (C):

Toronto Hydro considers medium duty vehicles to be part of the heavy duty category and does not track such vehicles separately.

Table 1: Breakdown of Vehicle Type

Vehicle Type	Electric	Hybrid	Non-EV/Hybrid	Total
Heavy Duty	1	3	145	149
Light Duty	14	55	141	210
Total	15	58	286	359

QUESTION (D):

d) What proportion of THSEL's planned fleet renewal investment will involve fully electric and/or hybrid vehicles? Please complete the following chart indicating THESL's anticipated breakdown of vehicle type in THESL's planned fleet renewal investment (2025 to 2029):

Vehicle Type	Fully Electric	Hybrid	Non-EV/Hybrid	2025-2029 Total
Heavy Duty Vehicles				
Medium Duty Vehicles				
Light Duty Vehicles				

RESPONSE (D):

Table 2: Anticipated Breakdown by Vehicle Type

Vehicle Type	Electric	Hybrid	Non-EV/Hybrid	Total
Heavy Duty	9	8	136	153
Light Duty	106	0	104	210
Total	115	8	240	363

QUESTION (E):

e) Please indicate the estimated quantum of efficiency savings (including fuel cost savings and greenhouse gas emission reductions) that THESL anticipates it will achieve by utilizing hybrid vehicles and EVs rather than traditional internal combustion engine vehicles over the rebasing period (2025-2029).

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 1B-Staff-47 part (i).

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-9

References: Exhibit 2B, Section D8

Exhibit 2B, Section E8.4

Preamble:

THESL proposes an Information Technology Investment Strategy, which includes an identification of and response to certain threats relating to cybersecurity.

QUESTION (A):

a) Please describe THESL's perspective on cybersecurity risks over the proposed rate term and beyond as they apply to the integration of DERs.

RESPONSE (A):

Toronto Hydro expects that the increasing adoption of DERs will change the cyber security landscape. During the 2025-2029 rate period, the utility expects to increase its utilization of DERs to effectively manage demand response and improve capabilities to monitor, schedule, control, and dispatch DERs through a centralized platform.[1] These operations would require DER technology to be integrated with Toronto Hydro's critical Information Technology and Operational Technology (IT/OT) systems to be effective. The integration of DERs carries with it cyber security risks, particularly as such resources start to incorporate intelligent capabilities and network connectivity.[2] Toronto Hydro expects these inherent risks to intensify over the 2025-2029 rate period. To mitigate these risks and enable the secure integration of DERs, the utility plans to invest

[1] Exhibit 2B, Section D5, subsection D5.2.2.2 "Leveraging DER Connections" at p. 31.
[2] For example, a poorly secured DER could serve as an entry point to manipulate wider systems.

into its robust cyber security infrastructure[3] and the acquisition and training of skilled resources.[4] Toronto Hydro also plans to measure its performance in the area of system security enhancements to ensure continuous improvement in achieving and maintaining robust cyber security.[5]

QUESTION (B):

b) Please describe THESL's perspective on cybersecurity risks over the proposed rate term and beyond as they apply to the adoption of smart grid or similar technologies used in support of the integration of DERs.

RESPONSE (B):

As the deployment of emerging technologies like network connected DERs and smart grid components gains pace, Toronto Hydro expects increasing risk to its systems and customer data, leading to a more complex cyber security landscape. As discussed in the response to subpart (a), the utility's capital and OM&A expenditures for IT/OT for the 2025-2029 rate period include investments in measures to mitigate such cyber security risks. Examples of such measures include perimeter control mechanisms such as firewalls and intrusion detection systems to address sophisticated attacks that may use of artificial intelligence. In addition, lifecycle upgrades are performed on a regular basis to ensure that the organization will maintain secure role-based access to resources and accurate records to facilitate auditing and forensic analysis.

QUESTION (C):

c) Please describe any efforts THESL has undertaken or will undertake to identify the full extent of risks to cybersecurity in the context of DERs and use of smart grid technology.

[3] Exhibit 2B, Section E8.4; see especially subsection 8.4.3.1, subpart 2 "IT Cybersecurity Practice" at p. 7-9.
[4] Exhibit 4, Tab 2, Schedule 17; see especially section 5 "Security and Enterprise Architecture Segment" at p. 13-20.
[5] Exhibit 1B, Tab 3, Schedule 1, subsection 2.1.3 "System Security Enhancements" at p. 21-23.

RESPONSE (C):

As outlined in Toronto Hydro's Information Technology Investment Strategy,[6] the utility leverages its investment planning process to develop and prioritize investments in an agile manner that is responsive to external drivers such as the integration of DERs and associated emerging cyber security risks. This involves a holistic business case development process and the evaluation of cyber security risks against Toronto Hydro's established IT standards, polices and enterprise architecture principles, as well as the OEB Cyber Security Framework and industry best practices.[7] The business case development process ensures a consistent and thorough assessment of each cybersecurity risk. In addition, regular assessments of the Toronto Hydro cybersecurity posture are performed to ensure continuous evaluation and adoption to the changing landscape.

QUESTION (D):

d) Please identify any portions of the record that THESL believes address these (or generally related) issues.

RESPONSE (D):

Please refer to the following evidence:

- Exhibit 1B, Tab 3, Schedule 1, subsection 2.1.3 "System Security Enhancements" at p. 21-23.
- Exhibit 2B, Section D8; see especially subsections D8.4 "IT Cyber Security Standards" and D8.5 "IT Investment Planning Process" at p. 6-10.
- Exhibit 2B, Section E8.4; see especially subsection 8.4.3.1, subpart 2 "IT Cybersecurity Practice" at p. 7-9.
- Exhibit 4, Tab 2, Schedule 17; see especially section 5 "Security and Enterprise Architecture Segment" at p. 13-20.

[6] Exhibit 2B, Section D8; see especially subsections D8.4 "IT Cyber Security Standards" and D8.5 "IT Investment Planning Process" at p. 6-10.
[7] *Supra* footnotes 3 and 4.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-10

Reference: **Exhibit 2B, Section A**

Preamble:

THESL states that customers are showing a continued interest in participating in the electricity system as both consumers and producers of power and that DER connections have grown in recent years as result of government policies and declining costs of technologies such as solar panels.

QUESTION (A) AND (B):

a) Please elaborate on customer interest related to solar power since the last rebasing period.
b) Please provide any other common constraints to DER installation and comment on (i) any improvements THESL has implemented over the past five years to address these constraints and (ii) whether there are areas within THESL's larger system that are worse for these constraints than others.

RESPONSE (A) AND (B):

Please refer to Exhibit 2B, Section E3, for information regarding Toronto Hydro's ability to accommodate renewable energy generation and other distributed energy resource ("DER"). This includes renewable DER applications (such as solar), overall DER connection projections, the distribution system's ability to connect, as well as known constraints on the distribution system.

For information regarding investments made over the 2020-2024 period, please refer to the Generation Protection Monitoring and Control program in Exhibit 2B, Section E5.5.

QUESTION (C):

c) Please indicate where there are expected areas of DER growth in THESL's service territory.

RESPONSE (C):

DER connection location probability greatly varies and is determined by customer demand. The DER forecast is based on growth trends using historical data. DER growth forecasted in specific station areas is determined based on generation types and pipeline information. For further details, please refer to Exhibit 2B, Section E3.

QUESTION (D) :

d) Please indicate the areas of THESL's service territory that THESL has been unable to meet DER installation demand and indicate whether there are any other areas where installation demand will not be met over the rebasing period and beyond.

RESPONSE (D):

A restricted feeder list posted on Toronto Hydro's website identifies the stations with no additional short circuit capacity, i.e. unable to connect generation facilities (DERs). This list is updated regularly and a snapshot is provided in Exhibit 2B, Section E3. Toronto Hydro's DER forecast identified stations expected to have no available short circuit capacity in the next 5 years. Over the 2025-2029 period, the utility proposes investments in the Generation Protection Monitoring and Control (Exhibit 2B, Section E5.5), Non-Wires Solutions (Section E7.2) and Stations Expansion (Section E7.4) programs to alleviate these constraints.

QUESTION (E) :

e) Please provide any comments and insights from THESL's perspective on the adoption and integration of DERs at a more granular level, such as at the neighbourhood level (which neighbourhoods are seeing a significant increase in DER and EV adoption, which neighbourhoods are not seeing any or an increase in demand for DERs and EVs, etc.). If known, please discuss the characteristics of THESL's customers that are adopting these technologies (age, income, location, residential type etc.).

RESPONSE (E):

The table below is provides the number of DERs connected to each substation. As described in Exhibit E3, Toronto Hydro's investments seek to alleviate constraints at the bus/feeder level. The utility does not track the requested information at that level of detail, however, from the data provided below, downtown locations appear to have lesser DER adoptions, which could indicate that space constraints may be a determining factor.

Table 1: Number of DERs Connected to Each Substation

	Number of Connected DERS (as of 2022)
East York	**96**
Leaside	96
Etobicoke	**371**
Horner	88
Manby	117
Rexdale	63
Richview	95
Woodbridge	8
North York	**552**
Bathurst	105
Bermondsey	90
Fairchild	101
Finch	144
Leslie	112
Scarborough	**675**
Agincourt	64
Cavanagh	59
Ellesmere	94
Malvern	37
Scarborough	137
Sheppard	142
Warden	142
Toronto	**548**
Basin	14
Bridgman	33
Carlaw	68

	Number of Connected DERS (as of 2022)
Cecil	54
Charles	14
Copeland	2
Dufferin	132
Duplex	30
Esplanade	24
Gerrard	7
Glengrove	34
John	7
Main	56
Strachan	33
Terauley	8
Wiltshire	32
York	**182**
Fairbank	106
Runnymede	76
Grand Total	**2424**

QUESTION (F) :

f) Please discuss the downside risks of underinvesting and inadequate capital expenditures on EVs and DERs servicing and system infrastructure over the rebasing period and the implications for the 2030-2040 period.

RESPONSE (F):

Under-investing in renewable enabling improvement ("REI") investments could become a barrier to the adoption of these technologies. Capital programs such as the Generation Protection, Monitoring and Control (GPMC) (Exhibit 2B, Section E5.5), Non-Wires Solutions (Exhibit 2B, Section E7.2), and Stations Expansion (E7.4) are meant to provide an environment that is conducive to the connection of more DERs. Growth and City Electrification programs as summarized in Exhibit 2B, Section E3, aim to alleviate future load constraints due to growth resulting from EV uptake.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-11

Reference: Exhibit 2B, Section D4, Appendix B

TransformTO Net Zero Strategy ("TransformTO")

Preamble:

THESL engaged Element Energy ("EE") to develop the Future Energy Scenarios model report (the "FES Report") to offer a range of plausible trajectories on the path toward decarbonization.

QUESTION (A):

a) Please place the TransformTO Net Zero Strategy materials on the record in this proceeding.

RESPONSE FROM TORONTO HYDRO (A):

Please refer to the TransformTO Net Zero Strategy:

https://www.toronto.ca/legdocs/mmis/2021/ie/bgrd/backgroundfile-173758.pdf

QUESTION (B):

b) Please explain why THESL and/or EE chose the TransformTO scenarios and any advantages or disadvantages in terms of the reliability of these scenarios for THESL over the next five years.

RESPONSE FROM TORONTO HYDRO (B):

As noted on page 3 of Section 2 of the FES report, the TransformTO scenarios were used as a "reference point to define the overall level of ambition modelled in the four scenario worlds." The TransformTO inputs were complemented by numerous other inputs, including the scenario worlds framework used by National Grid in the U.K., which defines scenario worlds according to their level of societal change and speed of decarbonization. Ultimately, the final scenario worlds in the FES model and report were shaped by internal stakeholder discussion and consensus, and did not

simply adopt the TransformTO scenarios without scrutiny. Toronto Hydro regards the modelled scenarios as being reasonable and fit for the purpose of the exercise, which was to illustrate the range of uncertainties in the low carbon energy transition.

QUESTION (C):

c) Please discuss the implications of the four central scenarios in the FES Report specifically for DERs, EVs, storage.

RESPONSE FROM TORONTO HYDRO (C):

These scenarios reinforce the fact that the rates of uptake of DERs, EVs, and storage are highly uncertain and will depend on numerous economic and policy factors, which as a consequence, creates uncertainty for system planning.

QUESTION (D):

d) Please explain what the drivers are for EV transition in the steady progression scenario and whether it's a gradual or concentrated transition.

RESPONSE FROM ERM (D):

Please see Section 4.3 of the FES report for details regarding the electrification of transport. Regarding the Steady Progression scenario world, Table 17 outlines how each of the modeled parameters map to the scenario world. For example, the details and graphs which outline or refer to the "Low" scenario in Section 4.3.2 detail the key inputs, methodology, and modeling that feed into the EV transition, for cars and light trucks, in the Steady Progression scenario world.

QUESTION (E):

e) Please explain how THESL's assumed EV adoption is aligned with TransformTO and why that is the standard that TH adopted. As part of your response, please also discuss whether any other metrics were considered by THESL and whether there are any disadvantages to relying on a plan that was developed in 2020.

RESPONSE FROM ERM (E):

Please see section 4.3.1 which outlines the modelling approach for EV adoption and states that "Element Energy's "Electric Car Consumer model" (ECCo) was used to generate bottom-up technology uptake scenarios for cars and light trucks, which consist of a varying mixture of full electric, hybrid and alternative-fuels based transport options." As noted in the same section, TransformTO data was used to derive an annual growth factor for the stock of cars and light trucks, which was applied to the base year stock to give an absolute number of cars and light trucks in the city each year; this feeds into the vehicle stock rather than the relative proportion or adoption of EVs as part of that stock. Detailed further in Section 4.3.2, it is reiterated that a bottom-up modelling approach was taken: "ECCo was used to model the development of the car stock from the common starting point derived as described in Section 4.3.1. By varying the assumptions related to policy, vehicles costs and infrastructure, three uptake scenarios for BEVs and PHEVs were developed representing a range of ambition levels."

QUESTION (F):

f) Please explain what the drivers are for solar power adoption in the steady progression scenario and whether it's a gradual or concentrated transition.

RESPONSE FROM ERM (F):

Please see Section 4.4.2 of the FES report for the details regarding solar photovoltaics. Regarding the Steady Progression scenario world in particular, Table 26 outlines how each of the modeled parameters map to the scenario world. For example, the details and graphs which outline or refer to the "Low" scenario in section 4.4.2 detail the key inputs, methodology, and modeling that feed into the solar power adoption in the Steady Progression scenario world

QUESTION (G):

g) Please elaborate on the moderate increase anticipated in the System Transformation scenario for distributed renewable generation.

RESPONSE FROM ERM (G):

Please see Section 4.4.1 (including Table 28) of the FES report for the general approach used for modelling the uptake of distributed generation (including the distributed renewable generation). For details regarding the uptake for each of the distributed renewable generation types, please see Sections 4.4.2, 4.4.3, and 4.4.5. Regarding the System Transformation scenario world in specific, Table 26 outlines how each of the modeled parameters map to the scenario world. For example, the details and graphs which outline or refer to the "Medium" scenario in section 4.4.2 and 4.4.5 (and the "Low" Scenario in section 4.4.3) detail the key inputs, methodology, and modeling that feed into the uptake of each of the distributed renewable generation types modelled.

QUESTION (H):

h) Please discuss what would be involved in assessing the probability of any specific outcome taking place.

RESPONSE FROM ERM (H):

As outlined in Section 2, this project's scenario-based modeling is used to represent a range of uncertainties in the low carbon energy transition. The modeling is not meant to comment on the probability of any of these scenarios.

Ultimately, assessing probabilities would require establishing views on macroeconomic factors, policies, and the other drivers which influence the model. The purpose of scenario-based modelling is to demonstrate the wide range of outcomes in future which stem from the uncertainty in societal and technological change. It is important to note that certain scenarios require much more change than others.

One benefit of a scenario-based model such as FES is that the utility can track developments as they occur and determine which scenario is more closely being followed.

QUESTION (I):

i) Please elaborate on drivers behind what THESL considers falling technology costs relevant to the distributed renewable generation that was identified as a possibility in the FES Report.

RESPONSE FROM TORONTO HYDRO (I):

With respect to the Future Energy Scenarios, the falling energy costs are referring to capital cost reductions as noted in sources 1 and 53 of the report prepared by Element Energy and linked below for reference.

1. CER, Canada's Energy Future[1], 2021

53. NREL, Solar Futures Study[2], 2021

QUESTION (J):

j) Please explain how the scenarios capture "the impact of flexibility options such as energy storage, smart charging and vehicle to grid options for electric vehicles".

RESPONSE FROM ERM (J):

The impact of smart charging and vehicle-to-grid options is discussed in section 4.3.7 of the FES report. Please see section 4.5 for details regarding energy storage.

QUESTION (K):

k) Please provide the full list of attributes used in the EE's "Electric Car Consumer model" and indicate which attributes THESL considers to be the most significant and describe how it affects EV uptake.

RESPONSE FROM ERM (K):

[1] https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/
[2] https://www.nrel.gov/analysis/solar-futures.html

Please see Section 4.3.1 for the relevant modelling approach (including figure 44). The following section of the report (4.3.2), details regarding the inputs (e.g., policy, vehicle costs, infrastructure) are provided. For example, table 18 outlines the assumptions in the low electric transport uptake scenario**.**

QUESTION (L):

l) Please indicate whether THESL accepts that consumer preferences and related consumer behaviour is changing and discuss how this and any such changing attitudes are incorporated into the analysis performed in the FES Report?

RESPONSE FROM ERM (L):

This project's scenario-based modeling represents the range of uncertainties for the distribution system in the future. A significant driver of this uncertainty is consumer behavior and its potential for change over time. In fact, one of the two major axes of change along which the scenario worlds were developed and subsequently modeled is "Level of Societal Change".

Please see section 3.1 for details regarding the bottom-up consumer choice modelling framework used. Additionally, for a specific example of the modeling of shifting consumer behaviour, please see Section 4.3.1.

Different levels of consumer behaviour change are modelled by the scenario worlds; please see Section 2.1 which outlines how they vary within each of the scenario world narratives.

QUESTION (M):

m) Did EE consider any other comparable jurisdictions (USA, Europe)? If, yes please indicate which jurisdictions and discuss how this was included in the analysis. If no, please discuss why no other comparable jurisdictions were included in the analysis.

RESPONSE FROM ERM (M):

Yes, this was considered. As an example, please see Section 4.3.3 which notes that the California Air Resource Board data was used as an input into the High scenario narrative for medium- and heavy-duty trucks. Similarly, in Section 4.3.6, input from the UK is referenced as well. Please see section 4 for all the relevant references to other jurisdictions and how they were included in this analysis.

QUESTION (N):

n) Please indicate whether there were any other factors considered for the purposes of allocating BEV and PHEV to neighbourhoods. If yes, please discuss how they were considered? If no other factors were considered, please discuss why not?

RESPONSE FROM ERM (N):

Please see Section 3.2 which outlines the local factors and customization to Toronto and includes commentary on the city's neighbourhood division. Please also see section 4.1.1 and 4.1.2 on archetype definitions and building stock respectively. Lastly, please see section 4.3.6 which outlines the factors considered, building upon the aforementioned sections.

QUESTION (O):

o) Please elaborate on what you view as the limitations around the business case for bi-directional chargers. As part of your response, please discuss whether these limitations are changing and the likely outlook bi-directional charging over the next 5 and 10 years? Please also discuss what has changed on these or related points since the study from 2019 cited in the FES Report.

RESPONSE FROM TORONTO HYDRO (O):

The limitations around the business case for bi-directional chargers that Toronto Hydro has considered include various factors that prohibit the technology from having a positive cost-benefit relation. These include costs associated with hardware, degradation, and energy along with

location, temporal, and regulation and market risks associated with potential revenue streams. A detailed discussion of these limitations is found in the 2019 report titled "V2GB – Vehicle to Grid Britain Requirements for market scale-up (WP4)" as Reference 48 of Exhibit 2B Tab 3 Schedule 4 Appendix B.

Toronto Hydro notes that there are many changes happening throughout the sector, many of which are externally driven (e.g. regulatory, supply chain, global prices, technological development). Toronto Hydro continues to monitor these changes and to consider potential use cases for the technology as the sector evolves. The cited 2019 report was not commissioned by Toronto Hydro and the study was conducted for a regulatory environment outside of Ontario; therefore, Toronto Hydro is not in a position to speculate on how reality has unfolded in that particular environment since the study's publication.

QUESTION (P):

p) Please elaborate on the in-house consumer choice model that EE used to develop solar PV projection and discuss whether or not THESL has analyzed whether solar PV will be evenly distributed across its service territory and how that picture will develop over time.

RESPONSE FROM ERM (P):

Please see Sections 4.4.1 and 4.4.2 of the FES report for details regarding PV uptake. Please also see Sections 4.1.1 and 4.1.2 regarding archetype definitions and building stock respectively. The distribution of the taken up solar PV across Toronto Hydro's service territory is not "even" as it depends on a number of factors. In the near term, the distribution is based on the distribution of already installed solar PV connections and solar PV installations that have an accepted connection agreement with Toronto Hydro. In the long term, the distribution depends on the size of the solar PV system; rooftop solar PV distribution depends on the archetype breakdown across the serviced neighbourhoods and ground-mount solar PV distribution depends on available land space, including parking lots.

QUESTION (Q):

q) Please discuss what additional measures are necessary for the more aggressive transition pathways. For example, how does this pathway alter what constitutes a safe bet and what are the neighbourhood-by-neighbourhood implications if there is greater uptake of DERs and EVs in some areas as compared to others.

RESPONSE FROM TORONTO HYDRO (Q):

Please note that the Future Energy Scenarios report is not intended to produce measures or investment recommendations for any of the scenarios (including what constitutes a safe bet).

In the event that one of the more aggressive scenarios unfolds, the utility could be faced with incremental capacity constraints at a localized level. To address these challenges, Toronto Hydro is proposing a Demand Related Variance Account, please refer to Exhibit 1B, Tab 2, Schedule 1 for information about this proposal.

Note that the more aggressive scenarios require a substantial amount of technological and societal change as compared to the less aggressive ones. Examples of additional investments that would be necessary under more aggressive transition pathways, include demand-driven capital programs aimed at alleviating capacity at transformer stations (e.g. Stations Expansion at Exhibit 2B, Section E7.4) and feeders (e.g. Load Demand at Exhibit 2B, Section E5.3).

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-12

Reference: Exhibit 2B, Section D5

Preamble:

THESL acknowledges it is necessary to accelerate strategic investment in specific field and information technologies that will deliver near-term benefits to customers while setting the utility on a path toward sustainable performance and improved efficiency as the pressures of climate change and the energy transition mount and that electrification, DER proliferation, and worsening climate change will place increasingly complex demands on the utility's system assets and operations.

QUESTION (A):

a) Please identify the jurisdictions that THESL believes provide lessons for successful transformation and discuss the lessons that THESL believes should be taken from these examples.

RESPONSE (A):

Through its engagement with peer utilities, involvement with industry groups and conferences, and general research and industry awareness, Toronto Hydro has taken note of certain jurisdictions and utilities that are comparatively advanced and/or setting a higher pace when it comes to grid modernization, including digital transformation. Toronto Hydro has also participated in benchmarking studies that provide some insight into the range of maturity along different grid modernization dimensions (including the benchmarking studies filed in response to 1B-SEC-5). The United Kingdom, California, Florida, Alberta, Texas, and Australia are just some of the major jurisdictions that Toronto Hydro pays attention to and which are commonly cited as leading the way in different aspects of grid modernization (exactly which aspects tends to vary from one jurisdiction to the next). While Toronto Hydro has not formally studied the drivers of success across

these jurisdictions, the utility has observed that sustained success in grid modernization efforts is generally influenced by several key factors, including (but not limited to) the following:

- **Policy, Regulation and Financing:** Successful jurisdictions often have supportive and consistent policy mandates, regulatory frameworks, incentives, and financing mechanisms, which together help to focus, permit, and encourage sustained investment in new technologies and capabilities.
- **Strategy and Implementation:** Utilities who are more successful at sustained grid modernization efforts typically have a clear strategy, with buy-in at all levels of the organization, and management systems to ensure effective execution focused on outcomes and performance. Toronto Hydro has also noted that successful utilities tend to be those who have proactively identified and addressed incremental workforce needs, including new skillsets. This often includes creating sufficiently robust modernization, innovation, data governance and analytics functions, with a particular focus on building strategy implementation and change management competence that enables a sustained organizational focus on transformative activities efforts that go beyond day-to-day operations.

QUESTION (B):

b) Please comment on to what extent, generally, do THESL's 5-year plans take into account the longer-term 2050 net zero scenario trajectories and discuss whether demand for transition will accelerate THESL's ability to accommodate?

RESPONSE (B):

Toronto Hydro has examined potential long-term net zero scenarios through its Future Energy Scenarios ("FES") tool. Generally, as summarized in Exhibit 2B, Section D4.2, Toronto Hydro has leveraged these scenarios as context for developing an investment plan that reflects a "least regrets" planning approach. With respect to capacity investments, this has (for example) resulted in taking a cautious approach toward building for drivers such as the electrification of buildings in the next rate period due to the uncertainty inherent in both the driver of building electrification

itself, and offsetting drivers such as thermal efficiency and DERs. As further discussed in Section D4.2, this "least regrets" approach extends to Grid Modernization, where the utility has developed a two-fold strategy:

1. Address emerging challenges and opportunities in a manner that leans first and foremost into the deployment of proven technologies (e.g., reclosers, switches, smart meters, analytics), which will deliver benefits to customers in the near-term (e.g., improved reliability), while laying the foundation for more advanced use cases that will be required in 2030 and beyond.

2. Compliment this focus on proven technology with a secondary emphasis on innovation. There are certain challenges – e.g., cost-effectively increasing the amount of distributed generation that can connect to congested feeders – for which the optimal technological and commercial solutions are not yet settled or mature. In these areas, Toronto Hydro is planning to increase its investment in pilot projects and industry partnerships, which the utility believes can contribute to accelerated progress across the entire sector.

Toronto Hydro submits that the level of investment proposed for modernization in its 2025-2029 investment plan (including the related OM&A requirements described in Exhibit 4) represents the minimum funding necessary to ensure that the utility has the appropriate foundational and enhanced capabilities, including operational flexibility, needed to navigate the incremental challenges, opportunities, and uncertainties in 2030 and beyond, regardless of which net zero scenario materializes.

QUESTION (C):

c) Under what scenarios does THESL anticipate that it may no longer be cost-effective or possible to connect new DERs in its service territory?

RESPONSE (C):

Please refer to 1B-DRC-02, parts (d) and (e).

QUESTION (D):

d) Please provide further detail concerning the timing and nature of the additional modeling or analysis that THESL says it will undertake following the completion of the FES and provide details of all anticipated efforts to enhance demand forecasts and scenario analyses

RESPONSE (D):

As identified in Section D5.2.2.5 of Exhibit 2B, Section D5, Toronto Hydro intends to explore opportunities to further enhance its demand forecasts and scenario analyses. This includes exploring more granular geospatial analytical models which can support improved capacity planning at the neighbourhood level. Toronto Hydro's intention is to settle on the next phases of a roadmap for this capability area in late 2024.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-13

Reference: Exhibit 2B, Section E3

Preamble:

THESL is seeking to grow its workforce by approximately 25 percent "to have the required resourcing capacity and capabilities to sustain foundations of a safe and reliable grid and meet the imperatives of an urban city and customers who are increasingly relying on electricity to expand, digitize and decarbonize their footprint."

QUESTION (A):

a) What, if any, are factors that THESL believes will influence customer choice as the "key driver of DER demand", in addition to the economic and policy considerations listed, both for the period 2024-2029 and beyond.

RESPONSE (A):

Please refer to 1B-DRC-02, part (c).

QUESTION (B) AND (C):

b) What are the consequences if DER growth rates exceed THESL's forecasts and more closely approximate the highest projection scenarios from the FES Report? Please include in your response a discussion on what challenges will this present in terms of THESL's ability to meet the higher demand and any consequences it may have on THESL's ability to meet demand past 2030 if demand continues to accelerate more quickly than anticipated.

c) What additional investments beyond those set out in E3.3.1 would THESL propose to accommodate the highest projections from the Future Energy Scenarios Report?

RESPONSE (B) AND (C):

Pleas refer to 1B-DRC-02, parts (d) and (e).

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-7

Reference: Exhibit 2B, Section A5.2

QUESTION (A) - (C):

a) Please provide a table showing, for each year from 2025 to 2029, the forecast number of new connections, the forecast contribution to co-incident system peak demand (summer and winter) for those that are gas heated, the forecast contribution to co-incident system peak demand (summer and winter) for those that are electrically heated, the forecast total demand for those that are electrically heated and those that are gas heated.

b) Please provide the information requested in (a) but for the most recent year of historical data.

c) Please provide a list of all expected connection requests during the rate period, the forecast peak (summer and winter) and annual demand of each, and how each is forecast to be heated.

RESPONSE (A) - (C):

As described in Exhibit 2B, Section D4, in the development of its Peak Demand Forecast, Toronto Hydro determined that building electrification (i.e. electrification of space and water heating) is not yet a significant driver of growth over the 2025-2029 period. The utility does not track customer heat source by type (i.e., gas-heated versus electrical) as such Toronto Hydro is unable to provide the requested information. For information regarding Toronto Hydro's customer connections forecast, please refer to Exhibit 2B, Section E5.1.

QUESTION (D) AND (E):

d) If all new construction in Toronto over 2025 to 2029 were to be heated with efficient heat pumps (i.e., no fossil fuels), would Toronto Hydro be able to provide the required electrical service? If not, what would the shortfall be and how would it arise?

e) If all of the new construction in Toronto over 2025 to 2029 that is expected to be heated by fossil fuels were to switch to heat pumps instead, approximately (i) how much additional revenue would Toronto Hydro collect from those customers due to incremental demand (nominal lifetime and NPV), and (ii) approximately how much additional cost would Toronto Hydro have to invest in its system that would not be covered by contributions in aid of construction from the connecting customers?

RESPONSE (D) AND (E):

Toronto Hydro is unable to undertake the detailed hypothetical analysis that is required to answer this question within the discovery timelines in this proceeding. Furthermore, Toronto Hydro notes that this analysis is not relevant and does not provide probative value to deciding the issues in this proceeding since the hypothetical scenario posed is extremely unlikely to materialize in the 2025-2029 rate period. Please refer to Toronto Hydro's response to interrogatory 2B-ED-19 parts (a) to (c) for details on how the utility is preparing the grid and its operations for an accelerated pace of electrification expected in the 2030s and beyond.

QUESTION (F):

f) Please provide a sample of the Appendix B DCF calculations for a typical new condominium construction with geothermal heating versus gas heating? Please indicate (i) the electricity connection capital costs for each heating scenario and (ii) the 25-year revenue offset for the connection costs under Appendix B (i.e. how much more distribution revenue would be paid and thus be used to offset the contribution in aid of construction).

For all of the above, please make and state simplifying assumptions as necessary. Please explain the answer and provide calculations.

RESPONSE (F):

With reference to Appendix B, economic evaluations are applied to modifications to Toronto Hydro's main distribution system (expansion) that are required in order to connect the customer to

the distribution system. A key input into this calculation is the peak demand load which is determined and requested by the customer. Toronto Hydro designs the service connections to meet the customer's peak demand load, which does not distinguish between building types, heating systems, HVAC, electric vehicle charging or building/property electrical requirements. The peak demand load provided by the customer is the customer's representation of their total load demand which will be required from Toronto Hydro's distribution system to meet their electrical needs. As such, Toronto Hydro is unable to provide the requested analysis and information.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-8

Reference: Exhibit 2B, Section A5.2

QUESTION (A):

a) Please compare the co-incident peak summer electricity demand from a typical commercial or residential tower that is cooled with geothermal versus traditional air conditioning.

RESPONSE (A):

Please see Toronto Hydro's response to interrogatory 2B-ED-7.

QUESTION (B):

b) Please provide the 20 highest winter demand hours and summer demand hours for each of the past five years for Toronto Hydro's system, including the date, hour, and demand.

RESPONSE (B):

Please see Tables 1-5 for 2018-2022 top 20 coincident system peak demand hours in MW. Toronto Hydro notes that the hour:min represents the time at which the peak was recorded.

Table 1: 2018 Top 20 Coincident System Peak demand (MW)

2018 Winter				System Coincident Peak (MW)	2018 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20180105	17	55	3856	1st	20180705	15	20	4585
2nd	20180104	18	0	3801	2nd	20180905	16	55	4568
3rd	20180102	17	55	3763	3rd	20180816	15	25	4323
4th	20180103	17	55	3743	4th	20180704	16	25	4317
5th	20180106	17	55	3709	5th	20180618	10	10	4303
6th	20180115	17	50	3706	6th	20180828	15	35	4282
7th	20180107	17	40	3689	7th	20180716	11	40	4276
8th	20180117	17	50	3670	8th	20180815	14	55	4268
9th	20180118	17	55	3660	9th	20180724	16	40	4204

2018 Winter				System Coincident Peak (MW)	2018 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
10th	20180208	18	30	3656	10th	20180904	15	50	4190
11th	20180205	18	30	3653	11th	20180703	16	55	4182
12th	20180130	18	25	3650	12th	20180709	16	0	4155
13th	20180108	17	55	3642	13th	20180817	13	40	4138
14th	20171213	17	50	3641	14th	20180710	16	0	4120
15th	20180207	18	35	3628	15th	20180829	13	15	4119
16th	20171212	18	0	3617	16th	20180725	15	40	4115
17th	20180116	18	0	3616	17th	20180713	13	45	4086
18th	20171215	17	30	3612	18th	20180807	14	55	4070
19th	20180202	18	0	3608	19th	20180702	14	40	4068
20th	20180125	17	55	3601	20th	20180814	16	55	4067

Table 2: 2019 Top 20 Coincident System Peak demand (MW)

2019 Winter				System Coincident Peak (MW)	2019 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20190131	18	20	3967	1st	20190719	11	20	4296
2nd	20190128	18	0	3924	2nd	20190705	13	25	4222
3rd	20190121	18	30	3921	3rd	20190729	12	5	4201
4th	20190130	18	25	3909	4th	20190711	12	55	4164
5th	20190122	17	55	3829	5th	20190720	13	30	4120
6th	20190120	18	35	3776	6th	20190717	15	55	4113
7th	20190201	18	0	3739	7th	20190716	13	50	4097
8th	20190227	18	45	3738	8th	20190821	16	0	4071
9th	20190129	18	0	3730	9th	20190704	16	45	4038
10th	20190212	18	0	3687	10th	20190718	16	25	4017
11th	20190110	18	0	3653	11th	20190730	15	30	4003
12th	20190119	17	50	3643	12th	20190726	15	45	3996
13th	20190117	17	55	3639	13th	20190703	15	50	3987
14th	20190107	17	50	3627	14th	20190710	16	40	3944
15th	20190116	18	0	3612	15th	20190706	14	45	3927
16th	20190125	18	0	3603	16th	20190807	14	55	3899
17th	20190111	17	55	3599	17th	20190819	16	55	3867
18th	20190127	18	0	3598	18th	20190820	16	55	3865
19th	20190220	18	0	3595	19th	20190813	15	20	3860
20th	20190226	18	30	3594	20th	20190806	15	40	3845

Table 3: 2020 Top 20 Coincident System Peak demand (MW)

2020 Winter				System Coincident Peak (MW)	2020 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20191218	17	50	3669	1st	20200709	14	35	4516
2nd	20191219	17	30	3639	2nd	20200708	13	0	4495
3rd	20191211	18	0	3587	3rd	20200710	13	55	4441
4th	20200120	18	0	3557	4th	20200727	15	10	4402
5th	20200109	17	55	3543	5th	20200707	15	45	4388
6th	20200108	17	55	3540	6th	20200810	16	50	4349
7th	20200213	18	40	3526	7th	20200824	16	45	4273
8th	20200214	18	20	3511	8th	20200702	15	45	4250
9th	20200117	17	55	3504	9th	20200703	16	0	4180
10th	20200227	18	50	3502	10th	20200706	13	40	4129
11th	20191212	17	20	3492	11th	20200811	16	35	4102
12th	20200206	17	55	3491	12th	20200726	16	55	4052
13th	20191202	17	55	3486	13th	20200813	15	50	4011
14th	20200207	18	0	3478	14th	20200717	16	55	3991
15th	20200122	18	0	3477	15th	20200827	14	5	3972
16th	20191220	17	40	3477	16th	20200718	15	50	3957
17th	20200121	17	55	3477	17th	20200729	14	55	3943
18th	20200220	18	30	3476	18th	20200720	16	25	3941
19th	20200116	17	55	3455	19th	20200728	17	0	3930
20th	20200219	18	30	3452	20th	20200715	16	45	3925

Table 4: 2021 Top 20 Coincident System Peak demand (MW)

2021 Winter				System Coincident Peak (MW)	2021 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20210216	18	30	3551	1st	20210826	14	35	4421
2nd	20201216	17	45	3545	2nd	20210825	12	50	4380
3rd	20210218	18	20	3511	3rd	20210823	13	5	4268
4th	20210128	17	55	3494	4th	20210824	15	35	4250
5th	20210129	18	0	3482	5th	20210811	14	55	4210
6th	20210212	18	25	3471	6th	20210629	12	15	4205
7th	20210208	18	20	3470	7th	20210809	14	45	4160
8th	20210217	18	15	3459	8th	20210628	14	55	4137
9th	20210201	17	55	3429	9th	20210706	15	50	4106
10th	20201217	17	55	3427	10th	20210813	13	50	4102
11th	20210126	17	55	3420	11th	20210812	15	55	4064
12th	20210210	18	0	3418	12th	20210810	11	10	4018

2021 Winter				System Coincident Peak (MW)	2021 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
13th	20210211	18	25	3411	13th	20210820	13	20	4017
14th	20210202	18	15	3404	14th	20210819	13	10	4012
15th	20210209	18	20	3399	15th	20210829	16	50	4003
16th	20210213	18	25	3388	16th	20210609	11	40	3982
17th	20201207	17	50	3385	17th	20210830	14	45	3956
18th	20210127	18	0	3383	18th	20210607	12	40	3936
19th	20201215	17	50	3382	19th	20210720	15	5	3929
20th	20210205	18	0	3373	20th	20210719	14	30	3887

Table 5: 2022 Top 20 Coincident System Peak demand (MW)

2022 Winter				System Coincident Peak (MW)	2022 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20220111	17	50	3737	1st	20220719	15	50	4291
2nd	20220126	18	0	3651	2nd	20220720	12	45	4259
3rd	20220124	17	55	3639	3rd	20220622	12	45	4254
4th	20220120	18	0	3605	4th	20220808	13	35	4173
5th	20220128	18	0	3598	5th	20220829	12	30	4143
6th	20220203	17	55	3585	6th	20220722	14	0	4051
7th	20220110	17	55	3578	7th	20220721	13	10	4043
8th	20220127	18	0	3577	8th	20220616	12	10	4009
9th	20220214	18	25	3573	9th	20220807	11	55	3996
10th	20220125	18	0	3561	10th	20220804	13	0	3954
11th	20220121	17	55	3543	11th	20220806	14	25	3912
12th	20220204	18	0	3531	12th	20220723	16	0	3887
13th	20220115	17	55	3482	13th	20220819	13	0	3879
14th	20220114	18	0	3480	14th	20220805	14	45	3877
15th	20220215	18	25	3476	15th	20220824	14	50	3860
16th	20220118	18	0	3474	16th	20220623	16	30	3823
17th	20220225	11	20	3467	17th	20220823	16	25	3810
18th	20220223	18	30	3467	18th	20220803	15	10	3796
19th	20220107	18	0	3447	19th	20220728	11	40	3790
20th	20211208	17	50	3441	20th	20220718	17	0	3788

QUESTION (C):

c) On average, what is the peak demand on Toronto Hydro's system in the summer versus the winter?

RESPONSE (C):

Toronto Hydro's 5-year average (2018-2022) for the system coincident peak demand in Summer and Winter is 4,422 MW and 3,756 MW respectively.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-9

Reference: Exhibit 2B, Section A5.2

QUESTION (A) AND (B):

a) If customer connection costs are higher than forecast, how would Toronto Hydro manage the cost?

b) The Minister of Energy has asked the OEB to consider customer connection costs, including the revenue horizon. Should Toronto Hydro implement a DVA to track any additional costs that might arise from this initiative?

RESPONSE (A) AND (B):

Please see description of the proposed Demand Related Variance Account in Exhibit 1B, Tab 2, Schedule 1 at pages 35-47.

QUESTION (C):

c) Please confirm that DSC allows utilities to apply a longer revenue horizon beyond the standard 25-years for calculating contributions in aid of construction. Has Toronto Hydro ever done this? Would Toronto Hydro consider doing this where the customer implements technology that lowers its impact on the system peak (such as geothermal, which lowers summer cooling requirements)?

RESPONSE (C):

The Distribution System Code Appendix B: Methodology and Assumptions for An Economic Evaluation, Specific Parameters/Assumptions states that:

(b) A maximum customer revenue horizon of twenty five (25) years, calculated from the in service date of the new customers[2].

Where footnote [2] states:

For example, that the revenue horizon for customers connected in year 1, is 25 years while for those connected in year 3, the revenue horizon is 22 years.

Toronto Hydro maintains compliance with the above DSC Appendix B and has not exceeded the 25 year maximum. In the event that the code changes, we may revisit this consideration.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-10

Reference: Exhibit 2B, Section 5.2

QUESTION (A):

a) Please complete the following table:

Toronto Hydro Customers – Characteristics by Sector			
	22		27
tal Customers			
Residential			
Commercial			
Industrial			
Customers with Electrical Space Heating			
Residential			
Commercial			
Industrial			
Annual Consumption (kWh) for Resistance Space Heating for Average Customer			
Residential			
Commercial			
Industrial			
Peak Demand (kW) for Resistance Space Heating for Average Customer			
Residential			
Commercial			
Industrial			
Annual Consumption (kWh) for Resistance Water Heating for Average Customer			
Residential			
Commercial			
Industrial			
Peak Demand (kW) for Resistance Water Heating for Average Customer			
Residential			
Commercial			
Industrial			

RESPONSE (A):

Information related to actual and forecast numbers of customers by rate class is listed in Table 2: Customer Numbers by Rate Class, in Exhibit 3, Tab 1, Schedule 1. Toronto Hydro does not have the requested information for characteristics by sector.

QUESTION (B):

b) Please complete the following table:

Electricity Use – Typical Customer After Conversion to Heat Pumps									
	Average Annual Electricity Consumption – Resistance Heating (kWh)			Average Annual Electricity Consumption (ccASHP & HPWP, HSPF Region 5=10[1]) (kWh)			Average Annual Electricity Consumption (GSHP & HPWP, sCOP=5) (kWh)		
	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating
Average or Typical Single-Family Residential Customer									

RESPONSE (B):

Toronto Hydro is unable to provide the data requested, as it does not have the means to disaggregate customer loads, especially behind the meter.

QUESTION (C):

c) Please complete the following table:

Winter Peak Demand – Typical Customer After Conversion to Heat Pumps			
	Average Peak Demand – Resistance Heating (kW)	Average Peak Winter Demand (ccASHP & HPWP, HSPF Region 5=10[2]) (kW)	Average Peak Winter Demand (GSHP & HPWP, sCOP=5) (kWh)

	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating
Average or Typical Single-Family Residential Customer									

RESPONSE (C):

Please refer to Toronto Hydro's response to part (b).

QUESTION (D):

d) Please complete the following table:

Summer Peak Demand – Typical Customer After Conversion to Heat Pumps									
	Average Peak Demand – Traditional Central AC (kW)			Average Peak Winter Demand (ccASHP & HPWP, HSPF Region 5=10[3]) (kW)			Average Peak Winter Demand (GSHP & HPWP, sCOP=5) (kWh)		
	Total – Space/ Water	Space Cooling	Water Heating	Total – Space/ Water	Space Cooling	Water Heating	Total – Space/ Water	Space Cooling	Water Heating
Average or Typical Single-Family Residential Customer									

RESPONSE (D):

Please refer to Toronto Hydro's response to part (b).

QUESTION (E):

e) Please complete this table of cooling efficiencies:

Cooling Efficiencies of Various Equipment Types			
		SEER	EER
Central air conditioners	Average of current stock (best estimate, Toronto Hydro customers or Ontario average)		
	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Air source heat pumps	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Air source heat pumps in hybrid systems (if different)	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Ground source heat pumps – closed loop	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Ground source heat pumps – open loop	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Cold climate heat pumps – variable speed	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		

RESPONSE (E):

Please refer to Toronto Hydro's response to part (b).

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-11

Reference: Exhibit 2B, Section A5.2

QUESTION (A):

a) How many electric vehicle charging stations are installed by Toronto Hydro customers now and how many are forecast for each year from 2021 to 2025? Please provide a high-end and low-end estimate.

RESPONSE (A):

Toronto Hydro in unable to provide the requested information because the utility does not collect this data from customers at this time. EV chargers are considered loads similar to appliances or other electrical equipment behind the service point.

QUESTION (B):

b) Is Toronto Hydro confident that it is making all the investments needed to facilitate increases in electric vehicles and electric vehicle charging stations even if its high-end forecasts come to fruition?

RESPONSE (B):

The proposed capacity investment plan can meet the level of EV loads forecasted for the upcoming 2025-2029 rate period. Toronto Hydro is confident that the plans described in Exhibit 2B, Section D4, is responsive to potential changes in EV adoption rates over the near-term.

QUESTION (C):

c) Have any Toronto Hydro customers been unable to install an electric vehicle charging station (e.g., a level 3 station) due to constraints on Toronto Hydro's distribution system? If yes, how many customers each year?

RESPONSE (C):

Toronto Hydro is not aware of any customers who were unable to install a level 3 charger due to capacity constraints on the distribution system.

QUESTION (D):

d) Have any Toronto Hydro customers been delayed in installing an electric vehicle charging station (e.g., a level 3 station) due to constraints on Toronto Hydro's distribution system? If yes, how many customers each year?

RESPONSE (D):

Toronto Hydro is not aware of any individual EV charging station installations delayed as a result of grid capacity constraints. The timeline to install or upgrade an electrical service varies depending on the level of complexity of the project and is influenced by factors such as project location, site conditions, customer electrical demand and requirements, system availability and constraints. Toronto Hydro works closely with customers to provide guidance and set expectations regarding timelines for a project.

QUESTION (E):

e) Is it Toronto Hydro's goal that all customers will be able to install and use electric vehicle charging stations if they wish to do so? If not, please detail Toronto Hydro's targets in this regard.

RESPONSE (E):

Yes.

QUESTION (F):

f) Is it Toronto Hydro's goal that all customers will be able to install and use electric vehicle charging stations without delay of more than one month if they wish to do so? If not, please detail Toronto Hydro's targets in this regard.

RESPONSE (F):

Toronto Hydro is committed to enabling new service connection requests (including EV charging stations) in a timely manner. To that end, the utility has put forward the composite New Services Connected on Time performance measure as part of its 2025-2029 Custom Scorecard with a target of achieving 99 percent. Please see Exhibit 1B, Tab 3, Schedule 1 at page 24 for more information about this performance commitment.

QUESTION (G):

g) Please list and describe the investments that Toronto Hydro intends to make over 2021-2025 to ensure readiness for electric vehicles.

RESPONSE (G):

To ensure readiness for electric vehicles Toronto Hydro intends to make investments in the following programs:

- Customer Connections, Exhibit 2B, Section E5.1 (to provide customers with timely, cost-efficient, reliable and safe access to the distribution system);
- Load Demand Exhibit 2B, Section 5.3 (to alleviate emerging capacity constraints to ensure the availability of sufficient capacity to efficiently connect customers to the distribution system); and
- Stations Expansion, Exhibit 2B, Section E7.4 (to prepare the system for growth including growth related to EVs, but not exclusively).

For more general information about how Toronto Hydro's 2025-2029 Investment Plan supports electrification please refer to Toronto Hydro's response to interrogatory 1B-PP-08.

QUESTION (H) – (J):

h) Please list and describe the ways in which Toronto Hydro is currently able to use the battery in electric vehicles as a distributed energy resource to provide a service that benefits the distribution system.

i) Please list and describe the ways in which it is possible to use the battery in electric vehicles as a distributed energy resource to provide a service that benefits the distribution system, focusing only on those which Toronto Hydro is not yet capable of undertaking.

j) Is Toronto Hydro able to capitalize on the storage capacity of electric vehicles to reduce distribution system costs by: (i) communicating directly with charging stations to reduce load during peak periods, (ii) communicating directly with charging stations to allow power to be drawn from batteries during peak periods, (iii) drawing energy from car batteries connected to charging stations during peak periods, and (iv) communicating directly with charging stations to ensure energy is drawn from the LDC's system at the optimal times? If not, please explain what additional steps Toronto Hydro is willing to commit to take to explore and implement these things.

RESPONSE (H) – (J):

As noted in Exhibit 2B, Section D5.2.2.5, Toronto Hydro partnered with Plug'n Drive and Elocity Technologies to trial an EV Smart Charging Pilot aimed at understanding EV charging patterns and behaviours in Toronto and gathering information to assist in the development of future EV programs to support current EV drivers and those wishing to switch over to an EV. Benefits of this pilot include supporting the development of additional tools for EV owners to monitor, schedule, and control their charging sessions, and collecting data and insights to understand the impacts of EV charging on the distribution grid.

At this time, it is difficult to quantify the value of EV demand response in terms of ability to defer or avoid capital expenditures due to the low volume of controllable EV chargers. This is an area of innovation that Toronto Hydro intends to continue to explore through EV demand response pilot projects as part of its Innovation Fund proposal, which is outlined in Exhibit 1B, Tab 4, Schedule 2.

The non-wires solutions ("NWS") considered for the 2025-2029 rate period have been outlined in detail in Exhibit 2B, Section E7.2. Toronto Hydro's use of NWSs is targeted and focuses on credible

capital deferral opportunities, and thus, the application of these solutions is limited to instances where such deferral opportunities can be identified and measured.

The NWS use case identified at this time applies to bus-level load transfer deferral or avoidance. This can be achieved through the procurement of dispatchable demand response from aggregators or customers. To that end, Toronto Hydro has set an ambitious performance target to procure 30 MW of flexible non-wires system capacity over the next rate term. Please see Exhibit 1B, Tab 3, Schedule 3 starting on page 46 for more information.

When Toronto Hydro runs its Local Demand Response ("LDR") procurements, aggregators are invited to offer capacity. If the volume of controllable EV charging systems reaches levels where the capacity could be aggregated to provide meaningful targeted capacity, aggregators will be welcome to bid this capacity into the LDR process. If the cost of such capacity is competitive, Toronto Hydro will work with these aggregators to leverage the devices mentioned. Toronto Hydro is agnostic to the technology (type of DER) or approach (load curtailment) utilized by aggregators or customers to deliver this demand response capacity. Participants are compensated based on measured and verified performance, utilizing the methodology outlined in IESO's Market Manual 12 – Issue 16.

QUESTION (K):

k) Is Toronto Hydro willing to offer customers special rates to encourage the expansion of electric vehicles?

RESPONSE:

As a licensed distributor, Toronto Hydro is legally bound by OEB codes, the *Electricity Act, 1998* and the *Ontario Energy Board Act, 1998*. As such, it cannot unilaterally offer customers special rates to encourage the expansion of electric vehicles. As demonstrated in the spring of 2023, Toronto Hydro is pleased to support the OEB and the government in launching incentives to encourage EV uptake, such as the Ultra-Low Overnight Electricity Price Plan. Toronto Hydro was one of the first utilities in the province to implement this initiative.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-12

Reference: Exhibit 2B, Section A5.2

QUESTION (A) AND (B):

a) What percent of Toronto's GHG emissions are from the combustion of methane gas?

b) What percent of Toronto's GHG emissions are from the combustion of methane gas in buildings (versus industrial uses)?

RESPONSE (A) AND (B):

Toronto Hydro is unable to provide a response as it does not have the requested information.

QUESTION (C):

c) Please describe potential roles that Toronto Hydro could play in relation to the implementation of electric heat pumps as an alternative to natural gas heating.

RESPONSE (C):

Toronto Hydro's capacity plan ensures that the distribution system is adequately sized to deliver reliable electricity to the utility's customers regardless of their source of heating (Exhibit 2B, Section D4).[1]

Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is also playing a proactive role in supporting the realization of the City's Net Zero Strategy by facilitating and stimulating the growth of emerging local cleantech markets. For more information, please see the latest Climate Action Plan status report.[2]

[1] Updated January 29, 2024.
[2] https://www.torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf

QUESTION (D):

d) How many new homes and businesses are forecast to be built in Toronto Hydro's coverage area in the next 10 years? If available, please provide an annual breakdown.

RESPONSE (D):

Toronto Hydro is unable to provide a response and it cannot speculate the number of homes and buildings to be built within its service territory in the next 10-years.

QUESTION (E):

e) How many new customers does Toronto Hydro expect to hook up in the next 10 years? If available, please provide an annual breakdown.

RESPONSE (E):

Please refer to Toronto Hydro's response to interrogatory 2B-Staff-181 part (b).

QUESTION (F):

f) What assistance could Toronto Hydro provide to developers to promote the installation of electric heat pumps instead of natural gas furnaces in new construction?

RESPONSE (F):

Please see Toronto Hydro's response to part (c).

QUESTION (G):

g) Would Toronto Hydro benefit from regulatory changes in order to play a greater role in promoting the expansion of electric heat pumps in lieu of natural gas? If yes, what are those potential changes?

RESPONSE (G):

Toronto Hydro is unable to provide a response to this question as it requites the utility to speculate on potential changes in policy.

QUESTION (H):

h) Please comment on the report by Ralph Torrie estimating that electricity demand could decline if all heating was converted to electric heat pumps and energy retrofits were increased: https://www.corporateknights.com/channels/built-environment/recovering-stronger-building-low-carbon-future-green-renovation-wave-15875463/.

RESPONSE (H):

The article in the link provided in the question shows no sources to assess the accuracy of the figures or calculations. Toronto Hydro's Future Energy Scenarios ("FES") forecasts varying levels of building retrofits and electrified heating assumptions (please see Sections 4.1 and 4.2 of Exhibit 2B, Section D4, Appendix B). In the most aggressive scenario, FES forecasts that 100 percent of domestic and industrial and commercial ("I&C") buildings are retrofitted by 2050 and that there is a 75 percent gain in electric heating efficiency. Even with these assumptions, electrical demand still increases in the scenario.

If building energy retrofits and energy management controls were always to accompany a conversion to heat pumps, then building electrical demand could decline relative to the current summer peak. Toronto Hydro's past CDM successes have demonstrated that energy efficiency improvements in buildings promoted through incentives are a viable solution. In fact, Toronto Hydro continues to assist the IESO to deliver energy efficiency in Toronto.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-13

Reference: Exhibit 2B, Section A5.2

Preamble:

An expert report filed in EB-2016-0004 by Dr. Stanley Reitsma, P. Eng., outlined significant benefits to the electricity system in reducing peak demand.[1] See page 5 to 13. For example, Dr. Reitsma concludes:

> "Though geothermal relies on electricity as an input (to power the pump), geothermal system actually reduces electricity demand in the summer, and increases it in the winter, relative to traditional methods of heating and cooling (heating with fossil fuels and cooling with traditional AC systems). For Ontario, a summer peaking jurisdiction, a greater reliance on geothermal would reduce peaking power needs and also reduce surplus baseload generation. Coincidentally, the load profile of a geo system is similar to the production profiles of Ontario wind energy facilities." [2]
>
> "For the cooling of buildings, Geo HP's use about half the electricity to operate compared to air source heat pumps and AC systems, and, geo's electrical demand doesn't spike as it gets hot outside, since the ground loop temperature remains relatively unchanged. They can reduce the "heat wave" electricity system demand spikes by up to 75%."[3]

[1] Dr. Stanley Reitsma, P. Eng., Ontario's Low Carbon Future: Geothermal Heat Pumps, March 21, 2016 (http://www.rds.oeb.ca/HPECMWebDrawer/Record/521626/File/document).
[2] Ibid. p. 5.
[3] Ibid. p. 6.

QUESTION (A):

a) Does Toronto Hydro agree with the comments in the above-referenced report regarding the benefits that geothermal systems can provide to the electricity system, including a reduction of peak demand? Please explain.

RESPONSE (A):

The technical merits of the referenced report are outside Toronto Hydro's area of expertise for critical analysis. Toronto Hydro notes that this report was published eight years ago and, given the dynamic nature of decarbonization technologies, more recent developments may be relevant to the conclusions reached in the report.

QUESTION (B) AND (C):

b) Does Toronto Hydro agree that the expansion of geothermal systems would reduce peak demand on Toronto Hydro's system, on which distribution system capacity is based?

c) Does Toronto Hydro agree that geothermal systems have the capacity to provide important benefits to the electricity distribution system, especially in comparison to traditional baseboard heating?

RESPONSE (B) AND (C):

Please see Toronto Hydro's response to interrogatory 1B-CCC-29.

Please also see the description of the modelling of low carbon heating in the Future Energy Scenarios report at Exhibit 2B, Section D4, Appendix B at pages 32-44 where ground source heat pumps were one of the modelled heating technologies.

QUESTION (D):

d) Does Toronto Hydro agree that the benefits of geothermal systems are not reflected in the distribution costs paid by residential consumers because those charges do not vary based on coincident peak demand?

RESPONSE (D):

Toronto Hydro confirms that residential distribution rates are fixed, and do not vary based on coincident peak demand.

QUESTION (E):

e) Does Toronto Hydro agree that increases in heat pumps would assist the City in achieving its GHG reduction targets?

RESPONSE (E):

Please see the responses to parts (b) and (c) with respect to the Future Energy Scenarios report.

QUESTION (F):

f) Would Toronto Hydro agree to study the possibility of offering customers with geothermal systems a reduction in their distribution charges that would approximately reflect the benefits those customers provide to the distribution system? Assume the overall rate structure would continue to make Toronto Hydro whole for its revenue requirement.

RESPONSE (F):

From time-to-time, the OEB re-assesses rate design on a sector-wide basis. That continues to be the most appropriate approach, in order to maintain consistency across service areas. As a result, Toronto Hydro does not support a utility-specific study.

QUESTION (G):

g) Please provide Toronto Hydro's best information on the number and proportion of its customers with (i) electrical, (ii) natural gas, (iii) propane, (iv) oil, (v) wood, and (vi) other kind of space heating.

RESPONSE (G):

Toronto Hydro is unable to provide a response as Toronto Hydro is currently unable to disaggregate customer meter data to identify end use. Toronto hydro does not have data reflecting non-electric fuel-based heating.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-14

Reference: Exhibit 2B, Section A5.2

QUESTION(S):

a) What is the appropriate role for Toronto Hydro to play with respect to efforts to ensure that customers with on-street parking can access electric vehicle charging?

RESPONSE (A):

Toronto Hydro (in collaboration with the City of Toronto) completed an on-street pilot project in 2020 with (17) charging stations, the project was extended with another (32) charging stations in 2022. In 2022 it was decided that the existing projects and future on-street charging projects would be constructed and operated by the City's parking agency, the Toronto Parking Authority.

QUESTION (B):

b) Does Toronto Hydro agree that there would be benefits to the electricity system if its customers with on-street parking are able to charge their vehicles at night in front of their homes instead of during the day at a third-party charger?

RESPONSE (B):

With current Ontario/Toronto daily electricity consumption patterns it is beneficial for the electricity system to have new loads consume energy during the overnight period rather than during the daytime where peak demand typically occurs.

QUESTION (C):

c) Has Toronto Hydro considered making efforts to facilitate sidewalk charging cable channels, such as the following:

   i. https://www.kerbocharge.com/

ii. https://www.stormguard.co.uk/stormguard-products/heavy-duty-ev-cable-channel/

iii. https://www.chargegully.com/

iv. https://gul-e.co.uk/

RESPONSE (C):

Toronto Hydro does not have jurisdiction over lands owned by the City of Toronto. Sidewalks and portions of land between the roadway and the municipal road are part of the City road allowance and the jurisdiction of the City of Toronto.

QUESTION (D):

d) If Toronto Hydro has not considered the solution listed in (c), is it willing to do so as a way to promote more charging overnight charging at home (versus charging in the daytime away from home)?

RESPONSE (D):

The suggested products of (c) appear to be physical conduits with implications to City of Toronto property and residential electrical appliances governed by the Ontario Electrical Safety Code. With current Ontario/Toronto daily electricity consumption patterns, Toronto Hydro encourages energy consumption through the overnight period when new loads such as EV charging is added.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-15

Reference: Exhibit 2B, Section A5.2

QUESTION (A):

a) Is Toronto Hydro considering technologies that could cost-effectively allow it to throttle electric vehicles chargers of participating customers who have internet-connected chargers?

RESPONSE:

Toronto Hydro has carried out a smart charging pilot that shifts energy consumption to off-peak times and participated in utility-initiated curtailment events through internet-connected chargers. Toronto Hydro continues to investigate emerging EV charging technologies that can be deployed at scale including vehicle telematics.

QUESTION (B):

b) By 2029, what does Toronto Hydro believe the cost of this kind of software solution may be?

RESPONSE (B):

Electrification technologies continue to develop at a rapid pace. Toronto Hydro continues to investigate solutions that monitor and evaluate a variety of technologies and solutions to identify the most valuable solutions that best support the use of future electrification technologies for our customers and the distribution system.

QUESTION (C):

c) Please describe some of the benefits of curtailable electric vehicle charging for high penetration scenarios (versus time-of-use approaches), such as evenly spreading the

demand out over the entire nighttime and avoiding a spike at the beginning of the nighttime low rate.

RESPONSE (C):

As a result of TOU rates along with the newly introduced Ultra Low Overnight Rates, customers are likely to schedule their EV charging to start at the beginning of these periods (during lower rates). As a result, when higher EV penetration occurs, the collective increase of load during the off-peak and ultra-low rates may see high demand on some areas of the distribution system. The ability of managed EV charging, coordinated and controlled by the utility, may be an effective tool to mitigate these high demand scenarios to limit overloading of certain sections of the distribution system resulting in a consistent demand through the overnight period.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-16

Reference: Exhibit 2B, Section A5.2

QUESTION (A) AND (B):

a) Please provide a breakdown of Toronto Hydro's customers by customer type with as much detail and granularity as possible (e.g. industrial, commercial, residential). Please also include a breakdown of the residential customers by type as possible (e.g. detached, semi-detachment, units in buildings, single-meter large buildings, etc).

b) Please provide a table showing the peak (summer and winter) and annual demand for each of customer type.

RESPONSE (A) AND (B):

Toronto Hydro is unable to provide the data requested in part (a) as it does not have the means to disaggregate customer loads.

Toronto Hydro is unable to provide the requested quantification in part (b) due to data limitations. When connecting a customer to Toronto Hydro's distribution system, consideration is given to the customer's requested demand load. The connection is not distinguished by sector or building type.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-17

Reference: Exhibit 2B, Section A5.2 (this is also relevant to D4)

QUESTION (A) AND (B):

a) On a best estimate basis, please provide Toronto Hydro's best estimate of the number of residential customers with different electrical panel sizes (e.g. 60 amp, 100 amp, 200 amp, etc.). Please include houses (i.e. detached and semi-detached) but exclude large buildings (condos).

b) On a best estimate basis, please provide Toronto Hydro's best estimate of the largest electrical panel that can be supported by the conductor leading to each residential customer (e.g., 60 amp, 100 amp, 200 amp, etc.). Please include houses (i.e., detached and semi-detached) but exclude large buildings (condos). In other words, we are looking for the percentage of homes with different conductor sizes leading to them.

RESPONSE (A) AND (B):

Toronto Hydro is unable to provide a response as the utility does not track customer panel sizes as they are located downstream of Toronto Hydro's demarcation point. However, based on experience working with developers, the utility estimates that the vast majority of residential customers in the City of Toronto are equipped with 100A electrical panels. With the increase in popularity of electrification in recent years, new and infill homes are typically being equipped with 200A panels.

QUESTION (C):

c) Customers can sometimes avoid installing a larger electrical panel when installing an electric vehicle charger by using a switch that allows a circuit in the existing panel to be shared as between the vehicle charger and, for instance, a clothes dryer. The switch will stop power flowing to one device (typically the charger) when the other device is on. Is

Toronto Hydro familiar with this kind of device, and if yes, can it provide some examples available in the Ontario market?

RESPONSE (C):

Toronto Hydro is familiar with energy management and switching devices. An example can be found at https://www.blackboxelectrical.com/. These devices are typically installed near the customer's electrical panel, which is beyond Toronto Hydro's demarcation point. These devices are permitted under the Ontario Electrical Safety Code (OESC) and fall under the jurisdiction of the Electrical Safety Authority (ESA). Toronto Hydro is generally not notified of such installations since they do not usually require an isolation from the grid during installation.

QUESTION (D):

d) If a customer installs a switch described in (c), or many customers install such a switch, would that have an impact on distribution capacity needs as estimated by Toronto Hydro (i.e. reducing the needs in comparison to an alternative scenario where a panel is upgraded to allow the new charger connection)? Please describe the mechanism by which this change would show up in Toronto Hydro's capacity forecast (e.g. through reduced peak load measurements used to forecast future load?). If there is an impact, how big is it?

RESPONSE (D):

Deploying an energy management device like the switch described may prevent the need for a customer panel upgrade or adjustments to the service conductor designated to the customer. The variability in customer preferences and adoption rates of such devices is currently unknown and requires further experience to assess the impact on the upstream distribution system. In this period, this technology is not expected to materially impact Toronto Hydro's distribution capacity forecast, as the technology is still in its infancy and not well established. Furthermore, while this technology can avoid a service upgrade for the customer, it is not yet clear to what extent, nor at what scale of adoption, it would impact system demand profiles. Toronto Hydro updates its 10-year peak demand forecast annually and adjusts its investment plans accordingly. As part of this

process, Toronto Hydro monitors growth trends in various consumer technology segments and adjusts modelling inputs and assumptions based on historical trends and emerging developments.

QUESTION (E):

e) If the switches described in (c) have a benefit in terms of distribution load management, would Toronto Hydro consider providing an incentive for customers to install those instead of upgrading their electrical panel? Alternatively, would Toronto Hydro provide all panels seeing an electrical upgrade information regarding that option?

RESPONSE (E):

As mentioned in part d) of this interrogatory, the variability in adoption rates of such devices are currently unknown and require further experience to assess the impact to the upstream distribution system, to then consider relevant incentives. Toronto Hydro remains dedicated to breaking down barriers that hinder customers from reducing their emissions. Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is also playing a proactive role in supporting the realization of the City's Net Zero Strategy by facilitating and stimulating the growth of emerging local cleantech markets and engaging in providing solutions for customers contemplating electrification. For more information, please see the latest Climate Action Plan status report.[1]

QUESTION (F):

f) If a customer upgrades their electrical panel, how would that impact the distribution capacity needs as estimated by Toronto Hydro? Please describe in detail. For instance, how far upstream of the electrical panel would potentially be impacted (between the pole-mounted transformer versus the feeder)?

[1] https://www.torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf

RESPONSE (F):

The incremental demand load from the upgrade may have varying impacts on the upstream distribution capacity needs, ranging from no changes, to service wire upgrades, system reconfiguration, transformer additions and/or upgrades. The extent of impact varies based on factors such as customer location, required demand load, load profile, and existing system conditions. Upstream distribution assets that could be affected include, but are not limited to: revenue meter, customer meter base, overhead and underground service wires, distribution bus wires, distribution transformers, civil infrastructure, primary feeder(s), fuses and switches.

The assessment of the impacts on the distribution system is fundamental to our standard practices and is incorporated as part of the forecasted investments for the System Access and System Renewal programs, see Exhibit 2B, Sections E5 and E6, respectively. While localized impacts are anticipated within the 2025-2029 period, the nature of the impact will depend on the constraints of the specific location and customer's requirements.

QUESTION (G):

g) If a customer installs a heat pump or an electric vehicle charger within their existing electrical panel, how would that impact the distribution capacity needs as estimated by Toronto Hydro? Please describe in detail.

RESPONSE (G):

The sizes of equipment such as heat pumps and electric vehicle chargers, along with their respective electrical loads, can vary considerably and are largely influenced by customer requirements and choice. For instance, electric vehicle chargers may range from 15A (3.6 kW) to 80A (19.2 kW), with the typical rating being 30A (7.2 kW). Depending on the equipment size, the customer's existing load and equipment, load profile, and the prevailing system conditions, heat pumps and/or an electric vehicle chargers trigger the same impacts outlined in part (f).

Toronto Hydro has encountered some electric vehicle charger installations and is actively reviewing the impacts of heat pumps. The specific electrical demand load and adoption rates remain

uncertain. While localized impacts are anticipated, they are not expected to have a material impact on the 2025-2029 rate period.

QUESTION (H):

h) Please describe how Toronto Hydro sizes equipment at different levels of the distribution system (e.g. service conductor, pole-mounted transformer, feeders, etc.).

RESPONSE (H):

Toronto Hydro sizes its service conductors according to the specific load requirements outlined by the Customer's licensed electrician, in accordance with the OESC. Upstream distribution transformers (pole-mounted, pad-mounted, vault transformers) and feeders (overhead, underground, or mixed), along with any distribution equipment and infrastructure between the customer and transformer, are sized to accommodate multiple customers in the vicinity. This depends on factors such as location, density, area landscape, geography, existing and anticipated future developments, historical customer load, and other relevant considerations.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-18

Reference: Exhibit 2B, Section A5.2 (also relevant to questions on service charges)

QUESTIONS (A):

a) Please provide all charges/fees levied by Toronto Hydro for a residential panel upgrade (e.g. fixed fee, conductor replacement if necessary, pole-mounted transformer replacement if necessary, etc.).

b) Please create a table to compare the charges in (a) to those charged by Alectra, Hydro Ottawa, and Elexicon Energy.

c) Please provide excerpts from the Toronto Hydro conditions of service and the DSC that allow Toronto Hydro to levy the charges/fees described in (a).

d) Please provide all studies and calculations justifying the fixed fees for a panel upgrade charged by Toronto Hydro.

e) Does Toronto Hydro agree that the fixed fees for panel upgrades must not be greater than the actual costs for that service on an aggregate basis? Please provide all the applicable regulatory criteria governing such fees/charges?

f) When were Toronto Hydro's current fixed fees for panel upgrades first set? Please provide the documentation provided at the time to justify the quantum of fee.

g) For each year from 2018 to 2023, please provide (i) the number of residential panel upgrades, (ii) number of each the upgrade type (e.g. 100 to 200 amps), (iii) the aggregate distribution system costs, (iv) a breakdown of those distribution system costs (e.g. conductor replacement, etc.), and (v) the aggregate amount charged to the upgrading customer.

RESPONSE (A) – (G):

Toronto Hydro does not have a fixed fee for residential panel upgrades in its OEB-approved service charges. See Exhibit 8, Tab 2, Schedule 1 at page 2.

Per section 11.7 of the 2006 Electricity Distribution Rate Handbook as referenced in DSC 6.1.2, a distributor may choose to recover the costs for services offered to a Customer either through an approved service charge, or at actual cost. Toronto Hydro recovers the relevant costs for upgraded services based on cost recovery principles and in accordance with section 2.1.1.1 of Toronto Hydro's Conditions of Service.

Toronto Hydro does not track upgrade type (e.g., by panel size). Toronto Hydro is unable to provide the requested cost breakdowns due to its data limitations. The number of new and low voltage upgrades since 2020 has been provided in Toronto Hydro's response to Interrogatory 2B-AMPCO-49.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-19

Reference: Exhibit 2B, Section A5.2 and Section D4

QUESTION (A) – (C):

a) If all Toronto Hydro residential customers were to convert to cold climate air-source heat pumps over the next 15 years, please provide a general description of the distribution system equipment that would need to be upgraded, including various conductors and transformers at different parts of the electrical system.

b) Please provide a high-level cost for replace the equipment described in (a) both as a gross figure and as a cost per kWh for the forecast incremental load over 40 years?

c) Please described some measures that Toronto Hydro could take to reduce those costs and the work that is being done to explore those options.

RESPONSE (A) – (C):

Toronto Hydro has not conducted the detailed hypothetical analysis that would be required to respond to the detailed questions posed above. This is because customer adoption rates of air-source heat pumps and other technology to decarbonize heat remains uncertain at this time, and are not expected to have a material impact on investment plans for the 2025-2029 rate period.

To prepare the grid and its operations for an accelerated pace of electrification that is expected to unfold in the 2030s and beyond, in the 2025-2029 rate period, Toronto Hydro is proposing to invest in technology to modernize its grid and improve system observability in order to be able to better detect and forecast distribution investment requirements to accommodate emerging demand drivers such as air-source heat pumps. These capabilities are necessary to maximize the utilization of existing assets and enable the utility to address distribution system constrains posed by electrified technologies in a targeted, measured and proactive manner to maintain the stability,

reliability and safety of the electrical grid. For more information, please refer to Toronto Hydro's Grid Modernization Strategy at Exhibit 2B, Section D5.

QUESTION (D) AND (E):

d) Please confirm that there are electric thermal storage units available in Ontario (e.g. those from SSi Energy, Stash, and Steffes).[1]

e) (e) If all homes were electrified, how much could the peak winter demand (MW) be reduced through electric thermal storage units (e.g. those from SSi Energy, Stash, and Steffes)?[2]

RESPONSE (D) AND (E):

Confirmed based on the link shared. However, Toronto Hydro is unable to comment on the impact of this technology on its grid as those impacts have not yet been evaluated for the reasons noted in above.

QUESTION (F):

f) If all homes were electrified, how much could the peak winter demand (MW) be reduced through bi-directional chargers for electric vehicles?

RESPONSE (F):

Toronto Hydro is unable to undertake the detailed hypothetical analysis that is required to answer this question within the discovery timelines in this proceeding. Furthermore, Toronto Hydro notes that this analysis is not relevant and does not provide probative value to deciding the issues in this proceeding since the hypothetical scenario posed is extremely unlikely to materialize in the 2025-2029 rate period.

[1] See https://www.ssie.ca/products/, https://stash.energy/en/product/, and https://www.steffes.com/ets/comfort-plus-forced-air/.
[2] See https://www.ssie.ca/products/, https://stash.energy/en/product/, and https://www.steffes.com/ets/comfort-plus-forced-air/.

QUESTION (G):

g) Please describe the incentives available for Electric Thermal Storage in Quebec, Nova Scotia, and PEI.

RESPONSE (G):

Toronto Hydro is unable to comment on incentive structures in other jurisdictions.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-20

Reference: Exhibit 2B, Section A5.2 / D4

If all Toronto Hydro residential customers were to install electric vehicle chargers, please provide a general description and approximately cost of the distribution system equipment that would need to be upgraded, including various conductors and transformers at different parts of the electrical system under the following two scenarios:

i. No panel upgrades are necessary; and

ii. All upgrades are achieved with a circuit sharing smart switch.[1]

Please assume that all cost-effective measures to manage this load are undertaken.

RESPONSE :

Toronto Hydro is unable to undertake the detailed hypothetical analysis that is required to answer this question within the discovery timelines in this proceeding. Furthermore, Toronto Hydro notes that this analysis is not relevant and does not provide probative value to deciding the issues in this proceeding since the hypothetical scenario posed is extremely unlikely to materialize in the 2025-2029 rate period.

[1] Customers can sometimes avoid installing a larger electrical panel when installing an electric vehicle charger by using a switch that allows a circuit in the existing panel to be shared as between the vehicle charger and, for instance, a clothes dryer. The switch will stop power flowing to one device (typically the charger) when the other device is on.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-21

Reference: Exhibit 2B, Section A5.2 / D4

For all of the lines and transformers that Toronto Hydro plans to replace to build new over the rate term, what percent would need to be replaced to accommodate full electrification of heating and transportation? Please assume that all cost-effective measures to manage these new loads are undertaken.

RESPONSE:

Toronto Hydro is unable to undertake the detailed hypothetical analysis that is required to answer this question within the discovery timelines in this proceeding. Furthermore, Toronto Hydro notes that this analysis is not relevant and does not provide probative value to deciding the issues in this proceeding since the hypothetical scenario posed is extremely unlikely to materialize in the 2025-2029 rate period.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-22

Reference: Exhibit 2B, Section A5.2 and Section D4

a) Knowing that Toronto is summer-peaking, approximately how many homes and what percent of homes could convert to air-source heat pumps without requiring substantial investments in incremental distribution system infrastructure? Please do not include potential individual service line replacements that may be needed and assume a relatively even distribution of conversions across the city.

RESPONSE:

For the 2025-2029 rate period Toronto Hydro expects to continue to operate as a summer peaking utility as outlined in the System Peak Demand forecast in Exhibit 2B, Section D4.3. Heat pumps impacts the winter capacity of the system, which is inherently greater than the summer capacity. Please refer to the system peak demand forecast Table 1 response to 2B Staff-158 (a). The variance between the summer versus winter peaks amounts to approximately 341MVA, which could be leveraged to support heating loads if needed.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-23

Reference: Exhibit 2B, Section A5.2 and Section D4

QUESTION (A):

a) Please provide the historic 5-year and forecast 10-year forecast of peak demand attributable to electric water heaters.

RESPONSE (A):

The impact of water heating is not a material growth driver in the Peak Demand Forecast, which is presented in Exhibit 2B, Section D4. As such, the inputs are modeled as part of the overall base load growth of the system over the near term.

QUESTION (B) – (D):

b) How much would it cost per home to implement an electric water heater demand response program for CTA-2045 enabled water heaters. Please provide a breakdown by (i) incremental equipment/installation costs, (ii) advertising, and (iii) incentives. If only (i) is available, please provide just that figure. Please provide a breakdown of the equipment/installation costs.

c) Please estimate the cost of (b) by 2030.

d) What investments would be needed today to lower that cost?

RESPONSE (B) – (D):

Toronto Hydro cannot answer these questions as the utility does not have plans to control electric water heaters through a demand response program. Please refer to Toronto Hydro's response 1B-Staff-88 parts (a) and (b) for general information about the use of demand response as a non-wires solution.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-24

Reference: Exhibit 2B, Section A5.2 / D4

QUESTIONS (A) - (C):

a) Modern electrical water and space heating systems can be connected to the internet through a thermostat (e.g. for air source heat pumps) or built-in connectivity (e.g. smart water heaters). This allows for utility control though TCP/IP protocol without any incremental customer installation. Please describe all efforts that Toronto Hydro is taking to explore this option and all the results of this exploration thus far.

b) Please confirm whether Toronto Hydro is considering use of equipment described in (a) for demand response (e.g. holding off on heating a water tank during coincident demand periods or slightly reducing or delaying space or water heating during those periods).

c) Is Toronto Hydro currently able to conduct a demand response program using the equipment described in (a)? If yes, what is the cost to implement it per customer (please provide a breakdown).

RESPONSE (A) - (C):

Exhibit 2B Section E7.2 describes Toronto Hydro's non-wires solutions investments over the 2025-2029 period. The utility's use of NWSs is targeted and focuses on credible capital deferral opportunities, and thus, the application of these solutions is limited to instances where such deferral opportunities can be identified and measured.

The use case identified at this time is limited to bus-level load transfer deferral or avoidance, through procurement of dispatchable demand response from aggregators or customers. Toronto Hydro is agnostic to the technology (type of DER) or approach (load curtailment) utilized by aggregators or customers to deliver this demand response capacity.

When Toronto Hydro runs its LDR procurements, aggregators are invited to offer capacity. If the volume of controllable electrical water and space heating systems reaches levels where the capacity could be aggregated to provide meaningful local capacity, aggregators will be welcome to bid this capacity into the LDR process. If the cost of such capacity is competitive, Toronto Hydro will work with these aggregators to leverage the devices mentioned.

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QUESTION (D):

d) Does Toronto Hydro agree that electric space and water heating equipment will be internet connected in greater and greater numbers over time? What percent penetration of internet connection electric space and water heating does Toronto Hydro predict by 2029 and 2035?

RESPONSE (D):

Directionally yes; however, Toronto Hydro is unable to comment on or speculate with respect to specifics (i.e. what percentage of equipment and over what period of time).

QUESTION (E) AND (F):

e) What open standards exist today to allow for cross-vendor communication for utility control of electric heating equipment?

f) Please compare the equipment and software cost for controlling internet-connected electric space and water heating equipment now, versus the forecast cost in 2029 and 2035?

RESPONSE (E) AND (F):

Toronto Hydro does not monitor nor collect information about these products or devices and is therefore unable to provide a response.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-25

Reference: Exhibit 2B, Section A5.2, D4

QUESTION (A):

a) What barriers exist to installing EV chargers in existing multi-residential buildings?

RESPONSE (A):

A 2019 report produced by Pollution Probe outlines barriers to installing EV chargers in multi-unit residential buildings in Ontario.[1] Toronto Hydro notes that infrastructure-related barriers to installing EV chargers in multi-residential buildings are typically past Toronto Hydro's demarcation point.

QUESTION (B):

b) What roles does Toronto Hydro typically play with respect to the installation of EV chargers in the parking area of multi-residential buildings.

RESPONSE (B):

As the local distribution company serving the city of Toronto, Toronto Hydro's role is to deliver electricity to the service connection point of each of our customers. When a multi-residential building requests an electrical service upgrade to install EV chargers, Toronto Hydro works closely with the customer and their consultants to establish plans and designs for grid connection. Once the design is completed, Toronto Hydro will complete the necessary construction work to enable the connection. Thereafter, Toronto Hydro operates and maintains assets within Toronto Hydro's jurisdiction.

[1] https://www.pollutionprobe.org/wp-content/uploads/2023/11/ZEV-Charging-in-MURBs-and-for-Garage-Orphans-1.pdf

QUESTION (C):

c) Please provide a breakdown of the number of and percent of multi-residential buildings in each rate class, with a description of how distribution charges are levied in each class (fixed, per kWh, or per kVA?).

RESPONSE (C):

Table 1: Number and Percent of Multi-Residential Buildings per Rate Class

RATE CLASS	BUILDINGS	PERCENTAGE OF MULTI-RESIDENTIAL BUILDINGS IN EACH RATE CLASS	DISTRIBUTION CHARGE TYPE
Residential	3,510	23.72%	Fixed
Competitive sector multi-unit residential service	365	100.00%	Fixed
General service less than 50 kw service	871	1.20%	Fixed and per kWh
General service 50 to 999 kw service	2,347	23.65%	Fixed and per kVA
General service 1,000 to 4,999 kw service	56	11.59%	Fixed and per kVA
Net metering service 50 to 999 kw service	12	27.27%	Fixed and per kVA
TOTAL	**7,161**		

QUESTION (D):

d) If distribution system upgrades are required to allow a multi-residential building to install EV chargers, how are the costs to be paid by the building customer calculated? Is the forecast incremental revenue from the incremental load considered as part of those calculations? If not, why not. Please describe two cases: (i) with individual meters for each unit and (ii) a single meter for the property.

RESPONSE (D):

With regards to distribution system upgrades costs and incremental revenue, please refer to Toronto Hydro's response to Interrogatory 1B-EP-2 c) and d). Incremental revenue consideration only occurs when expansion work is required and is evaluated through the economic evaluation model as described in the above referenced interrogatory. Incremental revenue is not applicable to connection asset work. The economic evaluation model considers buildings connected via a

single bulk meter or Toronto Hydro-supplied unit submetering, based on the customer's preference.

QUESTION (E):

e) How many and what percent of multi-residential buildings have a meter for each unit?

RESPONSE (E):

There are 3,875 multi-residential buildings that have a Toronto Hydro meter for each unit. This represents 54% of all multi-residential buildings in Toronto. The balance of the multi-residential buildings are bulk metered and Toronto Hydro does not have complete information on the metering arrangements of the units behind bulk meters.

QUESTION (F):

f) What additional steps could Toronto Hydro take to ease the connection of EV chargers in multi-residential buildings?

RESPONSE (F):

Toronto Hydro works closely with new and existing customers to support the installation and connection of EV chargers in multi-residential buildings. Toronto Hydro is also participating in the Ontario Energy Board Electric Vehicle Charging Connections Process Working Groups to improve the experience for our customers.

Toronto Hydro remains dedicated to breaking down barriers that hinder customers from reducing their emissions. Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is also playing a proactive role in supporting the realization of the City's Net Zero Strategy by facilitating and stimulating the growth of emerging local cleantech markets and engaging in providing solutions for customers contemplating electrification. For more information, please see the latest Climate Action Plan status report.[2]

[2] https://www.torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-26

Reference: Exhibit 2B, Section D4 (also relevant to questions on service charges)

QUESTION (A):

a) Please provide all charges/fees levied by Toronto Hydro for microgeneration connection.

RESPONSE (A):

For a microgeneration connection (≤10kW), a connection deposit of no more than $500+HST may be collected if a site assessment is required. A connection charge is also applied. The connection charge is site and scope dependent and recovers the basic connection and connection asset costs required to safely connect the customer to the Toronto Hydro grid. For further information, please refer to section 2.2.4 of Toronto Hydro's Conditions of Service, Reference #3 - Distributed Energy Resource Requirements.

QUESTION (B):

b) Please create a table to compare the charges in (a) to those charged by Alectra, Hydro Ottawa, and Elexicon Energy.

RESPONSE (B):

Toronto Hydro is unable to provide a listing of microgeneration connection charges and fees as they are typically site and scope dependent. Utilities may provide some charges publicly, however, these do not typically include the listing of all applicable charges.

QUESTION (C):

c) Please provide excerpts from the Toronto Hydro conditions of service and the DSC that allow Toronto Hydro to levy the charges/fees described in (a).

RESPONSE (C):

Toronto Hydro's charges and fees described in part (a) are supported by the Distribution System Code, the OEB's Distributed Energy Resources Connection Procedure ("DERCP"), and Toronto Hydro's Conditions of Service, Reference Document #3 - Distributed Energy Resource Requirements. Excerpts from these documents are as follows:

Distribution System Code

Section 3.1.5A:

"For micro-embedded generation facility customers, a distributor shall define a basic connection and recover the cost of the basic connection through a charge to the customer. The basic connection for each micro-embedded generation facility customer shall include, at a minimum, the supply and installation of any new or modified metering."

Section 3.1.6:

"All customer classes shall be subject to a variable connection charge to be calculated as the costs associated with the installation of connection assets above and beyond the basic connection. A distributor may recover this amount from a customer through a connection charge or equivalent payment."

The OEB's DERCP:

Section 5.3.6:

"If a site assessment is needed, the distributor may charge a $500 connection deposit for preparing the offer to connect, which shall be payable in the form of cash, cheque, electronic funds transfer, letter of credit from a bank, or surety bond."

Toronto Hydro's Conditions of Service Reference Document #3

Section 2.2.4, Page 9:

"If the connection of the micro-embedded DER facility will require a site assessment, then Toronto Hydro may collect a connection deposit for the preparation of the CA. The connection deposit shall not be more than $500 per CA".

Section 2.4, Connection Cost and Meter Charges, Page 14:
"Toronto Hydro will recover costs associated with the installation of connection assets. Connection costs and Meter charges vary with the type and size of DER facility".

QUESTION (D) – (E):

d) Please provide all studies and calculations justifying the fees charged by Toronto Hydro in (a).

e) Does Toronto Hydro agree that the fees charged for micro connections must not be greater than the actual costs for those connections on an aggregate basis? Please provide all the applicable regulatory criteria governing such fees/charges?

RESPONSE (D) – (E):

Please refer to Toronto Hydro's response to parts (a) and (c) above. The connection charge, which consists of the basic connection and connection asset, will not be greater than the actual costs for those connections.

QUESTION (F):

f) When were Toronto Hydro's current fixed fees for micro connections first set?

RESPONSE (F):

Toronto Hydro does not charge fixed fees for micro generation connections. Please refer to Toronto Hydro's response to parts (a) and (d) above.

QUESTION (G):

g) For each year from 2018 to 2023, please provide (i) the number of microgeneration connections, (ii) the aggregate distribution system costs, (iii) a breakdown of those distribution system costs, and (iv) the aggregate amount charged by the customer installing the DER.

RESPONSE (G):

The number of annual microgeneration connections are provided within Table 1 below.

Table 1: Annual number of microgeneration connections.

	2018	2019	2020	2021	2022	2023
Microgeneration Connections (Annual)	260	19	25	49	81	190

Toronto Hydro tracks generation connection costs at the program level and is unable to disaggregate the costs for microgeneration connections. For the program level costs, please see Exhibit 2B, Section E5.1.4.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-27

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Does Toronto Hydro require customers with net meters to move to tiered rates? If not, how is the billing accomplished in light of the SME not collecting and remitting generation information? If yes, what changes are necessary to allow customers to remain on TOU rates if they have a net meter.

RESPONSE (A):

No, Toronto Hydro does not require customers with net meters to move to tiered rates. Net metering customers have the ability to choose their price plan under the Regulated Price Plan ("RPP"), including Time of Use ("TOU"), Tiered, and Ultra Low Overnight ("ULO") pricing. Toronto Hydro's internal systems have the automated capability to bill customers with net meters across all RPP price plans.

QUESTION (B):

b) What is the monthly incremental cost to a customer for a net meter? Please fully justify this cost with details of the incremental costs to Toronto Hydro.

RESPONSE (B):

There is no monthly incremental cost to a customer with a net meter.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-28

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Approximately how many vehicles are owned by Toronto Hydro customers?

RESPONSE (A):

There are approximately 1,100,000 passenger vehicles in the City of Toronto.

QUESTION (B):

b) If approximately 20% of all cars in Toronto were connected to bi-directional chargers with a 10 kW export capability, what would their collective capacity be?

RESPONSE (B):

The premise of this question is based on untested assumption that each vehicle could export 10 kW to the grid, and that this capacity can be aggregated in a targeted manner to provide grid-value, when and where it is needed. For demand response to provide value, it must be dispatchable and available reliably in areas of need. Please see the evidence in Exhibit 2B, Section E7.2 and the response to 1B-ED-11 for more information about Toronto Hydro's experience with demand response and openness to working with third-parties (e.g. aggregators) to leverage this capacity if and when it is available and can provide cost-effective value to the distribution system as a whole.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-29

Reference: **Exhibit 2B, Section D4**

QUESTION (A):

a) Please comment on the potential for car batteries to be used to reduce building loads with bi-directional chargers at the time of distribution peaks and thus reduce the need for distribution infrastructure.

RESPONSE (A):

Toronto Hydro is willing to consider the use of bi-directional chargers as demand response once volumes of controllable, dispatchable installations reach levels that can be aggregated to provide grid value. The utility is open to working with third-parties (e.g. aggregators) to leverage this capacity when and if it is available and if it can provide cost-effective value to the distribution system as a whole. The current use-case of non-wires solutions is outlined in Exhibit 2B Section E7.2.

QUESTION (B):

b) Please describe all steps Toronto Hydro is taking to (a) assist its customers in installing or purchasing electric vehicle chargers and (b) install electric vehicle chargers for its own use.

RESPONSE (B):

Through its website, Toronto Hydro provides customers with the process required to install an EV charger, which includes recommendations to work with licensed electrical contractors. However, in the event that a service upgrade is required at a customer's service address, Toronto Hydro works with the customer and their contractor through the connections process.

Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is also playing a proactive role in supporting the realization of the City's Net Zero Strategy by facilitating and stimulating the growth of emerging local cleantech markets. For more information, please see the latest Climate Action Plan status report.[1]

For its own use, the utility installs electric vehicle chargers in tandem with its investments to replace internal combustion engine fleet vehicles with electric and hybrid vehicles (see Exhibit 2B, Section E8.3 for more details).

QUESTION (C):

c) With respect to Toronto Hydro's efforts to install electric vehicle chargers, what proportion will be bi-directional chargers?

RESPONSE (C):

Toronto Hydro supports, facilitates and enables the installation of electric vehicle chargers as requested by customers. The utility does not require customers to install specific charges models or types, outside of compliance with codes and standards. Toronto Hydro has explored bi-directional charging capabilities for its own fleet vehicles and has determined the technology is not ready for deployment at this time. As charging technologies develop, Toronto Hydro will investigate opportunities to implement bi-directional charging.

QUESTION (D) AND (E):

d) Nova Scotia Power is undertaking a bi-directional charger pilot project involving 20 bi-directional chargers of 4 different types. David Landrigan, vice-president of commercial for Nova Scotia Power stated as follows: "I think we can call it a game-changing resource". Would Toronto Hydro consider a similar pilot? Would this require additional regulatory approvals if it were to occur prior to 2029?

[1] https://www.torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf

e) The following utilities are piloting bi-directional chargers:

- San Diego Gas & Electric in California (10 V2G busses, 25 kW/bus, 250 kW)
- Con Edison in New York (5 V2G busses, 10 kW/bus, 50 kW)
- EDF Energy in the UK (Customer-facing V2G program based on ABB equipment)
- National Grid in Rhode Island (Fermata V2G bidirectional pilot, 15-20 kW)
- Roanoke Electric Cooperative in N. Carolina (Fermata V2G system, 15-20 kW)
- Green Mountain Power in Vermont (Fermata V2G bidirectional pilot, 15-20 kW)
- Austin Energy in Texas (V2G/V2B pilot)
- Snohomish County Public Utility District in Washington State (V2G pilot)

Is Toronto Hydro considering similar pilots? If not, why not. Would this require additional regulatory approvals if it were to occur prior to 2029? Please explain.

RESPONSE (D) AND (E):

Toronto Hydro believes bi-directional charging has the potential to provide grid benefits in the future. Future pilots would be proposed and selected through the Innovation fund summarized in section 2.5.3 and detailed in Exhibit 1B, Tab 4, Schedule 2 and Appendix A.

QUESTION (F) AND (G):

f) Please provide 6 examples of bi-directional charges available in North America (3 AC and 3 DC) and list their charge/discharge rate (kW) and approximate price. This could include chargers from wallbox, dcbel, ABB, Fermata, Siemens, etc.

g) Please compare the price of bi-directional chargers to one-directional chargers. Is this price differential expected to decrease?

RESPONSE (F) AND (G):

Toronto Hydro does not collect commercial information with respect to products that would be purchased, installed, owned and operated by third-parties.

QUESTION (H) - (J):

h) Please comment on the following potential non-wires-alternative to traditional infrastructure and whether Toronto Hydro would consider pursuing this if cost-effective:

- School bus companies incentivized to install V2G bi-directional chargers
- The bus batteries can be used to serve the grid during distribution peaks
- Busses have big batteries
- Commercial DC chargers are very fast (e.g. 125 kW)
- School buses usually plugged in at peak times
- Can help pay for fleet electrification
- 20,000+ school buses in Ontario

i) Please comment on the following potential non-wires-alternative to traditional infrastructure and whether Toronto Hydro would consider pursuing this if cost-effective:

- Incentivize municipalities to use grid-connected bi-directional chargers when electrifying on-street parking and city lots
- Low incremental cost because a new grid connection is likely required regardless
- Grid connection and protection simplified b/c the connection is not shared with other loads
- Can leverage existing connections between LDCs and municipalities
- Can be piloted and then implemented at scale
- Can help to support electrification of on-street parking and city lots

j) Please comment on the following potential non-wires-alternative to traditional infrastructure and whether Toronto Hydro would consider pursuing this if cost-effective:

- Key design elements:
    - Consumers offered a $X discount on a bi-directional charger
    - Participants must opt-into an EV rate structure
    - The strong TOU price signal increases the incentive to charge off-peak and to discharge to offset household demand on-peak o Equipment is pre-set with optimal settings (e.g. discharge threshold levels, timing for charging/discharging, etc.)

- Consumer has full control over equipment settings and when to charge/discharge o Charger is vehicle-to-building (i.e. not exporting to the grid)

- Consumer take-up driven by:
  - Desire for back-up power
  - Desire for high-speed charger (at a discount)
  - Reduced household electricity charges from load shifting and load offsetting o Upfront incentive payment (i.e. discount on bidirectional charger)
  - Marketing and technical advice
  - Ability to retain full control over vehicle charging/discharging times
- Utility considerations:
  - Reduces distribution peaks and increases reliability
  - Very low cost
  - No need for expensive or complicated communication equipment, grid connection, active control, or ongoing contractual arrangements/payments
  - Demand reductions must be modelled in aggregate, similar to CDM programs because the resource is not dispatchable

RESPONSE (H) - (J):

Please see 2B-ED-24 parts (a) to (c).

QUESTION (K):

k) Please comment on the following reasons why bi-directional chargers should be a priority and could be a lost opportunity if not pursued early:

- It is cheaper to incentivize bi-directional charging sooner, before millions of "dumb" and "one-directional" chargers are purchased
- About 1 million customers will start charging EVs at home between now and 2030; many commercial EV chargers will be purchased over that time

- The opportunity to upgrade to bi-directional chargers is greatest before the initial purchase (i.e. the incremental cost is lowest)
- The lead time for a vehicle-to-building/grid program is likely long (needs OEB policy changes, LDC program development, program approval by OEB, etc.)

RESPONSE (K):

Please see response to part (e).

QUESTION (L):

l) Does Toronto Hydro have an EV Charging Station Technical Installation Guide akin to this one from Hydro Quebec: https://www.hydroquebec.com/data/electrification-transport/pdf/technical-guide.pdf If not, why not? Is one under consideration?

RESPONSE (L):

Toronto Hydro does not have an EV charger technical installation guide. Due to the continuous evolution of the industry, and the variety of established EV charger vendors, specific EV charger installation guides are well documented by the respective manufacturers. Aside from specific manufacturer specifications, Toronto Hydro approaches installation of EV chargers similar to other electrical appliances and provides information on its website to assist customers in making informed decisions about purchasing an EV and installing EV chargers at the home. This information can be found here: https://www.torontohydro.com/electric-vehicles.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-30

Reference: **Exhibit 2B, Section D4**

QUESTION (A):

a) Please provide a table showing the forecast spending on distributed energy resources (DER) in each year, and total over the five-year term, with a breakdown by (i) type of DER (efficiency, demand response, storage, etc.), (ii) cost amount by source of funding (ratepayers, government, etc.), (iii) capital versus operational spending, and (iv) whether the spending is likely to be on new DERs facilities versus existing DERs (e.g. contracting for an addition service from a pre-existing generator).

RESPONSE:

Please see Table 1 below; please note that this table covers equipment or programs owned and operated by Toronto Hydro and does not address privately owned DERs.

Table 1: Forecasted Spending on DERs

DER Type	Forecasted Rate-based spend	Forecasted Provincial spend	Leveraging existing assets (yes/no)
Local Demand Response[1]	$5.7 million (OPEX)	None	Yes, contracts for services from existing customer owned DERs
Energy Storage[2]	$1.4 million (CAPEX)	$21.2 million (CAPEX)	No, these are new assets

Please note that all project expenses and operational costs to facilitate the connections of DER are recovered from customers. Toronto Hydro does not propose any net expenditure for DER Connections for the years 2025 to 2029.

[1] Non-Wires Solutions Program, Exhibit 2B, Section E7.2, pages 1-17.
[2] Non-Wires Solutions Program, Exhibit 2B, Section E7.2, pages 13-34.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-31

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Please discuss how forecast customer connections are factored into Toronto Hydro's demand forecasting for the purpose of capacity planning. Please explain in detail.

RESPONSE (A):

In the Toronto Hydro's peak demand forecast, the load from new Customer Connections is assumed to materialize over 5 years from the in-service date as follows: 35% in first year, 20% in the second year, and 15% in each of the remaining years.

QUESTION (B):

b) For the purposes of capacity planning, how does Toronto Hydro account for incremental connections of single-family dwellings with 200 amp service? For instance, how many kW are assumed (either explicitly or implicitly) to be added to co-incident system peak for such a dwelling? For instance, would that be the maximum kWs the dwelling could consume, the average, or some other number?

RESPONSE (B):

Toronto Hydro Peak demand forecast does not forecast customer connections below 2MVA. These loads are captured in the base load growth trends shown in Figure 4 of Exhibit 2B, Section D4.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-32

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Please describe what DERMS are.

RESPONSE (A):

As noted in Exhibit 2B Section D5.3.6, a Distributed Energy Resource Management System ("DERMS") is a powerful software tool which can be used to integrate, aggregate monitor, and where appropriate, control Distributed Energy Resources ("DERs") in real-time.

QUESTION (B):

b) Please describe the difference in cost and characteristics between utility-grade DERMS equipment and standard internet-connected power control systems (PCS).

RESPONSE (B):

Utility-grade DERMS equipment and standard internet-connected PCS play essential roles in power management, but they are tailored for different applications. DERMS equipment is designed to handle distributed energy resources at a utility-scale. It offers advanced functionalities like real-time monitoring, control, and optimization of various energy resources. This includes managing solar panels, wind turbines, battery storage systems, and more while ensuring grid stability and efficiency. However, DERMS equipment tends to be more expensive due to its complexity and scalability.

On the other hand, standard internet-connected PCS is better suited for smaller-scale applications with more straightforward integration needs. These systems are typically used for localized power distribution and control within buildings, microgrids, or small-scale energy systems. PCS is more

cost-effective and easier to implement. They offer basic control features for managing power flows and system operations within a limited scope.

QUESTION (C):

c) Is Toronto Hydro considering software that would allow it to control smaller DERs through an internet-connected PCS at the customer site? What additional investments are needed by Toronto Hydro to make this possible? What are the barriers and how is Toronto Hydro exploring solving them?

RESPONSE (C):

Toronto Hydro does not at this time directly control devices owned and installed behind-the-meter by its customers. Toronto Hydro is open to working with aggregators or other commercial parties with the ability to control and aggregate such devices, if and when it can be established that such devices can provide meaningful, cost-effective grid services.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-33

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Please describe all the steps that Toronto Hydro is considering implementing to increase the capacity of its system to connect DERs but which it has not yet decided to implement. For each, please indicate when a decision is likely to be made and whether incremental funding from what is sought in this application would be needed.

RESPONSE (A):

Toronto Hydro is working with our transmitter, HONI, on methods to alleviate short circuit capacity constraints. Currently, Toronto Hydro is considering bus-tie reactors to increase the capacity of the system to connect DERs. Please reference Exhibit 2B Section E5.5 for more details on the Generation Protection, Monitoring, and Control (GPMC) program that describes the bus-tie reactor plan. Toronto Hydro plans to explore several initiatives under the Grid Innovation program as part of its Grid Modernization Strategy. The utility recognizes that achieving system optimization through improved dynamic system control is integral to both enhancing the capacity to connect as well as leverage DER's for Grid benefit. However, maturity in the Grid Observability domain is essential in achieving favorable outcomes in a dynamic grid of the future with high levels of DER penetration. It is for this reason, Toronto Hydro has opted to first invest in technology to improve it grid observability as outlined in Exhibit 2B, Section D5. Subsequent to this, Toronto Hydro intends to explore technologies that enable the use dynamic as opposed to static ratings of grid assets to better leverage and optimize load and generation connections to balance supply and demand across increasing larger portions of the grid.

QUESTION (B):

b) Please confirm that Toronto Hydro is allowed to treat applications with over 10 kW nameplate capacity as a microgeneration connection under the DSC. Would Toronto Hydro consider raising its internal threshold for microgeneration connections in order to facilitate the connection of use cases somewhat larger than 10 kW (like solar battery combinations)?

RESPONSE (B):

Confirmed.

Toronto Hydro has not contemplated a DSC exemption to increase the threshold for microgeneration connections. The utility's view is that such a change to the DSC would be best addressed on a generic basis in order to ensure fairness and consistency for customers and third-party DER providers across the province

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-34

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) Does Toronto Hydro agree with the following sources suggesting that Ontario's RNG potential is roughly 2.5% of the current fossil-based gas consumption:

Feasible RNG Potential – Percent of Current Fossil Gas Consumption	
Canadian Biogas Association Study	2.5%[10] (Ontario)
IESO, Pathways to Decarbonization Study (Interpreting Torchlight Bioresource Report)	2.5%[11] (Ontario)
Canada Energy Regulator, Canada's Energy Future 2023	3%[12] (Canada-wide)

RESPONSE (A):

Toronto Hydro does not forecast or analyze RNG to any capacity and is therefore unable to comment on the RNG potential noted in the sources in the table above.

QUESTION (B):

b) Does Toronto Hydro agree with out interpretation of those reports?

RESPONSE (B):

Toronto Hydro agrees that the figures represented in the table above reflect the figures in the reports, but cannot comment on Environmental Defense's interpretation of those reports.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-35

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) Under the "system transformation" scenario, what percent of Toronto's current gas use is replaced with RNG?

RESPONSE FROM ERM (A):

Future Energy Scenarios models Toronto Hydro's electrical distribution system and does not model gas (including RNG). This was out of scope.

QUESTION (B):

b) Did Element Energy conduct an assessment of whether that is actually feasible?

RESPONSE FROM ERM (B):

No, as noted in a) the modelling of gas was out of scope.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-36

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) Please comment on the analysis in the following submissions starting at page 6 suggesting that decarbonization of building heating is likely to take place mostly through electrification, not low-carbon gases: https://www.rds.oeb.ca/CMWebDrawer/Record/815078/File/document

RESPONSE FROM TORONTO HYDRO (A):

Toronto Hydro cannot comment on the method in which decarbonization of building heating is likely to take place. The Future Energy Scenarios ultimately does not place probabilities on any of the scenarios or technologies becoming reality. The scenarios themselves vary the levels of electrified heating and do not make conclusions on the methods in which non-electrified heating takes place.

QUESTION (B):

b) Please ask Element Energy to comment on the analysis in the following submissions starting at page 6 suggesting that decarbonization of building heating is likely to take place mostly through electrification, not low-carbon gases, including each specific reason provided therein: https://www.rds.oeb.ca/CMWebDrawer/Record/815078/File/document

RESPONSE FROM ERM (B):

This is not in-scope for the Future Energy Scenarios report, which models Toronto Hydro's electrical distribution system. The modelling is not intended to comment on the probability of any of these scenarios or technological developments, and therefore cannot comment on the likelihood of one technology over another.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-37

Reference: Exhibit 2B, Section D4, Appendix B, Figure 5

QUESTION (A):

a) The report states: "The resulting peak network load for Toronto Hydro is shown in Figure 5, which illustrates how the two most ambitious decarbonization scenarios (Consumer Transformation and Net Zero 2040) have the lowest peak demands by 2050 when the full benefits of appliance and building fabric efficiency measures, demand side flexibility and renewable generation." Pease provide the full underling calculations and a table showing the quantify of peak demand reduction achieved by each measure.

RESPONSE FROM ERM (A):

The full set of underlying calculations would constitute the entire modelling methodology within the FES Model. The uptake methodologies for the drivers are provided in section 4 of the report. For details on how the load is modelled, please review section 5.1 of the report.

The amount of demand reduction achieved by each measure was not modelled as that would entail a completely separate modelling exercise that takes into account each permutation of the drivers for each scenario. Please refer to Figure 75 of the report which shows the scale of the impact of flexibility, efficiency and behind-the-meter renewable generation on the summer and winter peaks in the Consumer Transformation and Net Zero 2040 scenario worlds.

QUESTION (B):

b) For each scenario shown in figure 5 please provide, for each 5-year interval (i) the percent of buildings with gas, electric, or hybrid heat and (ii) the average demand per building for heating per heating type.

RESPONSE FROM ERM (B):

Please note that the average demand per building for heating per heating type is calculated only as part of the larger interim-calculations and is not an explicit output produced from the FES Model and so is not in-scope as something that can be provided.

Please see the percent of buildings split out by heating type across the scenario worlds below:

Proportion of domestic buildings

Scenario	Heating type	2021	2025	2030	2035	2040	2045	2050
Steady Progression	Electric	5.6%	7.5%	10.7%	14.0%	15.7%	16.2%	16.0%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.4%
	Air Source Heat Pump	0.6%	1.6%	3.1%	4.9%	10.4%	18.8%	27.1%
	Hybrid Heat Pump	0.1%	0.2%	0.9%	1.8%	2.7%	3.1%	3.2%
	Gas Furnace	93.2%	90.2%	84.7%	78.8%	70.8%	61.5%	53.3%
	Other	0.6%	0.6%	0.6%	0.5%	0.3%	0.2%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
System Transformation	Electric	5.6%	7.4%	9.3%	12.5%	16.8%	19.3%	19.6%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.1%	0.2%	0.5%	1.0%
	Air Source Heat Pump	0.6%	1.3%	3.7%	10.6%	29.4%	47.2%	60.6%
	Hybrid Heat Pump	0.1%	1.4%	3.8%	6.8%	12.0%	16.0%	18.8%
	Gas Furnace	93.2%	89.4%	82.6%	69.7%	41.4%	17.0%	0.0%
	Other	0.6%	0.6%	0.5%	0.3%	0.2%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Consumer Transformation	Electric	5.6%	7.4%	9.3%	12.3%	16.2%	19.0%	20.6%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.2%	0.6%	1.2%	1.9%
	Air Source Heat Pump	0.6%	2.2%	7.8%	16.8%	41.3%	61.8%	77.5%
	Hybrid Heat Pump	0.1%	0.3%	0.8%	4.1%	3.7%	3.0%	0.0%
	Gas Furnace	93.2%	89.6%	81.7%	66.4%	38.2%	14.9%	0.0%
	Other	0.6%	0.6%	0.4%	0.2%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Net Zero 2040	Electric	5.6%	7.4%	13.6%	17.6%	21.4%	20.5%	21.3%
	Ground Source Heat Pump	0.0%	0.0%	0.1%	0.4%	0.9%	1.4%	2.1%
	Air Source Heat Pump	0.6%	2.3%	28.5%	55.4%	77.7%	78.1%	76.6%
	Hybrid Heat Pump	0.1%	0.3%	0.3%	0.2%	0.0%	0.0%	0.0%
	Gas Furnace	93.2%	89.5%	57.2%	26.3%	0.0%	0.0%	0.0%
	Other	0.6%	0.6%	0.4%	0.2%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Proportion of I&C buildings

Scenario	Heating type	2021	2025	2030	2035	2040	2045	2050
Steady Progression	Electric	4.9%	4.7%	4.7%	4.5%	4.4%	4.3%	4.1%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Air Source Heat Pump	1.3%	1.2%	1.0%	1.1%	6.8%	14.0%	21.8%
	Hybrid Heat Pump	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%
	Gas Furnace	93.3%	93.7%	93.9%	94.0%	88.6%	81.6%	74.0%
	Biomass Boiler	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
	Other	0.4%	0.3%	0.3%	0.2%	0.1%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
System Transformation	Electric	4.9%	4.7%	4.6%	4.4%	4.1%	3.9%	3.8%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Air Source Heat Pump	1.3%	1.2%	1.0%	5.9%	25.4%	45.8%	61.7%
	Hybrid Heat Pump	0.0%	0.0%	0.1%	0.1%	13.2%	24.7%	34.5%
	Gas Furnace	93.3%	93.7%	93.9%	89.4%	57.2%	25.5%	0.0%
	Biomass Boiler	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
	Other	0.4%	0.3%	0.3%	0.1%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Consumer Transformation	Electric	4.9%	4.7%	4.6%	4.4%	4.1%	3.9%	3.7%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Air Source Heat Pump	1.3%	1.2%	1.2%	6.1%	38.7%	70.6%	96.2%
	Hybrid Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gas Furnace	93.3%	93.7%	93.9%	89.4%	57.1%	25.4%	0.0%
	Biomass Boiler	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
	Other	0.4%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Net Zero 2040	Electric	4.9%	4.7%	4.6%	4.3%	4.0%	3.7%	3.5%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Air Source Heat Pump	1.3%	1.2%	33.3%	65.0%	95.9%	96.2%	96.4%
	Hybrid Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gas Furnace	93.3%	93.7%	61.8%	30.5%	0.0%	0.0%	0.0%
	Biomass Boiler	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
	Other	0.4%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

QUESTION (C):

c) Please provide a table showing the differences as between the consumer transformation and consumer transformation low scenarios in terms of both inputs and outcomes.

RESPONSE FROM ERM (C):

For inputs, please review table 1 of the FES report which outlines the technology uptake scenarios that make up each of the four scenario worlds and the "Low" sensitivity cases applied to Consumer Transformation and Net Zero 2040. Additionally, please review the narrative for Consumer Transformation (including "Consumer Transformation – Low Efficiency") provided in section 2.1. Outcomes can be found outlined in the Executive Summary and section 4 and 5.

QUESTION (D):

d) Please provide a table showing the differences as between the net zero 2040 and new zero 2040 low scenarios in terms of both inputs and outcomes.

RESPONSE FROM ERM (D):

For inputs, please review table 1 of the FES report which outlines the technology uptake scenarios that make up each of the four scenario worlds and the "Low" sensitivity cases applied to Consumer Transformation and Net Zero 2040. Additionally, please review the narrative for Net Zero 2040 (including "Net Zero 2040 – Low Efficiency") provided in section 2.1. Outcomes can be found outlined in the Executive Summary and section 4 and 5.

QUESTION (E):

e) The net zero 2040 scenario winter peak demand reaches a peak in 2040 or so before declining. What causes the winter peak to decline at that stage.

RESPONSE FROM ERM (E):

As outlined in the text underneath figure 5 of the report, "The 2030s see the time of network peak shifting to winter, with loads increasingly being driven by heat pump uptake and electric vehicles. As these technologies become more established, they are adopted in large numbers, especially in the more ambitious net zero compliant scenarios. These trends continue into the 2040s; however, increasing electricity demands are moderated by the uptake of renewable generation and storage, which also see an accelerated growth in the later years. The impact of efficiency measures is

assumed to increase at an approximately constant rate over the full modelled timeline, with the more ambitious scenarios seeing a more rapid acceleration in the early years, followed by diminishing improvements in later years." A full low carbon energy technology uptake by around 2040 is seen in the Net Zero 2040 scenario, while having energy efficiency measures continue to be deployed. This means that a peak is seen (as the electric demand technologies are taken up to a maximum) around 2040 and then declines thereafter (accounting for the continued deployment of energy efficiency measures, but limited increases in electric demand technologies).

QUESTION (F):

f) Please provide a table breaking down the incremental peak demand for each scenario by (i) customer growth, (ii) electrification of transportation, and (iii) electrification of buildings.

RESPONSE FROM TORONTO HYDRO (F):

Incremental peak between 2021 and 2050 is shown for each scenario by (i) baseload (customer growth), (ii) transportation, and (iii) heating (electrification of buildings) in Table 1 below.

Table 1: Incremental Peak Between 2021 and 2050 for Each Scenario

		Unit	SP	ST	CT	CT Low	NZ	NZ Low
2021 Peak	**Baseload**	*(MW)*	3,871	3,871	3,871	3,871	3,871	3,871
	Transportation	*(MW)*	18	18	18	18	18	18
	Heating	*(MW)*	23	23	23	23	23	23
2050 Peak	**Baseload**	*(MW)*	4,744	4,141	3,616	4,726	3,577	4,726
	Transportation	*(MW)*	1,295	958	1,184	1,036	1,652	1,040
	Heating	*(MW)*	1,324	2,477	1,718	3,339	692	3,378
Incremental	**Baseload**	*(MW)*	873	270	(255)	855	(294)	855
	Transportation	*(MW)*	1,277	940	1,166	1,018	1,634	1,022
	Heating	*(MW)*	1,301	2,454	1,695	3,315	669	3,355

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-38

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) At a very high level, what is the approximately difference in distribution system costs (gross $, $/kWh, and $kW) as between the consumer transformation scenario and the consumer transformation low scenario?

RESPONSE FROM ERM (A):

The FES Model does not output total distribution system costs.

RESPONSE FROM TORONTO HYDRO (A):

Toronto Hydro cannot provide distribution system cost estimates from the basis of a FES Model output without further engagement in extensive system planning.

QUESTION (B):

b) Are the investments outlined in the Toronto Hydro's application sufficient for the electricity system to be ready for the consumer transformation scenario? If not, what investments need to be added?

RESPONSE FROM TORONTO HYDRO (B):

Please refer to Exhibit 2B, Section D4.3, pages 11-13 for details on how Toronto Hydro considered the Consumer Transformation scenario in relation to its System Peak Demand Forecast. Please also refer to Toronto Hydro's response to interrogatory 2B-Staff-153.

QUESTION (C):

c) Please reproduce figure 5 showing summer and winter demand (GWh) instead of peak demand (GW).

RESPONSE FROM TORONTO HYDRO (C):

The information cannot be provided in the format requested as the Future Energy Scenario model does not break consumption down into winter and summer values.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-39

References: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) Please rank the scenarios in figure 5 for overall societal cost-effectiveness. Please explain and quantify as best as possible.

RESPONSE FROM ERM (A):

The FES Model does not calculate or output total societal cost. This comparison requires an agreed-upon method of valuing societal cost and benefit.

QUESTION (B):

b) Which of the scenarios in figure 5 are most likely to come to pass. Please explain.

RESPONSE FROM ERM (B):

As outlined in section 2, this project's scenario-based modeling is used to represent the range of uncertainties in the low carbon energy transition. The modeling does not attach probability to any of the scenarios.

QUESTION (C):

c) Please provide the full calculations and spreadsheets underlying the Element Energy report.

RESPONSE FROM TORONTO HYDRO (C):

The full set of underlying calculations would constitute the entire modelling methodology within the FES Model. The uptake methodologies for the drivers are provided in section 4 of the report. For details on how the load is modelled, please review section 5.1.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-40

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

(a) After reviewing the following, would Element Energy agree that heat pumps are usually the cheapest way to heat buildings:

- Energy Futures Group Report - see p. 23.
- Dr. McDiarmid Report - see p. 11.
- Corporate Knights Report
- Ministry of Energy Paper - see pp. 10 & 11. Note, page 10 indicates that the lower cost numbers in the figure on page 11 are for heat pumps.
- November 2020 Ontario Auditor General Report - see p. 18. This refers to heat pumps as an alternative to gas "that is both lower cost and consistent with the government's Environment Plan."
- Enbridge evidence in recent gas expansion cases - see pdf p. 17. This evidence shows that heat pumps are cheaper than gas heating. But it underestimates those savings. If assumptions are corrected (such as accounting for the savings from avoiding fixed gas charges by getting off gas completely), the savings from heat pumps grow and it becomes clear that heat pumps with on electric backup are cheaper than heat pumps with a gas backup. For those additional details, see Hearing Transcript Vol. 5, p. 172, ln. 17 to p. 174, ln. 7.
- OEB DSM Decision - see page 28 and 30. The decision notes that heat pumps are cost-effective. It also allocates efficiency funding to heat pumps. That funding is restricted to cost-effective measures.

• OEB Decision re Enbridge Rates - see page 38. It says "the operating cost of a new all-electric house using a cold climate air source heat pump for space heating, is lower than a new gas and electricity serviced house."

RESPONSE FROM ERM (A):

The cheapest way to heat a building will depend on several factors including technology prices, fuel and electricity costs, thermal efficiency for the specific building, and other possible factors (e.g. human intervention / error). Please see section 4.2.1. for the modeling approach taken to determine the low carbon heating uptake used in this work.

QUESTION (B):

(b) What is the average cost per home and payback period for the retrofits described on page 36?

RESPONSE FROM ERM (B):

This is not produced as an explicit output from the FES model.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-41

References: Exhibit 2B, Section D4, Appendix B, Page 64

QUESTION (A):

a) What additional investments or steps does Element Energy recommend that Toronto Hydro take within the rate period with respect to V2G and V2B technology?

RESPONSE FROM ERM (A):

This is out of scope. Element Energy (now ERM) does not provide investment advice. As outlined in Section 2, this project's scenario-based modeling is used to represent the range of uncertainties in the low carbon energy transition.

QUESTION (B):

b) What costs are associated with those steps?

RESPONSE FROM ERM (B):

Please see the response provided to part a) above.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-42

Reference: Exhibit 2B, Section D4, Appendix B

a) For each scenario, please provide the assumptions for the use of gas versus electricity in new construction between now and 2030. Please compare that to Toronto Hydro's actual forecasts based on current realities.

RESPONSE FROM ERM:

Please review Table 9 of the report which outlines the ban dates for choosing Business as Usual heating fuels in building types (new builds or existing) across all scenarios. Please see how these scenarios map to each scenario world in Table 8.

RESPONSE FROM TORONTO HYDRO:

Toronto Hydro does not produce forecasts for the use of gas versus electricity in homes to which these could be compared to.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-43

Reference: Exhibit 2

QUESTION (A):

a) How does Toronto Hydro's rate of distribution system energy losses compare to other leading LDCs inside and outside of Ontario? Please provide a comparison with equivalent peer utilities in Ontario.

RESPONSE (A):

Toronto Hydro's analysis in Figure 1 below, based on 8-year average historical line losses for the top 10 LDCs using RRR data, reveals that Toronto Hydro holds the third position for the lowest line losses, standing at approximately 2.91 percent. This places Toronto Hydro in a favorable position within Ontario, as the majority of LDCs experience line losses above 3.0 percent.

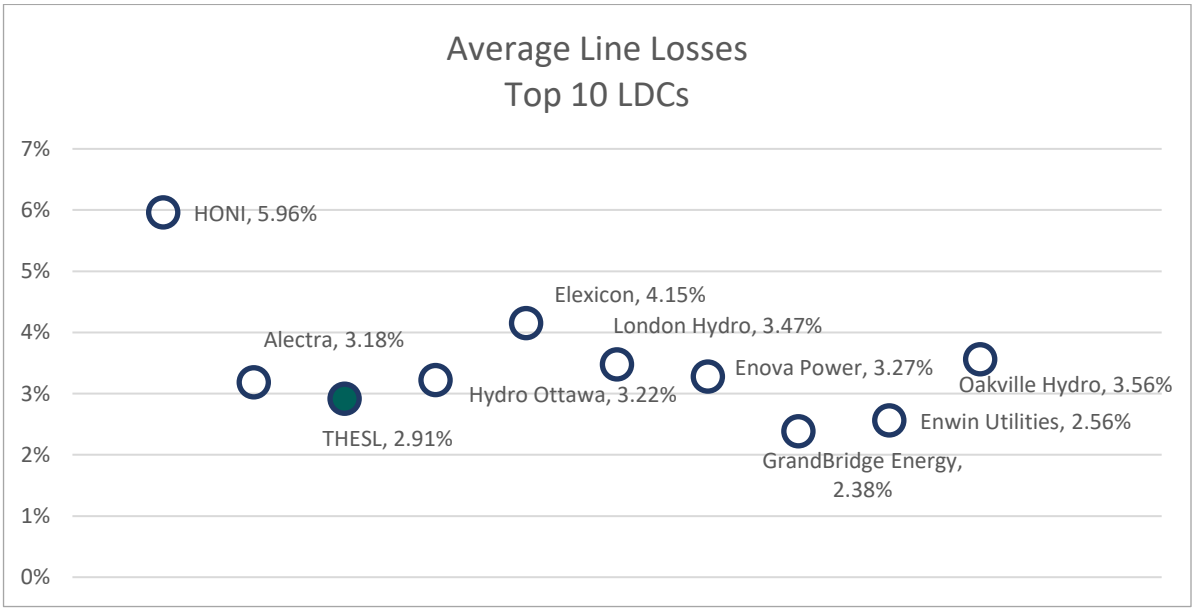

Figure 1: Average Line Losses for Top 10 LDCs

QUESTION (B):

b) How does Toronto Hydro compare to other LDCs in terms of its efforts to reduce distribution system energy losses? In what ways is or isn't Toronto Hydro a leader in this regard?

RESPONSE (B):

As shown in part (a), Toronto Hydro is among the leaders in Ontario for actual system energy losses. Toronto Hydro has not participated in any benchmarking studies that address this specific question, nor does the utility have sufficient direct knowledge of other comparable utilities' efforts to reduce energy losses to provide a meaningful response.

QUESTION (C):

c) What are the most important steps that Toronto Hydro has taken in the past 20 years to reduce distribution system energy losses?

RESPONSE (C):

Toronto Hydro's planning and operational processes are designed to optimize efficiency and reduce losses where feasible. Various measures are embedded into Toronto Hydro's processes to cost-effectively reduce distribution losses. These measures include but are not limited to:

- Continuous improvement of equipment procurement and standards development based on industry standards and best practices;
- Voltage conversions and system renewal where appropriate; and
- Regular maintenance and upgrades of the distribution infrastructure.

Toronto Hydro evaluates the appropriateness of implementing these measures holistically considering its fundamental pillars of safety and reliability. Factors such as cost-effectiveness, regulatory requirements, and customer needs are taken into account. Toronto Hydro is committed to optimizing its distribution system's efficiency, and its line losses have been relatively low due to the proactive measures implemented over the years and the inherent nature of its urban

distribution system. Toronto Hydro operates in compliance with all applicable regulatory requirements and standards, including loss reduction provisions.

QUESTION (D):

d) Where does Toronto Hydro believe the greatest opportunities are to make additional reductions in distribution losses in the next 20 years?

RESPONSE (D):

Toronto Hydro believes that continued investment in modernizing, expanding, and renewing infrastructure will all be crucial to maintaining and improving Toronto Hydro's line loss levels. By deploying advanced technologies and implementing smart grid solutions, utilities like Toronto Hydro will create opportunities to enhance the efficiency and reliability of the distribution system, leading to potential reductions in losses.

QUESTION (E)

e) Does Toronto Hydro quantify and consider the potential value of distribution loss reductions for different options when procuring equipment (e.g. transformers) and deciding on the details of demand-driven capital projects (e.g. the type and sizing of conductors)? If yes, please explain how and provide documentation detailing the methodology used.

RESPONSE (E):

Toronto Hydro procures distribution equipment (e.g. transformers, conductors) based on market availability and industry standards. When designing distribution systems for all projects, factors such as nominal line voltage, equipment sizing, and loading are carefully considered, as they can impact losses. Distribution losses are factored into the development of preferred plans and alternatives, as detailed in various programs such as Exhibit 2B, Section E6.1 - Area Conversions, E6.2 - Underground System Renewal - Horseshoe, E6.5 - Overhead System Renewal, and E6.6

Stations Renewal. Please see response to part (g) for a list of operational measures Toronto Hydro takes to manage losses.

While Toronto Hydro does not possess a standalone document outlining the methodologies employed to minimize line losses, these strategies are integrated within the utility's numerous standards, processes, and practices.

QUESTION (F) :

f) If Toronto Hydro is considering the value to its customers of distribution loss reductions for planning purposes, how does it calculate the dollar value ($) of said loss reductions (kWh)? Is the value calculated based only on the HOEP or on all-in cost of electricity (e.g. including the GA)?

RESPONSE (F):

Toronto Hydro does not currently assign a dollar value to line loss reductions for the purposes of investment planning decisions.

QUESTION (G):

g) Please list and describe the operational measures that Toronto Hydro takes to cost-effectively reduce distribution losses.

RESPONSE (G):

A list of key operational measures Toronto Hydro takes to cost-effectively reduce distribution losses:

- Load Balancing – Phase balancing is assessed during the connection of new customers. Unbalanced phases are also identified by the grid operations team and are often corrected through switching orders or as a part of system renewal programs.

- Raising Nominal Voltage – Toronto Hydro seeks to connect new customers and actively converts existing customers using higher distribution system operating voltages, a practice reflected in renewal and conversion work.
- Adding an additional (parallel) feeder – Evaluated and recommended as part of customer connection assessment or system access projects (load demand).
- Voltage control – Toronto Hydro designs the distribution system per CSA C235-83 Preferred Voltage Level for AC Systems, 0 to 50,000V.
- Changing out a distribution transformer – Evaluated and recommended as part of customer connection assessment or replaced reactively as part of operational checks.
- Primary Conductor Size Increase – Evaluated and recommended as part of customer connection assessment or system renewal projects.
- Minimizing the use of multiple conductors – Large conductors with lower impedances are selected to minimize losses.
- Upsizing conductors or reconfiguring secondary network - Evaluated and recommended as part of customer connection assessment or system renewal projects (SDP).
- Optimizing voltages - Compliance with standards in optimizing voltages across the distribution network.
- Avoiding transformational steps in between and consolidating transformers where necessary, or adhering to Transformer Efficiency standards (CSA C802.1-13) for minimum efficiency values for liquid-filled distribution transformers.

QUESTION (H):

h) Please provide a table listing the technically available measures to cost-effectively reduce distribution losses and describe for each the respective responsibilities of Toronto Hydro, the IESO, and Toronto Hydro.

RESPONSE (H):

Toronto Hydro's measures are discussed in parts (c), (e) and (g).

The IESO, Hydro One, and Toronto Hydro each play a role in the overall reduction of system energy losses, with the IESO focusing on system-wide planning and market mechanisms, Hydro One responsible for the transmission infrastructure, and Toronto Hydro managing the local distribution network.

QUESTION (I):

i) Please complete the following table

Value of Toronto's Distribution System Energy Losses - Historic						
	2020	2021	2022	2023	2024	Total
Electricity Purchases (MWh)						
Electricity Sales (MWh)						
Losses (MWh)						
Losses %						
All-In Cost of Electricity in ($/Mwh) – Annual Average						
Cost of Losses ($)						

RESPONSE (I):

Please see Table 1 below.

Table 1: Toronto Hydro's Historical Distribution System Losses

Value of Toronto's Distribution System Energy Losses - Historic						
	2020	**2021**	**2022**	**2023**	**2024**	**Average**
Electricity Purchases (MWH)	23,686,189	23,484,889	24,054,524	23,729,818	N/A	23,738,855
Electricity Sales (MWh)	22,958,448	22,775,842	23,359,362	23,094,573	N/A	23,047,056
Losses (MWh)	727,741	709,048	695,162	635,245	N/A	691,799
Losses %	3.17%	3.11%	2.98%	2.75%	N/A	3.00%
All-In Cost of Electricity in ($/Mwh) – Annual Average	$13.77	$28.30	$47.74	$29.81	N/A	$29.71
Cost of Losses ($)	$10,021,995	$20,068,452	$33,190,260	$18,937,777	N/A	$20,554,621

QUESTION (J):

j) Does Toronto Hydro anticipate the value of losses on its system to be materially higher or lower over the next five years?

RESPONSE (J):

Toronto Hydro does not forecast losses on its system. There are various factors that could influence the value of losses to be either higher or lower over the next five years. Toronto Hydro cannot provide specific projections at this time. Toronto Hydro remains committed to ensuring that losses are kept within benchmarks provided by the OEB.

QUESTION (K):

k) Please complete the following table:

GHG's from Toronto's Forecast Distribution System Energy Losses						
	2021	2022	2023	2024	2025	Total
Forecast Losses (MWh) [1]						
Carbon Intensity of Electricity (CO2e/MWh)[2]						
GHGs (CO2e)						

RESPONSE (K):

While the IESO's data provides valuable insights, Toronto Hydro cannot solely base these figures on the IESO's January 2020 Annual Planning Outlook. These figures cannot be directly applied to Toronto Hydro's jurisdiction as Toronto Hydro does not directly control the mix of generation that is transmitted to its service territory. Therefore, the figures provided in Table 2 are for illustrative purposes only. Note that Toronto Hydro does not forecast line losses.

[1] If no better numbers are available, the losses from 2019 or the average over 2015 to 2019 could be used for the purpose of this row of this response.
[2] Please base this figure on the IESO's January 2020 Annual Planning Outlook - http://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/Annual-Planning-Outlook-Jan2020.pdf?la=en;

Please note that the carbon intensity is calculated using Scenario 1 of IESO's 2020 Annual Planning Outlook. Figure 2 is used for Ontario's demand (2021 demand is taken from the 2021 year in review[3] as it was not provided in the data for the 2020 APO). Figure 37 is used for GHG emissions. The units are tonnes of CO_2e/MWh.

Table 2: GHG Emissions from Toronto Hydro's Distribution System Losses (Illustrative Only)

GHG's from Toronto's Forecast Distribution System Energy Losses						
	2021	**2022**	**2023**	**2024**	**2025**	**Total**
Forecast Losses (MWh)[4]	709,048	695,162	684,846	N/A	N/A	2,089,056
Carbon Intensity of Electricity (CO2e/MWh)[5]	0.027	0.031	0.042	0.048	0.054	0.033
GHGs (CO2e)	19,078	21,622	28,886	N/A	N/A	69,586

QUESTION (L):

l) Is Toronto Hydro willing to review its operational measures, investment planning, and other practices to consider whether it could be taking additional measures to cost-effectively reduce the energy losses occurring in its distribution system?

RESPONSE (L):

Toronto Hydro is not likely to prioritize changes in its operational measures, investment planning, or other practices specifically aimed at reducing energy losses in its distribution system. This is because the line losses are already within established benchmarks and consistently below the guidelines set by the OEB. While Toronto Hydro remains open to exploring enhancements in its practices, it appears that the current measures are effectively managing and keeping line losses at acceptable levels.

[3] https://www.ieso.ca/en/Sector-Participants/IESO-News/2022/02/2021-Year-in-Review-Data-Now-Available
[4] If no better numbers are available, the losses from 2019 or the average over 2015 to 2019 could be used for the purpose of this row of this response.
[5] Please base this figure on the IESO's January 2020 Annual Planning Outlook - http://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/Annual-Planning-Outlook-Jan2020.pdf?la=en;

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-44

Reference: Exhibit 2B

QUESTION (A):

a) In EB-2019-0261, Hydro Ottawa agreed to, and the Board approved, the following: "Between 2021 and 2025, Hydro Ottawa shall endeavour to maintain its five-year average total system losses below the target of 3.02% set by the OEB in EB-2005-0381 through cost-effective measures." Is Toronto Hydro willing to agree to the same terms? If not, what commitments can Toronto Hydro make to the Board in this regard? In particular, please indicate what target Toronto Hydro is willing to meet.

RESPONSE (A):

As stated in the response to interrogatory 2B-ED-43, Toronto Hydro's ongoing efforts consistently ensure that the utility's distribution line losses remain below the thresholds set by the OEB. Toronto Hydro holds the third position for the lowest line losses, standing at approximately 2.91%. At present, Toronto Hydro finds no necessity for further commitments beyond the utility's existing obligations in this regard.

QUESTION (B):

b) In EB-2019-0261, Hydro Ottawa agreed to, and the Board approved, the following: "In addition, over the course of 2020-2021, Hydro Ottawa shall prepare a plan to reduce distribution losses as much as possible through cost-effective measures. The utility shall file the plan with the OEB when complete. In 2022-2025, Hydro Ottawa shall implement as many of the cost-effective measures set out in its plan as possible (e.g. any changes to planning and procurement processes to better mitigate losses, investments that can be made within current budgets, operational measures, etc.). All other cost-effective measures will be incorporated into the utility's next rebasing application and DSP." Is

Toronto Hydro willing to agree to the same terms? If not, what commitments can Toronto Hydro make to the Board in this regard?

RESPONSE (B):

Please refer to the response to interrogatory 2B-ED-43 parts (e) and (g) for detailed information on Toronto Hydro's planning and operational efforts regarding distribution line loss reduction. At present, Toronto Hydro finds no necessity for further commitments beyond utility's existing obligations in this regard.

QUESTION (C):

c) In EB-2019-0261, Hydro Ottawa agreed to, and the Board approved, the following: "Finally, as described in Hydro Ottawa's response to undertaking JT 3.10, a pilot of a Grid Edge Volt/VAr Control ("VVC") solution will be complete by the end of 2020. If this pilot is successful, Hydro Ottawa shall increase the deployment of these (or equivalent) units by conducting an analysis in 2021 to identify potential suitable locations and by deploying these units in a subset of locations which are deemed to be suitable and cost-effective, with an estimated investment of up to $1.0M over the five-year test period. The cost of these investments will be accommodated within the overall approved capital budget." Is Toronto Hydro willing to agree to implement similar technology through an equivalent commitment? If not, what commitments can Toronto Hydro make to the Board in this regard?

RESPONSE (C):

Distribution line losses are not a major concern for Toronto Hydro warranting a commitment to implementing specific technologies or undertaking investments in this area. Toronto Hydro's current plans are designed to effectively manage and mitigate line losses while strategically investing in areas of immediate priority. Toronto Hydro remains firm in its commitment to maintaining distribution line losses within regulatory benchmarks.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-24

Reference: Exhibit 2B, Section A3.4, Page 13

Preamble:

"For instance, in May 2022, an extreme wind event known as the Derecho Storm struck Southern Ontario and Quebec with 120+km/h winds. These extreme winds caused substantial damage to vegetation, which in turn damaged overhead distribution wires and equipment leaving approximately 142,000 customers (18 percent of Toronto Hydro's total customer base) without power at the peak of the storm. While the majority of customers were restored within 48 hours, it took approximately 5 days and cost approximately $2.35 million to restore power to all customers."

QUESTION:

Has Toronto Hydro previous prepared any projections for anticipated costs to restore service for extreme weather events? If so, please provide those past projections so they may be compared to the actual cost incurred in the May 2022 case of extreme weather.

RESPONSE:

Toronto Hydro does not project costs for restoration from extreme events. Due to the inherent unpredictability in the frequency, magnitude and specific system impacts of such exceptional events, actual costs vary significantly based on factors outside the utility's control.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-25

References: Exhibit 2B, Section A3.5, Page 15
Exhibit 2B, Section D4.3, Page 13
Exhibit 2B, Section E3.2, Page 3
Exhibit 2B, Section E5.5, Page 6

Preamble:

"By the end of the decade, Toronto Hydro expects to have over 4,400 DER connection projects representing a total installed capacity of approximately 517 MW, an increase of approximately 67 percent compared to 2022"

"Based on the capacity planning process outlined above, Toronto Hydro proposes investments in various programs to meet the utility's fundamental obligation to connect new and expanded services to the grid in this decade and beyond. These programs include expansion to increase grid capacity and enhancements to better utilize existing equipment. Through programs such as Load Demand, Stations Expansion, and Horseshoe and Downtown Renewal, Toronto Hydro is renewing and enhancing stations, buses, feeders, and other equipment that will facilitate load growth at the appropriate locations. In areas where Toronto Hydro expects customers to connect more DERs, programs such as Grid Protection, Monitoring and Control alleviate short-circuit capacity constraints."

"Toronto Hydro's 2023-2029 DER connection and capacity forecast considers a combination of historical trends, project pipeline, economic environment, and the current energy policies at the time of the forecast. Total DER projects are expected to contribute a total increase of 67 percent to total installations, reaching nearly 4,500 connections by the end of 2029, as shown in Figure 2. This represents a total DER installed capacity of approximately 516.7 MW by the end of 2029 in comparison to the 304.9 MW installed as of the end of December 2022, depicted in Figure 3."

"Currently, three station buses have reached short circuit capacity limits and are not able to connect additional DERs. Toronto Hydro anticipates that a total of eight station busses will exceed short circuit capacity by 2029. To arrive at the projected constraints in Table 4, Toronto Hydro mapped its overall forecast of 2029 DER capacity onto station busses by assuming that the geospatial distribution of DERs will continue to follow existing load connection patterns."

QUESTION (A):

a) How does Toronto Hydro determine where to expect customers to connect more DERs?

RESPONSE (A):

Toronto Hydro uses historical data to forecast the likelihood of customer DER connection locations. The forecast incorporates generation types and pipeline information to model the probability of DER connections in specific station areas. Please refer to Exhibit 2B, Section E3 for more details on the DER forecast.

QUESTION (B) - (D):

b) Please describe how Toronto Hydro would act in the event that more customers want to connect DERs than Toronto Hydro expects in a particular area.

c) How will Toronto Hydro ensure that it is not picking certain neighborhoods, such as only those that have previously shown demand to connect DERs, at the expense of other neighbourhoods for being able to benefit from connecting DERs?

d) If a neighbourhood ends up having greater demand for connecting DERs in the future than Toronto Hydro has planned for, please describe the approach Toronto Hydro would take to service those customers?

RESPONSE (B) - (D):

On an annual basis, Toronto Hydro evaluates DER connection capabilities. This process utilizes the most up to date information to help aid in the planning process to address DER hosting capacity constraints and help improve Toronto Hydro's DER adoption rate. Please see Exhibit 2B, Section E3

for the proposed planned investments. If demand for DER connections increases in a particular area, the utility would take corresponding actions as outlined in the 2025-2029 Investment Plan under GPMC (Exhibit 2B Section E5.5) and/or provide alternative options to customers such as connection to areas where capacity is available. This is why Toronto Hydro would require the necessary flexibility to adapt and align its investment plans to specific and localized system needs.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-26

References: Exhibit 2B, Section C1, Page 1

Preamble:

"A key theme of the Ontario Energy Board's guidance is that utilities should align their investment plans with customer needs, and adopt an outcomes-based approach to tracking their performance."

QUESTION (A):

a) Since the shift to more people working from home during and after the pandemic, has Toronto Hydro changed its approach to tracking reliability performance data in any way to align with the needs of more customers working from home and needing reliable power at residential addresses during working hours? If so, how has Toronto Hydro's approach to tracking reliability performance data changed?

RESPONSE (A):

Toronto Hydro is undertaking a multi-year project to upgrade its Outage Management System ("OMS") with Oracle's Network Management System ("NMS"). As part of this project, the utility will introduce a commercial interruption tracking and analytics platform—Oracle's Utility Analytics ("OUA")—to track interruption and reliability performance information. Enhanced telemetry information from these systems will address the needs of our customers, particularly concerns related to reliability, by informing future decision-making in system and maintenance planning, as well as grid operation related activities. Toronto Hydro also anticipates that the ongoing roll-out of next generation smart meters with "last gasp" capabilities will eventually provide the additional

telemetry required to build more granular reliability analytics, including customer-specific reliability metrics.[1]

QUESTION (B):

b) Does Toronto Hydro track power outages of a few seconds or minutes (momentary interruptions) when compiling reliability performance data?

RESPONSE (B):

Toronto Hydro measures the frequency of momentary outages (less than one minute), excluding Major Event Days ("MEDs"). In accordance with the Ontario Energy Board's ("OEB's") Decision,[2] the utility reports its Momentary Interruption Frequency Index ("MAIFI") results on its 2020-2024 Custom Scorecard. Please refer to Exhibit 1B, Tab 3, Schedule 2 for the utility's historical performance.

QUESTION (C):

c) What is the minimum interruption time Toronto Hydro tracks when compiling Reliability Performance data?

RESPONSE (C):

Toronto Hydro tracks interruptions as prescribed by the OEB's Electricity Reporting and Record Keeping Requirements ("'RRR'"). As stated in the RRR, [3]

> *An "Interruption" means the loss of electrical power, being a complete loss of voltage, of a duration of one minute or more, to one or more customers, including planned interruptions scheduled by the distributor but excluding part power situations, outages scheduled by a*

[1] For further details about Toronto Hydro's smart meter investment plans, please refer to Exhibit 2B, Section E5.4.
[2] EB-2018-0165, Decision and Order (December 19, 2019) at page 50.
[3] Refer to OEB's Electricity Reporting & Recording Keeping Requirements for more information: https://www.oeb.ca/sites/default/files/RRR-Electricity-20230308.pdf

customer, interruptions by order of emergency services, disconnections for non-payment or power quality issues such as sags, swells, impulses or harmonics.

Please see Toronto Hydro's response to part (b) for momentary outages lasting less than one minute in duration. It's important to note momentary outages are not considered as interruptions.

QUESTION (D):

d) Are there any plans to change the tracked minimum interruption time with changing customer needs?

RESPONSE (D):

The minimum interruption time for reporting purposes is determined by the Regulator (the OEB) and not by the Distributor (Toronto Hydro). It should be noted that Canadian-based electricity utilities follow more stringent interruption reporting requirements compared to US-based utilities. For instance, the IEEE 1366 standard (followed by US utilities) defines sustained interruptions as interruptions that last more than five minutes. In contrast, Electricity Canada (formerly the Canadian Electricity Association) and the OEB use a criterion of one minute or more in duration.

QUESTION (E):

e) Does Toronto Hydro have a plan for reducing the frequency of momentary interruptions in service that may negatively impact customers working from home?

RESPONSE (E):

Toronto Hydro's System Renewal and Maintenance programs are designed to efficiently and proactively manage the risk of equipment failure and other causes of both momentary and sustained interruptions across the system to the benefit of all customers. The utility uses various leading indicators of future reliability performance (e.g. asset condition) in combination with historical performance trends and engineering judgement to identify the specific areas most in

need of investment. When specific feeders begin to exhibit poor performance, Toronto Hydro may also take short-term actions to provide relief through its Worst Performing Feeder segment.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-27

References: Exhibit 2B, Section C2.6, Page 14

Preamble:

"On average, between 2018 and 2022, defective equipment was the main contributor to SAIFI and SAIDI, at 27.5 percent and 36.2 percent, respectively. However, in 2020 and 2022, defective equipment was surpassed by unknown caused outages as the top contributor to SAIFI."

QUESTION (A) AND (B):

a) Does Toronto Hydro view it as a problem that the number of outages by unknown causes is increasing? If not, why not?

b) As Toronto Hydro's data shows the number of outages with unknown causes is increasing, does Toronto Hydro have a plan for improving its ability to diagnosing unknown causes in the future? If so, what is the plan? If there is no plan, why is there no plan to address this increasing problem?

RESPONSE (A) AND (B):

Toronto Hydro considers reliability metrics SAIDI and SAIFI more informative for evaluating underlying system performance than assessing performance solely based on the number of interruptions. Unknowns are typically short-duration, high-impact interruptions, transient in nature, and do not require a truck roll for restoration; instead, they are typically restored through SCADA-controlled devices. About two-thirds of interruptions lasting between 1 to 5 minutes are attributed to Unknown causes. Similarly, about half of interruptions lasting between 5 to 10 minutes are attributed to Unknown causes. The high percentage of Unknowns is likely attributed to a variety of factors, including Toronto Hydro's operating and protection practices. These practices are intended

to protect equipment and personnel, specifically related to circuit breaker protection settings and the issuance of Hold Offs[1] (including third-party tree trimming work).

Furthermore, operating authority for station feeder breakers within Toronto Hydro's territory is generally assigned to the transmitter (Hydro One) for equipment that is transmitter-owned. This includes operating authority over feeder circuit breakers at certain transformer stations in the Horseshoe region. In response to a trip of a feeder breaker under the operating control of the transmitter, the transmitter's control authority will contact the customer's control authority (Toronto Hydro). Communication between the two parties must be established, and when safe to do so, Toronto Hydro's control authority will request that the transmitter attempt a closure of the tripped circuit breaker. This process is further delayed if there are any hold-offs in effect for the affected feeder, as they would need to be surrendered before a reclose can be attempted.

While Toronto Hydro makes its best effort to investigate these events, it is not always possible to pinpoint the exact cause. The majority of these interruptions are usually non-permanent and self-clearing, stemming from potential causes including animal contacts, tree contacts, weather, and emerging equipment failures.

Nevertheless, Toronto Hydro leverages short interval control methods for the identification and mitigation of unknown interruptions. This includes, but is not limited to, performing fault localization analysis as part of an effort to identify problematic areas where past faults may have occurred in the distribution system. Targeted feeder patrols based on these fault localization results are conducted under the Corrective Maintenance program (see Exhibit 4, Tab 2, Schedule 4). The insights garnered from feeder patrols also aid in the identification of near-term corrective actions, as part of the Worst Performing Feeder program (see the Reactive and Corrective Capital program Exhibit 2B, Section E6.7). In addition, performing cable diagnostic testing is helping Toronto Hydro to improve the assessment of underground cables and cable accessories (see Exhibit 4, Tab 2, Schedule 2:

[1] When a hold-off is in effect on a line or other apparatus, it shall not be re-energized following an automatic trip until the holder surrenders the hold-off. It is a basic requirement of hold-off procedures that satisfactory communication be established and maintained with the holder of the hold-off.

Preventative and Predictive Underground Line Maintenance), which supports identifying the root cause of incipient cable faults.

Toronto Hydro notes that the SAIFI contribution from Unknown causes was down to 0.37 in 2023, which is lower than any year in the 2020-2022 period and more in line with performance from the 2015-2019 period.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-28

Reference: **Exhibit 2B, Section D4, Appendix A, Page 1**

Preamble:

"Government at all levels are implementing decarbonization policies, including GHG emission targets and incentives to encourage consumers to electrify their transportation and heating needs. Key policies and incentives include: Canada Greener Homes Grant provides up to $5,000 for electrified heating technologies such as heat pumps. This grant was introduced in December 2020 and is expected to stay in place for seven years."

QUESTION (A):

a) Has Toronto Hydro performed any analysis of the impacts on peak electricity demand in winter months for a sizable portion of residential customers converting their home heating to heat pumps? If not, why not?

RESPONSE (A):

Yes. The Future Energy Scenarios model includes electrified heating. Please see Exhibit 2B, Section D4, Appendix A and B for more information.

QUESTION (B):

b) Does Toronto Hydro presently expect the transition to heat pumps for home heating to have a material effect on peak electricity demand? If not, why not?

RESPONSE (B):

In the long-term, Toronto Hydro's view is that successful decarbonization of the energy system is very likely dependent upon the widescale adoption of heat pumps. This will ultimately have a material impact on peak electricity demand, including very likely the shift to a winter peak.

However, as illustrated by the Future Energy Scenarios, the extent and timing of the impact of heat pump adoption on peak electricity demand is highly uncertain, and dependent on many factors outside of Toronto Hydro's control.

QUESTION (C):

c) If significantly more residential customers install heat pumps in a particular area than Toronto Hydro has presently anticipated, how will this impact service reliability?

RESPONSE (C):

Toronto Hydro planning process is designed to support the maintenance and operation of a safe, stable and reliable grid. Toronto Hydro undergoes an annual update to its Peak Demand Forecast that reflects both emerging trends and updated planning assumptions. Toronto Hydro recognizes that the pathway through the energy transition is both uncertain and uneven with local needs and constraints becoming more evident before more regional needs are manifested. It is in recognition of that changing landscape, Toronto Hydro has approached the energy transition arming itself with new tools in its forecasting toolbox and increasingly sophisticated methods of understanding customer behaviour. For more information on Toronto Hydro's capacity planning approach to the energy transition, please refer to Exhibit 2B Section D4.2.

Toronto Hydro is also planning to invest in sensing technology that will provide useful data that will aid in determining load profiles at a level of granularity that will permit Toronto Hydro to respond to local system constraints in a targeted and cost-efficient manner. More information can be found under the system observability section of the Grid Modernization Strategy in Exhibit 2B Section D5.2.1.

If significantly more residential customers install heat pumps in a particular area, Toronto Hydro, through its normal planning process, will support the need by installing new transformers or upgrading existing transformers and other relevant infrastructure to ensure service reliability.

QUESTION (D):

d) Does Toronto Hydro have a plan in the event that significantly more customers install heat pumps in a particular area than anticipated?

RESPONSE (D):

Toronto Hydro used the Future Energy Scenarios to stress-test whether the utility's capacity plan can accommodate energy transition needs (e.g. building heating electrification) in the early part of the next decade. In an effort to adopt a proactive approach to managing forecasted local constraints, Toronto Hydro has outlined plans reflected in its Load Demand and Non-Wires Alternatives portfolio, to provide flexibility to adequately respond to local drivers that may result in capacity constraints. For more information on Toronto Hydro's Load Demand and Non-Wires Alternatives plans, please refer to Exhibit 2B Section 5.3 and 7.2 respectively.

While Future Energy Scenarios reveal that the impact of building electrification in the next two decades could be significant, there are notable differences (driven by policy, technology and consumer-behaviour choices) as to when and how building electrification could unfold. Due to this, Toronto Hydro acted with a higher degree of caution in terms of building new capacity to prepare the distribution grid for wide-scale building electrification in the next two decades, as the policy and consumer-behaviour drivers of this type of demand remain uncertain, and technology advancement could offer more cost-effective solutions in the future. Practically, this meant that Toronto Hydro decided to take a "wait and see approach" to investments in new capacity for accommodating wide-scale building electrification in the mid-2030s and beyond. For more information on Toronto Hydro's capacity plan, please refer to Exhibit 2B, Section D4.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-29

Reference: **Exhibit 2B, Section D4, Appendix A, Page 3**

Preamble:

"Consumer choices and behaviors regarding energy use are gradually changing. Activities that previously did not affect the electricity system (including fueling vehicles and space heating) now have the potential to change electricity consumption patterns and shift system peaks. For example, residential and fleet EV charging could create new system needs like real-time voltage control to support a sharp rise from morning and/or afternoon charging on a scale similar to that created by air conditioning demand on hot summer days. Additionally, as heating systems are electrified (e.g. heat pumps), electricity system peaks can shift from summers to winters."

QUESTION (A):

a) Are the demands on service areas expected to vary depending on whether the area has more residential EV charging activity vs fleet or commercial EV charging activity?

RESPONSE (A):

Various classes of electric vehicle charging infrastructure will have differing impacts on the grid due to their distinct demand profiles. The aggregate demand effect of EVs in a specific service area will depend on the amount of EV charging infrastructure of all types. For fleet/commercial charging in particular, the impact will further depend on the specific charging needs of each particular location (i.e., overall size, type of commercial activity, scheduled charging, etc.).

QUESTION (B):

b) Does Toronto Hydro have any projections for what areas of the city are likely to experience increases in fleet or commercial EV charging vs residential EV charging?

RESPONSE (B):

EV load was modelled with three vehicle classes: light-duty, medium-duty, and heavy-duty. For all EV classes, load was allocated geographically based on the existing distribution of EVs in the City of Toronto.

QUESTION (C):

c) Has Toronto Hydro identified areas in the city that require infrastructure upgrades to support projected EV charging needs?

RESPONSE (C):

EV charging needs are integrated within Toronto Hydro's Peak Demand Forecast, which is the primary basis for the investment plans outlined in the Stations Expansion (Exhibit 2B, Section E7.4) and Load Demand (Exhibit 2B, Section E5.3) programs.

QUESTION (D):

d) How will Toronto Hydro ensure that it does not pick certain neighbourhoods to provide sufficient capacity for future EV charging but not other neighbourhoods?

RESPONSE (D):

Capacity planning (and capital expenditure planning in general) is a dynamic process. Toronto Hydro regularly monitors system capacity needs and makes necessary adjustments to its plan to ensure investments are targeted at the right areas at the right time. The utility updates its 10-year Peak Demand Forecast annually and leverages this as part of the annual Investment Planning & Portfolio Reporting process, where priorities are re-evaluated and adjustments made as needed.

In addition, to further enhance its ability to anticipate and address the highly localized impacts of EV proliferation expected in the next decade, Toronto Hydro is planning to invest in enhanced forecasting, scenario analysis, and predictive analytics capabilities for system planning. Please refer to Exhibit 2B, Section D5.2.3.3 and Section D5.3.7.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-27

Reference: This plan continues the utility's effort to renew a significant backlog of deteriorated and obsolete assets at risk of failure, and to adapt to the continuously evolving challenge of serving and operating within a dense, mature, and growing major city. [DSP Page 1]

QUESTION (A):

a) Please explain what criteria (e.g. age or field condition assessment), data (e.g. how many assets have up-to-date field assessment information in the asset management system) and (system) approach (e.g. is this just harvesting statistical data from the asset management system, asset life statistic or using a different approach) THESL is using to determine that there is a large list of assets that are deteriorated and obsolete.

RESPONSE (A):

Toronto Hydro relies on a variety of data sources and approaches within its Asset Management System ("AMS") to manage its distribution system effectively and to maximize the value delivered by its assets. Toronto Hydro relies on both condition and age as key indicators of its asset demographics to determine the level of asset deterioration. Toronto Hydro also has a number of legacy asset types and system configurations that are functionally obsolete. These legacy assets pose elevated reliability, environmental and safety risks to the distribution system and personnel.

Toronto Hydro implements maintenance programs, outlined in Exhibit 4, Tab 2, Schedule 1 to 4, to identify and address system risks. Inspections play a crucial role in supplying the necessary data to pinpoint assets that are deteriorated or obsolete. Such information, including the detection of oil leaks or any other signs of equipment wear, is vital to manage the health of its assets.

Toronto Hydro also leverages a number of tools and system analytics to determine the probability and consequence of failure that underpin risk analyses for its assets. Please refer to Exhibit 2B, Section D3.2.1 for a detailed discussion on the key data sources and tools that Toronto Hydro relies on to manage it distribution system. For details on how these tools and approaches were leveraged to develop the proposed capital expenditure plan for the 2025-2029 period, please refer to Exhibit 2B, Section E2. For a comprehensive discussion on expected asset demographic changes over the 2025-2029 period, please refer to 2B-SEC-44.

QUESTION (B):

b) Please explain what (number & percent of total) of deteriorated and obsolete assets THESL addressed in the most recent rate period (2020-2024, or per data available) and how this helped reduce the burden for the new rate period (2025-2029). What residual number of deteriorate and obsolete assets remain.

RESPONSE (B):

Toronto Hydro does not maintain comprehensive historical records of the condition of its assets at the time that they were replaced. The challenge of maintaining precise and thorough records of the condition of replaced assets arises from limitations within the current information systems.

At the system level, Toronto Hydro has included a comparative analysis and discussion of its asset demographics in 2018, prepared as part of the last rate application, against the current condition demographics in Exhibit 2B, Section E2.2.1.1. Both condition and age demographics indicate a need for continued investment to manage asset deterioration.

In regards to obsolete assets, Toronto Hydro continues to manage a number of legacy assets and configurations within its system. These legacy designs typically consist of outdated components that lack available supplier support, require specialized labor to support maintenance, repair, or replacement, and present increased risks to reliability, safety, or the environment. Exhibit 2B, Section

E6 details a number of legacy and obsolete assets or configurations, including Toronto Hydro's 2020-2024 performance and the proposed approach for 2025-2029, specifically:

- Rear Lot Configuration (E6.1 Area Conversions)
- Box Construction (E6.1 Area Conversions)
- Direct Buried Cables (E6.2 Underground System Renewal – Horseshoe)
- Lead Covered Cables (E6.3 Underground System Renewal – Downtown)
- 4.16kV Feeder Lines (E6.2 Underground System Renewal – Horseshoe and E6.5 Overhead System Renewal)
- Non-submersible Network Units (E6.4 Network System Renewal)
- Electromechanical Relays (E6.6 Stations Renewal)

In addition, Toronto Hydro eliminated legacy Automatic Transfer Switches ("ATS") and Reverse Power Breakers ("RPB") through its Network System Renewal program during the 2020-2024 rate period.

QUESTION (C):

c) Please describe how THESL prioritizes which assets to replace against the list of deteriorated and obsolete assets.

RESPONSE (C):

Toronto Hydro's AMS, detailed in Exhibit 2B, Section D1 highlights the key processes that Toronto Hydro relies on to manage its assets. As indicated in Section D1.2.1.2, Toronto Hydro performs an Asset Needs Assessment that allows it to identify and prioritize its asset sustainment needs. Toronto relies on a Condition Based Risk Framework based on Asset Condition Assessments ("ACA") as well as assets past useful life and consideration of potential consequence of failures to guide its decision. Once asset level needs are identified, system planners combine this with additional information such as capacity constraints and other system planning drivers to develop scopes of work, targeting areas to maximize the overall benefit to the system, as detailed in Exhibit 2B, Section D1.2.2. Please see response to 2B-SEC-44 for additional discussion regarding asset replacement and pacing decisions.

QUESTION (D):

d) Please explain how THESL's proposal to increase the service life of assets (some up to double the current value per the Concentric Report) was taken into account when determining that assets are already deteriorated and obsolete.

RESPONSE (D):

The proposal to increase the service life of assets (based on the Concentric report) primarily effects the useful life assumptions used for the purposes of calculating depreciation. Toronto Hydro also leveraged the Concentric report to review mean useful life values used for the purpose of producing asset management metrics (such as the high-level Assets Past Useful Life ("APUL") metric). However, the changes for these asset management parameters were comparatively minor and are accounted for in the APUL values provided. Please see response to 2B-Staff-129 and 2B-Staff-131 for more information.

QUESTION (E):

e) Would increasing the asset life decrease the number of assets considered beyond their asset life based on current values? If not, why not?

RESPONSE (E):

In general, increasing asset life will decrease the number of assets considered to be beyond their service life to some extent (depending on the age distribution of the asset class). Please see response to part (d) for more information on how the updated depreciation lives relate to asset management.

It is important to note that Toronto Hydro never replaces an asset simply because it has crossed a threshold where it is now "beyond useful life." Furthermore, even in situations where the advanced age of an asset is an important consideration, the utility does not prioritize replacement on the basis of age alone. Factors including (but not limited to) detailed maintenance records, asset condition assessment, reliability, criticality (i.e., consequence of failure), resourcing, and cost are important

considerations when developing capital projects. For more information, please see response to 2B-SEC-44.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-28

Reference: Exhibit 2B, Page 2

Preamble:

Through an outcomes-oriented, customer-focused integrated planning process, this plan was designed to achieve balance between price and service quality performance both in the near-and longer-term, while readying the grid with least regrets investments to serve the needs of an increasingly electrified economy. [DSP Page 2]

QUESTION (A):

a) Please provide details on the tools, plans or documents that THESL is using to identify metrics/outcome and gauge progress against there over the longer term (i.e. across rate terms and out to 2030/2050).

RESPONSE (A):

Toronto Hydro's Asset Management System ("AMS") outlines the processes it relies on to plan, prioritize, and optimize its expenditures to deliver on key outcomes in alignment with corporate goals and objectives, while creating value to its customers. Toronto Hydro relies on its AMS, specifically its Integrated Planning and Portfolio Reporting ("IPPR") process, to monitor progress and refine its plan on a continuous basis. Toronto Hydro's AMS and associated processes are detailed in Exhibit 2B, Section D1. As part of the AMS, Toronto Hydro relies on a number of key analyses and tools to support its decision-making process and to optimize its asset lifecycles, which are detailed in Exhibit 2B, Section D3. Toronto Hydro leveraged its AMS and related tools to develop its Distribution System Plan for the 2025-2029 period, the details of this planning process are included in Exhibit 2B, Section E2.

QUESTION (B):

b) Please provide an documents THESL has to indicate where it currently is against its long-term outcome-oriented objectives and where it expects to be by the end of the new rate period (end of 2029).

RESPONSE (B):

Toronto Hydro proposed a number of outcome-oriented objectives and measures as part of its Performance Incentive Mechanism ("PIMs") along with its commitments for these measures by the end of the 2025-2029 rate period, which are detailed in Exhibit 1B, Tab 3, Schedule 1.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-29

Reference: Exhibit 2B, Figure 2: Percentage of Assets Past Useful Life

QUESTION (A):

a) Please provide the number of assets against the percentages included in Figure 2. If the detailed breakdown is available in evidence filed already, please provide the reference.

RESPONSE (A):

Please see Table 1 below for the number of assets contributing to the percentages in Figure 2, Exhibit 2B, Section A.

Table 1: Asset Count for Assets Past Useful Life – 2023

	Non-Linear Assets (Units)	Linear Assets (km)
Additional Assets to Reach Useful Life by 2030	298,632	2,637
Assets at End of Useful Life by 2023	473,316	4,363
Assets Not at End of Useful Life	427,829	33,511

QUESTION (B):

b) Please provide the equivalent pie chart, percentages and units underlying the percentages for 2020 information (the start of the current rate period, or as close as possible based on information available).

RESPONSE (B):

Please see Figure 1 below containing the assets at and past useful life for 2020.

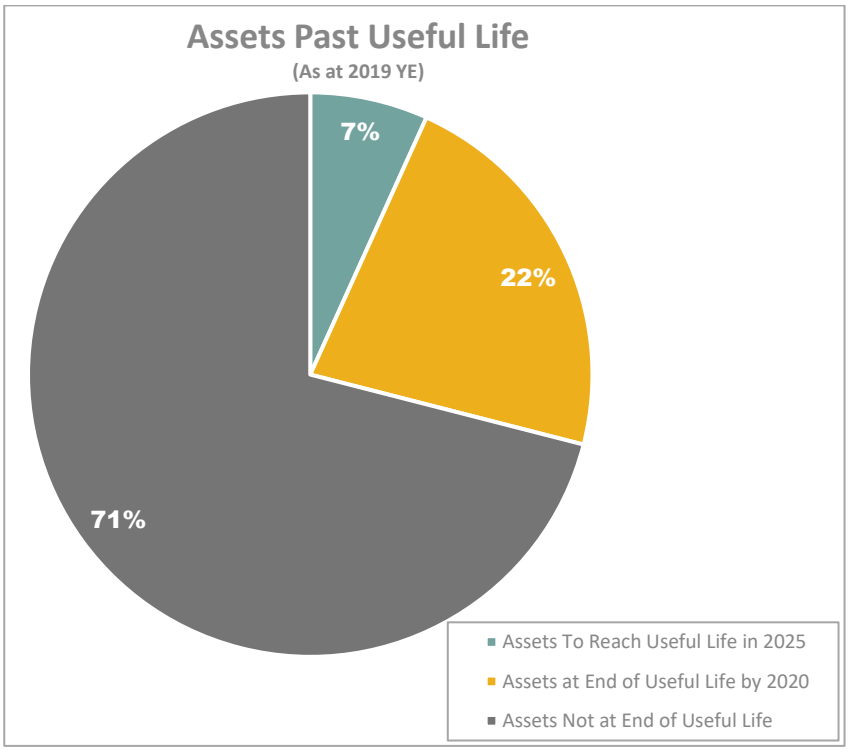

Figure 1: Assets Past Useful Life for 2020

Please see Table 2 below for the number of assets contributing to the percentages for Figure 1 above.

Table 2: Asset Count for Assets Past Useful Life – 2020

	Non-Linear Assets (Units)	Linear Assets (km)
Additional Assets to Reach Useful Life by 2025	601,229	1,125
Assets at End of Useful Life by 2020	50,578	3,572
Assets Not at End of Useful Life	362,818	35,270

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-30

Reference: Exhibit 2B, Page. 27, Footnote 42
PollutionProbe_IR_AppendixB_Assessment-of-IESO-Pathways-to-Decarbonization

QUESTION (A):

a) One of the references used by THESL is the Enbridge Pathways to Net Zero Report prepared by Guidehouse. There were 3 versions of the report issued in support of EB-2022-0200 Phase 1 and there was general consensus that the report over-estimated electrification costs and facilities, while under-estimating gas costs and facilities. Please confirm what analysis THESL did (if any) to validate or adjust for the residual errors in that report.

RESPONSE (A):

Toronto Hydro did not rely upon the Enbridge Pathways to Net Zero Report in the development of its proposals in this rate application. The utility has not undertaken a detailed analysis of the study.

QUESTION (B):

b) THESL references the IESO Pathways to Decarbonization Report and there has been recent analysis and reports that provide an objective assessment and a focus on the alignment of that study with municipal climate action plans. An example is included as Appendix B noted above. Please provide copies of any analysis THESL did (if any) to validate what was in the IESO report. Please also provide what consideration THESL has given to the Assessment-of-IESO-Pathways-to-Decarbonization Report.

RESPONSE (B):

Toronto Hydro did not rely upon the IESO Pathways to Decarbonization Report to develop its proposals in this rate application, nor has the utility undertaken a detailed analysis of the study.

As to the "Assessment-of-IESO-Pathways-to-Decarbonization Report," Toronto Hydro has not reviewed this report in detail and understands the focus of the report to be the IESO's provincial pathways study as opposed to local distribution system planning. As discussed in Exhibit 2B, Section D4, Municipal Energy Plans are one of several key elements of peak demand forecasting and capacity planning that Toronto Hydro enhanced for the 2025-2029 period.

QUESTION (C):

c) If the information outlined in the Assessment report were applied, please confirm that a lower amount of capital investment would be required. If not correct, please explain.

RESPONSE (C):

As noted in response to part (b), Toronto Hydro has not reviewed the referenced report in detail and is unsure about which elements of the report Pollution Probe believes would result in lower capital investment needs.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-31

Reference: Exhibit 2B, Section B, Needs Assessment Report

QUESTION (A):

a) The Technical Working Group for the Needs Assessment only included utilities. Please explain why no other stakeholders such as the City of Toronto were included in the TWG.

RESPONSE (A):

Please refer to Toronto Hydro's response to 2B-PP-33 part (b).

QUESTION (B):

b) THESL's application and related evidence relies heavily on funding/actions THESL believes are needed to meet customers' needs from the Energy Transition and City of Toronto Net Zero by 2040 objectives. The Needs Assessment, RIP and Infrastructure Plan include needs and recommendations only for traditional poles-and-wires solutions. Please reconcile this discrepancy between the poles-and-wires recommendations and the THESL application which highlights a broader plan.

RESPONSE (B):

As described in detail in Exhibit 2B, Section B, Regional Planning focuses on the facilities that provide electricity to transmission-connected customers such as distributors and large directly-connected customers, which typically includes the transformer stations that supply the load and the transmission circuits between the stations. It also includes the 115 kV and 230 kV auto-transformers and their associated switchyards. From a resource perspective, regional planning considers local distributed generation, Conservation and Demand Management ("CDM"), as well as other forms of

Non-Wires Solutions ("NWS") that could be developed to address supply and reliability issues in a region or local area.[1]

While Regional Planning was an input to Toronto Hydro's capital plans, as the local distributor, Toronto Hydro is responsible for assessing its capacity needs and ensuring reliability across the entire distribution system, down to the more granular elements of the system, such as substation buses and feeders. It is at this more granular level of distribution need that the proposed use of non-wires alternatives were considered and applied where appropriate. Please refer to Exhibit 2B, Section E7.2 and the responses to interrogatory 1B-Staff-88 and 1B-Staff-89 for more information about the targeted use of non-wires solutions in the next rate period.

QUESTION (C):

c) Please explain how THESL's application (and in particular the DSP and Capital Plan) will deliver on needs and recommendations outlined in the Needs Assessment and subsequent documents [Integrated Regional Resource Plan (IRRP) and Regional Infrastructure Plan (RIP)] that resolve the recommendations from the Needs Assessment.

RESPONSE (C):

As described in Exhibit 2B, Section E7.4 (updated January 29, 2024), Toronto Hydro's proposed plan and investments align with Hydro One's 2022 Needs Assessment and 2020 RIP.

QUESTION (D) AND (E):

d) Please describe how (if at all) Non-Wires Solutions (including DERs) will be included in the current cycle of planning, such as the

- Needs Assessment
- Scoping Assessment

[1] The Toronto Region Integrated Regional Resource Planning (IRRP) process is currently underway under the IESO's leadership. Planning activities include forecasting the expected growth in electricity demand for 25 years, and evaluation conservation, distributed generation, and transmission and distribution investments to meet future customer needs in the Toronto Region.

- Integrated Regional Resource Plan (IRRP); and
- Regional Infrastructure Plan (RIP)

e) Please describe how (if at all) stakeholder input (including the City of Toronto) will be identified and included in the current cycle of planning, such as the

- Needs Assessment
- Scoping Assessment
- Integrated Regional Resource Plan (IRRP); and
- Regional Infrastructure Plan (RIP)

RESPONSE (D) AND (E):

Please refer to Exhibit 2B, Section B3.2 at pages 6-9 for details on whether and how non-wires solutions are considered in as well as a list of the stakeholders participating at each stage of the Regional Planning process.

QUESTION (F):

f) Please explain how Non-Wire Solutions (including DERs) can be considered and implemented instead of poles-and-wires solutions when they were not included in the regional planning exercise and related reports.

RESPONSE:

Please see the answer to parts (b) and (d).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-32

Reference: n/a

The previously Toronto RIP was completed in March 2020 and was filed. However, the updated IRRP and RIP are currently in progress. The Toronto RIP for the current cycle is scheduled for completion in March 2025 based on the Needs Assessment completed December 2022 and the Scoping Assessment report in March 2023.

Based on the updates in progress, please outline what significant changes are expected from the 2020 RIP and what impact it could have on the 2025-2029 period and beyond.

RESPONSE:

The IESO's Integrated Regional Resource Plan ("IRRP") planning process is currently underway; however, the assessment of needs for this cycle has yet to be undertaken by the IRRP Technical Working Group. As a result, it is not yet possible to provide the requested information.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-33

Reference: Exhibit 2B, Section B, Appendix E, Scoping Assessment Outcome Report dated March 21, 2023

QUESTION (A):

a) The Scoping Report indicates that "The implementation of recommendations from the previous planning cycle should continue". Would locking poles-and-wires recommendations in from the previous planning cycle provide a barrier to more current solutions such as DERs? If not, why not.

RESPONSE (A):

The Toronto Region is currently undergoing its IRRP, which will take both wires and non-wires solutions into consideration. At the end of that process, the optimal solution(s) will be selected.

QUESTION (B):

b) Would THESL support City of Toronto being a member of the Technical Working Group? If not, why not.

RESPONSE (B):

Toronto Hydro strongly supports the City of Toronto's involvement in regional energy planning in the Toronto region. Active involvement is not dependent on participating on the Technical Working Group. Toronto Hydro was active in the OEB's Regional Planning Process Advisory Group (RPPAG), and endorses its Report to the OEB dated December 7, 2022, including its emphasis on drawing municipalities and municipal information into the regional planning process. The RRPAG report does not recommend that Technical Working Groups be expanded beyond the IESO, transmitters, and distributors.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-34

Reference: Exhibit 2B, Section D4.1.1.4 Electric Vehicle Demand Driver Analysis

QUESTION (A):

a) Figure 1 is called "Peak Demand Forecast" but appears to be just the forecasted number of EVs. Please confirm why the term 'peak' was used.

RESPONSE (A):

Toronto Hydro confirms Figure 1 refers to the number of EVs used in the System Peak Demand Forecast. The term 'peak' was used to represent the system peak demand forecast inclusive of EV volumes.

QUESTION (B):

b) Please confirm how the number of EVs forecasted is translated into system peak demand forecast and how the following adjustments are factored in.
   - Off-peak Ultra Low EV charging rates (migrating to off peak)
   - Consumer choice and behaviour to charge off peak
   - DER integration or programs to decrease peak load or increase local generation.

RESPONSE (B):

Toronto Hydro considered the impact of managed versus unmanaged EV charging, as well as the impact of Off-peak Ultra Low EV charging rates, in the updated System Peak Demand forecast which was filed on January 29, 2024. Please see 2B-SEC-61 for more information about this update. With respect to DER integration or programs please see Toronto Hydro's responses to 1B-PP-07.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-35

Reference: Exhibit 2B, Section D4, Figure 4

QUESTION (A):

a) Please provide the numbers underlying the Figure 4.

RESPONSE (A):

Table 1: Toronto Hydro System Peak Demand Forecast by Driver (%)

Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Base Forecast	99%	99%	98%	97%	95%	94%	92%	92%	91%	89%
Electric Vehicle	0%	0%	0%	1%	1%	1%	2%	2%	2%	3%
Electrified Transit	0%	0%	0%	0%	1%	2%	2%	2%	2%	2%
Municipal Energy Plans	0%	0%	0%	0%	0%	0%	1%	1%	1%	2%
Data Centres	1%	1%	1%	2%	3%	3%	3%	3%	4%	4%

QUESTION (B):

b) Figure 4 appears to forecast EV as increasing demand only rather than EVs being a potential DER resource. Please provide details on how THESL plans to leverage EVs to benefit the system over the rate period and beyond.

RESPONSE (B):

Please refer to the response to interrogatory 2B-ED-11(i).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-36

Reference: Exhibit 2B, Section D4, Appendix B, Future Energy Scenarios, Report by Element Energy

QUESTION (A):

a) Was the Future Energy Scenario Report peer reviewed? If yes, please provide a list of participants and their feedback.

RESPONSE FROM ERM (A):

No.

QUESTION (B):

b) Please provide a list of the stakeholders consulted or stakeholders otherwise part of the information input, modeling inputs and/or report development process.

RESPONSE FROM TORONTO HYDRO (B):

The following external stakeholders were engaged as part of the information input stage: City of Toronto, Toronto Transit Commission, and Plug'N Drive. Internally, Toronto Hydro formed a steering committee to guide the development of the project, which consisted of subject matter experts across the organization.

QUESTION (C):

c) Please provide the source of information and related references for each row in Table 1: Technology uptake scenarios

RESPONSE FROM ERM (C):

Table one of Exhibit 2B, Section D4, Appendix B is provided as a summary of decisions and choices that indicate the relative make-up of each of the technology uptake scenarios. In-report referencing is detailed throughout the report. For example, the details for each of the parameters (including sources of information and related references) for "Core Demand", "Low-Carbon Transport", and "Decarbonized Heating" are detailed in sections 4.1, 4.2, and 4.3 respectively. The sources of information and related references for each parameter can be found in the summary table below.

Table 1: Net Zero by 2050 Parameter

Parameter	Reference(s)
Net zero by 2050?	Modeling decision based on Element Energy expertise and agreed scenario narrative

Table 2: Core Demand Parameters

Parameter	Reference(s)
Electrical efficiency	• ENERGY STAR, 2022, ENERGY STAR 2022 Most Efficient, available from: https://www.energystar.gov/products/most_efficient • Natural Resources Canada, 2000-2018, Energy Efficiency Trends Analysis Tables, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/analysis/tables.cfm • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • 2018 CDM data provided by Toronto Hydro • Natural Resources Canada, 2015, 2015 Survey of Household Energy Use, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/sheu/2015/tables.cfm *Residential Sector Canada Table 37: Appliance Stock by Appliance Type and Energy Source* • Natural Resources Canada Comprehensive Energy Use Database (2000 – 2018) | Commercial/Institutional Sector – Ontario • Natural Resources Canada, Canada-wide Energy Use Database (2000 – 2018) | Total End-Use Sector - Energy Use Analysis

Parameter	Reference(s)
	• Toronto Public Health, Protecting Vulnerable People from Health Impacts of Extreme Heat, July 2011
Building stock growth	• City of Toronto, 2016, Neighbourhood profiles, available from: https://open.toronto.ca/dataset/neighbourhood-profiles/ • City of Toronto, 2016, Ward Profiles, 2014-2018 Wards, available from: https://open.toronto.ca/dataset/ward-profiles-2014-2018-wards/ • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Natural Resources Canada, 2000-2018, 2015 Survey of Household Energy Use (SHEU-2015) Data Tables, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/sheu/2015/tables.cfm • City of Toronto, 2022, Data requested through Toronto Hydro • Growth Scenario GP 2012NH used (Provincial Growth Plan 2013) • Watson & Associates Economists Ltd , 2008 - City of Toronto 2008 Development Charge Background Study (Recommended by City of Toronto) • City of Toronto, 2022, Data requested through Toronto Hydro • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Watson & Associates Economists Ltd , 2008 - City of Toronto 2008 Development Charge Background Study (Recommended by City of Toronto) • City of Toronto, About Toronto Neighbourhoods, 2022. *Note that since the time of analysis, some neighbourhoods have been split up because of very high population growth. Effective after April 12, 2022, the number of neighbourhoods in Toronto is 158.* • North American Industrial Classification System NAICS & SIC Identification Tools | NAICS Association • Toronto Data Management Group, Traffic Zones Boundary Files, 2006 (Toronto Hydro's network area covers 677 traffic zones). • City of Toronto, SmartTrack Stations Program, 2021

1

2 **Table 3: Low Carbon Transport Parameters**

Parameter	Reference(s)
Cars and light trucks	• Element Energy, 2022, Electric vehicle Consumer Choice model (ECCo). • Element Energy, 2022, Cost & Performance model • Canada Energy Regulator, 2021, Canada's Energy Future 2021, available from: https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/

Parameter	Reference(s)
	• City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Ontario vehicle population data, 2016, available from: https://data.ontario.ca/en/dataset/vehicle-population-data/resource/c61643a9-8338-47c9-b0a8-00f7c6298d05 • Statistics Canada vehicle registration data, 2015-2019, available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310006701&pickMembers%5B0%5D=1.7&cubeTimeFrame.startYear=2015&cubeTimeFrame.endYear=2019&referencePeriods=20150101%2C20190101 • Element Energy, 2015, Consumer survey of 2,000 new car buyers in Great Britain • Government of Canada, Incentives for Zero-Emissions Vehicles (iZEV), April 2022 • Statistics Canada, New zero-emission vehicle registrations, January 2022 • Bloomberg NEF, Electric Vehicle Outlook, 2021 • Element Energy and WSP Parsons Brinckerhoff, Plug-in electric vehicle uptake and infrastructure impacts study, 2016 • Element Energy, Electric Vehicle Charging Behaviour Study, 2019 • Statistics Canada, 2021 Census of population, 2021 • Toronto Metropolitan University, Household car ownership, 2018 • City of Toronto Open Data Portal, Land use zoning by-law, 2022
Medium / heavy trucks and Buses	• High targets: Californian Air Resource Board, available from: https://afdc.energy.gov/laws/12473 • Medium targets: Government of Canada, Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles Program, July 2022 • Element Energy, 2022, HGV Cost & Performance model • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Ontario vehicle population data, 2016, available from: https://data.ontario.ca/en/dataset/vehicle-population-data/resource/c61643a9-8338-47c9-b0a8-00f7c6298d05 • Statistics Canada vehicle registration data, 2015-2019, available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310006701&pickMembers%5B0%5D=1.7&cubeTimeFrame.startYear=2015&cubeTimeFrame.endYear=2019&referencePeriods=20150101%2C20190101 • Element Energy work for HGV vehicle operators • Toronto Transit Commission, 2022, TH Connection Assessment tracking • Element Energy, 2022, HGV Cost & Performance model • Toronto Transit Commission, 2022, TH Connection Assessment tracking • Element Energy work for bus operators

Parameter	Reference(s)
	• Toronto Transit Commission, Service Summary 2021, January 2022 • Toronto Transit Commission, TTC Green Initiatives, 2022 • Element Energy for Transport & Environment, Battery electric HGV adoption in the UK: barriers and opportunities, November 2022
Rail	• Metrolinx, 2022, Greater Toronto Region Projects, available from: https://www.metrolinx.com/en/greaterregion/projects/default.aspx • Toronto Transit Commission, 2019, Line 1 Capacity Requirements - Status Update and Preliminary Implementation Strategy (For Action), available from: https://ttc-cdn.azureedge.net/-/media/Project/TTC/DevProto/Documents/Home/Public-Meetings/Board/2019/April_11/Reports/18_Line_1_Capacity_Requirement_and_Preliminary_Implementatio.pdf?rev=812341c5088e48fa8a0bc0d7e68ff199&hash=01979E9C12FC9BAE9B9CE8B70D026760 • The City of Toronto, Transit Expansion, June 2022
Smart charging / V2G	• fleetcarma, 2021, Charge the North, available from: https://fncdn.blob.core.windows.net/web/1/smart-transport-resources/charge-the-north-results-from-the-worlds-largest-electric-vehicle-charging-study.pdf • Previous analysis conducted by Element Energy • Element Energy, V2GB – Vehicle to Grid Britain Requirements for market scale-up (WP4), June 2019 • Bauman, J. et. al., Residential Smart-Charging Pilot Program in Toronto: Results of a Utility Controlled Charging Pilot, June 2016 • IAEE, Driver Experiences with Electric Vehicle Infrastructure in Ontario, Canada and the Implications for Future Policy Support, Fourth Quarter 2020

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2 **Table 4: Decarbonized Heating Parameters**

Parameter	Reference(s)
Heat pump	• Natural Resources Canada, 2021, Canada Greener Homes Grant, available from: https://www.nrcan.gc.ca/energy-efficiency/homes/canada-greener-homes-grant/23441 • Canada Energy Regulator, 2021, Canada's Energy Future 2021, available from: https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/ • International Energy Agency, 2021, Are renewable heating options cost-competitive with fossil fuels in the residential sector?, available from: https://www.iea.org/articles/are-renewable-heating-options-cost-competitive-with-fossil-fuels-in-the-residential-sector
Thermal efficiency	• Natural Resources Canada, 2000-2018, Comprehensive Energy Use Database, Residential Sector, Ontario, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive/trends_res_on.cfm

Parameter	Reference(s)
	• Efficiency Canada & Carleton University, 2021, Canada's Climate Retrofit Mission, available from: https://www.efficiencycanada.org/wp-content/uploads/2021/06/Retrofit-Mission-FINAL-2021-06-16.pdf • City of Toronto, 2021, TransformTO Net Zero Strategy, https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • City of Toronto, 2021, Net Zero Existing Buildings Strategy, https://www.toronto.ca/wp-content/uploads/2021/10/907c-Net-Zero-Existing-Buildings-Strategy-2021.pdf • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Natural Resources Canada, 2000-2018, Energy Efficiency Trends Analysis Tables, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/analysis/tables.cfm • City of Toronto, 2021, Net Zero Existing Buildings Strategy, available from: https://www.toronto.ca/wp-content/uploads/2021/10/907c-Net-Zero-Existing-Buildings-Strategy-2021.pdf • Efficiency Canada & Carleton University, 2021, Canada's Climate Retrofit Mission, available from: https://www.efficiencycanada.org/wp-content/uploads/2021/06/Retrofit-Mission-FINAL-2021-06-16.pdf
Gas heating in 2050	• The Independent Electricity System Operator, Pathway to Decarbonization – Assumptions for Feedback, March 2022 • The Canadian Gas Association, Potential Gas Pathways to Support Net Zero Buildings in Canada, October 2021 • Modeling decision based on Element Energy expertise and agreed scenario narrative
Gas grid availability	
Gas grid composition	

1

2 **Table 5: Distributed Generation Parameters**

Parameter	Reference(s)
Solar PV	• Canada Energy Regulator, 2021, Canada's Energy Future 2021, available from: https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/ • National Renewable Energy Laboratory, 2021, Solar Futures Study, available from: https://www.nrel.gov/analysis/solar-futures.html • Independent Electricity System Operator, microFIT Program, available from: https://www.ieso.ca/en/Get-Involved/microfit/news-overview • Government of Canada, 2020, Photovoltaic potential and solar resource maps of Canada, available from: https://www.nrcan.gc.ca/our-natural-resources/energy-

Parameter	Reference(s)
	sources-distribution/renewable-energy/solar-photovoltaic-energy/tools-solar-photovoltaic-energy/photovoltaic-potential-and-solar-resource-maps-canada/18366 • Ontario Energy Board, Historic electricity Rates, 2022, available from: https://www.oeb.ca/consumer-information-and-protection/electricity-rates/historical-electricity-rates • Rapid Shift, Solar carports: how do they work and how much do they cost?, available from: http://www.rapidshift.net/solar-carports-how-do-they-work-and-how-much-do-they-cost/ • Solar Electricity Supply, Inc. Commercial Solar Carports: Carport Mounted Shade Structure Solar Systems for Commercial PV Applications, available from: https://www.solarelectricsupply.com/commercial-solar-systems/solar-carport • Alternative Energy, How Much Do Solar Carports Cost?, available from: https://powersolarphoenix.com/carport-solar-panels-cost/ • Government of Canada, Canada Greener Homes Grant, available from: https://www.nrcan.gc.ca/energy-efficiency/homes/canada-greener-homes-grant/23441 • Independent Electricity System Operator, Capacity Auction, 2022, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Capacity-Auction • Data provided by Toronto Hydro • Independent Electricity System Operator, Active Generation Contract List, available from: https://www.ieso.ca/en/Power-Data/Supply-Overview/Distribution-Connected-Generation • City of Toronto, Toronto Green Standard, available from: https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/ • City of Toronto, 2018, Forest and Land Cover, available from: https://open.toronto.ca/dataset/forest-and-land-cover/ • City of Toronto, 2021, 3D Massing, available from: https://open.toronto.ca/dataset/3d-massing/ • City of Toronto, 2019, Physical area of parking lots, available from: https://open.toronto.ca/dataset/3d-massing/ • Google Insights, Environmental Insights Explorer, available from: https://insights.sustainability.google/places/ChIJpTvG15DL1IkRd8S0KlBVNTI • City of Toronto, SolarTO, available from: https://www.toronto.ca/services-payments/water-environment/environmental-grants-incentives/solar-to/ • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/

Parameter	Reference(s)
	• National Renewable Energy Laboratory, 2021, The North American Renewables Integration Study (NARIS): A Canadian Perspective, available from: https://www.nrel.gov/analysis/naris.html
Onshore wind	• Data provided by Toronto Hydro • City of Toronto, 2018, Forest and Land Cover, available from: https://open.toronto.ca/dataset/forest-and-land-cover/ • Mackay, D., 2008, Sustainable Energy - Without the Hot Air, available from: https://www.withouthotair.com/ • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/
Biogas	• Data provided by Toronto Hydro • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • City of Toronto, Turning Waste into Renewable Natural Gas, available from: https://www.toronto.ca/services-payments/recycling-organics-garbage/solid-waste-facilities/renewable-natural-gas/ • The Department for Business, Energy, and Industrial Strategy, 2017, Hybrid Heat Pumps, available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700572/Hybrid_heat_pumps_Final_report-.pdf • Ontario Clean Air Alliance, 2021, Ontario Municipalities that have endorsed gas power phase-out, available from: https://www.cleanairalliance.org/ontario-municipalities-that-have-endorsed-gas-power-phase-out/
Other non-renewable generation	• Data provided by Toronto Hydro • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Ontario Clean Air Alliance, Ontario Municipalities that have endorsed gas power phase-out, March 2021

1

2 **Table 6: Battery Storage Parameters**

Parameter	Reference(s)
Domestic battery storage	• National Renewable Energy Laboratory, 2021, Cost Projections for Utility-Scale Battery Storage: 2021 Update, available from: https://www.nrel.gov/docs/fy21osti/79236.pdf

Parameter	Reference(s)
	• KPMG, 2016, Development of decentralised energy and storage systems in the UK, available from: https://www.r-e-a.net/resources/development-of-decentralised-energy-and-storage-systems-in-the-uk-2/ • Data provided by Toronto Hydro • Ontario Energy Board (OEB), Frequency of Regulated Price Plan Switching Under Consumer Choice, 2021
I&C behind-the-meter battery storage	• National Renewable Energy Laboratory, 2021, Cost Projections for Utility-Scale Battery Storage: 2021 Update, available from: https://www.nrel.gov/docs/fy21osti/79236.pdf • KPMG, 2016, Development of decentralised energy and storage systems in the UK, available from: https://www.r-e-a.net/resources/development-of-decentralised-energy-and-storage-systems-in-the-uk-2/ • Independent Electricity System Operator, 2021, Annual Planning Outlook, available from: https://www.ieso.ca/en/Sector-Participants/Planning-and-Forecasting/Annual-Planning-Outlook • Independent Electricity System Operator, Accessed 2022, Hourly Ontario Energy Price (HOEP), available from: https://www.ieso.ca/en/Power-Data/Price-Overview/Hourly-Ontario-Energy-Price • Independent Electricity System Operator, Accessed 2022, Capacity Auction, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Capacity-Auction • Independent Electricity System Operator, Accessed 2022, Operating Reserve Markets, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Operating-Reserve-Markets • Independent Electricity System Operator, Accessed 2022, Ancilliary Services, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Ancillary-Services-Market • Independent Electricity System Operator, Accessed 2022, Global Adjustment Class A Eligibility, available from: https://www.ieso.ca/en/Sector-Participants/Settlements/Global-Adjustment-Class-A-Eligibility • Convergent, Accessed 2022, Energy Storage Versus Generators: the Case for Battery Storage in Ontario, available from: https://www.convergentep.com/portfolio/energy-storage-versus-generators-the-case-for-battery-storage/ • Independent Electricity System Operator, Accessed 2022, Energy Efficiency Auction Pilot, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Energy-Efficiency-Auction-Pilot • Data provided by Toronto Hydro

QUESTION (D):

d) Please indicate if/how the modeling was validated against the City of Toronto energy and emissions plan information, modeling and data.

RESPONSE (D):

Response from ERM:

Nothing by the name of the "City of Toronto energy and emissions plan" was used. The modeling takes many sources of Toronto-specific data as input, however. Please review the second and third paragraphs in section 2 (page 3) where TransformTO is referred to as the most significant existing resource that was used. Please feel free to also see the references listed in the above table.

Response from Toronto Hydro:

Note that the FES model was an independent exercise not intended to validate or reproduce results of any City of Toronto energy and emissions models.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-37

Reference: Grid Modernization Strategy

Please explain how THESL will pick where to deploy each of the Grid Modernization elements (i.e. are there specific geographies or areas of the grid, or will it be spread diffusely across the system).

RESPONSE:

As noted in Exhibit 2B, Section D5, grid modernization elements are present across a number of investment programs and encompass different technologies. Each of these programs and technologies require different strategies for deployment. However, all strategies are grounded in the basic principles of identifying those areas of the system where the technologies will have the greatest benefit, reduce the greatest amount of risk, or both. The only exception may be very early-stage modernization initiatives (such as innovation projects), where the area for deployment may be based on specific demonstration project criteria.

While summaries are provided in Sections D5.2.1, D5.2.2, and D5.2.3, more detail can be found when referring to the investment programs themselves. Table 2 starting at page 19 and Table 3 started at page 34 provide references to the investment program(s) associated with each grid modernization element/technology. These program narratives provide greater detail on the strategy for deployment.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-38

Reference: DER connections have grown in recent years as a result of government policies and declining costs of technologies such as solar panels. By the end of the decade, Toronto Hydro expects to have over 4,400 DER connection projects representing a total installed capacity of approximately 517 MW, an increase of approximately 67 percent compared to 2022. [Investment Plan Section 2.3.1]

Please provide a breakdown by major category of the current and expected (end of decade or best available information) DERs by count and MW contribution.

RESPONSE:

Table 1: DERs by Count and MW Contribution

Generation Type	2022 (Units)	2022 (MW)	2029 (Units)	2029 (MW)
Renewable	2280	116.2	4263	200.4
Energy Storage	28	18.7	82	89.5
Non-Renewable	116	170.0	147	226.8
Total	2424	304.9	4492	516.7

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-39

Reference: Exhibit 2B, Section E3.2.1 Forecasted Connections for Renewable - Between 2023 and 2029, Toronto Hydro forecasts over 1700 additional renewable connections (totaling over 74 MW) to the distribution system.

Please summarize what THESL is doing to promote and enable customers to invest in and connect the over 1700 additional renewable resources.

RESPONSE:

In accordance with the Distribution System Code, Toronto Hydro promotes renewable generation connections by providing cost limiting measures. Capital assets such as the SCADA monitoring equipment under the Generation Protection, Monitoring and Control (GPMC) program (Exhibit 2B Section E5.5) provides customers the required telemetry monitoring component to provide system controllers visibility on remote generation assets, ensuring the safe delivery of distributed energy.

Toronto Hydro is committed to meeting timelines throughout the DER Connections process, such as Connection Impact Assessments, to ensure timely project completions. Please see Exhibit 1B, Tab 3, Schedule 1 at page 24.

Toronto Hydro has also performed informational outreach presentations to promote and enable DERs. One example is the Climate Action and Solar Connection Process For Connections < 10kW presentation conducted by Toronto Hydro for the Harbord Village Residents' Association (HVRA), which is a volunteer organization of residents representing and engaging home owners and renters living in Toronto between Bloor, College, Spadina, and Bathurst Streets.

For more information, please refer to Toronto Hydro's response to interrogatory 1B-PP-8.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-1

References: Exhibit 2B, Section A, Page 13
Exhibit 2B, Section E6.2, Page 1
Exhibit 2B, Section A, Page 13

Preamble:

Ref 1: "The underground system is vulnerable to flooding from extreme rainfall, while the overhead system is susceptible to extreme winds, freezing rain, and wet snow, resulting in damage and outages."

Ref 2: "Outages caused by asset failure on the underground system take approximately 34 percent longer to restore than outages on the overhead system, resulting in lengthy interruptions that may last up to 24 hours or longer."

Ref 3: "Toronto Hydro now incorporates climate data projections into its equipment specifications and station load forecasting."

QUESTION (A):

a) What is THESL's overall strategy regarding asset investment/replacement as between overhead vs. underground?

RESPONSE (A):

Toronto Hydro manages its system based on the distinct needs of each asset class and system type across the grid, including both the overhead and underground system. Investment strategies depend on the specific characteristics of assets (or system configurations) and the risks they pose to the distribution system. Details regarding Toronto Hydro's asset lifecycle optimization policies and practices are discussed in Exhibit 2B, Section D3.1.

QUESTION (B):

b) What technologies are considered to deal with underground equipment failure such as cables, PVC ducts etc.

RESPONSE (B):

Toronto Hydro considers the following technologies:

- **Cables**: Cable testing procedures for underground circuits, including cables and accessories such as terminations and joints, are implemented to pre-emptively address cable failure. The primary goal of cable testing in underground circuits is to enhance reliability by identifying potential issues before they manifest as operational problems. This proactive approach allows for corrective measures to be taken, minimizing the risk of failures and ensuring the smooth operation of the electrical infrastructure.
- **Ducts:** Borescoping contractors may be engaged in order to locate PVC duct failures to flag for repair.
- **Transformers**: Network Condition Monitoring and Control ("NCMC") systems plays crucial role for SCADA monitoring and control, as well as environmental monitoring and functions within underground vaults. This provides real-time data on imminent equipment failures or scenarios that may cause equipment failures.
- **Switchgears**: Switchgears are capable of communicating functional outputs through SCADA capable radio frequency antenna in order to provide control room with real-time data.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-2

Reference: Exhibit 2B, Section A, Page. 20

Preamble:

"To ensure that price was kept top-of-mind, the utility also adopted top-down financial constraints for the development of the plan:

i. Price Limit: Toronto Hydro set an upper limit of approximately 7 percent as a cap on the average annual increase to distribution rates and charges.

ii. Budget Limits: Toronto Hydro set upper limits of $4,000 million for the capital plan and $1,900 million for the operational plan over the 2025-2029 period."

a) How did THESL arrive at these price and budget upper limits - what is the basis or assumption or rationale for picking these limits? Please describe the approach or steps followed to arrive at these limits?

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-33.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-3

Reference: Exhibit 2B Section E4 ORIGINAL, Page 8 of 23:
"Expenditures [2020-2024] in the Underground System Renewal - Horseshoe, and Underground System Renewal - Downtown are forecasted to be approximately 24 percent lower than planned."

QUESTION (A):

a) Please identify and list Underground System Renewal program investments that were planned to be completed in the 2020-2024 rate period but deferred to the 2025-2029 rate period.

RESPONSE (A):

The following tables shows the amount of planned work for the referenced programs that was planned to be completed in the 2020-2024 period but was deferred to the 2025-2029 rate period.

Table 1: 2020-2024 Underground Asset Replacement Deferral Volumes

Asset Class	Planned Work Deferred	% of Planned Work Deferred
Total Cable (in circuit km)	12	6%
Transformers	0	0%
Switches	87	38%

Table 2: 2020-2024 Underground Renewal Downtown Asset Replacement Deferral Volumes

Asset Class	Planned Work Deferred	% of Planned Work Deferred
PILC (in circuit km)	0	0%
AILC (in circuit km)	47	89%
Cable chamber rebuilds	50	67%
Cable chamber roof rebuild	87	73%

Asset Class	Planned Work Deferred	% of Planned Work Deferred
URD Submersible Switches	5	38%
URD Transformers	0	0%
URD Vault Roof	9	50%

QUESTION (B):

b) In THESL's view, is the deferral of Underground System Renewal investments from the 2020-2024 rate period a major/material reason for the proposed increase in expenditure in the current application?

RESPONSE (B):

Deferral of work is one of several reasons Underground System Renewal - Horseshoe and Underground System Renewal – Downtown expenditures are increasing in 2025-2029. Toronto Hydro is proposing the minimum expenditures necessary to maintain reliability on the underground system. The various drivers of investment need are discussed and quantified in detail in Exhibit 2B, Section E6.2 and Section E6.3. Please see 2B-Staff-211 for additional details on the Horseshoe program.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-4

Reference: Exhibit 2B, Section E4 ORIGINAL, Page 9 of 23:
"Expenditures [2020-2024] in the Overhead System Renewal program are forecasted to be approximately 18 percent lower than planned."

QUESTION (A):

a) Please identify and list Overhead System Renewal program investments that were planned to be completed in the 2020-2024 rate period but deferred to the 2025-2029 rate period.

RESPONSE (A):

The following tables shows the amount of planned work for the referenced programs that was planned to be completed in the 2020-2024 period but was deferred to the 2025-2029 rate period.

Table 1: 2020-2024 Overhead Asset Replacement Deferral Volumes

Asset Class	Planned Work Deferred	% of Planned Work Deferred
Poles	3,727	32%
Pole Top Transformers	3,201	48%
Overhead Switches	0	0%
Primary Conductor (km)	27	8%

QUESTION (B):

b) In THESL's view, is the deferral of Overhead System Renewal program investments from the 2020-2024 rate period a major/material major reason for the increase in expenditure in this category in the current application?

RESPONSE (B):

The deferral of Overhead System Renewal investments from the last filing period is one of several reasons for the increase in expenditure in this category. Please see response to 2B-Staff-219, part (a) for more information.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-5

References: **Exhibit 2B Section E4 ORIGINAL Page 3 of 23:**

"Connected approximately 10,000 customers through the Customer Connections program, with an increase of $147.5 million (71 percent) in capital expenditures over the forecast to maintain and exceed performance."

a) Was the $147.5 million increase in capital expenditure due to under-forecasting of customer connection or due to other factors?

RESPONSE:

The noted increase is due to a variety of factors which are discussed at pages 18-23 of the Customer Connections program evidence in Exhibit 2B, E5.1.4. Toronto Hydro also notes that the budget for this program was reduced by approximately $14.7 million by the OEB in Toronto Hydro's last rate application, due to concerns that the forecast was overstated.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-6

Reference: Exhibit 2B Section E4 ORIGINAL Pages 7-8 of 23

QUESTION (A):

a) The reference indicates that from 2020 to 2024, System Access expenditures are forecasted to be approximately 33 percent higher than planned due to higher than forecast expenditures in the Customer Connections program (55%), in the Load Demand program (38%), and Externally Initiated Plant Relocations and Expansions (18%).

Why were such significant variances in demand for resources for these programs not anticipated/foreseen in the plan?

RESPONSE (A):

Please refer to Toronto Hydro's response to Interrogatory 2B-SEC-58.

QUESTION (B):

b) It appears that the higher than planned expenditures in System Access are partially made possible by shifting resources away from investments in System Renewal, especially the overhead and underground system renewal programs. Did THESL consider other funding options such as ICM funding? If not, why?

RESPONSE (B):

No. Under a Custom IR rate framework, Toronto Hydro is not eligible for ICM funding.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-7

Reference: Exhibit 2B, Section E4, Page 9

Preamble:

"In Downtown program, Toronto Hydro was able to find some savings over the 2020-2024 rate period by engineering an alternative approach to cable renewal work which leverages existing available civil infrastructure to the extent possible."

a) Please describe and give example/s of such alternative approaches to cable renewal work.

RESPONSE:

As noted in Exhibit 2B, Section E6.3.4.1 at page 37, the alternative approach to limit civil work associated with cable renewal work was to use available civil infrastructure on the other side of a road or on another parallel road.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-8

References: Exhibit 2B, Section E4, Page 9

- Expenditures in the Network System Renewal program are forecasted to be approximately 26 percent higher than planned.[23] The increase is driven in large part by design and execution complexities that emerged as the projects matured from conceptual to detailed design. This includes additional scope of work (e.g. civil construction and legacy cable removal), material cost increases driven by supply chain disruptions, and work execution challenges related to field conditions (e.g. urban congestion) and operational complexities (e.g. coordination challenges).
- Expenditures in the Stations Renewal program are forecasted to be approximately 23 percent higher than planned due to project complexity, necessary scope increases, and inflationary cost escalations.[24]

a) The reference suggests that the forecasted increases in expenditure (for the 2020-2024 rate period) are due to changes in the scope, design, and complexity of projects as well as due to inflationary cost escalations. What lessons did THESL learn from this variance? Has THESL incorporated those lessons, if any, into the planning and design of projects proposed in the 2025-2029 system plan?

RESPONSE:

As described in Exhibit 2B Section D3 at pages 56-57, Toronto Hydro maintains a change management and governance process to track changes to project cost, schedule, or scope of work. This process provides visibility to all relevant stakeholders on major project changes, requiring approval so that the change is appropriately processed and documented for awareness regarding lessons learned for future projects. Toronto Hydro notes that in most cases, including the Network System Renewal program, it did not plan at the project level in developing its 2025-2029 proposals. Therefore, Toronto Hydro generally applies lessons learned, such as higher network unit renewal costs driven by legacy secondary cable replacements and installation of network automation components, by basing forecast 2025-2029 costs on recent historical actual unit costs that reflect

these cost drivers. When the utility is planning and designing projects it will conduct field inspections prior to developing scopes to identify site-specific project requirements and better inform estimated costs.

In addition, for the Stations Renewal program, Toronto Hydro has provided specific details regarding lessons learned from 2020-2024 projects and how they are being applied to the planning of 2025-2029 projects and forecast costs in the Stations Renewal expenditure plan in Exhibit 2B, Section E6.6 (see pages 48 and 58-61). Examples of this include allocating additional resources to coordinate with switchgear suppliers to mitigate supply risks and conducting feasibility studies for specific Transformer Station switchgear replacements.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-9

Reference: Exhibit 2B, Section E4, Page 8, Lines 14-15

"From 2020 to 2024, System Renewal expenditures are forecasted to be approximately 5 percent lower than planned."

QUESTION (A):

a) Please confirm that the 5% lower than planned expenditure amounts to $76.6 million

RESPONSE (A):

The variance is $72.9 million (4.8 percent). Please see Table 1 for the calculation of the variance.

Table 1: System Renewal Capital Expenditure Summary from 2020-2024 ($ Millions)

Year	Plan	Act. / For.	Var.	Var. %
2020	290.5	261.7	(28.8)	(9.9%)
2021	307.2	247.3	(59.9)	(19.5%)
2022	304.7	276.6	(28.1)	(9.2%)
2023	319.4	314.0	(5.4)	(1.7%)
2024	309.5	358.8	49.4	(16.0%)
Total	**1,531.3**	**1,458.4**	**(72.9)**	**(4.8%)**

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-10

Reference: Exhibit 2B, Section E4 ORIGINAL Page 20 of 23:
"Starting in 2025 Toronto Hydro is adjusting inspection cycles for wood poles from ten years to eight years to manage failure risk driven by wood pole age and condition demographics. Toronto Hydro will also begin inspecting concrete and steel poles as part of its Pole inspection program on a ten-year cycle."

a) What study or other information did THESL use to apply an 8-year cycle and 10-year cycle for wood pole inspection, and concrete and steel poles, respectively? Did THESL consider the practices of other similar utilities including in other jurisdictions?

RESPONSE:

The decision to adjust the inspection cycles for wood poles from a 10-year to an 8-year cycle is to allow Toronto Hydro to (1) further refine the utility's asset condition assessment ("ACA") of wood poles to support transition to condition-based maintenance; (2) manage the increasing volume of wood poles past their useful life which represents over 24,000 poles; and (3) facilitate additional targeted inspections of wood poles in deteriorated conditions which represents over 9,400 poles (represented by HI4 & HI5). This number is projected to increase to over 32,000 poles by 2029 with no intervention.

In accordance with CSA C22.3 No. 11:22 – Maintenance of electric and communication utility equipment and systems standard, a dedicated inspection program for concrete and steel poles is required. There are approximately 33,300 of these poles across the system of which Toronto Hydro has little to no condition information for. A dedicated inspection program will allow the utility to collect detailed condition data for these assets so their health can be monitored over time. This will enable Toronto Hydro to make more informed decisions on planned overhead renewal investments for these assets and reduce the impact on reactive capital by replacing at risk poles before failure.

Please refer to Exhibit 4, Tab 2, Schedule 1, Section 5.1 at pages 15-16 for examples of steel and concrete poles in poor condition.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-11

Reference: Exhibit 2B Section E4 ORIGINAL Page 20 of 23:
"Toronto Hydro plans to reduce its Network Vault civil inspection program starting in 2027 as a result of the implementation of Network Condition Monitoring and Control resulting in reduced costs in that program."

QUESTION (A):

a) Please describe how the implementation of Network Condition Monitoring and Control has resulted in cost reductions in the Network Vault civil inspection program.

RESPONSE (A):

Please refer to Exhibit 2B, Section E7.3.3.2 for the description of how Network Condition Monitoring and Control (NCMC) is expected to impact the Maintenance program.

QUESTION (B):

b) What impact (positive or negative) on reliability and safety performance does THESL anticipate as a result of the plan to reduce the Network Vault civil inspection program?

RESPONSE (B):

NCMC is capable of providing real-time condition monitoring on developing hazardous conditions and allows for proactive actions to be taken to mitigate safety and reliability risks. Please refer to Section E7.3.3.1 of Exhibit 2B for further details on the benefits of NCMC.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-12

Reference: Exhibit 2B, Section E5.1, Page 10 of 30:

"Under Section 6.2 of the DSC, for all types of DERs, Toronto Hydro has an obligation to enable and connect the DER. Toronto Hydro must balance its obligations to prospective and existing DER connections with its responsibilities to maintain a safe and reliable distribution system for its load customers."

QUESTION (A) :

a) Please describe, with examples, the kind of safety and reliability risks that DER connections pose to existing load customers.

RESPONSE (A):

DERs could introduce unwanted system harmonics due to the electronics involved particularly with inverter based DERs. Toronto Hydro requires all DER applications to ensure that the harmonic level is within acceptable limits as prescribed by the CSA.

Outage back feed is another potential risk for DERs to customer load when islanding conditions are prohibited (some programs such as emergency back-up DERs are allowed to island based on required conditions). Unwanted back feed conditions are addressed by requiring anti-islanding provisions to be in place (generation prohibitive mode during outages). Unwanted islanding or excessive generation could also be mitigated through the remote disconnect means that the THESL SCADA monitoring and control equipment possess (refer to section Exhibit 2B Section E5.5).

QUESTION (B) :

b) Has THESL encountered safety issues such as islanding in connection with DER connections? Please describe safety risks, if any, suffered by THESL's employees or members of the public.

RESPONSE (B):

Toronto Hydro has not recorded any back-feed events related to DER within its distribution grid. To date, no adverse incidents have occurred related to DER islanding conditions. This speaks to the diligent commissioning steps and requirements in place to safe guard customers and the public in general.

QUESTION (C) :

c) How does THESL ensure that DER connections do not detract from the reliability of the distribution system?

RESPONSE (C):

Toronto Hydro has put into place processes that requires DER connections to go through in-depth testing to meet all industry related standards, such as IEEE-1547, CSA-C22.3 No. 9, etc. This is to determine facility compliance to all related electrical limit parameters and/or the existence of protection and reliability components that would deter any unwanted grid conditions.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-13

Reference: Exhibit 2B, Section E6.1, Pages 27-28

Preamble:

The reference describes the three options proposed for Rear-Lot Conversion

a) Please complete the table, making any corrections to the numbers that have already been provided.

OPTION	Estimated Cost
Option 1 - at Current (2020-2024) Pace	
Option 2 - Moderately Increased Pace **(selected)**	$ 236.7M
Option 3 - at Accelerated Pace	

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-59. Toronto Hydro notes that the selected option cost (i.e. proposed Rear Lot segment costs for 2025-2029) is $120.6 million not $236.7 million.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-14

Reference: Exhibit 2B, Section E6.2 ORIGINAL, Page 13

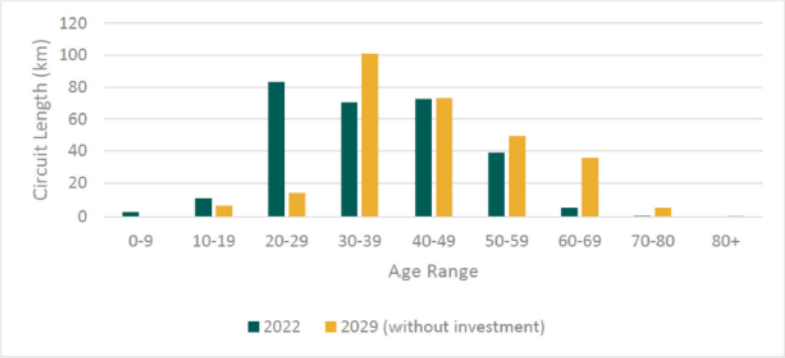

Figure 9: Age Demographics of Direct-Buried ("DB") Cable XLPE in Underground Horseshoe System as of 2022 and by 2029 (without Investment)

QUESTION (A) :

a) Please provide the tabular data behind the chart, adding a column showing age demographics in 2029 with investment, i.e., assuming the proposed investment plan is approved by the Board.

RESPONSE (A):

Toronto Hydro is unable to provide an accurate representation of the age demographics profile with investment as the specific list of projects and its corresponding assets have yet to be planned, designed, and issued for execution. Toronto Hydro typically produces detailed scopes of work 12-18 months in advance of construction. There are several other factors that impact asset renewal decisions which are discussed in detail in interrogatory response 2B-SEC-44.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-15

Reference: Exhibit 2B, Section E6.2 ORIGINAL, Page 14

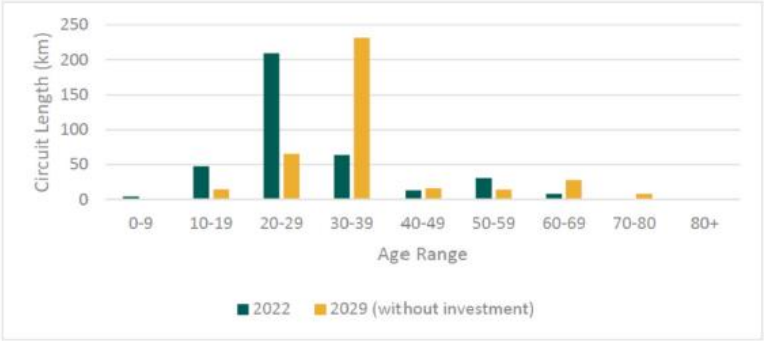

Figure 10: Age Demographics of Direct-Buried Cable in-Duct in Underground Horseshoe System as of 2022 and by 2029 (without Investment)

QUESTION (A) :

a) Please provide the tabular data behind the chart, adding a column showing age demographics in 2029 with investment, i.e., assuming the proposed investment plan is approved by the Board.

RESPONSE:

Toronto Hydro is unable to provide an accurate representation of the age demographics profile with investment as the specific list of projects and its corresponding assets have yet to be planned, designed, and issued for execution. Toronto Hydro typically produces detailed scopes of work 12-18 months in advance of construction. There are several other factors that impact asset renewal decisions which are discussed in detail in interrogatory response 2B-SEC-44.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-16

Reference: Exhibit 2B, Section E6.2 ORIGINAL, Page 14

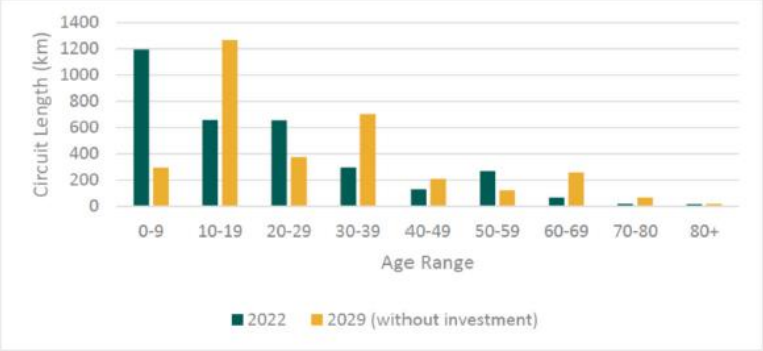

Figure 11: Age Demographic of Cable in in Concrete-Encased Ducts as of 2022 and by 2029 (without Investment)

QUESTION (A) :

a) Please provide the tabular data behind the chart, adding a column showing age demographics in 2029 with investment, i.e., assuming the proposed investment plan is approved by the Board.

RESPONSE (A):

Toronto Hydro is unable to provide an accurate representation of the age demographics profile with investment as the specific list of projects and its corresponding assets have yet to be planned, designed, and issued for execution. Toronto Hydro typically produces detailed scopes of work 12-18 months in advance of construction. There are several other factors that impact asset renewal decisions which are discussed in detail in interrogatory response 2B-SEC-44.

Figure 11 provided in the rate filing application had an error which has now been corrected below.

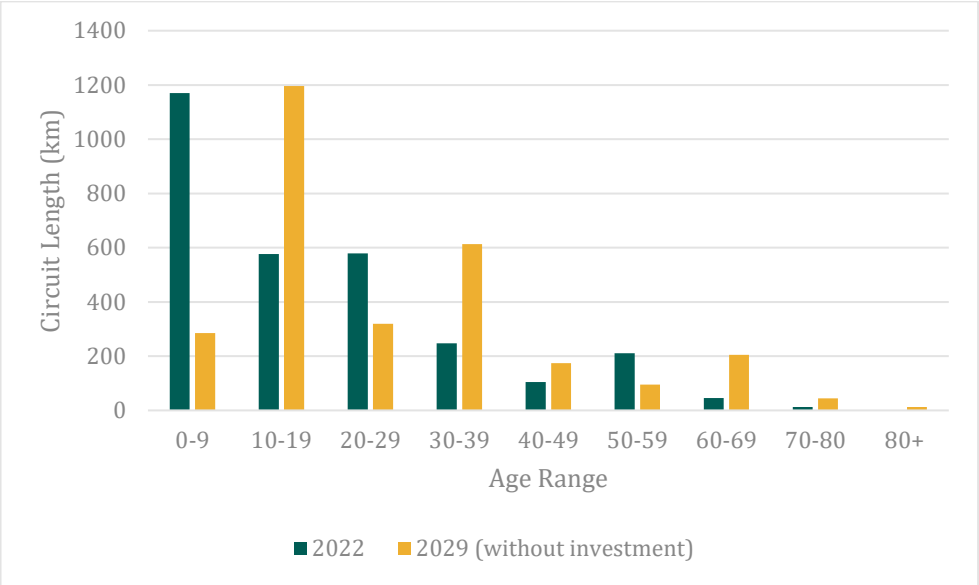

Figure 11: Updated: Age Demographic of Cable in in Concrete-Encased Ducts as of 2022 and by 2029 (without Investment)

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-17

Reference: Exhibit 2B, Section E6.2 ORIGINAL, Page 21

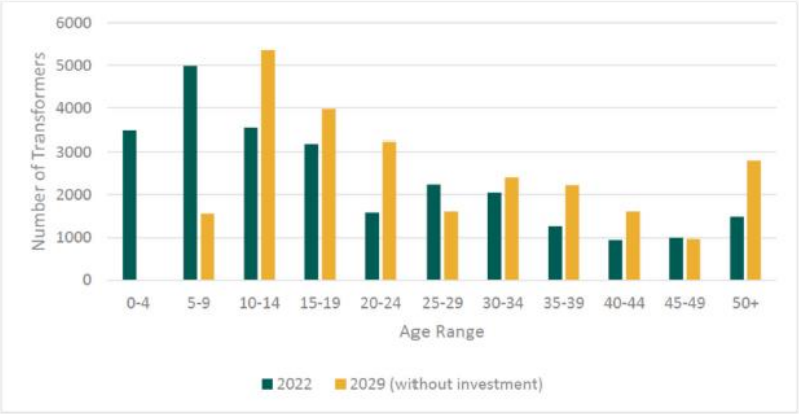

Figure 19: Age Distribution of All Transformers in Underground Horseshoe System as of 2022 and 2029 Without Investment

QUESTION (A) :

a) Please provide the tabular data behind the chart, adding a column showing age demographics in 2029 with investment, i.e., assuming THESL's proposed investment plan is approved by the Board.

RESPONSE (A):

Toronto Hydro is unable to provide an accurate representation of the age demographics profile with investment as the specific list of projects and its corresponding assets have yet to be planned, designed, and issued for execution. Toronto Hydro typically produces detailed scopes of work 12-18 months in advance of construction. There are several other factors that impact asset renewal decisions which are discussed in detail in interrogatory response 2B-SEC-44.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-18

Reference: Exhibit 2B Section E6.2 ORIGINAL Page 22 of 36

Table 5: Asset Condition Assessment for Underground Transformers in Underground Horseshoe System in 2022 and 2029 without Investment

Condition	UG TX - Padmounted		UG TX - Submersible		UG TX - Vault		Total	Total
	2022	2029	2022	2029	2022	2029	2022	2029
HI1 – New or Good Condition	4521	3920	7666	6939	6108	4625	18295	15484
HI2 – Minor Deterioration	1009	469	548	585	3618	1533	5175	2587
HI3 – Moderate Deterioration	476	804	130	534	494	3400	1100	4738
HI4 – Material Deterioration	215	561	120	178	225	506	560	1245
HI5 – End-of-Serviceable Life	22	489	46	274	11	392	79	1155
Grand Total	**6243**	**6243**	**8510**	**8510**	**10456**	**10456**	**25209**	**25209**

a) Please reproduce the table such that it includes figures for 2029 with investment, i.e., assuming THESL's proposed investment plan is approved by the Board.

RESPONSE:

For a comprehensive discussion of expected changes in asset demographics over the 2025-2029 period, please see Toronto Hydro's response to 2B-SEC-44.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-19

Reference: Exhibit 2B, Section E6.2 ORIGINAL, Page 22 of 36

Table 5: Asset Condition Assessment for Underground Transformers in Underground Horseshoe System in 2022 and 2029 without Investment

Condition	UG TX - Padmounted		UG TX - Submersible		UG TX - Vault		Total	Total
	2022	2029	2022	2029	2022	2029	2022	2029
HI1 – New or Good Condition	4521	3920	7666	6939	6108	4625	18295	15484
HI2 – Minor Deterioration	1009	469	548	585	3618	1533	5175	2587
HI3 – Moderate Deterioration	476	804	130	534	494	3400	1100	4738
HI4 – Material Deterioration	215	561	120	178	225	506	560	1245
HI5 – End-of-Serviceable Life	22	489	46	274	11	392	79	1155
Grand Total	**6243**	**6243**	**8510**	**8510**	**10456**	**10456**	**25209**	**25209**

a) Please reproduce the table such that it includes a column for figures for 2029 with investment, i.e., assuming THESL's proposed investment plan is approved by the Board.

RESPONSE:

For a comprehensive discussion of expected changes in asset demographics over the 2025-2029 period, please see Toronto Hydro's response to 2B-SEC-44.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-20

Reference: Exhibit 2B, Section E6.3, Page. 17

Please provide the tabular data behind the chart, adding a column showing HI distribution in 2029 with investment, i.e., assuming THESL's proposed investment plan is approved by the Board.

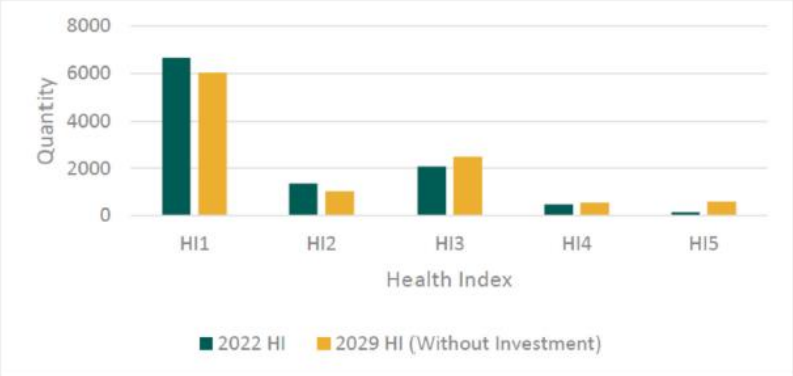

Figure 12: Cable Chamber HI Distribution (Actual and 2029 Forecast)

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-44.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-21

Reference: Exhibit 2B, Section E6.3, Page 32

Please provide the tabular data behind the chart, adding a column showing asset condition in 2029 with investment, i.e., assuming THESL's proposed investment plan is approved by the Board.

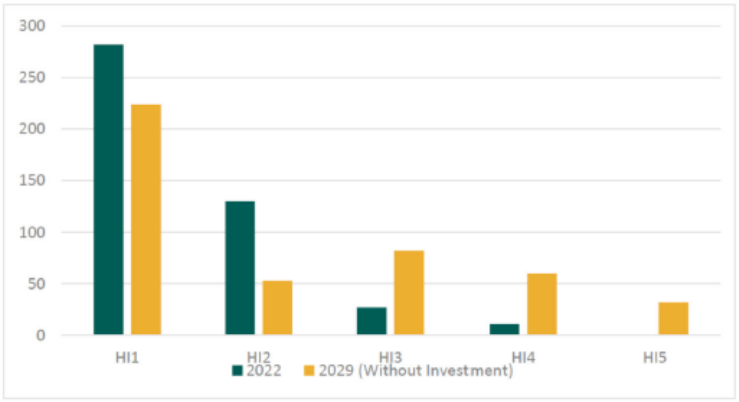

Figure 33: URD Transformer Asset Condition as of 2022 and 2029 (without investment)

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-67 part (b).

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-22

Reference: Exhibit 2B, Section E6.3, Page 34

Please provide the tabular data behind the chart, adding a column showing ACA distribution in 2029 with investment, i.e., assuming THESL's proposed investment plan is approved by the Board.

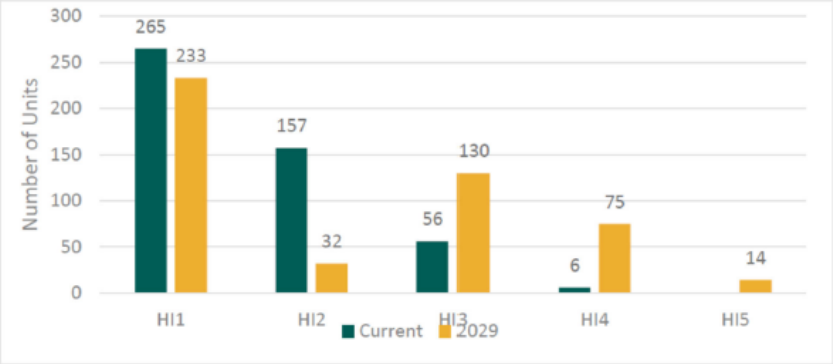

Figure 35: Underground Switchgear ACA distribution

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-67 part (b).

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-23

Reference: Exhibit 2B, Section E6.4, Page 7

Please provide the tabular data behind the chart, adding a column showing condition demographics in 2029 with Renewal, i.e., assuming THESL's proposed investment plan is approved by the Board.

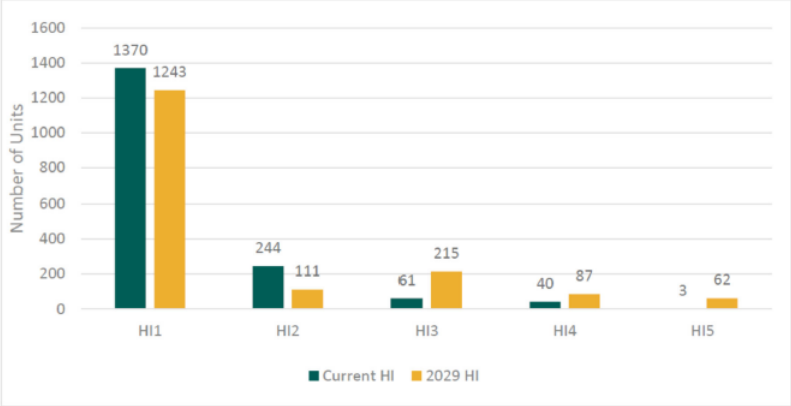

Figure 3: Network Transformers Condition Demographics – Current and Forecasted HI (without Renewal)

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-44.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-24

Reference: Exhibit 2B, Section E6.4, Pages. 24-28

Preamble:

The reference shows the three options considered for Network Unit Renewal and Network Vault Renewal

QUESTION (A):

a) Please complete the table, making any corrections to the numbers that have already been provided.

OPTION (Network Unit Renewal)	Estimated Cost
Option 1 – Reduced Pace	
Option 2 – Moderate Pace (selected)	$ 51.2 M
Option 3 - Accelerated Pace	

RESPONSE (A):

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-59.

QUESTION (B):

b) Please complete the table, making any corrections to the numbers that have already been provided.

OPTION (Network Vault Renewal)	Estimated Cost
Option 1 – Reduced Pace	
Option 2 – Moderate Pace (selected)	$ 69.1M?
Option 3 - Accelerated Pace	

RESPONSE (B):

Toronto Hydro notes that the amount is $69.0 million. Please refer to Toronto Hydro's response to interrogatory 2B-SEC-59.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-25

References: **Exhibit 2B, Section E6.5 ORIGINAL, Page 3 of 43, lines 6-8:**

"Approximately 9 percent of wood poles are already showing signs of material deterioration (as of 2022) and, without intervention, this proportion is forecast to increase to 30 percent by 2029."

Exhibit 2B, Section E6.5 ORIGINAL, Page 9 of 43, Table 3

Table 3: Asset Demographics

	Population	Typical Useful Life (Years)	Assets Past Useful Life as of 2022 (%)	Assets Past Useful Life in 2029 without Investment (%)
Wood Poles	108,988	45	23	29
Concrete Poles	49,059	55	13	22
Overhead Transformers	27,690	35	8	17
Overhead Load Break Gang Operated Switches	3,015	30	18	26
Overhead Disconnect Switches	4,425	30	33	54

Exhibit 2B, Section E6.5 ORIGINAL Page 9 of 43, Table 4

Table 4: Condition Data for Wood Pole

Asset Condition Index	2022	2029 (Without Investment)
HI1 – New or Good Condition	68,193	60,253
HI2 – Minor Deterioration	7,536	8,310
HI3 – Moderate Deterioration	21,015	5,544
HI4 – Material Deterioration	8,918	24,404
HI5 – End-of-serviceable Life	504	7,655

QUESTION (A):

a) Given the total number of poles is 108,988 (Ref 2); 9% of wood poles with material deterioration (Ref 1) means 9,808 poles have shown material deterioration. However, that number is given as 8,918 in Ref 3. Please reconcile.

RESPONSE (A):

To clarify, Table 4 shows there are 9,422 wood poles with significant material deterioration (HI4 and HI5) out of a total of 106,166 that have had their condition assessed.

The 108,988 figure in Table 3 represents the total subject population of wood poles and includes a small number of poles that do not have condition information. The subset of poles with condition information totals 106,166. Nine percent of this subset is 9,422.

QUESTION (B):

b) Please reproduce Table 3 in Ref 2 adding a column showing Asset Past Useful Life in 2029 with investment, i.e., assuming the Board approves THESL's investment plans proposed in the current application)

RESPONSE (B):

Toronto Hydro is unable to provide an accurate representation of the age demographics profile with investment as the specific list of projects and its corresponding assets have yet to be planned, designed, and issued for execution. Toronto Hydro typically produces detailed scopes of work 12-18 months in advance of construction. There are several other factors that impact asset renewal decisions which are discussed in detail in interrogatory response 2B-SEC-44.

QUESTION (C):

c) Please reproduce Table 4 in Ref 3 adding a column showing condition data for wood pole in 2029 with investment, assuming the Board approves THESL's investment plans proposed in the current application)

RESPONSE (C):

For a comprehensive discussion of expected changes in asset demographics over the 2025-2029 period, please see Toronto Hydro's response to 2B-SEC-44.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-26

Reference: **Exhibit 2B, Section E6.5 ORIGINAL, Page 34 of 43:**

"The level of spending and overall unit volumes are both lower than forecast in the 2020-2024 DSP ($265.7 million and e.g. over 11,000 poles) as Toronto Hydro reduced the segment budget to support meeting overall capital funding limits and faced supply chain challenges and other pressures impacting pacing and costs."

Table 7: Historical & Forecast Segment Cost ($ Millions)

	Actual			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Overhead System Renewal	36.1	38.2	38.2	32.5	73.9	50.5	49.4	53.3	60.3	58.9

Table 8: 2020 – 2024 Overhead Asset Replacement Volumes

Asset Class	Actual			Bridge		Total
	2020	2021	2022	2023	2024	
Poles	1,418	1,263	1,137	790	2,674	7,282
Transformers	401	584	579	215	1,892	3,671
OH Switches	185	290	71	43	114	703
Conductors (km)*	53.0	60.0	76.0	4.8	45.1	238.8

*Primary cables only

Please clarify whether the $265.5 M spending and the over 11,000 poles mentioned above are 2020-2024 DSP plans or Board-approved amounts. If plans/forecasts, what were the corresponding Board-approved amounts?

RESPONSE:

These referenced figures are from the 2020-2024 DSP for Overhead System Renewal. The OEB did not order any reductions or modifications to this program.

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 2B-PWU-27

Reference: Exhibit 2B, Section E6.5 ORIGINAL Page 38-40 of 43

The reference lists and describes three options for Overhead System Renewal

a) Please complete the table, making any corrections to the numbers that have already been provided.

OPTION (Overhead system Renewal)	Forecasted/Estimated Cost
Option 1 – Limited rebuild/renewal	
Option 2 – Proactive rebuild/renewal (selected)	$272.4 M
Option 3 - Replace all assets in deteriorated condition (or beyond useful life)	Over $350 million

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-59.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-31

References: Exhibit 2B, Section A, Page 7

Please provide the data underlying Figure 2, by asset type.

RESPONSE:

Please see Table 1 below which breaks down the categories of Assets at End of Useful Life by 2023, Assets to Reach Useful Life by 2030, and Assets Not at End of Useful Life by asset type. The utility calculated the underlying data by following the methodology described in Toronto Hydro's response to interrogatory 2B-AMPCO-16.

Table 1: Break Down of Assets Past Useful Life - 2023

	Assets at End of Useful Life by 2023	Assets at End of Useful Life by 2030	Assets Not at End of Useful Life
OH Conductor	0.57%	0.80%	6.56%
OH Switches	0.10%	0.32%	0.47%
OH Transformers	0.85%	0.66%	4.52%
Poles	2.59%	0.59%	7.51%
UG Cables	7.38%	2.08%	25.47%
UG Switches	0.06%	0.05%	0.71%
UG Transformers	2.70%	2.12%	2.90%
Network Assets	0.42%	0.12%	1.35%
Switchgear	3.65%	1.53%	3.45%
DC Systems	0.06%	0.04%	0.02%
Power TX	1.02%	0.06%	0.91%
Circuit Breakers	0.59%	0.09%	0.92%
Civil Assets	4.24%	1.60%	8.79%
Meters	0.95%	0.64%	0.55%

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-32

Reference: Exhibit 2B, Section A, Page 17

Please provide a detailed chronology of when the various steps in the capital and business plan process took place that led to the filing of the application.

RESPONSE:

Toronto Hydro's integrated business planning process for this rate application unfolded as follows:

1. **In 2021,** through ongoing strategic planning discussions, Toronto Hydro began considering the incremental business requirements related to emerging drivers – such as technology availability, evolving customer needs and preferences, and decarbonization – that would require it to sustain, expand and modernize its grid and operations.
2. **In the last quarter of 2021**, Toronto Hydro undertook a first phase of customer engagement to collect feedback about customers' needs and priorities, which was used to inform and guide Toronto Hydro's investment priorities for 2025-2029. Please see Exhibit 1B, Tab 5, Schedule 1 for more details about customer engagement.
3. **In the first quarter of 2022**, after receiving the phase 1 customer engagement results, the utility-initiated capital and maintenance investment planning through a process which is described in Exhibit 2B, Section D1. Please see the response to interrogatory 2B-SEC-33 for more information about this stage of the process.
4. **In the second quarter of 2022**, in parallel with ongoing capital and maintenance planning activities being undertaken as part of step 3 above, Toronto Hydro began developing its workforce plan. Please see the response interrogatory 4-CCC-58 for more information about the workforce planning aspects of the process.
5. **In the third quarter of 2022**, the initial capital plan was refined through iterative engagements and deliberations among senior leaders involved in the planning process. Through these iterations and deliberations, the draft capital plan took shape in the summer

of 2022, following which the complimentary workforce and operational plans were considered, giving rise to a consolidated 2025-2029 draft investment plan.

6. **In the fourth quarter of 2022**, based on the draft investment plan, the budget and price limits were adopted to guide the further development, refinement and finalization of the 2025-2029 Investment Plan. For more information about the budget and price limits please see 2B-SEC-33.
7. **In the first quarter of 2023**, while detailed planning activities continued, Toronto Hydro prepared the Customer Engagement Phase 2 survey workbook based on the draft investment plan and lower/higher capital expenditure options that were considered through the planning process in 2022, as noted in the response to 2B-SEC-33. The survey was launched in March 2023. Please see Exhibit 1B, Tab 5, Schedule 1 for more information about Phase 2 Customer Engagement.
8. **In the second quarter of 2023**, the utility refined and finalized the 2025-2029 Investment Plan taking into account two sets of considerations: (i) updated planning considerations including the impact of 2022 actuals and refined workforce growth assumptions as noted in the response to 4-CCC-58, and (ii) customer feedback received from the Phase 2 engagement with respect to trade-offs between price and other outcomes of the plan.
9. **In the third quarter of 2023**, following the finalization of the 2025-2029 Investment Plan, Toronto Hydro worked cross-functionally to develop the 2025-2029 Custom Scorecard and targets to be achieved as part of the proposed Performance Incentive Mechanism (PIM), which is detailed in Exhibit 1B, Tab 3, Schedule 1.
10. **In the fourth quarter of 2023**, the rate application was filed on November 17.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-33

Reference: Exhibit 2B, Section A, Page 20

With respect to the top-down financial constraints used for the development of the plan:

QUESTIONS (A) – (E):

a) Please provide the specific basis for the 7% price limit Toronto Hydro chose.
b) Did Toronto Hydro consider other price limits, both in terms of level of price increase and how it was measured? If so, please discuss and provide a copy of any analysis that it undertook regarding the impact of different price increases.
c) Please provide the specific basis for the specific budget limit chosen ($4B for capital and $1.9B for OM&A).
d) Did Toronto Hydro consider other budget limits? If so, please discuss and provide a copy of any analysis that it undertook regarding the impact of budget limits.
e) Were any price limits for other classes considered? If so, please provide. If not, why not?

RESPONSE (A) – (E):

The referenced budget and price limits were set in the fall of 2022 based on the outputs of the first stage of the integrated planning process described in Exhibit 2B, Section E2 and in Exhibit 4, Tab 1, Schedule 1. In this stage of the planning process, which took place over the second and third quarter of 2022, Toronto Hydro determined the 2025-2029 draft investment plan, having regard to numerous considerations and factors, including customer needs and preferences identified in Phase 1 Customer Engagement (Exhibit 1B, Tab 5, Schedule 1).

As noted in the timeline provided in response to 2B-SEC-32, the integrated planning process commenced in the first quarter of 2022 with the roll-out of the Phase 1 of Customer Engagement results which were summarized in a placemat that was widely distributed to those involved in the

capital planning process.[1] Planners developed investment options for the four investment priorities (i.e. sustainment, modernization, growth and general plan), based on asset needs, technical requirements and specific investment objectives which are summarized in Table 1 to Table 3 in Exhibit 2B, Section D1.2.1, Page 11-13.

The planners developed program budgets along a continuum of options which are summarized in the evidence at Exhibit 2B, Section E2 and outlined in detail in the response to interrogatory 2B-SEC-54. Through the planning process, Toronto Hydro arrived at the draft capital plan budgets that formed the basis of the $4B budget limit.

Similarly, the operational plan budget limit of $1.9B was based on the following assessments:

- Asset maintenance and operational requirements, which were developed alongside the capital plan for system-related and general plant investments. This included operational requirements for Preventative, Corrective and Emergency Maintenance, Public Safety and Damage Prevention, Customer Owned Equipment Services, Fleet and Equipment Services, Facilities Management, and Information Technology
- Workforce planning considerations as outlined in the response to 4-CCC-58(d).
- Operational requirements in customer-interfacing programs and corporate services
- Other costs such as training and insurance premiums and regulatory costs.

Toronto Hydro did not consider other budget and price limits, but in setting the referenced limits the utility considered other capital investment options (summarized in Exhibit 2B, Section E2, page 6) which had higher/lower budget and price implications.[2] These investment options were presented to customers in the Phase 2 Customer Engagement, with price impacts that cumulatively ranged from 5% to 9%. Over 33,000 customers participated in the Phase 2 engagement, and 84% of

[1] The Phase 1 Placement can be found at Exhibit 1B, Tab 5, Schedule 1, App A at Appendix 07.
[2] Please see Toronto Hydro's response to interrogatory 2B-SEC-53.

customers across all rate classes supported the total rate increase associated with Toronto Hydro's draft plan, which formed the basis of the 7% average annual price limit.

The price limit was expressed with reference to residential customers, as they represent the largest rate class in terms of total number of customers. However, the price limit was not set on the basis of residential customer impacts. It was based on the capital and operational investment requirements that were identified through the process described above, having regard to customer needs and preferences and other important considerations outlined in the evidence at Exhibit 2B, Section E2 and in Exhibit 4, Tab 1, Schedule 1.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-34

References: Exhibit 2B, Section A, Page 22

Preamble:

With respect to recent enhancement of the AM process:

QUESTION (A):

a) Please provide a copy of the 2020 ISO 55001 Gap Analysis.

RESPONSE (A):

Please see Appendix A to this response. Toronto Hydro is providing the most recently available gap analysis with the most current information on the utility's journey to achieving ISO 55001 certification.

QUESTION (B):

b) Between the completion of the ISO 55001 Gap Analysis and the capital planning process used for the purposes of the DSP and capital budgets in this application, what changes have been made by Toronto Hydro to move closer to meeting the ISO 55001 requirements?

RESPONSE (B):

Between the completion of the 2020 ISO 55001 Gap Analysis and the capital planning process used for the purposes of the Distribution System Plan ("DSP") and capital budgets in this application, the following changes have been made by Toronto Hydro to move closer to meeting the ISO 55001 requirements:

- The creation of a formal Asset Management ("AM") Policy and authorization of the AM Policy;
- AM Policy training for all key stakeholders;

- Enhancement of Asset Management Plans ("AMPs") for all key asset classes;
- Improved level of awareness and competence regarding AM throughout the organization;
- Development of competency framework – Toronto Hydro has mapped key roles, functions and capabilities against the organizational structure, in consultation with leadership of various stakeholder business units;
- Creation of the Asset Management Governance Committee;
- Development of AM Performance and Capability Objectives (see Exhibit 2B, Section D1); and
- Development of a draft Strategic Asset Management Plan.

QUESTION (C):

c) Please provide a copy of Toronto Hydro's internal Asset Management Policy document.

RESPONSE (C):

Please see Appendix B to this response.

AMCL+
LEADING ASSET MANAGEMENT

Toronto Hydro-Electric System Limited
EB-2023-0195
2B-SEC-34
Appendix A
FILED: March 11, 2024
(18 Pages)

TORONTO HYDRO

Asset Management Gap Assessment

High-Level Score Refresh Report

Version: Final

Date: 8th February 2024

endorsed ASSESSOR
endorsed TRAINER
The Institute of Asset Management PATRON



KEY CONTACTS

Australasia +61 (0) 2 9252 7623

Americas +1 212 370 7319

Europe +44 (0) 207 688 2828

Asia +852 2834 6122

Original held by AMCL at:

2 St. Clair Avenue West, Floor 12, Toronto, Ontario M4V 1L5, Canada

Tel: +1 416-925-1424 Email: mailto:enquiries@amcl.com

www.amcl.com

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DOCUMENT CONTROL

APPROVAL

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EXECUTIVE SUMMARY

Toronto Hydro is on a journey to improve its asset management maturity, targeting ISO 55001 conformance and certification. To this end, AMCL conducted an ISO 55001 Gap Assessment in 2020. Following the 2020 ISO 550001 gap assessment, a rescore was performed in December 2023 to assess the progress made by Toronto Hydro. This report captures the key findings of that rescore. The rescore was not a full-scale deep dive into every ISO 55001 clause, but rather a high-level investigation into areas where Toronto Hydro indicated it had made advancements. To meet ISO 55001 requirements, Toronto Hydro needs to achieve an overall score of 3.0 on the ISO maturity scale (45%). The assessment result indicates a modest increase in the overall score for Toronto Hydro from 2.56 to 2.69 (38% to 40%).

Key areas that improved the score were the creation of the Asset Management Governance Committee (AMGC), the creation of a formal Asset Management Policy, AMGC review and authorization of the AM Policy, AM Policy training for all key stakeholders, a draft Strategic Asset Management Plan (SAMP), an Asset Management System Manual document, enhancement of Asset Management Plans (AMPs) for all key asset classes, and improved level of awareness and competence regarding Asset Management throughout the organization. As a result, scores for clauses 4.3 (Determining the Scope of the Asset Management System) 4.4 (Asset Management System), 5.2 (Policy), 7.2 (Competence) and 7.4 (Awareness) have improved. Toronto Hydro scores lowest for clauses 7.5 (Information Requirements) and 7.6 (Documented Information), indicating there is work to be done in these areas.

In our experience, organizations average between 2-3% per year in rate of improvement. While Toronto Hydro's progress is at the lower end of this range, key factors affecting this have been the recent rate application filing that resulted in the diversion of key Asset Management System (AMS) resources. As a result, the AMGC has been on a hiatus for the better part of the last year and has not formally convened recently. Leadership championing asset management is a key factor that has impacted progress made thus far and will have a bearing on progress planned in 2024.

The sections below discuss the above aspects in detail.

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CHANGES IN SCORES BY CLAUSE

The table below shows the differences between the scores for the assessment that was conducted in 2020 versus the assessment conducted in December 2023. Of all the ISO 55001 clauses evaluated, there was a change in score for four clauses while scores for the other clauses remained unchanged. Toronto Hydro made important progress in the areas of defining the scope of the asset management system, developing, and implementing an asset management policy, and improving competence and awareness of asset management within the organization. Toronto Hydro's overall score has gone up from 2.56 to 2.69. On a percentage basis the score has gone up from 38% to 40%. It should be noted that although only five clauses have an increased score, various initiatives within Toronto Hydro will eventually raise the scores for several other clauses in 2024. Details behind the scores for each clause that has a changed score are discussed below.

ISO 55001 Clause	2020 Score	Percentage	2023 Score	Percentage	Change
4.1 - Understanding the organization and its context	3	45%	3	45%	
4.2 - Understanding the needs and expectations of stakeholders	3	45%	3	45%	
4.3 - Determining the scope of the Asset Management System	1.9	29%	**2.1**	32%	↑
4.4 - Asset Management System	2.17	33%	**3**	45%	↑
5.1 - Leadership and commitment	2.6	39%	2.6	39%	
5.2 - Policy	2.5	38%	**3**	45%	↑
5.3 - Organizational roles, responsibilities and authorities	3	45%	3	45%	
6.1 - Actions to address risks and opportunities for the Asset Management System	1.98	30%	1.98	30%	
6.2 - Asset Management Objectives and planning to achieve them	2.57	39%	2.57	39%	
7.1 - Resources	3	45%	3	45%	
7.2 - Competence	2.2	33%	**2.8**	42%	↑
7.3 - Awareness	2.4	36%	**3**	45%	↑
7.4 - Communication	3	45%	3	45%	
7.5 - Information requirements	1.44	22%	1.44	22%	
7.6 - Documented Information	1.9	29%	1.9	29%	
8.1 - Operational planning and control	2.72	41%	2.72	41%	
8.2 - Management of Change	2.88	43%	2.88	43%	
8.3 - Outsourcing	3	45%	3	45%	
9.1 - Monitoring, measurement, analysis and evaluation	2.94	44%	2.94	44%	
9.2 - Internal audit	2.58	39%	2.58	39%	
9.3 - Management review	2.63	39%	2.63	39%	
10.1 - Nonconformity and corrective action	3	45%	3	45%	
10.2 - Preventive action	3	45%	3	45%	
10.3 - Continual improvement	2.33	35%	2.33	35%	
Average	2.56	38%	2.69	40%	↑

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HIGH LEVEL OBSERVATIONS BY CLAUSE

CLAUSE 4.1 – UNDERSTANDING THE ORGANIZATION AND ITS CONTEXT

The score for clause 4.1 is unchanged at 3.0, which means Toronto Hydro conforms to the requirements of the ISO 55001 standard. Toronto Hydro's latest rate application clearly outlines the organization's context, drivers, requirements, and constraints, both from an external and internal perspective, that impact its ability to deliver on its goals. The rate application also presents all the different aspects of legal, regulatory, customer, environmental, supplier, financial, resource and other constraints that impact its ability to provide service. The commentary on its internal and external environment provides a clear view of Toronto Hydro's organizational context. Toronto Hydro's rate application can be considered as serving the purpose of a Strategic Asset Management Plan (SAMP). It describes the organizational context and the implications for the asset management system. It also explains how the asset management policy was used to derive the asset management objectives. Although compliant with ISO requirements, Toronto Hydro is considering continual improvement actions, including determining if there is a need for a separate SAMP document that could document the full set of Toronto Hydro's asset management objectives.

CLAUSE 4.2 – UNDERSTANDING THE NEEDS AND EXPECTATIONS OF STAKEHOLDERS

The score for clause 4.2 remains unchanged at 3.0. Exhibit 1B in the rate application discusses key Toronto Hydro stakeholders, with a particular focus on external stakeholders. Discussion with stakeholders reveals key aspects important to them and sheds light on stakeholder requirements and expectations and key decision-making criteria that will affect the asset management system. Robust stakeholder management processes are in place, particularly for external stakeholders such as customers and regulators. While compliant with ISO requirements, Toronto Hydro is considering including a dedicated stakeholder analysis section in a separate SAMP document (refer to discussion in 4.1 above).

CLAUSE 4.3 – DETERMINING THE SCOPE OF THE ASSET MANAGEMENT SYSTEM

Clause 4.3 has been rescored from 1.9 in 2020 to 2.1. While this is a modest increase, it also illustrates that some progress has been made in this area. Since the 2020 gap assessment, Toronto Hydro has established an Asset Management Governance Committee (AMGC), which oversees the asset management system. The scope of the Asset Management System (AMS) has been defined and documented in the draft Asset Management System Manual (AMSM). The AMSM also outlines the key roles and responsibilities of achieving Toronto Hydro's asset management objectives. The AMS boundaries include all distribution system assets, SCADA systems and station buildings. Current AMSM documentation does not identify external and internal issues identified in clause 4.1, and the requirements in clause 4.2. and need to be reviewed and approved by the AMGC.

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CLAUSE 4.4 – ASSET MANAGEMENT SYSTEM

Clause 4.4 has been rescored from 2.17 in 2020 to 3 in this latest assessment, indicating good progress made by Toronto Hydro since the last assessment. Based on information provided by Toronto Hydro, the Asset Management System manual includes details on the various documents related to the asset management system, and information on how they link with each other. Documents such as the SAMP (both the draft created by Toronto Hydro and documentation in the latest rate application) have been developed in accordance with the requirements of ISO 55001. As noted in clause 4.1 above, this documentation shows the external and internal issues identified in clause 4.1, the requirements identified in clause 4.2, and outlines the asset management objectives. Although a separate draft SAMP document has been developed, this rate application is deemed to serve the same purpose. In the future, if a separate SAMP document were to be formalized, it would be authorized and formally issued by the AMGC. At this time, it is determined that the requirements of clause 4.4 have been met.

CLAUSE 5.1 – LEADERSHIP AND COMMITMENT

There is no change to the scoring of clause 5.1 and the score stands at 2.6. After the assessment, Toronto Hydro created an Asset Management Governance Committee (AMGC) with overall responsibility for the governance of the AM System, chaired by the Executive Vice-President and Chief Planning & Modernization Officer. The chair is the owner of the AM system. There is on-going work to develop a competency framework that delineates key asset management roles and responsibilities and the resumption of regular AMGC meetings.

CLAUSE 5.2 – POLICY

Following the last assessment in 2020, Toronto Hydro created an Asset management policy in February 2022. The policy is updated every three years, and it has been reviewed and approved by the Asset Management Governance Committee (AMGC). The policy is housed on Toronto Hydro's SharePoint and has been shared with all key stakeholders. All stakeholders were also required to undergo mandatory asset management policy training toward the end of 2022. The policy is in alignment with Toronto Hydro's organizational objectives as it was developed by taking the corporate goals into account. Due to these activities performed, Toronto Hydro's score on clause 5.2 has been increased to a 3.0, which indicates that Toronto Hydro is compliant with the requirements of ISO 55001 for this clause.

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CLAUSE 5.3 – ORGANIZATIONAL ROLES RESPONSIBILITIES AND AUTHORITIES

This clause has a score of 3, indicating that Toronto Hydro conforms with the requirements of ISO 55001. No change to the score is deemed necessary at this time. Key factors that have contributed to this score are establishment of the governance framework through the establishment of the AMGC, identification of key roles and responsibilities within the AMS for activities such as development and ownership of the SAMP, including asset management objectives, and development of asset management plans for all key asset classes. Key asset management processes within the AMS are mapped and have roles and responsibilities identified in the process documents.

CLAUSE 6.1 – ACTIONS TO ADDRESS RISKS AND OPPORTUNITIES FOR THE ASSET MANAGEMENT SYSTEM

Clause 6.1 had a score of 1.98 during the 2020 assessment. This score remains unchanged. The Enterprise Risk Management (ERM) framework at the corporate level is relatively mature and the current framework was developed in 2009. This framework aligns to ISO 31000. In 2018, there were upgrades to this enterprise framework, that now includes nine enterprise level risks, three Strategic and six Functional risks. One of the functional risks is Operations risk, which includes component risks such as Asset Management Risk and Supply Chain Risk. Every year, ERM conducts risk assessments on capital programs which are both qualitative and quantitative in nature. Thus, the ERM framework ensures a linkage between enterprise and the AMS risks. The Asset Management risk for ERM is measured using SAIDI and SAIFI, which also have associated corporate KPI's. AMS risk frameworks are still in the development phase, with asset risk assessments that are descriptive and subjective in nature and not quantified or "mapped" using tools utilized by the ERM framework. Note that risk assessment methodologies are developed and detailed in Section D of the Distribution System Plan. The AMGC has not actively reviewed AMS risks. Strategic risks to achieving the asset management objectives have not been identified or evaluated. Project risks are identified and escalated to ERM through the Investment Planning & Portfolio Reporting (IPPR) process. Change management works with project leaders from IT and Business Units to ensure that the key risks in any project are identified and documented as part of the Project Status Report (PSR) and regularly reviewed, re-evaluated, managed, erased, or mitigated accordingly. Outsourcing risks, such as Supply Chain risk, are also captured and categorized under operational risk. Procurement risks are identified and addressed through the contractor pre-qualification program. Within the AMS, there isn't a formal risk register or established risk targets. AMS risks are not measured using Impact and likelihood scales utilized by ERM. Asset health calculations (which feed into risk) are performed for several distribution assets but how this process feeds into the IPPR for investment planning and optimization could be improved.

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CLAUSE 6.2 – ASSET MANAGEMENT OBJECTIVES AND PLANNING TO ACHIEVE THEM

Clause 6.2 had a score of 2.57 in the 2020 assessment. This score remains unchanged. Toronto Hydro has developed asset management objectives (AMOs) – both asset-focused objectives and asset management capability objectives. Asset objectives are categorized into customer service, reliability, safety, environment and financial. Asset Management capability objectives include developing a SAMP, enhancing Asset Management Plans (AMPs), and establishing Asset Risk indices for key asset classes, among others. The draft SAMP document lists all objectives and demonstrates alignment with corporate objectives. Asset management objectives have been reviewed and approved by AMGC, but they are not yet reviewed periodically. AMPs have been developed for all major asset classes to achieve the AMOs. However, the alignment between AMOs and AMPs is not clarified, and asset risks are not identified clearly. The process for planning capital and maintenance work is well documented. Process documentation is housed on SharePoint.

CLAUSE 7.1 – RESOURCES

Clause 7.1 was scored 3.0 in the 2020 assessment. This score remains unchanged. No additional actions are necessary at this time. Resource planning is an enterprise function. Toronto Hydro uses a mix of internal and external resources to perform work. The IPPR process feeds into the Execution Work Program (EWP) process to determine resourcing needs and allocate internal and external resources for programs and projects. Project Variance Analysis (PVA) is conducted for all projects/programs exceeding expected tolerance (-15% to +20%). The PVA investigates various factors that impact work, including the use of resources. As a continual improvement step, Toronto Hydro is in the process of developing models for long-term resource planning.

CLAUSE 7.2 – COMPETENCE

The score for clause 7.2 has improved from 2.2 to 2.8. The primary driver for this is a competency framework that was developed in 2022. In addition, key roles, functions, and capabilities have been mapped against the organizational structure, in consultation with leadership of various stakeholder business units. This helps to identify the key stakeholders associated with key capabilities within all major asset management processes.

CLAUSE 7.3 – AWARENESS

The score for clause 7.3 has improved from 2.4 to 3.0, which indicates that Toronto Hydro is in conformance with ISO 55001 requirements. The primary driver of this score was the recently implemented AM Policy training for all stakeholders related to the AMS. The training is a 30-minute online training on key aspects of Toronto Hydro AM policy. The training also requires certification, including testing on key concepts, to ensure that the participant understands the AM Policy. There is a three year recertification requirement for this training. This training platform and approach can be further expanded in the future to incorporate other asset management-related training.

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CLAUSE 7.4 – COMMUNICATION

The score for this clause remains unchanged at 3.0, indicating continued conformance with ISO 55001 requirements. No additional action is necessary at this time.

CLAUSE 7.5 – INFORMATION REQUIREMENTS

The score for clause 7.5 remains unchanged at 1.44. An Asset Information Strategy draft is currently being developed but has not been finalized, nor has it been reviewed or approved by the AMGC. Asset data used for decision-making resides in several systems. SAP is the asset register for non-linear assets, while GIS (GEAR) is the asset register for both linear and non-linear assets. A new SAP WMS system records all warehouse transactions, including on-hand quantities and storage locations. There are processes in place to ensure valid linkage and alignment between SAP and GIS. However, the process of updating SAP with asset additions/removals is typically several months behind schedule and can create a discrepancy in SAP. The data from GEAR is used by the control center for operational needs to address this issue. Asset data is captured through change-out forms, which are digitized versions of paper forms. However, there is variation in the level of detail captured through these forms beyond the minimum required information. As a result, asset data quality varies across asset classes within the AMS. There are parallel efforts to clean up data or fill in gaps, but there is limited enforcement through processes, governance, or use of technology. Training has been performed with key stakeholders responsible for collecting and providing the data, but there are opportunities for further improvement. A roadmap that clearly outlines future data requirements and a plan to reach that future state has not been developed. Intelex is the Environment, Health & Safety management system utilized by EHS. This system also has a link with the AMS for assets involved in environmental incidents, but this capability is not proactively utilized for developing asset management planning. Alteryx is the data analytics tool utilized to consolidate electrical equipment data and asset information from the SAP and GEAR database such as asset identifiers, types, and installation dates. Additionally, Alteryx extracts similar data from other databases for meter information and from the SAP database for other asset types and consolidates these diverse data sets, extracting relevant columns to determine asset age and type. Toronto Hydro also has a data warehouse beyond Alteryx which pulls key AM information from various systems.

CLAUSE 7.6 – DOCUMENTED INFORMATION

The score for clause 7.6 remains unchanged at 1.9. This clause requires an organization to control its Documented Information (DI) across the DI lifecycle. The three types of documented information include information required by ISO 55001 standard, information referenced in clause 7.5 above and information required for legal and regulatory purposes. SharePoint is the repository for documented

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information required by ISO 55001 standards; this includes the AM Policy, draft SAMP including the Asset Management objectives, Asset Management Plans, among other documents. Although these documents or drafts exist, not all have been reviewed or approved by the AMGC, and the evidence to demonstrate information control across its lifecycle is limited. Refer to clause 7.5 for discussion on information related to the effectiveness of the AMS – there are opportunities for improvement for this information. Based on evidence gathered during the 2020 gap assessment, no concerns were identified relating to documented information management for legal and regulatory information. Limited progress has been made for this clause since the 2020 gap assessment, consequently, no changes in the score for this clause are warranted at this time.

CLAUSE 8.1 – PLANNING AND CONTROL

The score for clause 8.1 remains unchanged at 2.72. The key requirement is to demonstrate that all operational processes are controlled. Although close to the conformance score of 3.0, Toronto Hydro has several improvement projects on-going after the 2020 gap assessment that have yet to be completed. These include comparing the current operational planning and control requirements with what has been defined in the AMS and identify gaps, undertaking a self-evaluation of current planning and control requirements defined in the AMS, developing requirements based on the planning cycle, and implementing these requirements. Toronto Hydro has most of the key operational processes in place. Some processes such as end-to-end project planning through closeout have not been mapped as a single process but exist as several divided processes. All processes are backed by process documentation housed on Toronto Hydro's Intranet Site and are owned and updated by the enterprise program management office. Current process maps show departments rather than functions in the swim lanes – which is inconsistent with Toronto Hydro's process standard. The alignment of work execution to the Asset Management objectives is not articulated clearly enough.

CLAUSE 8.2 – MANAGEMENT OF CHANGE

The score for clause 8.2 remains unchanged at 2.88. Several actions were identified from the 2020 gap assessment that are still ongoing. These include reviewing the current policies of managing change and a gap assessment against the new AM System, reviewing existing internal change management, and submitting the updated Management of Change procedure for authorization to AMGC, and formally issue and brief out the Management of Change procedure. As none of these actions have been completed, the score does not warrant a change.

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CLAUSE 8.3 – OUTSOURCING

The score for this clause remains unchanged at 3.0, indicating continued conformance with ISO 55001 requirements. No additional action is necessary at this time.

CLAUSE 9.1 – MONITORING, MEASUREMENT, ANALYSIS, AND EVALUATION

The score for this clause remains unchanged at 2.94. Although close to conformance, there are several pending actions that Toronto Hydro is working on. These include reviewing the current performance monitoring processes, developing a set of leading measures for the performance and condition of the assets, and defining a set of higher-level measures that will enable monitoring of the achievement of the asset management objectives.

CLAUSE 9.2 – INTERNAL AUDIT

The score for clause 9.2 remains unchanged at 2.58. Internal audit is an enterprise-wide function that involves auditing approximately thirty-six processes. Every year, processes are selected based on focus areas for executives and perceived risk areas for the organization. Auditing is a three-step process – planning, execution, and reporting. Planning involves identifying audit objectives and risks, coordinating with stakeholders, and analysis. Execution involves reviewing planning outputs in detail, additional analytics, walk-through conversations with key stakeholders, and developing recommendations for improvement. Reporting involves approval of the report from leadership, sharing action items with stakeholders and follow-up activities to ensure conformance. A formal audit committee oversees and governs the audit process. An external audit was performed for AMS processes in 2022 – an internal audit was not conducted to avoid duplication. Another audit for AMS related processes is planned for 2026. Follow up actions after the 2020 gap assessment included developing and submitting an AMS audit plan for authorization to the AMGC and reporting progress to the AMGC on a regular basis.

CLAUSE 9.3 – MANAGEMENT REVIEW

The score for clause 9.3 remains unchanged at 2.63. No progress has been made on the activities identified after the 2020 gap assessment such as developing and submitting the AMS management review framework to the AMGC for approval, followed by implementation. Progress is expected after the AMGC resumes regular meetings in 2024.

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CLAUSE 10.1 – NONCONFORMITY AND CORRECTIVE ACTION

The score for this clause remains unchanged at 3.0 indicating continued conformance with ISO 55001 requirements. No additional action is necessary at this time.

CLAUSE 10.2 – PREVENTIVE ACTION

The score for this clause remains unchanged at 3.0 indicating continued conformance with ISO 55001 requirements. No additional action is necessary at this time.

CLAUSE 10.3 – CONTINUOUS IMPROVEMENT

The score for this clause remains unchanged at 2.33. The AMGC has not convened in a year due to competing priorities such as the recent rate application. Therefore, limited progress has been made against the asset management roadmap, developed following the 2020 gap assessment, and management review of these activities.

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APPENDICES

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APPENDIX 1 – DOCUMENTATION REVIEWED

Category	Document Name
2020 Gap Analysis Report	THESL ISO 55001 Gap Analysis v3.0-FINAL
Org Charts	1. Customer Care, Electric Operations and Procurement
Org Charts	2. Human Resources and Safety
Org Charts	3. Regulatory Affairs and Legal
Org Charts	4. Engineering and Construction
Org Charts	5. Finance
Org Charts	6. IT Services
Organization & Competence	Job Profiles
Organization & Competence	OC 1 - TH_RACI_ISO Job Profiles
Organization & Competence	OC 2 - TH_COMPETENCY_FRAMEWORK
Processes & Procedures	2018-electricity-distributor-scorecard
Processes & Procedures	Engineering Portfolio Meeting Nov 2023
Processes & Procedures	ISO55001 Steering Committee Update - July 2022 v1.0
Processes & Procedures	major-event-report-july-8-2020
Processes & Procedures	PP 1&2 - L0 and L1 Business Process Design - v1.0
Processes & Procedures	PP 3 - L0 and L1 Business Process Guidance - v0.5
Processes & Procedures	PP 4 - Change Management Framework - v0.5
Rate Application	Consolidated Application
Rate Application	Customer Summary
Rate Application	Executive Summary
Rate Application	Exhibit 1C – Corporate Information
Rate Application	Exhibit 2A – Rate Base
Rate Application	Exhibit 2B – Distribution System Plan
Rate Application	Exhibit 3 – Operating Revenue
Rate Application	Exhibit 4 – Operating Expenses
Rate Application	Exhibit 5 – Cost of Capital and Capital Structure
Rate Application	Exhibit 6 – Revenue Requirement
Rate Application	Exhibit 7 – Cost Allocation
Rate Application	Exhibit 8 – Rate Design
Rate Application	Exhibit 9 – Deferral and Variance Accounts
Rate Application	Exhibit-1B-application-overview
Rate Application	Filing Cover Letter
Roadmap	ISO55001 Progress and Plan_16.11.2023
Roadmap	THESL - ISO 55001 Roadmap v2.0_Final
Strategy & Planning	SP 1 - SAMP Draft Phase 1 (2021-2022) v0.5
Strategy & Planning	SP 2 - AMSM Draft Phase 1 (2021-2022) v0.5

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Systems & Information	CoE Enterprisers
Systems & Information	ISO55001 Information Model Data Elements v0.3 2021.10
Systems & Information	SI 1 - Asset Information Strategy - v0.5
Systems & Information	SI 2 - Conceptual Asset Information Model - v0.5
Systems & Information	TH ISO Information Model 2021.11.22 v0.11

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APPENDIX 2 – ACRONYMS USED

Acronym	Description
AM	Asset Management
AMGC	Asset Management Governance Committee
AMO	Asset Management Objective
AMP	Asset Management Plan
AMS	Asset Management System
AMSM	Asset Management System Manual
DI	Documented Information
EHS	Environment, Health & Safety
ERM	Enterprise Risk Management
IPPR	Investment Planning & Portfolio Reporting
PSR	Project Status Report
PVA	Project Variance Analysis
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SAMP	Strategic Asset Management Plan
SCADA	Supervisory Control and Data Acquisition

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POLICY

Asset Management	**Policy Owner:** Executive Vice President, Planning & Chief Engineering and Modernization Officer
	Policy Approver: Policy Administration Steering Committee
	Version Approval Date: 2022-02-01
	Last Review by PASC: 2022-02-01
The most recent version of this policy can be obtained from http://pluggedin.torontohydro.com/policy/Pages/allpolicies.aspx	
The distribution of this policy is restricted to Toronto Hydro.	

Anthony Haines
President and CEO, Toronto Hydro Corporation

February 17, 2022
Date

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1 DOCUMENT REVIEW & REVISION HISTORY

This policy is reviewed every three years.

Version Number	Date of Review	Reviewed By	Brief Description of Change	Next Review Date
V1.0	2018-12-19	PASC	New Policy. V 1.0 approved by PASC.	December 2021
V2.0	2021-11-19 2022-02-01	AMGC PASC	Policy updated to reflect continuous improvement changes to the Asset Management System through the ISO55001 project.	November 2024

2 DISTRIBUTION HISTORY

Version Number	Date of Posting	Format of Distribution
V 1.0	2018-12-19	Toronto Hydro Intranet Site (Plugged In)
V 2.0	2022-02-22	Toronto Hydro Intranet Site (Plugged In)

3 POLICY OVERVIEW

The Asset Management Policy formalizes Toronto Hydro's Asset Management direction and establishes a framework to develop and continuously improve Toronto Hydro's Asset Management System.

4 DEFINITIONS AND ABBREVIATIONS

TERM or ACRONYM	DESCRIPTION
AMGC	Asset Management Governance Committee - whose role is to provide oversight of the application, maintenance, and continuous improvement of the Asset Management System (AMS) at Toronto Hydro
Asset Management	Coordinated activity of an organization to realize value from its assets. This involves balancing costs, opportunities, and risks against the desired performance of assets to achieve the organization's objectives.[1]
Asset Management System	The management system for Asset Management whose function is to establish the Asset Management Policy and Asset Management objectives
Contractor	Any resource engaged through a third party agency or organization that is not directly employed by Toronto Hydro.
Employee(s)	Includes any individual employed by Toronto Hydro (including but not limited to individuals employed on a full-time, part-time,contract, or casual basis).
PASC	Policy Administration Steering Committee
Toronto Hydro	Toronto Hydro Corporation and its subsidiaies.

5 SCOPE

5.1 This policy applies to the Asset Management System, which comprises all Toronto Hydro distribution system assets, including stations buildings and SCADA systems.

5.2 This policy does not apply to Fleet, Tools, Facilities, or Information Technology assets.

5.3 This policy applies to all aspects of asset management, including the acquisition, operation, maintenance, and disposal of assets.

5.4 This policy applies to all employees, officers and directors of Toronto Hydro, as well as contractors and visitors to Toronto Hydro facilities and sites.

5.5 This policy is designed to augment other corporate policies and is not intended to replace or preclude them. Should an overlap arise between the application of this policy and any other policy, the policy most applicable to the situation will be applied.

[1] The Institute of Asset Management – www.iam.org

6 POLICY STATEMENT

Toronto Hydro's asset management policy is to ensure that it effectively manages its electricity distribution assets, across the complete asset lifecycle, in a safe, cost-effective, and sustainable manner, and that the management of those assets meets the needs of its customers and stakeholders, and provides a fair return to its shareholder. Toronto Hydro shall comply with all legal, regulatory and environmental requirements placed upon the organization and will prioritize the safety of its employees and the public.

This Asset Management Policy shall be achieved through the management and continuous improvement of an efficient, coordinated, systematic, and embedded Asset Management System that:

- develops and implements a **Strategic Asset Management Plan**;
- balances costs, risks, opportunities and performance by applying a holistic approach to decision-making while:
    - optimizing the distribution system's reliability performance in accordance with customer needs and preferences;
    - enabling growth, fostering electrification, and accommodating evolving consumer and stakeholder needs; and
    - striving for zero public and employee safety incidents.
- aligns with Toronto Hydro's corporate strategy as well as its safety and environmental management systems;
- collects and analyzes asset information to enable informed and holistic decision-making; and
- ensures the availability of the required resources to develop and implement Asset Management strategies and plans.

All employees and contractors shall comply with this policy and contribute towards the continuous improvement of the Asset Management System.

7 POLICY ADMINISTRATION OWNERSHIP, APPROVAL AND RESPONSIBILITIES

Policy Owner

7.1 This policy is owned by the Executive Vice President, Planning & Chief Engineering and Modernization Officer

7.2 The Executive Vice President, Planning & Chief Engineering and Modernization Officer is responsible for

- Ensuring that this policy is comprehensive, clear and current
- Ensuring that this policy is implemented and communicated to the departments and staff that are impacted
- Ensuring ongoing compliance with this policy
- Approving any exceptions to this policy, as required
- Reviewing this policy as per the review frequency stated in Section 1 of this policy

Policy Approver

7.3 This policy is reviewed and updated by the AMGC.

7.4 The AMGC is responsible for oversight of the application, maintenance, and continuous improvement of the Asset Management System at Toronto Hydro. The AMGC will formally review and update this Asset Management Policy before formal review by the PASC.

7.5 The PASC is responsible for:

- Considering the impact of the proposed policy on corporate risks
- Reviewing and approving this policy as per the review frequency stated in Section 1 of this policy

Designated Responsible Person (DRP)

7.6 This policy is managed by the Director, Integrated Planning & Modernization

7.7 The Director, Integrated Planning & Modernization is responsible for:

- Immediately communicating any exceptions or violations of this policy to the Executive Vice President, Planning & Chief Engineering and Modernization Officer for review and remedial action
- Reviewing this policy as per the review frequency stated in Section 1, and recommending changes as required

8 POLICY COMMUNICATION

COMMUNICATION TRIGGER	TYPE OF COMMUNICATION	PARTY RESPONSIBLE FOR POLICY COMMUNICATION	AUDIENCE	ACKNOWLEDGEMENT
Policy review and approval	PASC meeting	Director, Integrated Planning & Modernization	PASC members	PASC minutes
Policy update	Post on Intranet	Business Law and Corporate Governance Department	All employees	N/A
Policy update	Senior Engagement Meetings	Integrated Planning & Modernization	Senior Leaders	N/A
Policy update	Email Memo	Integrated Planning & Modernization	All Employees	N/A
Policy update	People Connect Training Attestation	Sustainability & Training	All Employees	Attestation
New employee hire	Onboarding	Direct Leader	New hire	N/A

9 POLICY COMPLIANCE AND VIOLATIONS

9.1 All Toronto Hydro employees, officers, directors and contractors are required to comply with this policy

9.2 Failure to comply with this policy will pose significant financial, operational, environmental, legal, regulatory, safety, and reputational risks to Toronto Hydro and its employees

9.3 The Director, Integrated Planning & Modernization is responsible for tracking and collecting applicable data, measuring compliance and reporting in such format as may be required

10 RELATED LAWS, REGULATIONS AND DOCUMENTATION

10.1 External legislation and standards that affect this policy include:

- *The Electricity Act, 1998*
- *Electricity Distribution Safety, Ontario Regulation 22/04*
- *Ontario Energy Board Act, 1998*
- Ontario Energy Board's Distribution System Code ("DSC")
- Toronto Hydro's Distribution Licence
- Electricity Utilities Safety Rules (EUSR)
- Relevant City of Toronto by-laws
- Relevant Ministry of the Environment, Conservation and Parks Statutes Regulations

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-35

References: Exhibit 2B, Section C

Preamble:

With respect to reliability performance:

QUESTION (A):

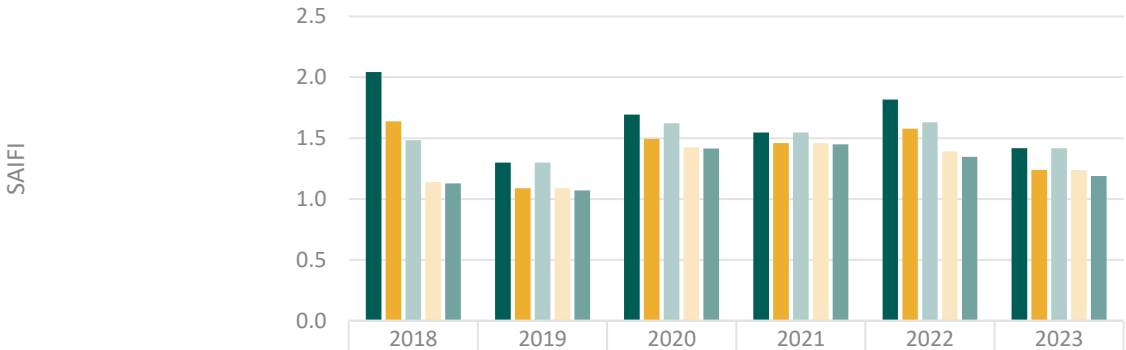
a) Please update the following figures and tables to provide 2023 information:

i. Figure 1, 2, 12, 13, 20, 21, 22, 23, 24, 25

ii. Tables 3, 4, 5, 6

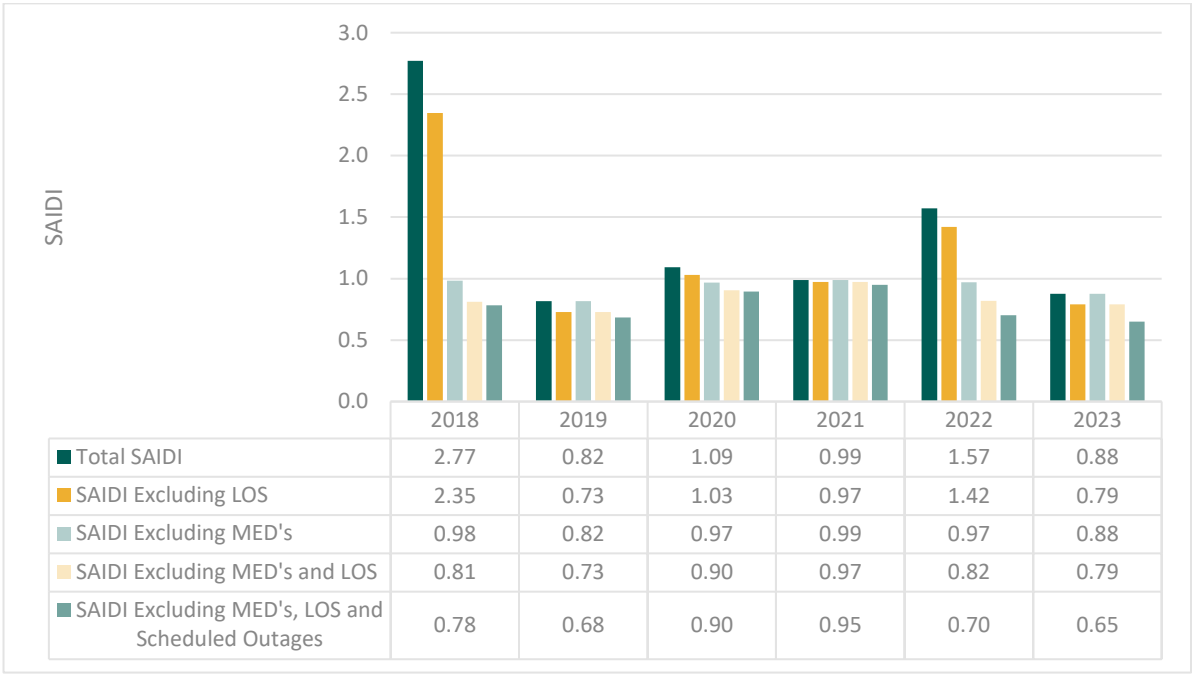
RESPONSE (A):

Please see Figures 1-12 and Tables 1-4 below. Toronto Hydro included Figures 10 and 11 from Exhibit 2B, Section C as well for completeness. The original figure and table numbers from Section C are noted in the captions for convenience.



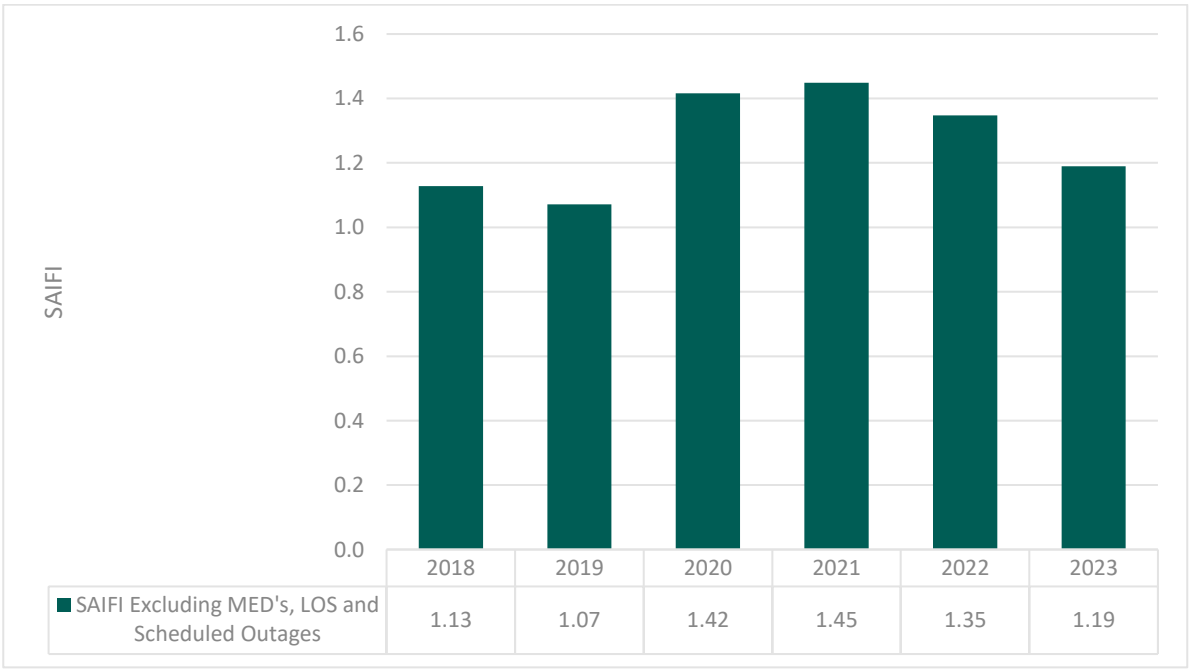
	2018	2019	2020	2021	2022	2023
Total SAIFI	2.04	1.30	1.69	1.55	1.82	1.42
SAIFI Excluding LOS	1.64	1.09	1.50	1.46	1.58	1.24
SAIFI Excluding MED's	1.48	1.30	1.62	1.55	1.63	1.42
SAIFI Excluding MED's and LOS	1.14	1.09	1.42	1.46	1.39	1.24
SAIFI Excluding MED's, LOS and Scheduled Outages	1.13	1.07	1.42	1.45	1.35	1.19

Figure 1: System Level SAIFI (Figure 1)



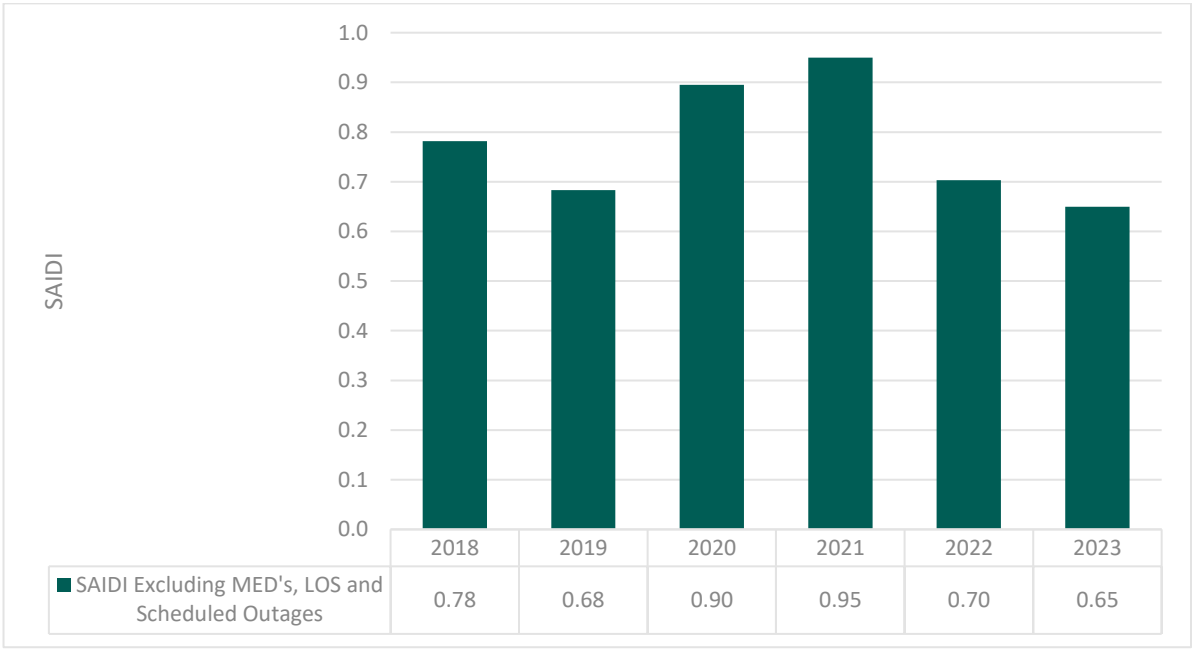
	2018	2019	2020	2021	2022	2023
Total SAIDI	2.77	0.82	1.09	0.99	1.57	0.88
SAIDI Excluding LOS	2.35	0.73	1.03	0.97	1.42	0.79
SAIDI Excluding MED's	0.98	0.82	0.97	0.99	0.97	0.88
SAIDI Excluding MED's and LOS	0.81	0.73	0.90	0.97	0.82	0.79
SAIDI Excluding MED's, LOS and Scheduled Outages	0.78	0.68	0.90	0.95	0.70	0.65

Figure 2: System Level SAIDI (Figure 2)



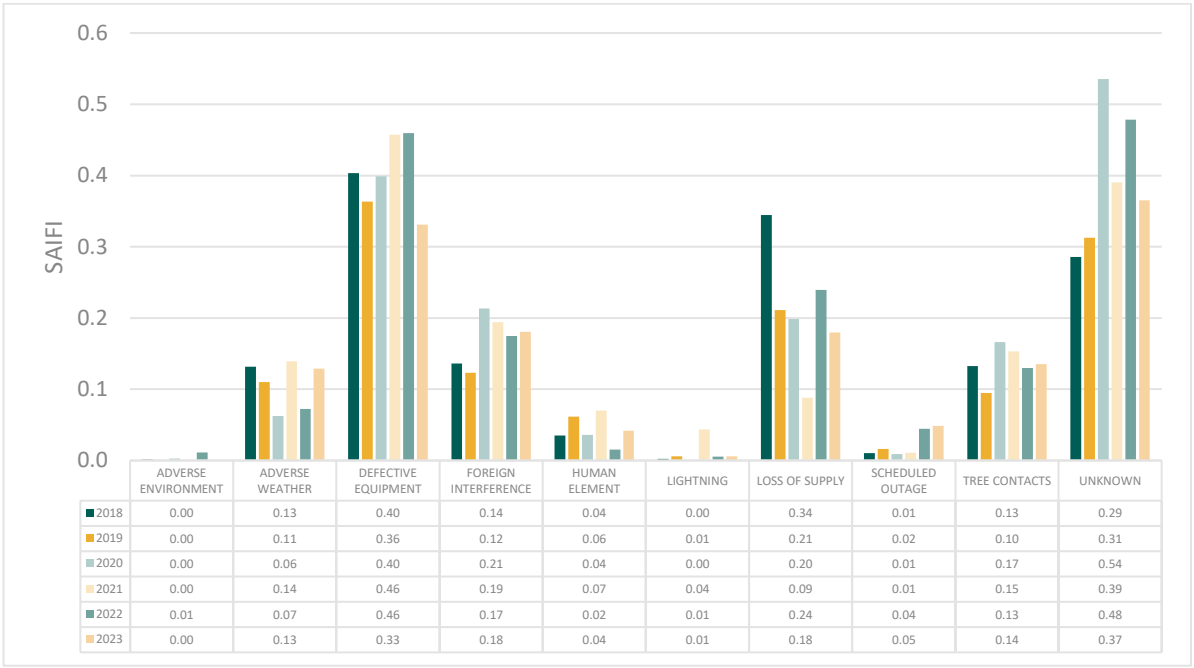
	2018	2019	2020	2021	2022	2023
SAIFI Excluding MED's, LOS and Scheduled Outages	1.13	1.07	1.42	1.45	1.35	1.19

Figure 3: System SAIFI Excluding MEDs, Loss of Supply, and Scheduled Outages (Figure 10)



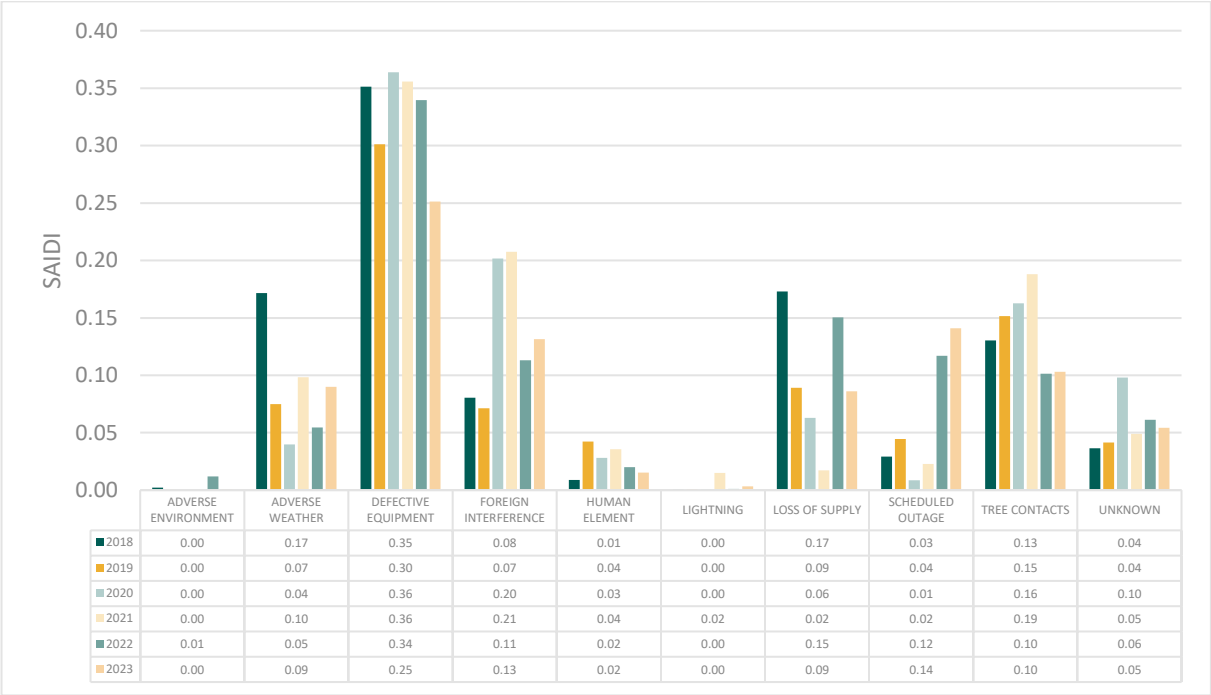
1 **Figure 4: System SAIDI Excluding MEDs, Loss of Supply, and Scheduled Outages (Figure 11)**

2



	ADVERSE ENVIRONMENT	ADVERSE WEATHER	DEFECTIVE EQUIPMENT	FOREIGN INTERFERENCE	HUMAN ELEMENT	LIGHTNING	LOSS OF SUPPLY	SCHEDULED OUTAGE	TREE CONTACTS	UNKNOWN
2018	0.00	0.13	0.40	0.14	0.04	0.00	0.34	0.01	0.13	0.29
2019	0.00	0.11	0.36	0.12	0.06	0.01	0.21	0.02	0.10	0.31
2020	0.00	0.06	0.40	0.21	0.04	0.00	0.20	0.01	0.17	0.54
2021	0.00	0.14	0.46	0.19	0.07	0.04	0.09	0.01	0.15	0.39
2022	0.01	0.07	0.46	0.17	0.02	0.01	0.24	0.04	0.13	0.48
2023	0.00	0.13	0.33	0.18	0.04	0.01	0.18	0.05	0.14	0.37

3 **Figure 5: SAIFI Cause Code Breakdown (Excluding MEDs) (Figure 12)**



	ADVERSE ENVIRONMENT	ADVERSE WEATHER	DEFECTIVE EQUIPMENT	FOREIGN INTERFERENCE	HUMAN ELEMENT	LIGHTNING	LOSS OF SUPPLY	SCHEDULED OUTAGE	TREE CONTACTS	UNKNOWN
2018	0.00	0.17	0.35	0.08	0.01	0.00	0.17	0.03	0.13	0.04
2019	0.00	0.07	0.30	0.07	0.04	0.00	0.09	0.04	0.15	0.04
2020	0.00	0.04	0.36	0.20	0.03	0.00	0.06	0.01	0.16	0.10
2021	0.00	0.10	0.36	0.21	0.04	0.02	0.02	0.02	0.19	0.05
2022	0.01	0.05	0.34	0.11	0.02	0.00	0.15	0.12	0.10	0.06
2023	0.00	0.09	0.25	0.13	0.02	0.00	0.09	0.14	0.10	0.05

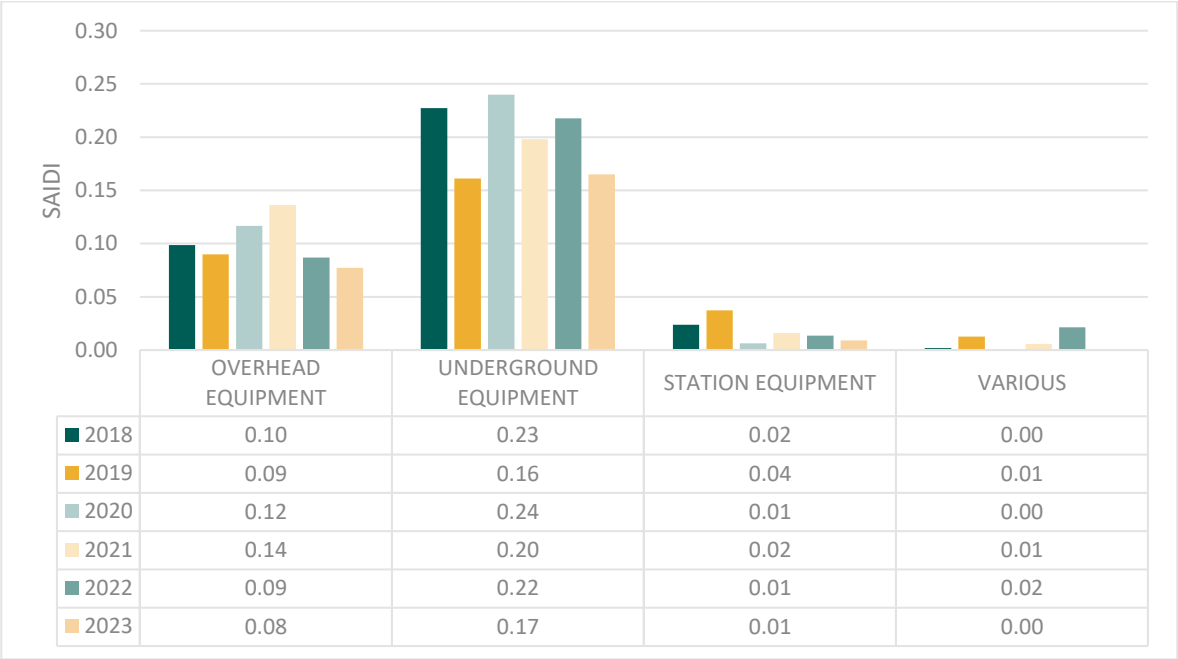
1 **Figure 6: SAIDI Cause Code Breakdown (Excluding MEDs) (Figure 13)**

2



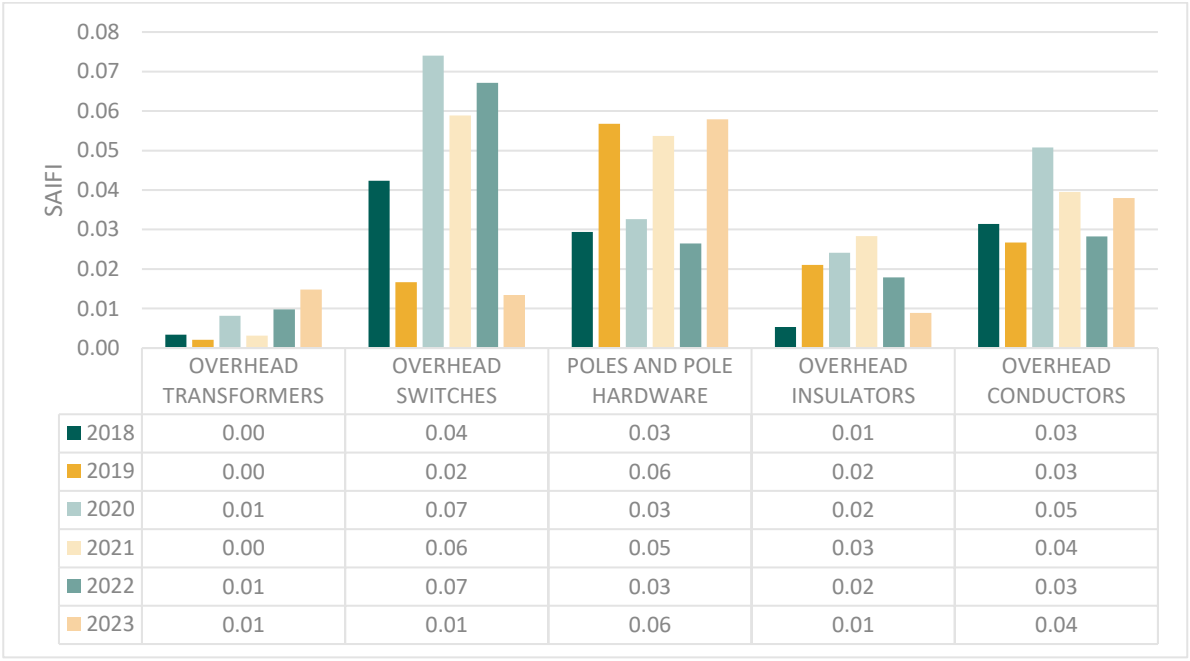
	OVERHEAD EQUIPMENT	UNDERGROUND EQUIPMENT	STATION EQUIPMENT	VARIOUS
2018	0.11	0.27	0.02	0.00
2019	0.12	0.21	0.01	0.01
2020	0.19	0.20	0.01	0.00
2021	0.18	0.26	0.01	0.01
2022	0.15	0.29	0.01	0.00
2023	0.13	0.19	0.01	0.00

3 **Figure 7: Defective Equipment SAIFI (Excluding MEDs) (Figure 20)**



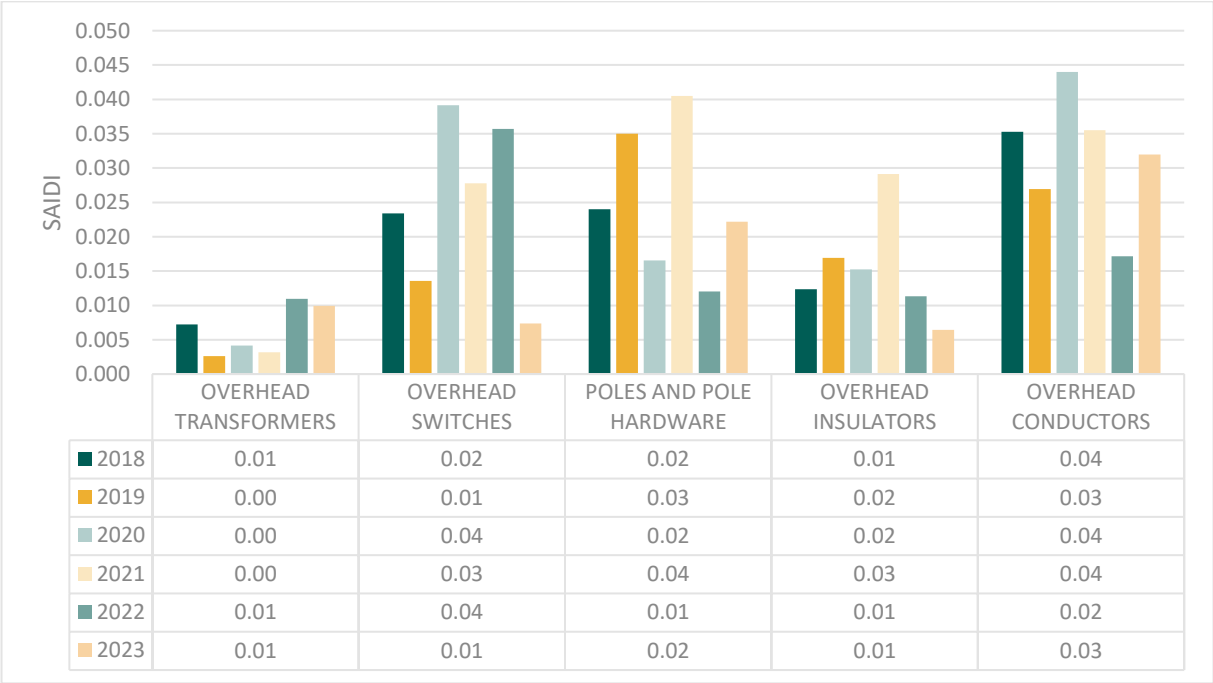
	OVERHEAD EQUIPMENT	UNDERGROUND EQUIPMENT	STATION EQUIPMENT	VARIOUS
2018	0.10	0.23	0.02	0.00
2019	0.09	0.16	0.04	0.01
2020	0.12	0.24	0.01	0.00
2021	0.14	0.20	0.02	0.01
2022	0.09	0.22	0.01	0.02
2023	0.08	0.17	0.01	0.00

Figure 8: Defective Equipment SAIDI (Excluding MEDs) (Figure 21)



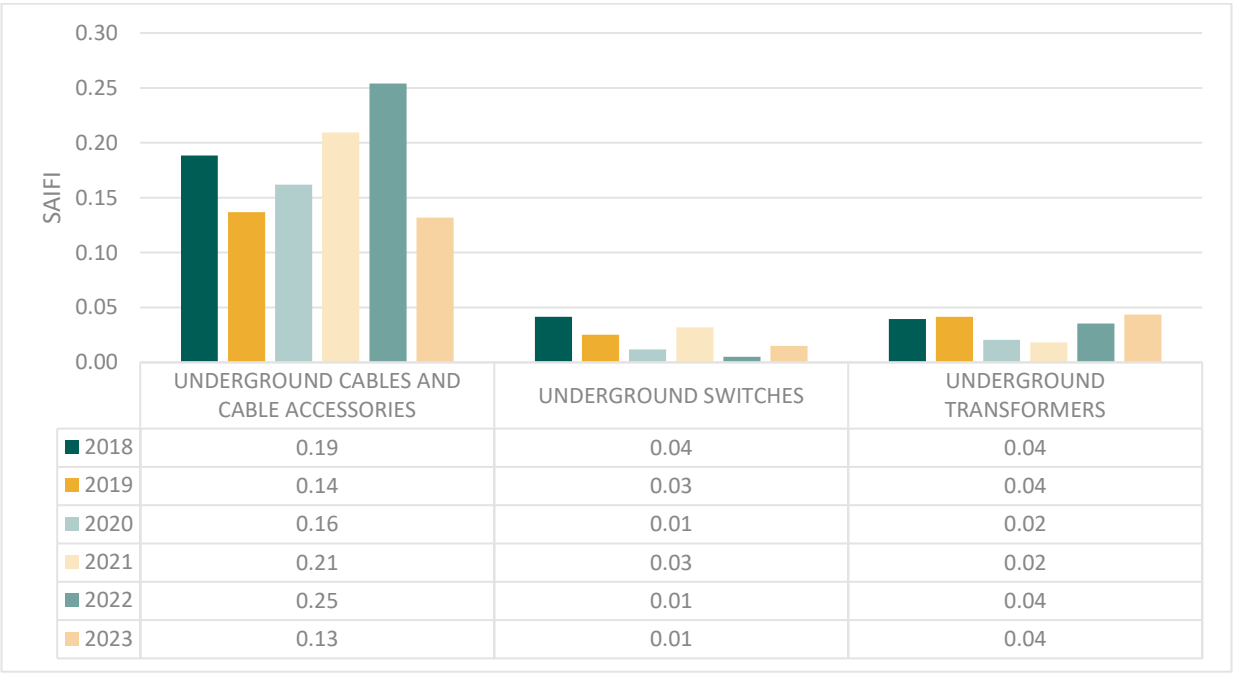
	OVERHEAD TRANSFORMERS	OVERHEAD SWITCHES	POLES AND POLE HARDWARE	OVERHEAD INSULATORS	OVERHEAD CONDUCTORS
2018	0.00	0.04	0.03	0.01	0.03
2019	0.00	0.02	0.06	0.02	0.03
2020	0.01	0.07	0.03	0.02	0.05
2021	0.00	0.06	0.05	0.03	0.04
2022	0.01	0.07	0.03	0.02	0.03
2023	0.01	0.01	0.06	0.01	0.04

Figure 9: Defective Equipment SAIFI – Overhead (Excluding MEDs) (Figure 22)



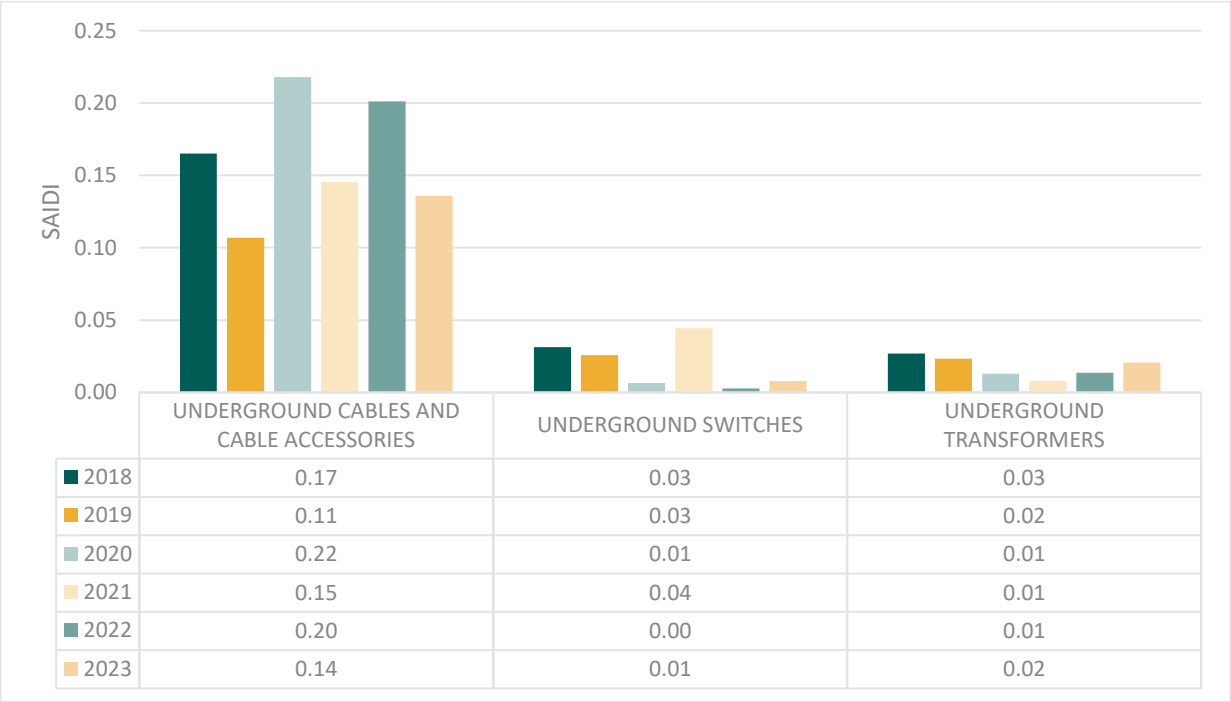
	OVERHEAD TRANSFORMERS	OVERHEAD SWITCHES	POLES AND POLE HARDWARE	OVERHEAD INSULATORS	OVERHEAD CONDUCTORS
2018	0.01	0.02	0.02	0.01	0.04
2019	0.00	0.01	0.03	0.02	0.03
2020	0.00	0.04	0.02	0.02	0.04
2021	0.00	0.03	0.04	0.03	0.04
2022	0.01	0.04	0.01	0.01	0.02
2023	0.01	0.01	0.02	0.01	0.03

Figure 10: Defective Equipment SAIDI – Overhead (Excluding MEDs) (Figure 23)



	UNDERGROUND CABLES AND CABLE ACCESSORIES	UNDERGROUND SWITCHES	UNDERGROUND TRANSFORMERS
2018	0.19	0.04	0.04
2019	0.14	0.03	0.04
2020	0.16	0.01	0.02
2021	0.21	0.03	0.02
2022	0.25	0.01	0.04
2023	0.13	0.01	0.04

Figure 11: Defective Equipment SAIFI – Underground (Excluding MEDs) (Figure 24)



	UNDERGROUND CABLES AND CABLE ACCESSORIES	UNDERGROUND SWITCHES	UNDERGROUND TRANSFORMERS
2018	0.17	0.03	0.03
2019	0.11	0.03	0.02
2020	0.22	0.01	0.01
2021	0.15	0.04	0.01
2022	0.20	0.00	0.01
2023	0.14	0.01	0.02

Figure 12: Defective Equipment SAIDI – Underground (Excluding MEDs) (Figure 25)

Table 1: Five-Year (2019-2023) Average SAIFI and SAIDI Contribution by Cause Code (Excluding MEDs) (Table 3)

Cause Code	Contribution % to SAIFI	Contribution % to SAIDI
UNKNOWN	27.7%	6.6%
DEFECTIVE EQUIPMENT	26.7%	34.9%
LOSS OF SUPPLY	12.2%	8.8%
FOREIGN INTERFERENCE	11.8%	15.7%
TREE CONTACTS	9.0%	15.3%
ADVERSE WEATHER	6.8%	7.7%
HUMAN ELEMENT	3.0%	3.1%
SCHEDULED OUTAGE	1.7%	7.2%
LIGHTNING	0.8%	0.5%
ADVERSE ENVIRONMENT	0.2%	0.3%

Table 2: Number of Interruptions by Cause Code (Excluding MEDs) (Table 4)

Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	8	1	4	3	17	7
Adverse Weather	129	57	49	79	80	80
Defective Equipment	441	330	334	364	484	461
Foreign Interference	144	123	151	169	212	227
Human Element	19	24	23	38	31	24
Lightning	4	3	2	22	5	5
Loss of Supply	34	21	18	10	42	34
Scheduled Outage	143	102	137	142	907	1,416
Tree Contacts	81	48	70	104	120	124
Unknown/Other	135	135	224	145	233	199
Grand Total	**1,138**	**844**	**1,012**	**1,076**	**2,131**	**2,577**

Table 3: Number of Customer Interruptions by Cause Code (Excluding MEDs) (Table 5)

Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	988	5	2,164	249	8,786	229
Adverse Weather	100,462	84,803	48,318	108,474	56,744	101,381
Defective Equipment	308,064	279,474	308,633	354,985	359,936	260,459
Foreign Interference	103,812	94,716	165,199	150,885	136,878	142,256
Human Element	26,929	47,271	27,811	54,623	12,029	32,801
Lightning	1,738	4,346	273	33,840	4,151	4,771
Loss of Supply	263,344	162,433	153,684	68,259	187,464	141,510
Scheduled Outage	7,993	12,452	6,897	8,398	35,004	38,330
Tree Contacts	101,329	73,108	128,667	118,879	101,713	106,394
Unknown/Other	218,398	240,491	414,343	303,457	374,813	287,442
Grand Total	**1,133,057**	**999,099**	**1,255,989**	**1,202,049**	**1,277,518**	**1,115,573**

Table 4: Number of Customer Hours Interrupted by Cause Code (Excluding MEDs) (Table 6)

Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	1,664	9	116	420	9,353	563
Adverse Weather	131,115	57,672	30,890	76,673	42,846	70,779
Defective Equipment	268,452	231,449	281,347	276,297	265,983	197,717

Cause Code	2018	2019	2020	2021	2022	2023
Foreign Interference	61,487	54,799	155,980	161,211	88,595	103,426
Human Element	6,837	32,542	21,656	27,607	15,633	12,023
Lightning	346	601	630	11,684	914	2,690
Loss of Supply	131,949	68,436	48,574	13,329	117,641	67,719
Scheduled Outage	22,465	34,377	6,770	17,662	91,633	110,968
Tree Contacts	99,505	116,665	125,859	146,037	79,471	81,096
Unknown/Other	27,880	31,812	75,791	38,041	48,000	42,759
Grand Total	**751,700**	**628,362**	**747,611**	**768,962**	**760,069**	**689,741**

QUESTION (B):

b) Does Toronto Hydro track reliability data separately for its Downtown and Horseshoe areas? If so, please provide a revised version of the data requested in part (a) broken down into the two areas.

RESPONSE (B):

Please see Figures 13-36 and Tables 5-12 below for the broken-down contributions from the Horseshoe and Downtown Core.



	2018	2019	2020	2021	2022	2023
Total SAIFI	0.25	0.21	0.19	0.12	0.21	0.15
SAIFI Excluding LOS	0.18	0.14	0.11	0.12	0.17	0.11
SAIFI Excluding MED's	0.21	0.21	0.19	0.12	0.18	0.15
SAIFI Excluding MED's and LOS	0.13	0.14	0.10	0.12	0.13	0.11
SAIFI Excluding MED's, LOS and Scheduled Outages	0.13	0.13	0.10	0.12	0.13	0.11

Figure 13: System Level SAIFI (Downtown)



	2018	2019	2020	2021	2022	2023
Total SAIDI	0.49	0.25	0.29	0.22	0.29	0.21
SAIDI Excluding LOS	0.40	0.22	0.26	0.22	0.21	0.18
SAIDI Excluding MED's	0.29	0.25	0.27	0.22	0.25	0.21
SAIDI Excluding MED's and LOS	0.20	0.22	0.24	0.22	0.16	0.18
SAIDI Excluding MED's, LOS and Scheduled Outages	0.19	0.18	0.24	0.21	0.15	0.15

Figure 14: System Level SAIDI (Downtown)

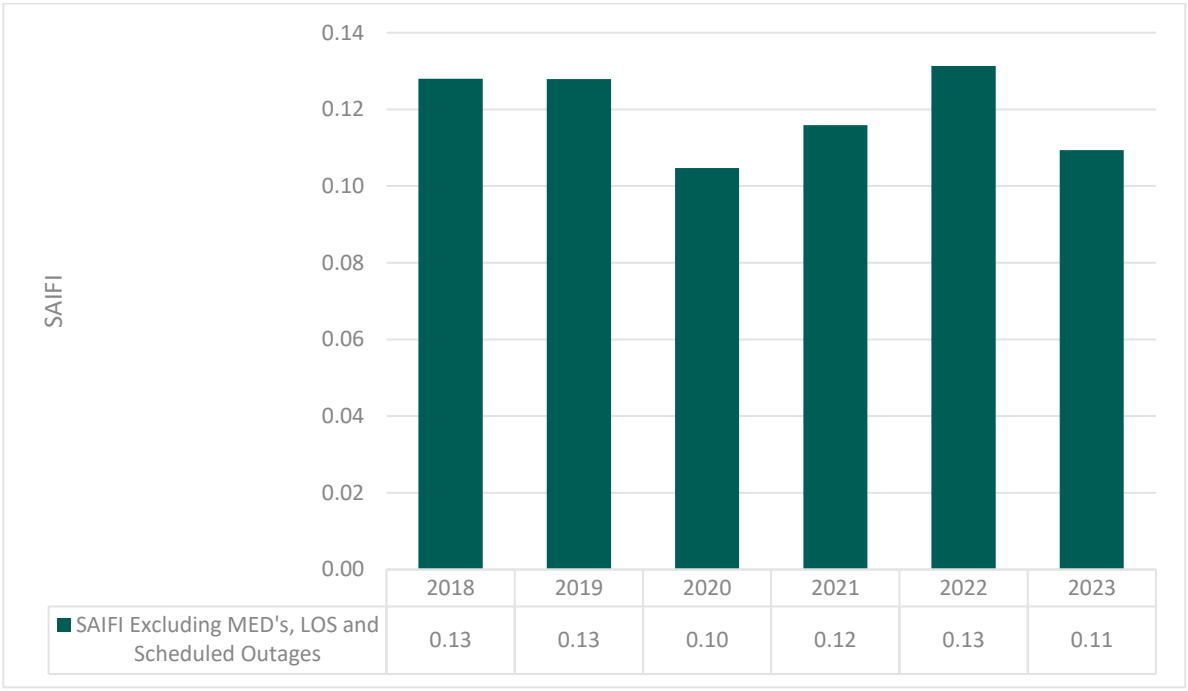


Figure 15: System SAIFI Excluding MEDs, Loss of Supply, and Scheduled Outages (Downtown)

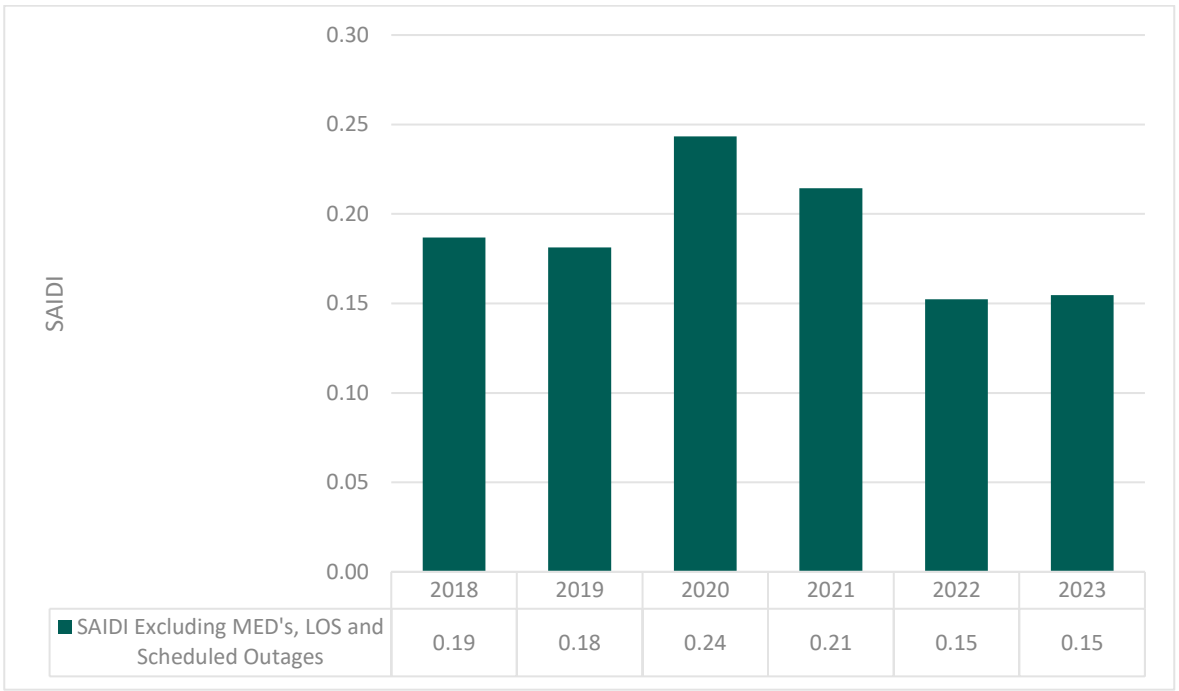


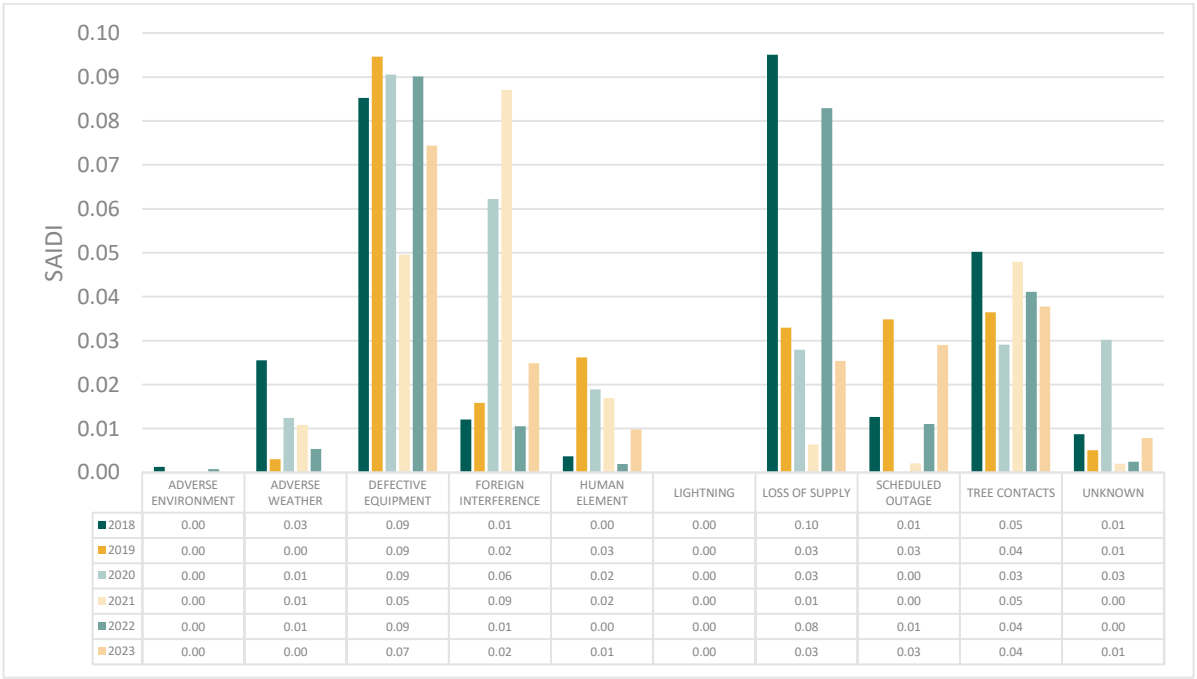
Figure 16: System SAIDI Excluding MEDs, Loss of Supply, and Scheduled Outages (Downtown)



	ADVERSE ENVIRONMENT	ADVERSE WEATHER	DEFECTIVE EQUIPMENT	FOREIGN INTERFERENCE	HUMAN ELEMENT	LIGHTNING	LOSS OF SUPPLY	SCHEDULED OUTAGE	TREE CONTACTS	UNKNOWN
2018	0.00	0.01	0.05	0.02	0.00	0.00	0.07	0.00	0.04	0.01
2019	0.00	0.00	0.05	0.02	0.02	0.00	0.07	0.01	0.02	0.02
2020	0.00	0.01	0.04	0.02	0.01	0.00	0.08	0.00	0.02	0.01
2021	0.00	0.00	0.03	0.04	0.01	0.00	0.00	0.00	0.03	0.01
2022	0.00	0.01	0.05	0.02	0.00	0.00	0.05	0.00	0.04	0.01
2023	0.00	0.00	0.03	0.01	0.02	0.00	0.04	0.00	0.03	0.01

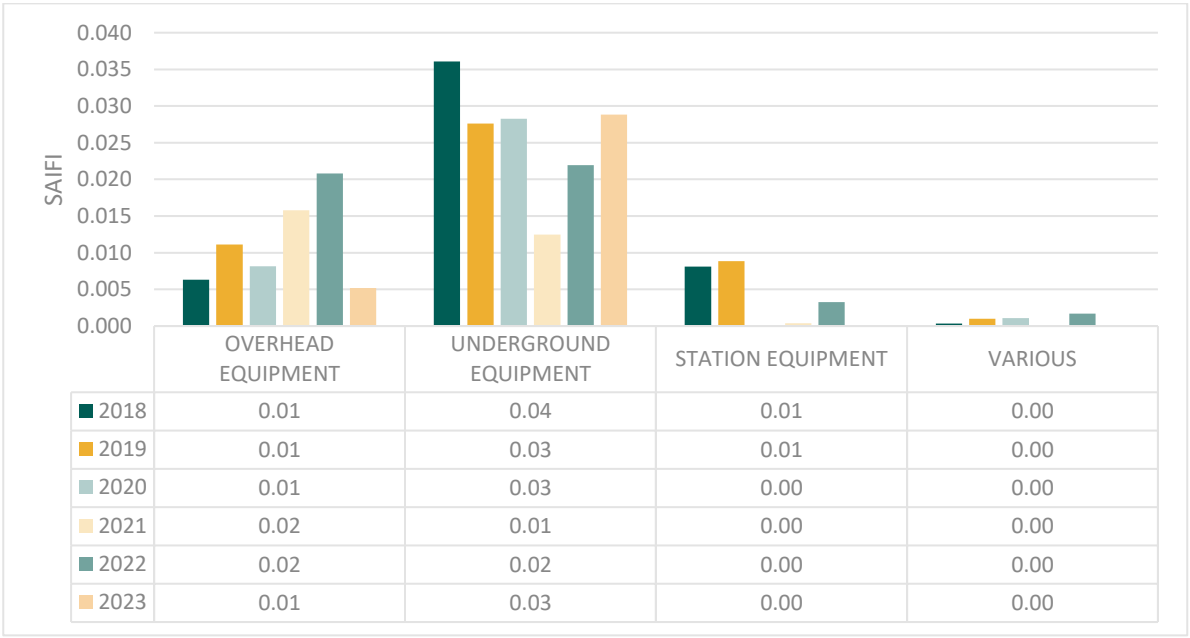
1 **Figure 17: SAIFI Cause Code Breakdown (Excluding MEDs) (Downtown)**

2



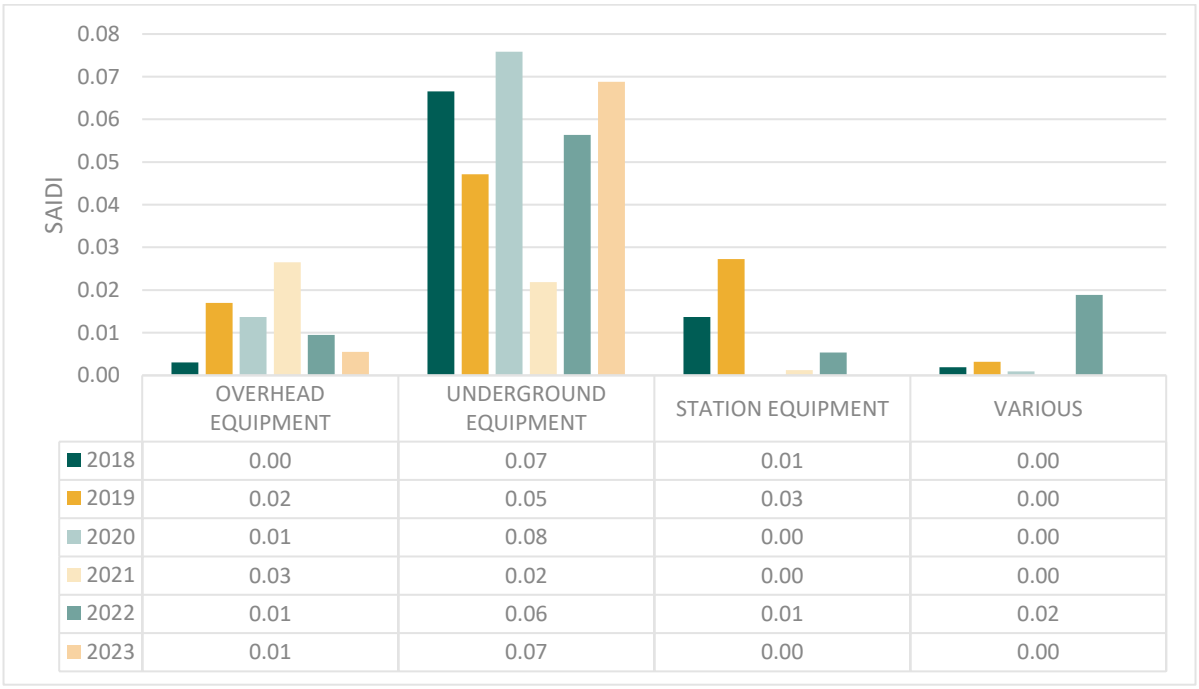
	ADVERSE ENVIRONMENT	ADVERSE WEATHER	DEFECTIVE EQUIPMENT	FOREIGN INTERFERENCE	HUMAN ELEMENT	LIGHTNING	LOSS OF SUPPLY	SCHEDULED OUTAGE	TREE CONTACTS	UNKNOWN
2018	0.00	0.03	0.09	0.01	0.00	0.00	0.10	0.01	0.05	0.01
2019	0.00	0.00	0.09	0.02	0.03	0.00	0.03	0.03	0.04	0.01
2020	0.00	0.01	0.09	0.06	0.02	0.00	0.03	0.00	0.03	0.03
2021	0.00	0.01	0.05	0.09	0.02	0.00	0.01	0.00	0.05	0.00
2022	0.00	0.01	0.09	0.01	0.00	0.00	0.08	0.01	0.04	0.00
2023	0.00	0.00	0.07	0.02	0.01	0.00	0.03	0.03	0.04	0.01

3 **Figure 18: SAIDI Cause Code Breakdown (Excluding MEDs) (Downtown)**



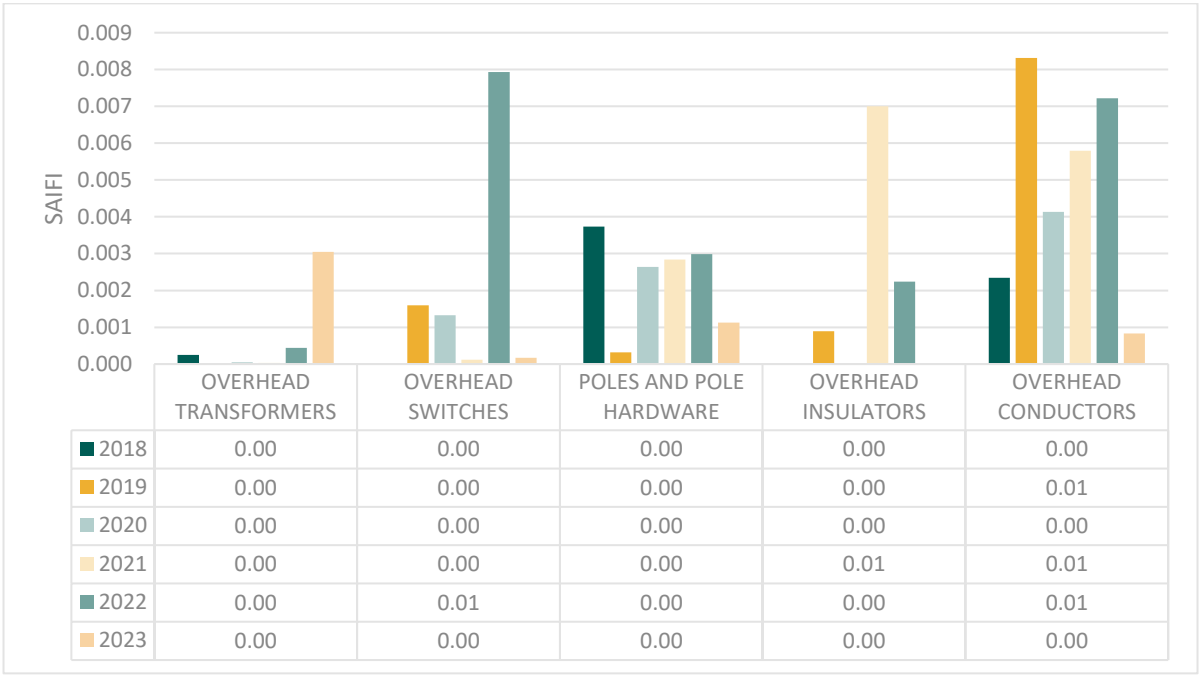
	OVERHEAD EQUIPMENT	UNDERGROUND EQUIPMENT	STATION EQUIPMENT	VARIOUS
2018	0.01	0.04	0.01	0.00
2019	0.01	0.03	0.01	0.00
2020	0.01	0.03	0.00	0.00
2021	0.02	0.01	0.00	0.00
2022	0.02	0.02	0.00	0.00
2023	0.01	0.03	0.00	0.00

Figure 19: Defective Equipment SAIFI (Excluding MEDs) (Downtown)



	OVERHEAD EQUIPMENT	UNDERGROUND EQUIPMENT	STATION EQUIPMENT	VARIOUS
2018	0.00	0.07	0.01	0.00
2019	0.02	0.05	0.03	0.00
2020	0.01	0.08	0.00	0.00
2021	0.03	0.02	0.00	0.00
2022	0.01	0.06	0.01	0.02
2023	0.01	0.07	0.00	0.00

Figure 20: Defective Equipment SAIDI (Excluding MEDs) (Downtown)



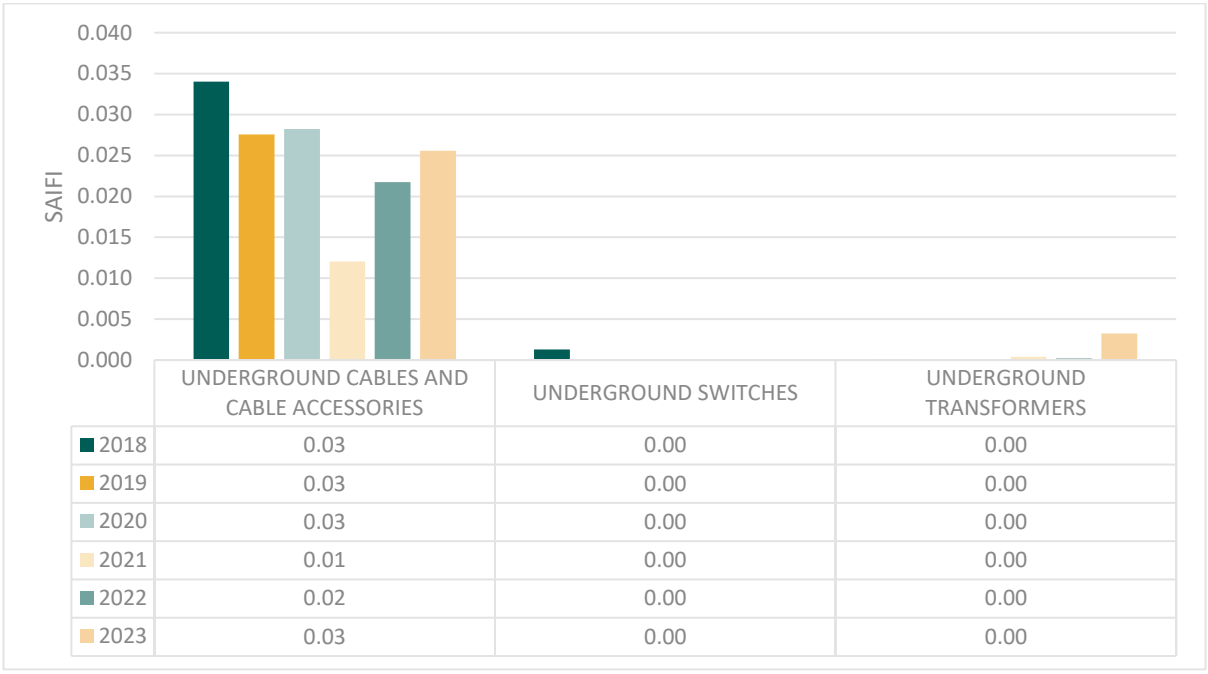
	OVERHEAD TRANSFORMERS	OVERHEAD SWITCHES	POLES AND POLE HARDWARE	OVERHEAD INSULATORS	OVERHEAD CONDUCTORS
2018	0.00	0.00	0.00	0.00	0.00
2019	0.00	0.00	0.00	0.00	0.01
2020	0.00	0.00	0.00	0.00	0.00
2021	0.00	0.00	0.00	0.01	0.01
2022	0.00	0.01	0.00	0.00	0.01
2023	0.00	0.00	0.00	0.00	0.00

Figure 21: Defective Equipment SAIFI – Overhead (Excluding MEDs) (Downtown)



	OVERHEAD TRANSFORMERS	OVERHEAD SWITCHES	POLES AND POLE HARDWARE	OVERHEAD INSULATORS	OVERHEAD CONDUCTORS
2018	0.00	0.00	0.00	0.00	0.00
2019	0.00	0.00	0.00	0.00	0.01
2020	0.00	0.00	0.01	0.00	0.01
2021	0.00	0.00	0.00	0.00	0.02
2022	0.00	0.00	0.00	0.00	0.00
2023	0.00	0.00	0.00	0.00	0.00

Figure 22: Defective Equipment SAIDI – Overhead (Excluding MEDs) (Downtown)



	UNDERGROUND CABLES AND CABLE ACCESSORIES	UNDERGROUND SWITCHES	UNDERGROUND TRANSFORMERS
2018	0.03	0.00	0.00
2019	0.03	0.00	0.00
2020	0.03	0.00	0.00
2021	0.01	0.00	0.00
2022	0.02	0.00	0.00
2023	0.03	0.00	0.00

Figure 23: Defective Equipment SAIFI – Underground (Excluding MEDs) (Downtown)



	UNDERGROUND CABLES AND CABLE ACCESSORIES	UNDERGROUND SWITCHES	UNDERGROUND TRANSFORMERS
2018	0.05	0.01	0.00
2019	0.05	0.00	0.00
2020	0.08	0.00	0.00
2021	0.02	0.00	0.00
2022	0.06	0.00	0.00
2023	0.07	0.00	0.00

Figure 24: Defective Equipment SAIDI – Underground (Excluding MEDs) (Downtown)

Table 5: Five-Year (2019-2023) Average SAIFI and SAIDI Contribution by Cause Code (Excluding MEDs) (Downtown)

Cause Code	Contribution % to SAIFI	Contribution % to SAIDI
LOSS OF SUPPLY	27.8%	14.6%
DEFECTIVE EQUIPMENT	23.3%	33.3%
TREE CONTACTS	16.4%	16.1%
FOREIGN INTERFERENCE	13.2%	16.7%
UNKNOWN	7.5%	4.0%
HUMAN ELEMENT	6.3%	6.2%
ADVERSE WEATHER	3.0%	2.6%
SCHEDULED OUTAGE	2.4%	6.4%
ADVERSE ENVIRONMENT	0.1%	0.1%
LIGHTNING	0.0%	0.0%

Table 6: Number of Interruptions by Cause Code (Excluding MEDs) (Downtown)

Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	2	0	0	0	3	0
Adverse Weather	11	2	3	2	3	1
Defective Equipment	72	72	61	59	63	48
Foreign Interference	15	13	9	22	23	19
Human Element	3	4	2	8	12	5
Lightning	0	0	0	0	0	0
Loss of Supply	13	10	5	2	27	9
Scheduled Outage	8	8	0	6	9	5
Tree Contacts	20	10	8	13	16	19
Unknown/Other	16	20	10	13	18	20
Grand Total	160	139	98	125	174	126

Table 7: Number of Customer Interruptions by Cause Code (Excluding MEDs) (Downtown)

Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	477	0	0	0	565	0
Adverse Weather	5,772	3,592	3,992	2,302	8,832	1,050
Defective Equipment	38,870	37,370	29,007	22,264	37,345	26,770

Cause Code	2018	2019	2020	2021	2022	2023
Foreign Interference	14,585	13,604	18,343	27,241	16,938	10,794
Human Element	1,528	14,996	4,386	4,029	1,819	15,888
Lightning	0	0	0	0	0	0
Loss of Supply	56,880	50,160	63,491	2,736	36,447	29,239
Scheduled Outage	3,684	9,385	0	1,700	2,313	2,628
Tree Contacts	27,332	15,165	18,439	23,119	28,425	22,816
Unknown/Other	9,196	13,651	6,784	11,143	8,858	8,744
Grand Total	**158,324**	**157,923**	**144,442**	**94,534**	**141,542**	**117929**

Table 8: Number of Customer Hours Interrupted by Cause Code (Excluding MEDs) (Downtown)

Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	1,002	0	0	0	606	0
Adverse Weather	19,498	2,337	9,610	8,472	4,172	53
Defective Equipment	65,126	72,811	69,970	38,564	70,574	58,538
Foreign Interference	9,196	12,193	48,025	67,561	8,260	19,555
Human Element	2,839	20,101	14,628	13,160	1,542	7,713
Lightning	0	0	0	0	0	0
Loss of Supply	72,494	25,330	21,587	4,949	64,867	19,921
Scheduled Outage	9,689	26,833	0	1,606	8,615	22,870
Tree Contacts	38,330	28,052	22,497	37,247	32,203	29,751
Unknown/Other	6,683	3,877	23,336	1,574	1,887	6,168
Grand Total	224,857	191,534	209,654	173,133	192,726	164568



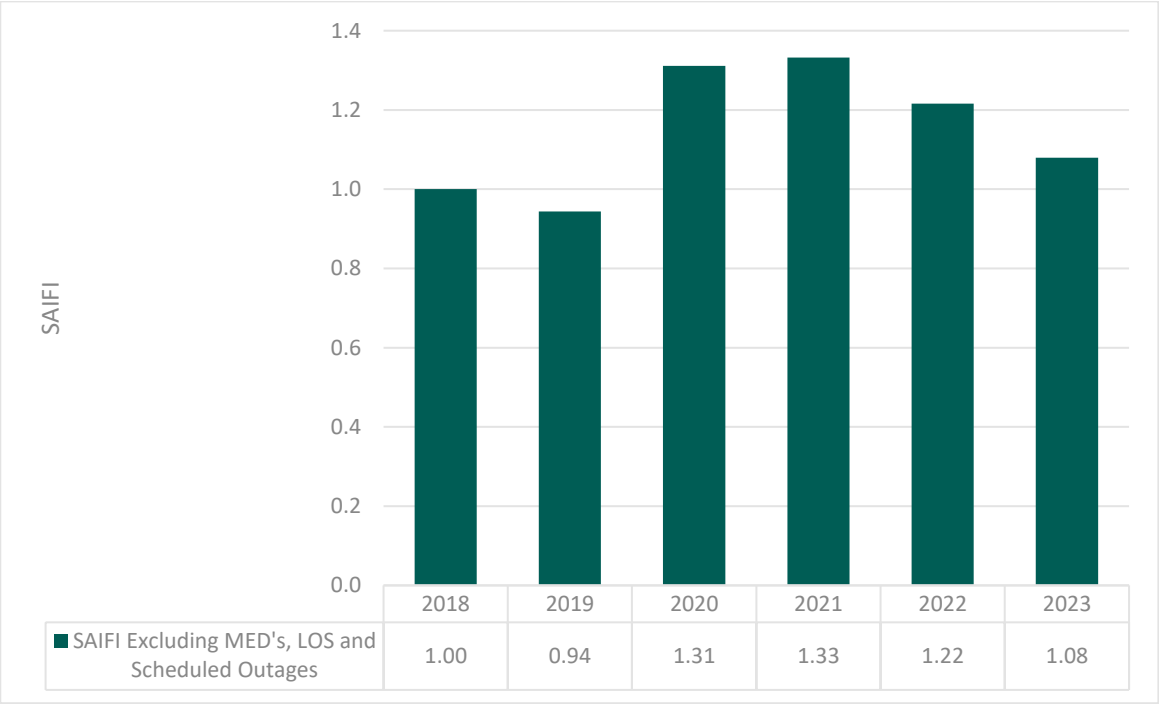
	2018	2019	2020	2021	2022	2023
Total SAIFI	1.79	1.09	1.50	1.43	1.60	1.27
SAIFI Excluding LOS	1.46	0.95	1.38	1.34	1.41	1.13
SAIFI Excluding MED's	1.28	1.09	1.44	1.43	1.45	1.27
SAIFI Excluding MED's and LOS	1.01	0.95	1.32	1.34	1.26	1.13
SAIFI Excluding MED's, LOS and Scheduled Outages	1.00	0.94	1.31	1.33	1.22	1.08

Figure 25: System Level SAIFI (Horseshoe)



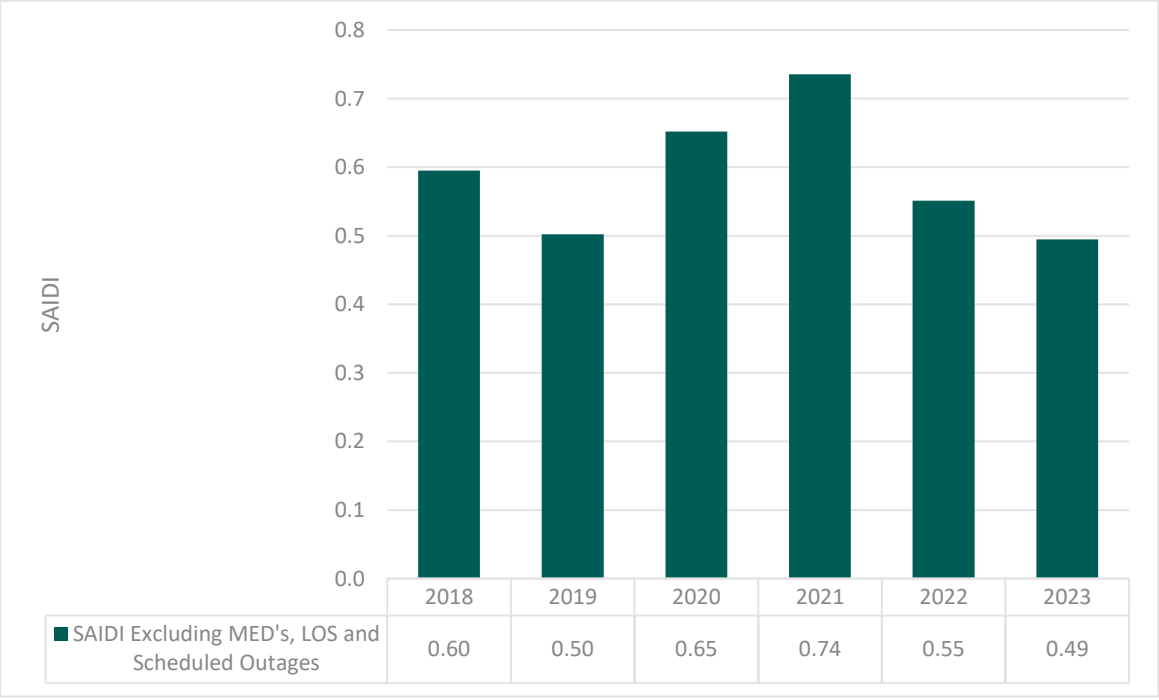
	2018	2019	2020	2021	2022	2023
Total SAIDI	2.28	0.57	0.81	0.77	1.28	0.67
SAIDI Excluding LOS	1.95	0.51	0.77	0.76	1.21	0.61
SAIDI Excluding MED's	0.69	0.57	0.70	0.77	0.72	0.67
SAIDI Excluding MED's and LOS	0.61	0.51	0.66	0.76	0.66	0.61
SAIDI Excluding MED's, LOS and Scheduled Outages	0.60	0.50	0.65	0.74	0.55	0.49

Figure 26: System Level SAIDI (Horseshoe)

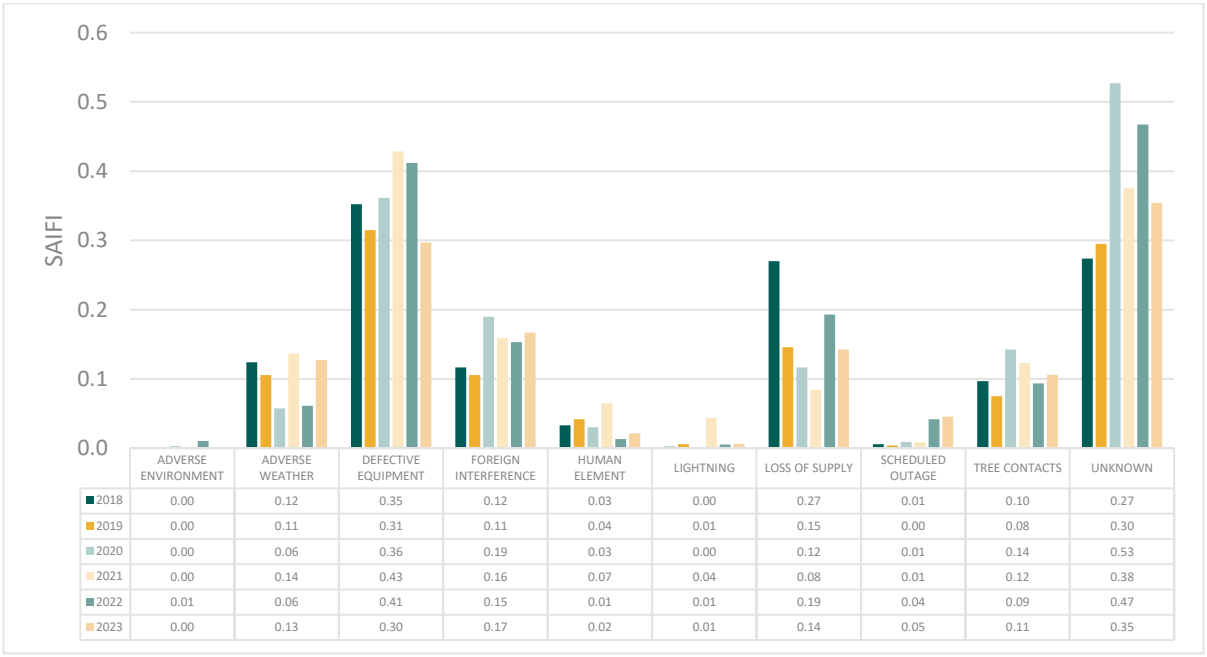


1 **Figure 27: System SAIFI Excluding MEDs, Loss of Supply, and Scheduled Outages (Horseshoe)**

2

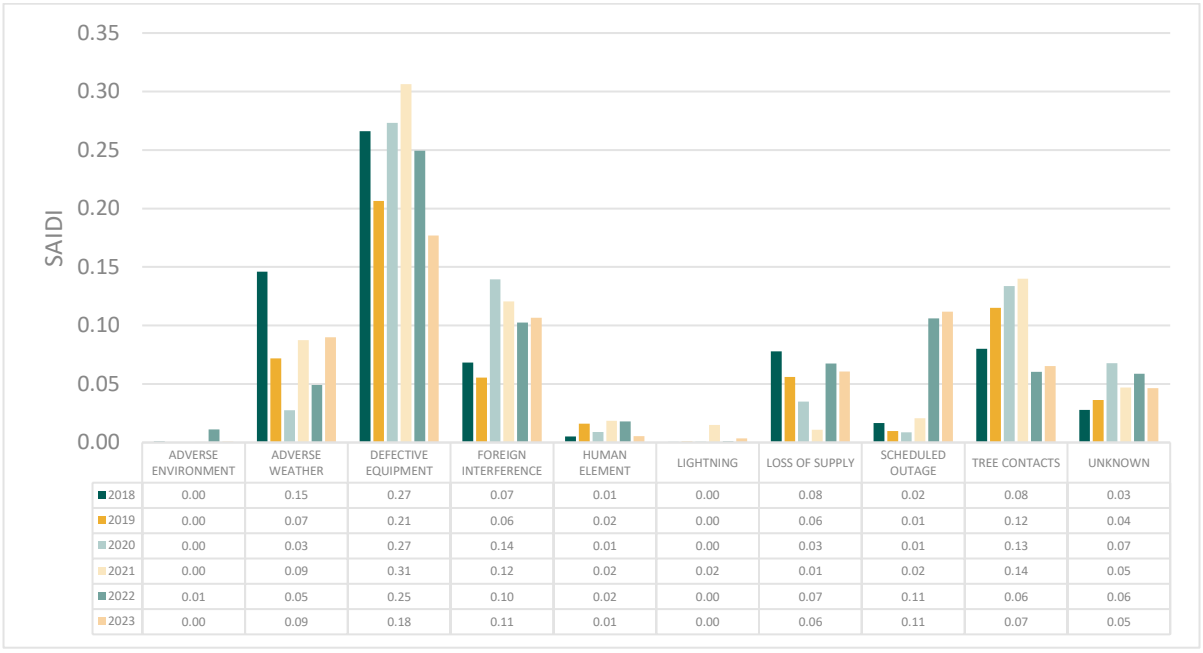


3 **Figure 28: System SAIDI Excluding MEDs, Loss of Supply, and Scheduled Outages (Horseshoe)**



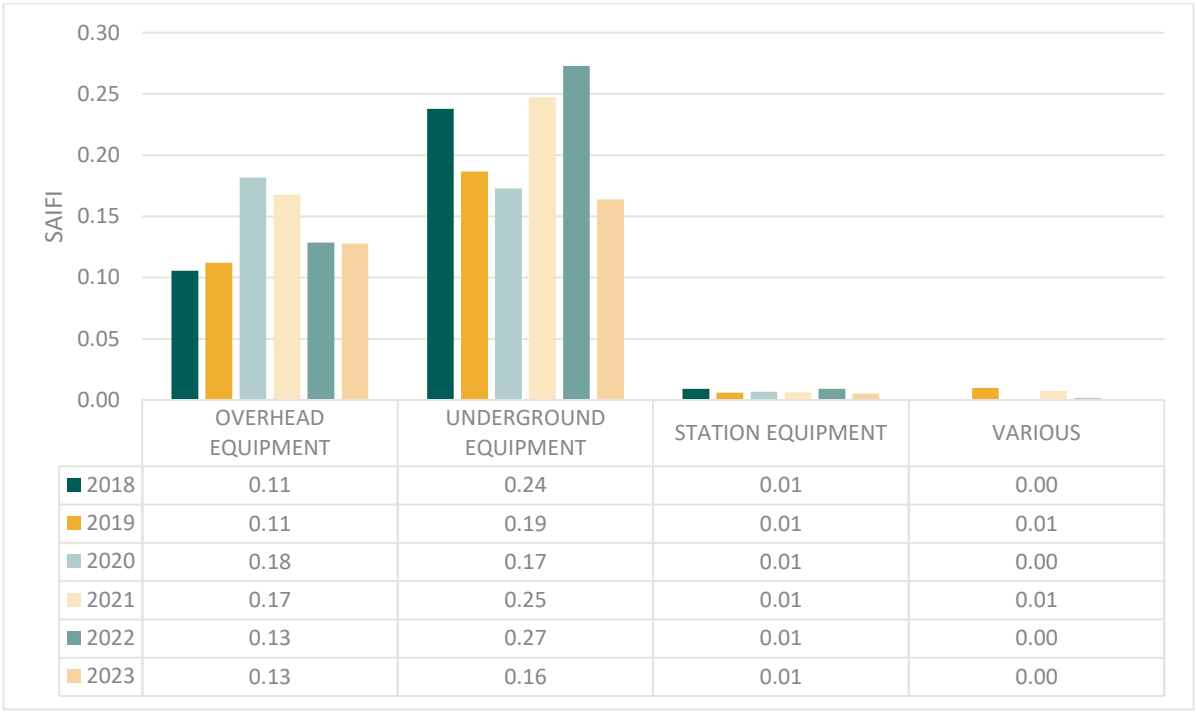
	ADVERSE ENVIRONMENT	ADVERSE WEATHER	DEFECTIVE EQUIPMENT	FOREIGN INTERFERENCE	HUMAN ELEMENT	LIGHTNING	LOSS OF SUPPLY	SCHEDULED OUTAGE	TREE CONTACTS	UNKNOWN
2018	0.00	0.12	0.35	0.12	0.03	0.00	0.27	0.01	0.10	0.27
2019	0.00	0.11	0.31	0.11	0.04	0.01	0.15	0.00	0.08	0.30
2020	0.00	0.06	0.36	0.19	0.03	0.00	0.12	0.01	0.14	0.53
2021	0.00	0.14	0.43	0.16	0.07	0.04	0.08	0.01	0.12	0.38
2022	0.01	0.06	0.41	0.15	0.01	0.01	0.19	0.04	0.09	0.47
2023	0.00	0.13	0.30	0.17	0.02	0.01	0.14	0.05	0.11	0.35

Figure 29: SAIFI Cause Code Breakdown (Excluding MEDs) (Horseshoe)



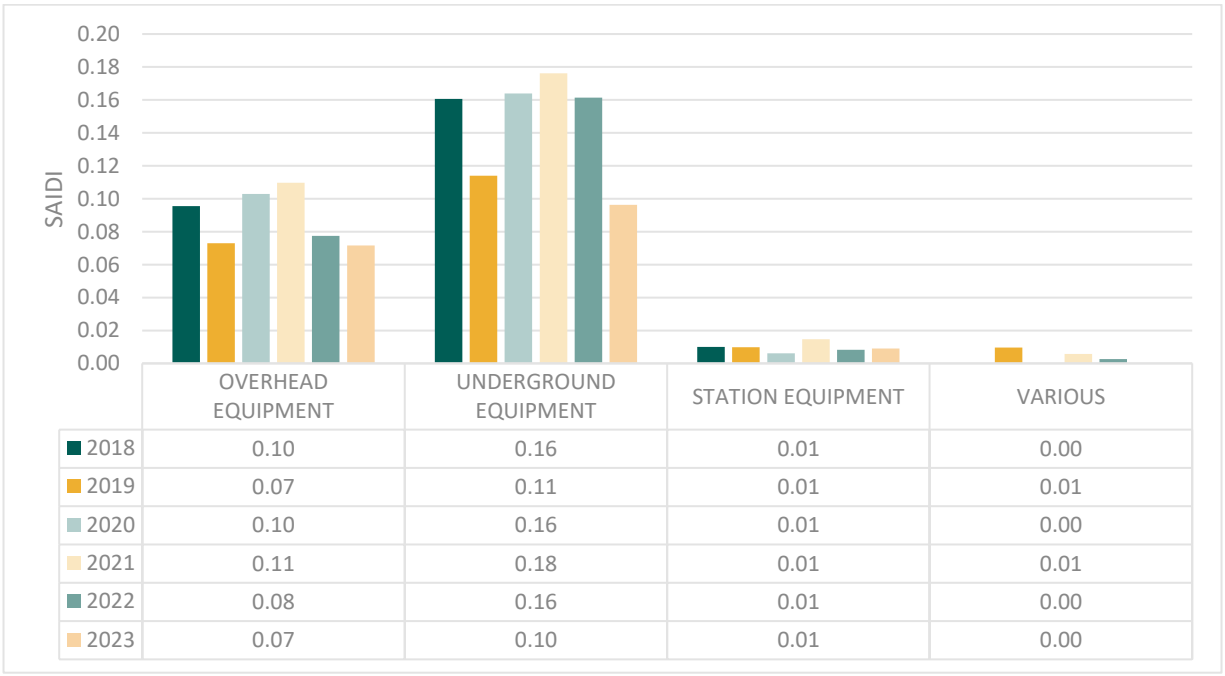
	ADVERSE ENVIRONMENT	ADVERSE WEATHER	DEFECTIVE EQUIPMENT	FOREIGN INTERFERENCE	HUMAN ELEMENT	LIGHTNING	LOSS OF SUPPLY	SCHEDULED OUTAGE	TREE CONTACTS	UNKNOWN
2018	0.00	0.15	0.27	0.07	0.01	0.00	0.08	0.02	0.08	0.03
2019	0.00	0.07	0.21	0.06	0.02	0.00	0.06	0.01	0.12	0.04
2020	0.00	0.03	0.27	0.14	0.01	0.00	0.03	0.01	0.13	0.07
2021	0.00	0.09	0.31	0.12	0.02	0.02	0.01	0.02	0.14	0.05
2022	0.01	0.05	0.25	0.10	0.02	0.00	0.07	0.11	0.06	0.06
2023	0.00	0.09	0.18	0.11	0.01	0.00	0.06	0.11	0.07	0.05

Figure 30: SAIDI Cause Code Breakdown (Excluding MEDs) (Horseshoe)



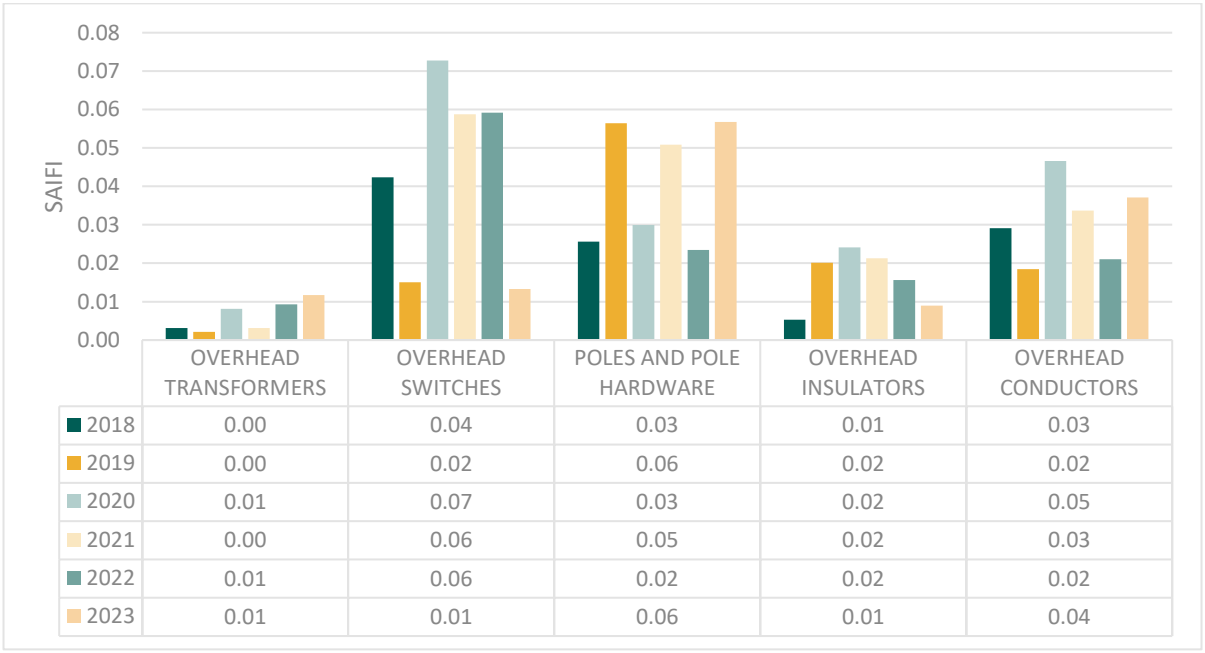
	OVERHEAD EQUIPMENT	UNDERGROUND EQUIPMENT	STATION EQUIPMENT	VARIOUS
2018	0.11	0.24	0.01	0.00
2019	0.11	0.19	0.01	0.01
2020	0.18	0.17	0.01	0.00
2021	0.17	0.25	0.01	0.01
2022	0.13	0.27	0.01	0.00
2023	0.13	0.16	0.01	0.00

Figure 31: Defective Equipment SAIFI (Excluding MEDs) (Horseshoe)



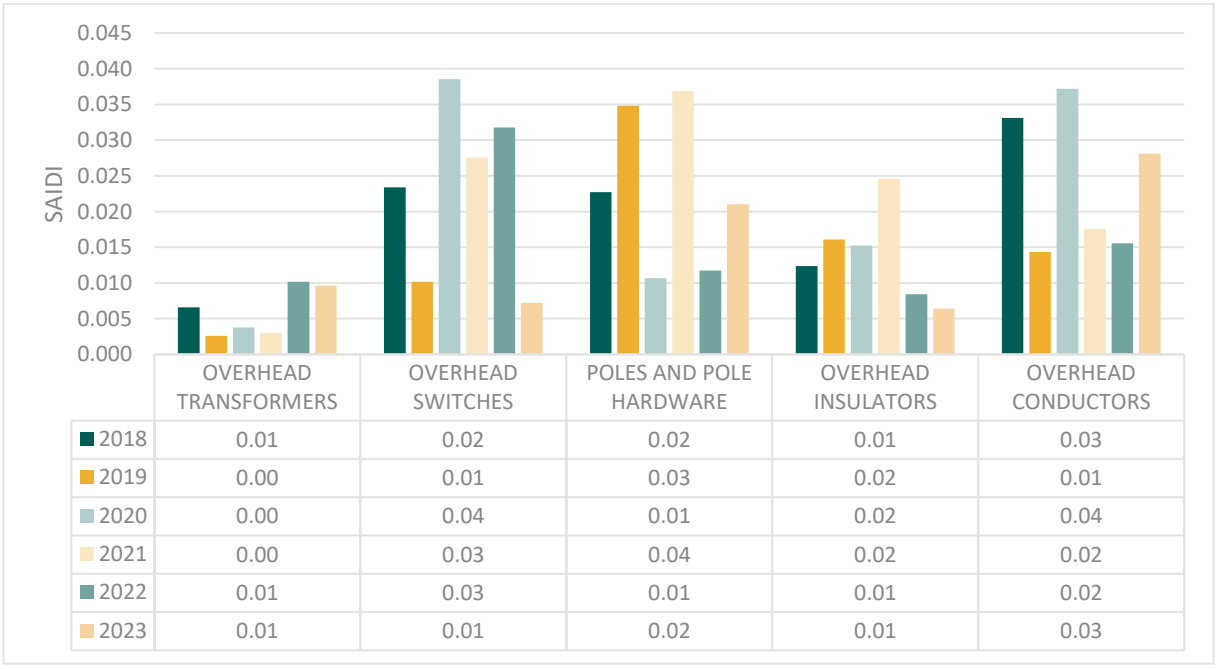
	OVERHEAD EQUIPMENT	UNDERGROUND EQUIPMENT	STATION EQUIPMENT	VARIOUS
2018	0.10	0.16	0.01	0.00
2019	0.07	0.11	0.01	0.01
2020	0.10	0.16	0.01	0.00
2021	0.11	0.18	0.01	0.01
2022	0.08	0.16	0.01	0.00
2023	0.07	0.10	0.01	0.00

Figure 32: Defective Equipment SAIDI (Excluding MEDs) (Horseshoe)



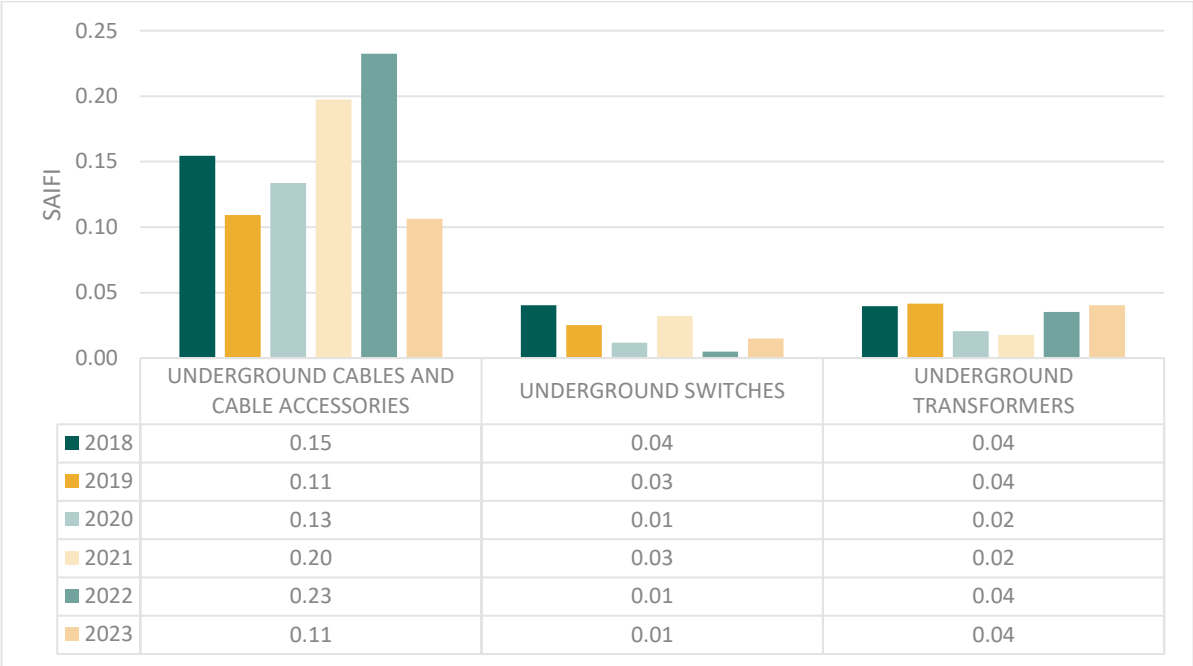
	OVERHEAD TRANSFORMERS	OVERHEAD SWITCHES	POLES AND POLE HARDWARE	OVERHEAD INSULATORS	OVERHEAD CONDUCTORS
2018	0.00	0.04	0.03	0.01	0.03
2019	0.00	0.02	0.06	0.02	0.02
2020	0.01	0.07	0.03	0.02	0.05
2021	0.00	0.06	0.05	0.02	0.03
2022	0.01	0.06	0.02	0.02	0.02
2023	0.01	0.01	0.06	0.01	0.04

Figure 33: Defective Equipment SAIFI – Overhead (Excluding MEDs) (Horseshoe)



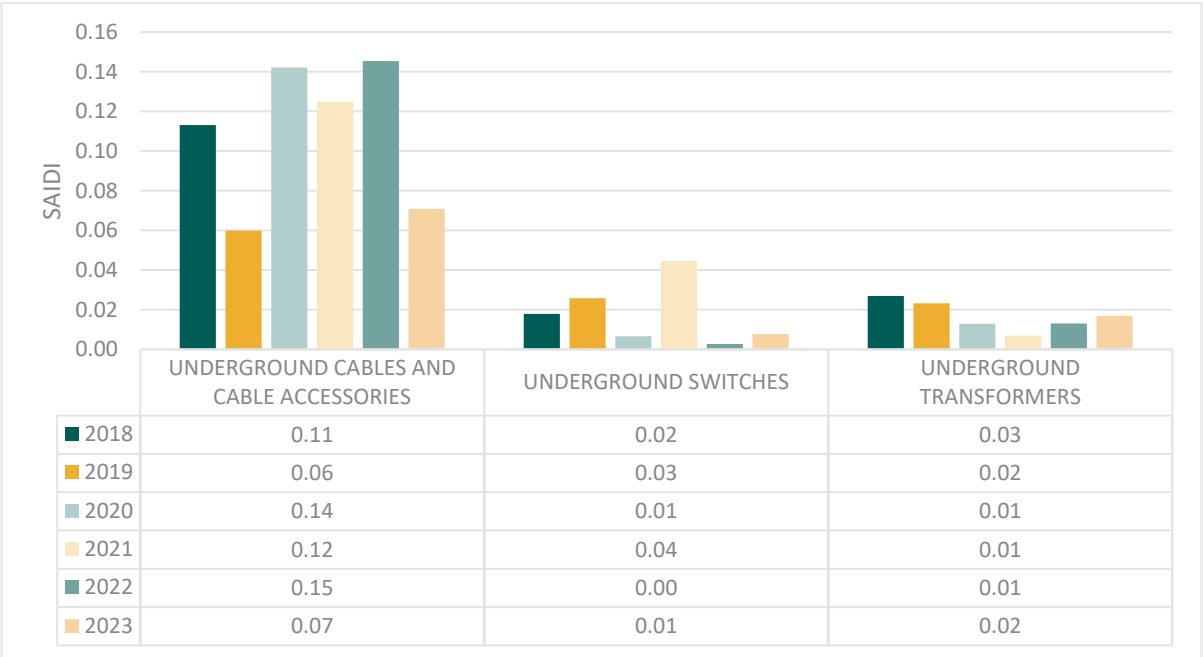
	OVERHEAD TRANSFORMERS	OVERHEAD SWITCHES	POLES AND POLE HARDWARE	OVERHEAD INSULATORS	OVERHEAD CONDUCTORS
2018	0.01	0.02	0.02	0.01	0.03
2019	0.00	0.01	0.03	0.02	0.01
2020	0.00	0.04	0.01	0.02	0.04
2021	0.00	0.03	0.04	0.02	0.02
2022	0.01	0.03	0.01	0.01	0.02
2023	0.01	0.01	0.02	0.01	0.03

Figure 34: Defective Equipment SAIDI – Overhead (Excluding MEDs) (Horseshoe)



	UNDERGROUND CABLES AND CABLE ACCESSORIES	UNDERGROUND SWITCHES	UNDERGROUND TRANSFORMERS
2018	0.15	0.04	0.04
2019	0.11	0.03	0.04
2020	0.13	0.01	0.02
2021	0.20	0.03	0.02
2022	0.23	0.01	0.04
2023	0.11	0.01	0.04

Figure 35: Defective Equipment SAIFI – Underground (Excluding MEDs) (Horseshoe)



	UNDERGROUND CABLES AND CABLE ACCESSORIES	UNDERGROUND SWITCHES	UNDERGROUND TRANSFORMERS
2018	0.11	0.02	0.03
2019	0.06	0.03	0.02
2020	0.14	0.01	0.01
2021	0.12	0.04	0.01
2022	0.15	0.00	0.01
2023	0.07	0.01	0.02

Figure 36: Defective Equipment SAIDI – Underground (Excluding MEDs) (Horseshoe)

Table 9: Five-Year (2019-2023) Average SAIFI and SAIDI Contribution by Cause Code (Excluding MEDs) (Horseshoe)

Cause Code	Contribution % to SAIFI	Contribution % to SAIDI
UNKNOWN	30.3%	7.5%
DEFECTIVE EQUIPMENT	27.2%	35.4%
FOREIGN INTERFERENCE	11.6%	15.3%
LOSS OF SUPPLY	10.2%	6.7%
TREE CONTACTS	8.1%	15.0%
ADVERSE WEATHER	7.3%	9.5%
HUMAN ELEMENT	2.6%	2.0%
SCHEDULED OUTAGE	1.6%	7.5%
LIGHTNING	0.9%	0.6%
ADVERSE ENVIRONMENT	0.2%	0.4%

Table 10: Number of Interruptions by Cause Code (Excluding MEDs) (Horseshoe)

Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	6	1	4	3	14	7
Adverse Weather	118	55	46	77	77	79
Defective Equipment	369	258	273	305	421	413
Foreign Interference	129	110	142	147	189	208
Human Element	16	20	21	30	19	19
Lightning	4	3	2	22	5	5
Loss of Supply	21	11	13	8	15	25
Scheduled Outage	135	94	137	136	898	1,411
Tree Contacts	61	38	62	91	104	105
Unknown/Other	119	115	214	132	215	179
Grand Total	978	705	914	951	1,957	2,451

Table 11: Number of Customer Interruptions by Cause Code (Excluding MEDs) (Horseshoe)

Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	511	5	2,164	249	8,221	229
Adverse Weather	94,690	81,211	44,326	106,172	47,912	100,331
Defective Equipment	269,194	242,104	279,626	332,721	322,591	233,689

Cause Code	2018	2019	2020	2021	2022	2023
Foreign Interference	89,227	81,112	146,856	123,644	119,940	131,462
Human Element	25,401	32,275	23,425	50,594	10,210	16,913
Lightning	1,738	4,346	273	33,840	4,151	4,771
Loss of Supply	206,464	112,273	90,193	65,523	151,017	112,271
Scheduled Outage	4,309	3,067	6,897	6,698	32,691	35,702
Tree Contacts	73,997	57,943	110,228	95,760	73,288	83,578
Unknown/Other	209,202	226,840	407,559	292,314	365,955	278,698
Grand Total	**974,733**	**841,176**	**1,111,547**	**1,107,515**	**1,135,976**	**997,644**

Table 12: Number of Customer Hours Interrupted by Cause Code (Excluding MEDs) (Horseshoe)

Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	662	9	116	420	8,747	563
Adverse Weather	111,618	55,334	21,280	68,201	38,674	70,726
Defective Equipment	203,327	158,638	211,376	237,733	195,409	139,179
Foreign Interference	52,292	42,606	107,955	93,650	80,335	83,871
Human Element	3,998	12,441	7,027	14,447	14,091	4,310
Lightning	346	601	630	11,684	914	2,690
Loss of Supply	59,455	43,107	26,987	8,381	52,774	47,798
Scheduled Outage	12,776	7,544	6,770	16,057	83,017	88,099
Tree Contacts	61,175	88,613	103,362	108,789	47,269	51,345
Unknown/Other	21,197	27,935	52,454	36,468	46,113	36,591
Grand Total	**526,844**	**436,829**	**537,958**	**595,829**	**567,343**	**525,173.2**

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-36

Reference: Exhibit 2B, Section D1, Page 14

Please provide a list of assets that Toronto Hydro has and does not have condition-based models. Please provide the total capital spending on assets that does and does not have condition-based models.

RESPONSE:

Please see Table 1 below for the list of Toronto Hydro's major system assets and whether a condition-based model exists.

Table 1: Major System Assets and Presence of Condition-Based Model

Major Asset Class	Conditional-based Model Present (Y/N/Partial)
OH Conductor-Primary	N
OH Conductor-Secondary	N
OH Switches	Partial
OH - Transformer	N
Wood Poles	Y
Concrete Poles	N
UG Primary Cable	N
UG Secondary Cable	N
UG Duct Bank	N
UG Switches	Y
UG Transformers	Y
Network Protector	Y
Network Transformer	Y
Cable Chamber	Y
Station Power Transformers	Y
Circuit Breakers	Y

Major Asset Class	Conditional-based Model Present (Y/N/Partial)
Substation Switchgear	N
UG Vaults	Y
Meters	N

Based on the above asset classes, the total capital spending on asset types that have a condition-based model is approximately 37%.

Underground Primary Cable, Underground Duct Banks and Meters are the three largest contributors to the total spending on assets that do not have a condition model, amounting to approximately 42% of total expenditures. Cables and ducts are buried in the earth and generally not conducive to inspection.[1] Please refer to 2B-Staff-144 regarding condition for Meters.

[1] The exception is cable testing. However, given the cost and intrusive nature of cable testing, it can only be applied to a very small population of high priority cables each year.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-37

Reference: Exhibit 2B, Section D1, Page 21

Please explain how senior management tracks progress on execution of its overall capital plan? For example, is there weekly or monthly reporting on capital plan execution and progress? If so, please provide a copy of the most recent version of all reporting materials.

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-AMPCO-29 parts (b) and (c).

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-38

Reference: Exhibit 2B, Section D1, Page 22

Exhibit 2A, Tab 4, Schedule 1

Please explain when corrective or emergency maintenance activities/spending are capitalized.

RESPONSE:

Corrective and maintenance activities/spending are typically capitalized when the repair of a major asset is determined to be insufficient and a replacement is required. Please refer to Toronto Hydro's Capitalization Policy filed in Exhibit 2A, Tab 4, Schedule 1 for more details.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-39

Reference: Exhibit 2B, Section D1, Page 26

Please provide a copy of the three most recent executive performance reports.

RESPONSE:

Please see 2B-AMPCO-29 part (c).

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-40

References: Exhibit 2B, Section D3, Page 13

Has Toronto Hydro undertaken any assessments of how different levels of sustainment and stewardship category expenditures impacts operations and maintenance expenditures? If so, please provide details.

RESPONSE:

Toronto Hydro has not undertaken any specific assessment of how different levels of sustainment and stewardship category expenditures impacts operations and maintenance ("System O&M") expenditures. Generally, the interrelationships between Sustainment and Stewardship expenditures are complex and nuanced in nature. Capital expenditures that are focused on like-for-like replacements are not expected to have a material impact on system maintenance costs because a significant portion of Toronto Hydro's maintenance programs are cyclical inspections to meet requirements set forward by the Distribution System Code. Renewal of assets may help reduce Corrective maintenance if done at a high enough pace, but a younger asset base that is more conducive to repairs rather than replacement may also increase corrective expenditures. The elimination of substandard equipment helps reduce maintenance requirements, but introduction of new asset technologies may increase maintenance requirements. Toronto Hydro routinely considers these and other interdependencies between capital expenditures and System O&M as detailed in Exhibit 2B, Section E4.1.6.1.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-41

Reference: Exhibit 2B, Section D3, p.35-37

Please confirm that while Toronto Hydro is in the process of implementing environmental, safety and financial consequences of failure into its risk assessment process, it has not done so yet for the purposes of assessing the impact of the investments included in this application.

RESPONSE:

Toronto Hydro confirms that it is in the process of implementing environmental, safety, and financial consequences of failure into its fully quantified value framework models to support risk-based project valuation and portfolio optimization within its Engineering Asset Investment Planning platform (further discussed in Exhibit 2B, Section D1 at page 14). Toronto Hydro is on track to complete this significant multi-year analytics project in advance of its next major capital planning cycle in 2025.

Please refer to Exhibit 2B, Section D3 for a discussion of various risk factors in Toronto Hydro's long-term planning process and how they have been reflected in the utility's 2025-2029 Distribution System Plan. Further details on risk and planning can be found in the various detailed investment program narratives in Exhibit 2B, Sections E5-E7.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-42

Reference: Exhibit 2B, Section D3, Page 39

QUESTION (A):

With respect to Toronto Hydro's reliability projections:

a) Please provide a copy of the detailed explanation of the methodology, including all assumptions, regarding Toronto Hydro's reliability projections.

RESPONSE (A):

Please find below a general overview, along with a more detailed explanation of the methodology, including relevant assumptions regarding Toronto Hydro's reliability projections.

General Overview of Reliability Projection ('RP') Methodology

As outlined in the evidence (Exhibit 1B, Tab 3, Schedule 1, Pg. 9 and Exhibit 2B, Section D3, Pg. 39), the projections in Figures 1 and Figure 2 (Exhibit 1B, Tab 3, Schedule 1, Pg. 10 and 17) are informed by the utility's reliability projection methodology, which is built up from projected performance across various cause codes. Toronto Hydro modeled Defective Equipment outages based on asset demographics and included the expected benefits of the utility's 2025-2029 planned sustainment investments. It also included projections for expected benefits of the reliability-related Grid Modernization investments. The utility assumed a historical five-year average for other cause codes (e.g. tree contacts).

The methodology models Defective Equipment outages by projecting failures and outage impacts at an asset class level based on:

1. asset demographics data and associated failure projections;
2. historical reliability performance; and
3. planned program investments.

Detailed Overview of RP Methodology

Toronto Hydro produces the Reliability Projection ('RP') by calculating an expected performance of individual reliability cause codes. The RP includes a detailed projection of the Defective Equipment cause code at an asset class level, a historical five-year average for other cause codes (e.g., Tree Contacts), and a projection of Grid Modernization investments, specifically the reliability benefits of new SCADA switches and mid-line reclosers (refer to Contingency Enhancement segment under Exhibit 2B, Section E7.1). These investments are expected to materially drive reliability performance, including SAIDI (Excluding Loss of Supply, Major Events, and Scheduled Outages) and SAIFI (Defective Equipment) performance over the 2025-2029 rate period.

Table 1, below, provides a breakdown of the Major Cause Codes considered in the RP along with a brief description of the forecast method applied.

Table 1: Breakdown of the Major Cause Codes

Major Cause Code	Forecasting Method for 2025-2029
Adverse Environment	5-Year Average (2018-2022)
Adverse Weather	5-Year Average (2018-2022)
Defective Equipment	Failure Projection Methodology
Foreign Interference	5-Year Average (2018-2022)
Human Element	5-Year Average (2018-2022)
Lightning	5-Year Average (2018-2022)
Tree Contacts	5-Year Average (2018-2022)
Unknown	5-Year Average (2018-2022)

In developing its approach, Toronto Hydro assessed climate related impacts on SAIDI performance, using observation data from Toronto Pearson International Airport of max wind gusts greater than 70 Km/h and total precipitation above 2mm, from 2014 to 2022. Although yielding strong correlation ($R^2 > 0.7$) using a 2nd degree polynomial fit, due to very low granularity in forecasted wind speeds (Exhibit 2B, Section D2, Appendix A, Pg. 11-12), Toronto Hydro excluded such factors from its forecasting methods for 2025-2029. The limited information available on changes to

climate parameters, that typically take place over long time horizons, pose a challenge to integrating such information into relatively shorter-term reliability projections.

The impacts of Grid Modernization investments were then integrated into the resultant output on outage frequency and duration as a percentage improvement (further explanation provided below).

Defective Equipment Projections

Defective Equipment cause code projections cover all major asset classes contributing to reliability performance. The RP calculates the expected number of outages per major asset class based on asset demographics, failure curves, failure modes, and replacement volumes. For assets with limited historical data and/or those deemed to pose a low risk to system-wide reliability metrics such as SAIDI and SAIFI (i.e. Network, Secondary Distribution, etc.), a five-year historical average was utilized. The RP multiplies the asset demographics for each asset class by failure curves, resulting in asset failure counts in a particular year. The projected asset failures are translated into system outages based on the established outage failure mode as a percentage of total failure and right-sized with Toronto Hydro's historical outage experience for that asset class. Reactive failures and proactive replacement volumes (as submitted under prominent System Renewal programs), are used to establish year-over-year changes to the underlying asset population.

Outage durations and frequencies are estimated by converting the number of system outages into SAIDI and SAIFI contributions. This involves using a five-year average (2018-2022) to analyze how each asset class has affected system reliability (SAIDI/SAIFI) in recent years.

The inputs for each asset class include:

- Asset class age demographics. A snapshot of asset demographics is specified for the initial year of the analysis. This entails quantifying the number of asset units or km of asset by age.
- Asset additions. An asset addition plan which specifies a schedule for continual growth of the asset class with new assets.

- Asset replacements. Asset replacement volumes for an asset class for the 2023-2029 period, based on the 2025-2029 Distribution System Plan.
- Asset failure curves each major asset class.

The following key assumption are made:

- Asset additions are estimated based on historical averages and adjusted for future plans if applicable.
- Asset replacement profiles sampled from project data are leveraged to inform a distribution of annual replacements.
- An outage failure mode for the asset class is calibrated to the ratio of the average historic system outages by total expected asset failures.

Disclaimer on Interpreting Projected Performance:

- The RP model cannot predict Force Majeure events, unforeseeable circumstances, or events beyond the utility's control such as Major Events.[1]

Disclaimer on Model Outputs and Interim Calculations:

- The aim of the Defective Equipment projection methodology is to establish a reasonable, quantifiable link between investments in System Renewal programs and their impact on SAIDI and SAIFI outcomes. This model constructs this relationship through foundational calculations, such as the anticipated number of asset failures, which are essential for establishing the base framework of this investment-outcome relationship. It is crucial to understand that these internal calculations serve as initial steps in the modeling process, setting the stage for the relationship between investment and reliability metrics; the outputs of the internal calculations are not appropriate for direct use or interpretation as model outputs themselves. The true strength of the model is realized through subsequent

[1] "Major Event" is defined as an event that is beyond the control of the distributor and is: a) unforeseeable; b) unpredictable; c) unpreventable; or unavoidable. "Beyond the control of the distributor" means events that include, but are not limited to, force majeure events and Loss of Supply events.
Ontario Energy Board. Electricity Reporting and Record Keeping Requirements (March 8, 2023).

calibration phases, where it is applied to historical asset demographics to verify its accuracy in reproducing historical SAIDI and SAIFI figures. Should there be discrepancies, the model undergoes extensive calibration, as necessary, to align with historical data. This iterative process ensures that the model not only predicts future performance based on investment but also aligns with proven historical outcomes, thereby providing a reliable tool for strategic planning and decision-making with respect to SAIDI and SAIFI metrics.

Anticipated Grid Modernization Improvements

In addition to leveraging the RP for forecasting expected performance of individual reliability cause codes, Toronto Hydro evaluated reliability improvements expected from Grid Modernization initiatives, particularly ones established by the System Enhancements program under the Contingency Enhancement segment. Under the Contingency Enhancement segment, reliability improvements were evaluated for the installation of SCADA switches, as well as the installation of mid-feeder reclosers.

The quantification was performed using historical interruption data from Toronto Hydro's Interruption Tracking Information System ("ITIS"). Feeder level outages were considered with MEDs, Loss of Supply, and Scheduled Outages excluded. Additional steps were taken to exclude for cases that would not result in a Contingency Enhancement benefit. This includes removing outages under a hold-off condition, and situations where SCADA switching would be proven ineffective at improving outage duration, including significant storms and bus level outages below the MED threshold.

1. *Mid-Recloser Installations*

To evaluate the recloser reliability benefits, a theoretical analysis was performed using S&C's technical paper on *Improving Medium-Voltage Main-Feeder Reliability by Increasing Fault-Sectionalizing*[2]. As part of the technical paper, S&C outlines the theoretical reliability improvements

[2] S&C Electric Company. Improving Medium-Voltage Main-Feeder Reliability by Increasing Fault-Sectionalizing. https://www.sandc.com/globalassets/sac-electric/documents/public---documents/sales-manual-library---external-view/technical-paper-766-t112.pdf?dt=638348867590192672

based on the number of feeder segments utilized for fault-sectionalizing. This scenario is based on an unsegmented radial feeder with uniform fault and customer distribution and fault-repair times.

Using the planned Contingency Enhancements volumes for recloser installations from 2023 to 2029, the projected benefits for 1 recloser per feeder (2 feeder segments) was produced based on an average SAIFI and SAIDI per feeder in the horseshoe region (excluding 4 kV). It was assumed the benefits from the program would be reflected in the year following the recloser installation. Operational factors which would limit reclosing capabilities were considered, such as outages that occurred under a Hold Off condition (i.e., manual intervention would be required by the power system operator for restoration under such occurrences).

In order to account for inefficiencies, an efficiency factor was added to adjust the overall improvements from the theoretical maximum. There are a few factors that may lead to inefficiencies including uneven distributions of faults across the region, uneven distribution of faults on a feeder, and uneven distribution of customers along a feeder. This was evident from Toronto Hydro's own experience based on a pilot recloser installation (ORC0003) on 502-M29 feeder, located half-way along the feeder trunk. Over the 2-year pilot period, ORC0003 operated 25% of the time when interruptions occurred on the feeder trunk (i.e., at 50% efficiency). All else being equal, ORC0003 should have theoretically operated 50% of the time. Given this result, limited operational experience with mid-line reclosers, and the system inefficiencies stated above, Toronto Hydro elected to use a conservative 30% efficiency factor to forecast the benefits from the installation of mid-line reclosers for purposes of reliability projections.

2. SCADA Switch Installations

SCADA switch installations improve reliability at the feeder level by minimizing the duration of outages. SCADA switches, operated remotely by a power system controller, lead to a reduction in SAIDI. However, they do not reduce SAIFI without Distribution Automation ('DA'), i.e., self-healing capability. DA was not considered in this analysis, since the technology is only expected to be operational beginning in 2030. As such this analysis considered improvements to SAIDI only. This

quantification was developed by observing the Customer Minutes Out ('CMO') reduction before and after a specific sectionalizer and tie count were installed on a feeder (e.g., 0 sectionalizers, 0 ties on feeder vs. 1 sectionalizer, 1 tie on a feeder).

Based on this analysis, leveraging asset information from Toronto Hydro's GIS, an installation benefit curve was derived to quantify the estimated benefits for any given feeder that are expected to increase from their baseline count of SCADA switches. The SCADA switch installation benefit curve was then applied to the planned volume anticipated for specific feeders over the 2025-2029 rate period.

The anticipated Grid Modernization improvements factored into the reliability projections would be reflective of the combined benefits of mid-line recloser and SCADA-switch installations.

The aggregation of these cause code level projections produces the final system level Outage Duration and Outage Frequency reliability projections, as presented in Exhibit 1B, Tab 3, Schedule 1, Pg. 10 and 17.

QUESTION (B):

b) Please provide a full copy of the reliability projection model.

RESPONSE (B):

The RP methodology is a model developed in Alteryx. The model relies on direct integration with various Toronto Hydro databases, and as such Toronto Hydro is unable to provide a full copy. For a visual depiction of the model for an asset class (in this case Wood Poles), please see Appendix A to this response.

QUESTION (C):

c) Please provide a forecast of Toronto Hydro's reliability performance based on the expenditures laid out in the application.

RESPONSE (C):

Toronto Hydro filed its original projections for reliability performance for Outage Duration and Outage Frequency in Exhibit 1B, Tab 3, Schedule 1, (Pg. 8 to 21).

In the process of preparing various interrogatory responses, Toronto Hydro identified corrections associated with the unit measure for population and replacement volume inputs used within the Reliability Projection ('RP') Methodology for underground cables (i.e. inconsistent use of conductor length vs. circuit length). Additionally, the pacing of overhead transformer replacements for the years 2025-2029 was updated, consistent with the correction provided under Integratory 2B-PWU-15. The updated Figures 1 and 2 below (originally filed under Exhibit 1B, Tab 3, Schedule 1, Pg. 10 & 17) are corrected accordingly, resulting in minor improvements to projected five-year SAIDI and SAIFI results as of 2029.

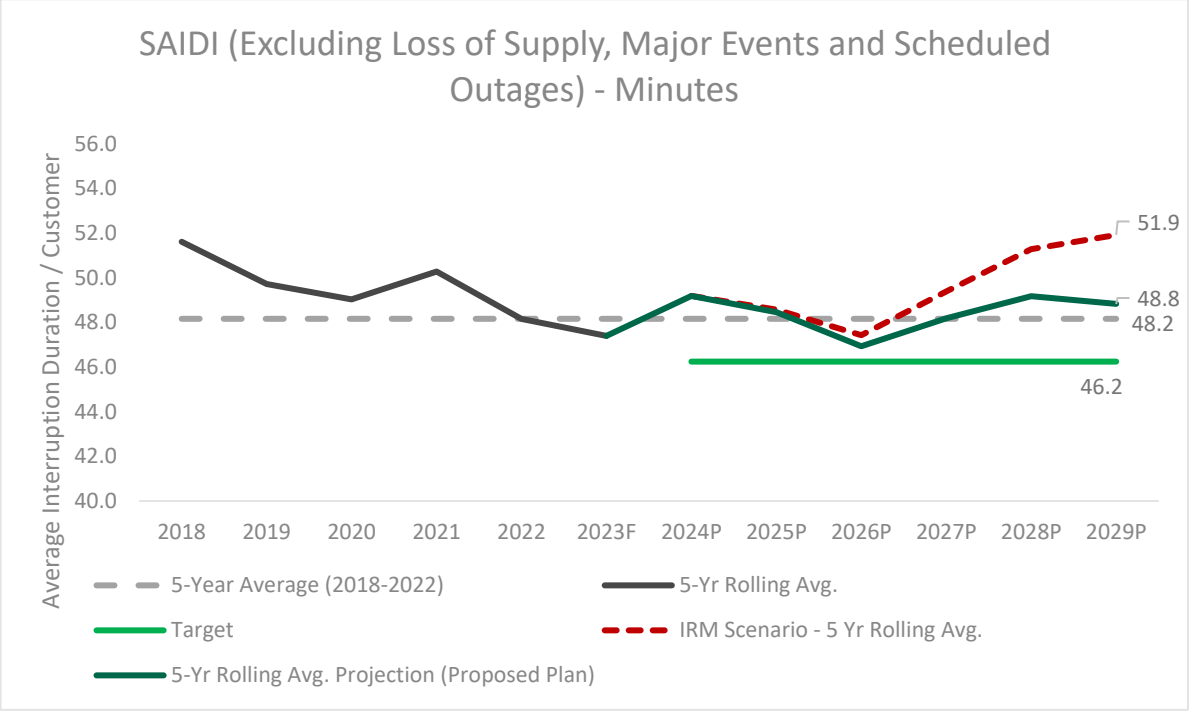


Figure 1: Historical and Projected SAIDI (excluding LoS, MEDs and scheduled outages)

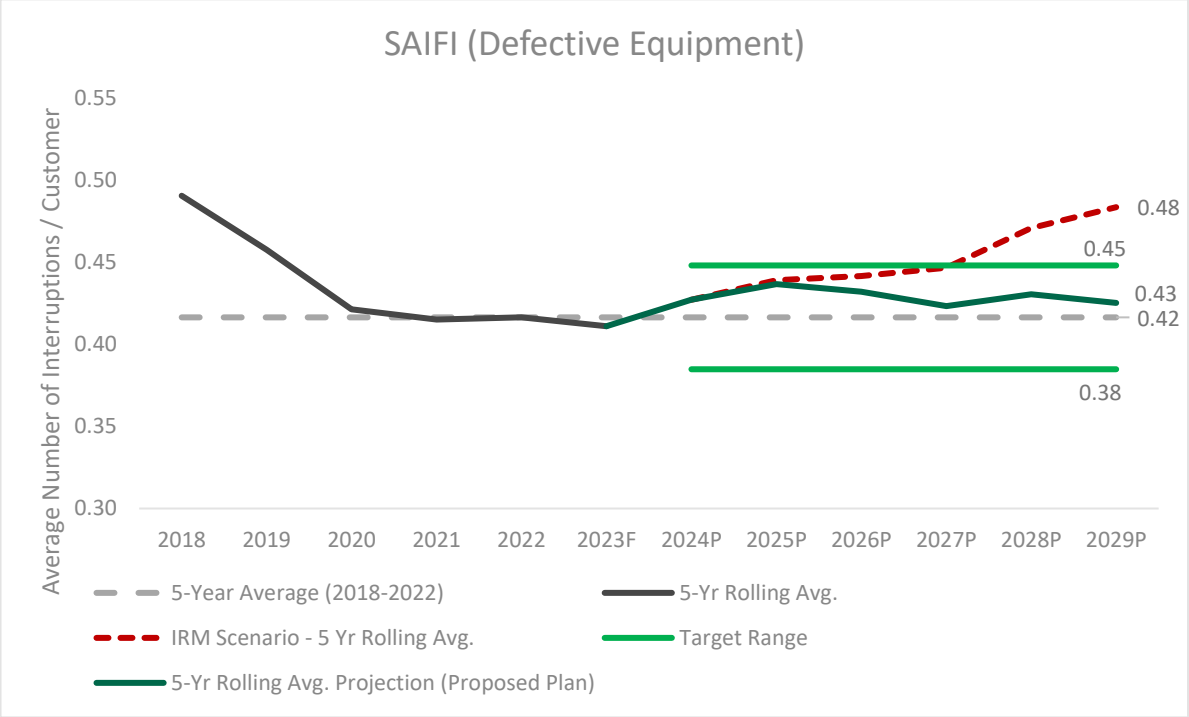


Figure 2: Historical and Projected SAIFI (Defective Equipment)

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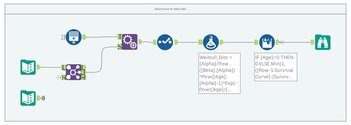

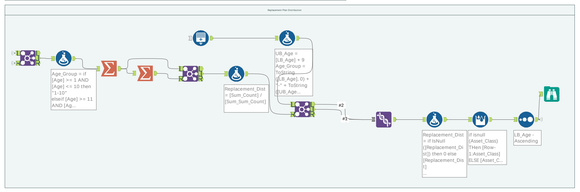

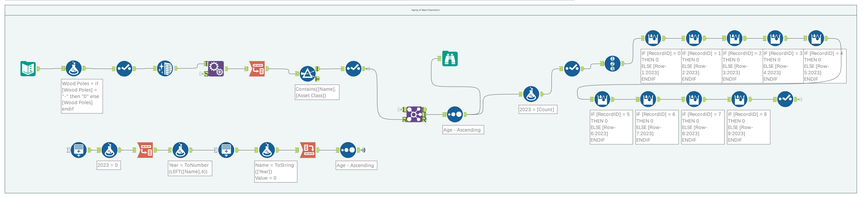

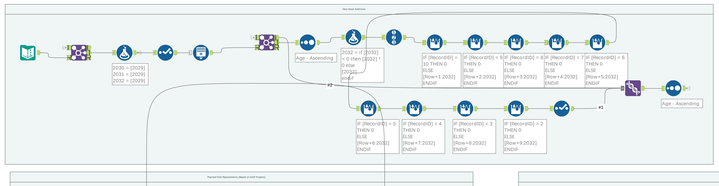

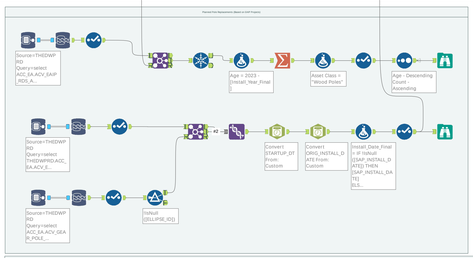

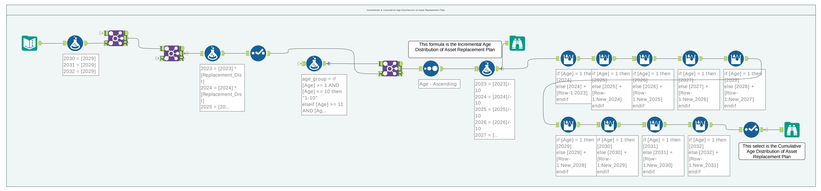

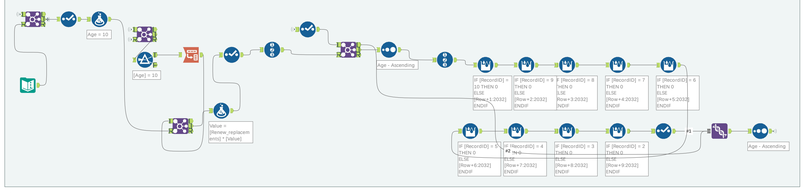

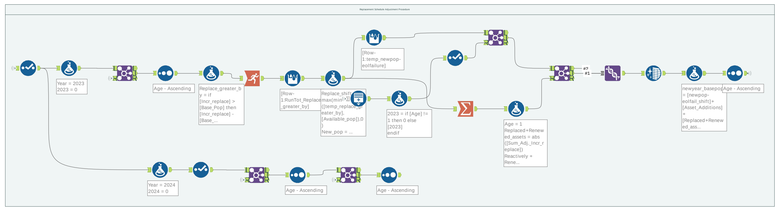

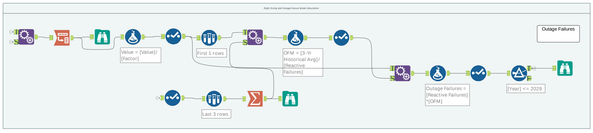

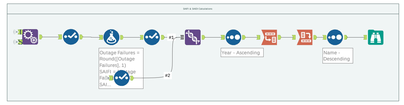

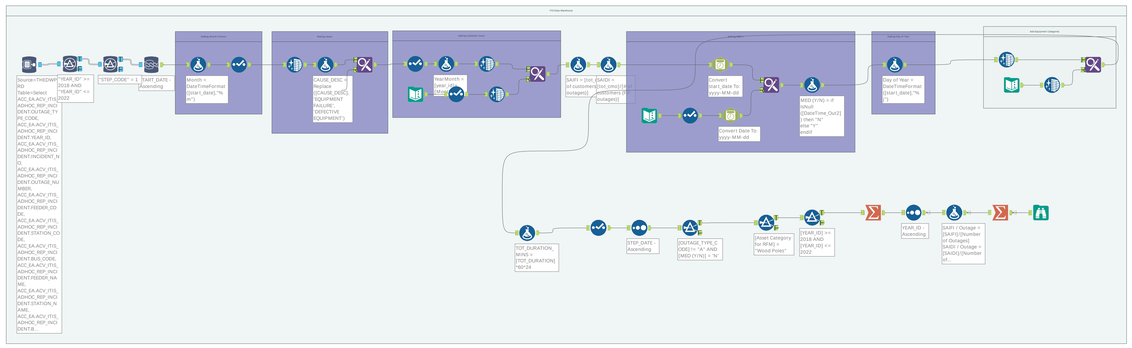



RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-43

Reference: Exhibit 2B, Section D3, Page 41]

Does Toronto Hydro have a corporate risk register (or similar document)? If so, please provide a copy.

RESPONSE:

Please refer to the attached Appendix A.

Enterprise and Component Risk Tree

STRATEGIC RISKS

Governance
- Shareholder Risk
- Community Representatives Risk
- City Operations Oversight Risk
- Municipal Policy Risk
- City Accountability Oversight Risk

Oversight
- Emerging Government Policy
- Application and Proceedings
- Emerging OEB Policy and Regulatory Framework
- Emerging IESO Policy

Franchise
- Customer
- Brand and Reputation
- Competitive

FUNCTIONAL RISKS

Cyber Security
- Electricity Distribution Grid
- Customer and Employee Private Information
- Intellectual Property
- Critical Business Operations

Safety
- Occupational Health and Safety
- Public Safety

Financial
- Capital Structure
- Financial Management
- Counter-Party Default
- Market Economic

Operations
- Asset Management Risk
- Business Interruption
- Customer Management
- Physical Security
- Supply Chain

Human Capital
- Attraction and Retention
- Internal and External Resource Management
- Labour Relationship

Compliance
- Regulatory
- Environment
- Finance and Governance
- Health and Safety
- Privacy and Cyber Security
- Labour and Employment
- Other

Governance Risk

Overview



Definition: Risk that municipal activity (laws, policies, or intervention) impedes Toronto Hydro's effective performance, and ability to meet its objectives and serve its customers.

Component Risks	
Shareholder Risk	Risk that TH's governance relationship with its shareholder is suboptimal and therefore impacts the corporation's ability to govern itself, deliver effective and efficient operations, and meet its business objectives.
Community Representatives Risk	Risk that negative interactions and prolong/difficult issues management process with City Councillors will increase negative attention to TH.
City Operations Oversight Risk	Risk that increased volume of city-building activities (e.g. large developments, waterfront) will impair TH's ability to effectively engage with the City and find mutually-acceptable resolution of issues.
Municipal Policy Risk	Risk that TH does not fully leverage its relationship with the Mayor, City councilors, administration, agencies, boards and commissions, and therefore the utility's ability to positively influence municipal policy application and decision-making is impacted. Risk that the strategic direction of the City of Toronto is not aligned with TH's strategic direction, thereby leading to the development of municipal policies or amendments to the Shareholder Direction that could impede TH business
City Accountability Oversight Risk	Risk that insufficient time and resources will result in the inability for TH to respond effectively to the City.

Oversight Risk

Overview



Definition: Risk that provincial government or regulator activity (laws, frameworks or policies) impedes Toronto Hydro's effective performance, and its ability to meet its objectives and serve its customers.

Component Risks	
Emerging Government Policy	Risk that emerging Ontario energy and utility policies create barriers to TH achieving its strategic objectives
Application and Proceedings	Risk of disallowance of a significant portion of TH's funding request for its Rate Application, or other negative decision in relation to a regular or issue-specific (e.g. Z-factor) application for rates, or other leave requiring express OEB approval (e.g. license amendment application, MAAD application, etc.)
Emerging OEB Policy and Regulatory Framework	Risk that OEB's regulatory model, manner of regulation and/or policy framework does not fit TH's business direction and may adversely impact the organization's strategic goals and financial results
Emerging IESO Policy	Risk that the IESO creates policies that do not align with or impede TH's business operations and strategic goals

Franchise Risk

Overview



Definition: Risk that restrictions in LDC's business model and/or external conditions impede its ability to maintain and grow its legal right to be the sole provider of electricity distribution and connection services in the city of Toronto (its franchise) and serve electricity customers.

Component Risks	
Customer	Risk that TH fails to identify and meet its customers' needs and expectations causing them to seek out alternative solutions involving lessened reliance on the distribution grid
Brand and Reputation	Risk that inaction by Toronto Hydro or restrictions placed upon it will impair its image in the community, public confidence or brand and lead to greater acceptance by governments that its monopoly position should be challenged
Competitive	Risk of development of competitive pressures from technology solutions providers and other unregulated entities, and the capacity of the organization to respond to those pressures

Cyber Security Risk

Overview



Definition: Risk that Toronto Hydro is unable to adequately safeguard digital information assets, connections to digital infrastructure, physical assets and people from threats or vulnerabilities.

Component Risks	
Electricity Distribution Grid	Risk that the Electrical Distribution Assets utilized to distribute electricity to Toronto Hydro customers is compromised by an unauthorized third party.
Customer & Employee Private Information	Risk that an unauthorized third-party gains access to personal information deemed private including driver's license, data of birth, electricity usage data, SIN, credit card, etc.
Intellectual Property	Risk that an unauthorized third-party gains access to Toronto Hydro's proprietary and confidential business information.
Critical Business Operations	Risk of critical business operational processes being compromised by a cyber security incident.

Safety Risk
Overview



Definition: Risk to Toronto Hydro employees or the general public of critical/fatal injuries and illnesses relating to or impacting upon Toronto Hydro activities.

Component Risks	
Occupational Health and Safety Risk	The risk that Toronto Hydro’s employees, and others for whom it is responsible at law, may be exposed to serious or fatal injuries or illness as a result of the work environment in which they operate.
Public Safety Risk	The general public may be exposed to serious or fatal injuries and safety issues as a result of Toronto Hydro's actions, inactions or the adequacy of its infrastructure and facilities.

Financial Risk

Overview



Definition: Risk that Toronto Hydro is unable to maintain its financial health and performance at acceptable levels.

Component Risks	
Capital Structure	Toronto Hydro is not able to optimize debt to equity structure to ensure market confidence and support
Financial Management	Risk that Toronto Hydro mismanages its financial accounting, budgeting, tax planning and internal controls, negatively impacting its profitability
Counter-Party Default	Risk that Toronto Hydro’s customers or other credit counterparties are unable or unwilling to settle payments or fulfill contractual obligations
Market Economic	Risk that deterioration of the macro economic factors in the electric utilities space and more generally may impact TH's ability to access financing at reasonable rates to execute its capital program and achieve strategic objectives

Operations Risk

Definition



Definition: Risk that Toronto Hydro is not able to effectively meet the needs of its customers and a growing city, and maintain the security and reliability of the distribution grid at acceptable levels.

Component Risks	
Asset Management Risk	The inability to maintain reasonable levels of reliability for its customers due to failure of existing distribution infrastructure and assets and the inability to replace/expand infrastructure in an optimal timeframe.
Customer Management Risk	TH fails to accurately measure customer consumption, respond to and address customer service issues or correctly bill customers on time (includes meter to cash management).
Business Interruption Risk	The inability to maintain continuing and sustainable business operations, or recover from business interruption after an incident that is beyond normal operations.
Physical Security Risk	The inability to adequately safeguard assets and people.
Supply Chain Risk	Risk that Toronto Hydro is unable to acquire critical equipment and material from its suppliers, impeding the Corporation's ability to operate at acceptable levels and meet the needs of its customers.

Human Capital Risk

Overview



Definition: Risk that Toronto Hydro is unable to maintain necessary resource talent and skilled resources.

Component Risks	
Attraction & Retention	Risk that TH is unable to attract and develop qualified employees or retain individuals who are strongly contributing to TH objectives and future needs
Internal and External Resource Management	Risk that Toronto Hydro is unable to effectively develop and manage the relationship with contractors to ensure resource flexibility, proper operationalization of resources, and maintenance of the right balance between outside and inside resources to address customer and distribution system needs
Labour Relationship	Risk that TH is not effectively managing matters related to the negotiation, development and enforcement of its collective agreements or its relationships with its labour unions and organized staff, so that all work situations are not adequately staffed and fulfilled.

Compliance Risk

Overview



Definition: Risk that Toronto Hydro does not meet its material compliance obligations under legal and regulatory instruments.

Component Risks	
Regulatory	Federal and provincial electricity and utility-related legislation and regulations. OEB Codes, rules, policies, and IESO's Market rules.
Environment	Federal and provincial policies, legislation, regulations and standards related to the protection of the environment.
Finance & Governance	Financial reporting & disclosure requirements, tax filing requirements, and governance obligations established under law.
Health & Safety	Federal and provincial regulations regarding rights and responsibilities of employees and employers in the workplace and the protection of the public's safety.
Privacy & Cyber Security	Federal or provincial laws and regulations related to the protection of personal information and access to our data, software and hardware.
Labour & Employment	Labour and employment laws and regulations.
Other	Federal or provincial laws and regulations including those related to consumer protection, record keeping, access for people with disabilities, etc.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-44

Reference: Exhibit 2B, D3, Appendix A

With respect to the Asset Condition Assessment: Methodology Update and 2022 Results Analysis, please provide a revised version of Table 5 that shows the future health index projected for year-end 2029, based on the work forecast in Toronto Hydro's proposed application.

RESPONSE:

Predicting the asset age and condition demographics as of year-end 2029 based on Toronto Hydro's proposed 2025-2029 investment plans is not possible without knowing which assets will be replaced over the entirety of the rate period. This requires discrete, project-level details which are not available for most asset classes. Toronto Hydro forecasts its executable capital plan on a rolling 30-month basis, and usually produces detailed scopes of work 12-18 months in advance of construction. This reality is part of Toronto Hydro's dynamic and programmatic approach to managing its assets, which has been tailored through decades of experience to efficiently manage risk and performance in a dense, dynamic and growing urban service territory.

When creating detailed and geographically bounded project scopes and designs for System Renewal programs, Toronto Hydro identifies the need for asset replacement based on three major factors:

1. The **Probability of Failure**, which is represented at the highest level by a health score, but at the project engineering and design level will also be informed by a detailed review of maintenance records and historical failure records (e.g., feeder regions with XLPE cables that have previously faulted and been repaired; number of splices in a run of PILC cable). For the small handful of major assets that would trigger a renewal project and which do not have Condition Based Risk Management ("CBRM") condition models (e.g., primary

underground cable), probability may also be informed by age and the specific type of asset. (Though to be clear, an asset is not replaced simply because it is beyond "useful life.") Note that there are certain major assets that generally do not trigger projects on their own, unless there is a reason to do so unrelated to reliability performance (e.g., eliminating pole top transformers at risk of containing PCBs). Please see Section D3.1.2 for more details.

2. The **Criticality of Failure**, i.e., the anticipated consequences should an asset or part of the system experience a failure. Depending on where an asset is on the system, the impact of failure on reliability, safety, and the environment will vary. Criticality is an important element in assessing risk and can result in the strategic replacement of assets that are not in the worst condition. For example, a wood pole holding up multiple trunk circuits on a street corner is more critical than a wood pole holding up a secondary service line on a residential side street. The criticality of the trunk pole represents the type of circumstance that could lead to an asset being replaced prior to reaching HI5 or even HI4 condition, especially in circumstances when that asset is connected to other assets in the immediate area that require intervention. Assessment of criticality at the project engineering stage is a detailed exercise that varies depending on the investment program. For example, for Horseshoe programs dealing with large volumes of assets, planners will look at the aforementioned trunk vs. lateral distinction, the size of the equipment and number of connected customers, the presence of critical loads, whether the next failure will impact an area that is already experiencing poor performance, whether an asset is of a particular vintage type that will cause a more extensive outage response than another type, whether the area of the system has relatively strong protection and switching capacities to reroute and restore power in the event of failure, etc. For more discrete asset classes that are of a higher criticality in general (e.g., stations power transformers), Toronto Hydro will also consider engineering factors such as what the impact of failure would be on the state of contingency of the system, the ability to transfer load between transformers, busses, and stations, and various environmental and safety impacts of different vintages and types.

3. The final factor in determining which assets will be replaced is the broad category of **Design Considerations.** This category refers to the various drivers that can result in the scope of work for projects extending beyond the narrower set of assets that may have triggered the initial decision to intervene in an area. Design considerations are a particularly significant factor for a utility like Toronto Hydro, operating in a dense, growing, and ever-changing urban environment, with various on-the-ground challenges such as utilities conflicts, clearance issues and other space restrictions, a heavy and expanding tree canopy, etc. When Toronto Hydro determines that it is necessary to intervene on an asset or group of assets in an area, a number of design factors come into play, including an assessment of the available rights-of-way and how they should be used for the long-term, the condition and age of assets in the contiguous surroundings, an assessment of loading in the area and whether the equipment needs to be upsized for the next 30-40 years of service, an assessment of area performance and system design, including whether as part of the project it is economical to introduce additional switching and protection capabilities or to generally reconfigure or reroute the area, etc. Any one of these additional drivers can trigger changes and additional considerations for another driver. Finally, standards and obsolescence also come into play. For example, if a larger transformer is required on a pole, this may require a taller pole, which in turn may require the replacement of adjacent poles, and so on. Another example is the obsolete 4 kV system. When it comes to the point where a critical mass of equipment needs to be replaced in a 4 kV area, this necessarily triggers the need to rebuild the entire area to standard, at either 13.8 kV or 27.6 kV. Overall, applying these and many other design considerations at the project level is a complex exercise that is project specific and does not lend itself to simplified asset demographic projection modelling such as determining asset population health seven years into the future.

Projected Health Demographics with Investment

Toronto Hydro has provided the above preamble as important context for understanding and interpreting the results of the following tables and the more detailed Appendix A (Excel) attached. What Table 1 below presents for asset classes with CBRM health score models is the following:

1. Asset health demographics as of 2022
2. Asset health demographics projected to 2029 without any intervention
3. Asset health demographics projected using a simplistic (i.e., unrealistic) assumption that the utility will put all of its planned investment volumes for 2023-2029 toward *only* the worst condition assets (i.e., eliminate all the HI5s, and then move on to HI4s, etc.).

The only exceptions Toronto Hydro has made to the simplistic assumptions in item number three above is to (i) account for the PCB at-risk equipment that the utility expects to remove in 2023-2025, and (ii) account for specific assets that have been identified as part of the Area Conversions program. This results in specific impacts on the HI1-HI5 condition bands in the projection with investment. It is also important to note that these projections do not account for the various other programs that impact asset demographics. For example, growth-related programs such as Customer Connections, Load Demand, and Externally Initiated Plant Relocations drive many asset replacements that are not related to failures and failure risk. Investments in these categories will impact assets across a broad range of age and condition values. Furthermore, the Reactive Capital program contributes to future health demographics for a number of asset classes. While there is a general correlation between the health and age of assets and the probability that they could need to be replaced reactively, it is also the case that assets can and do fail at any age and observed condition, and given the large overall population of assets in HI1-HI3 health bands, the utility would expect a number of assets to fail in these condition bands.

For the reasons discussed in the introduction to this interrogatory response, the figures in the final column of Table 1 should not be taken as a forecast, a target, or an achievable result. These figures are presented for further context and to be responsive, on a best-efforts basis, to the various

questions asked regarding 2029 asset age and condition with investment. Toronto Hydro offers additional notes on the results seen in Table 1 later in this interrogatory response.

Table 1: Summary of Simplistic 2029 Health Demographic Projections

ACA Assets	Renewal Program		Sum HI4 & HI5 at Year End		
			2022	2029 w/o Investment	2029 w/ Investment (Simplistic Scenario)
Overhead Gang Operated Switches	Overhead Renewal, Area Conversions	Overhead Switches	40	446	N/A[1]
SCADAMATE Switches					
Wood Poles		Wood Poles	9,459	32,158	19,732
Network Transformers	Network Renewal	Network Units[2]	43	149	-
Network Protectors					
Network Vaults		Network Vaults[3]	91	137	90
Submersible Transformers	Underground Renewal (Horseshoe and Downtown)	Underground Transformers[2]	695	2,699	1,133
Vault Transformers					
Padmount Transformers					
SF6 Insulated Padmount Switch		Underground Switches	94	284	105
Air Insulated Padmount Switch					
SF6 Insulated Submersible Switch					
Air Insulated Submersible Switch					
Cable Chambers		Cable Chambers[3]	592	1,113	838
URD Vaults		URD Vaults	8	13	4

Notes Regarding the Figures in Table 1

The results in Table 1 for the "simplistic" projection of 2029 results with investment show a wide variability in outcomes across asset classes. For example, wood pole condition is expected to

[1] Please see discussion regarding Overhead Switches below.
[2] For underground and network transformers, total units changed in Health Index Bands include removal of at-risk of PCB
[3] For cable chamber and network vaults, total units changed in Health Index Bands is sum of units for rebuild and abandonment

deteriorate, even under this unrealistically optimistic scenario, while all HI4/HI5 Network Units would theoretically be eliminated. Additional context for these outcomes is provided here:

- **Overhead Assets:** Exhibit 2B, Section D3, Table 2, summarizes Toronto Hydro's approach to replacing overhead system assets.
  - **Wood Poles:** As shown in Figure 19 of Exhibit 2B, Section E6.5, Toronto Hydro has, in reality, experienced substantial deterioration of its wood pole population since 2018 and this is one of the reasons Toronto Hydro intends to increase investment in the Overhead System Renewal program in 2025-2029.[4] The utility looks forward to refocusing on condition and reliability-driven investment in the Overhead Circuit Renewal program in 2026 following completion of the PCB at-risk equipment elimination activities in 2025. Investments in the Area Conversions program will also contribute to pole condition improvements.

    The number of HI4/HI5 wood poles nearly doubles by 2029 in Table 1. As discussed in 2B-Staff-226, Toronto Hydro recognizes that the projection aspect of its wood pole condition model is a continuing work in progress, and, despite recent adjustments that the utility has made to dampen the rate of deterioration in these projections, may (or may not) be predicting a somewhat accelerated rate of deterioration in the Future Health Scores. The utility is proposing to adjust its maintenance strategies and to continue monitoring and studying the model to address some of the inherent challenges with modelling future states in this asset class. Toronto Hydro notes that its ability to recognize the need for these maintenance adjustments is a reflection of the benefits of introducing the CBRM approach in 2017, which not only supports better asset replacement decisions, but

[4] The statement regarding observed deterioration in wood pole condition since 2018 is based exclusively on the number of HI4 and HI5 assets (Current Health Scores). While there is some discussion in the EA Technology report regarding the accuracy of the Normal Expected Life value for the wood pole condition model, Toronto Hydro would like to re-emphasize that the Current Health Score of an asset cannot exceed HI3 without observed condition data to support it.

provides a basis for investigating broader asset management strategies and trends for the relevant asset classes.

Should Toronto Hydro continue to experience significant deterioration in the wood pole asset class over the 2025-2029 period, this will be a factor in determining longer-term rates of investment (i.e., 2030+). Overall, the utility does expect a continued deterioration in wood pole condition over the 2025-2029 period, which it intends to manage by prioritizing the worst condition and most critical poles and by adjusting its inspection strategy.

- **Overhead Switches:** There are multiple types of overhead switch, of which only gang operated and SCADAMATE switch types have asset condition models. Toronto Hydro does not yet know the specific breakdown of switch replacements between asset type over the full 2025-2029 period and therefore cannot accurately allocate expected switch replacements between ACA and non-ACA supported types in Table 1. The utility notes that the number of switches in HI4 and HI5 condition is expected to increase by upwards of 400 units between 2022 and 2029. The utility is planning to replace over 650 switches between 2023 and 2029 in the Overhead System Renewal program, plus additional switches within the Area Conversions program as well as other programs that are not related to System Renewal. As noted, the extent to which these units are applied to switches with asset health models is yet to be determined. (Note that the switch types with asset health models account for approximately 25% of the total overhead switch population.) Furthermore, as discussed in the preamble to this response, there are several factors that result in the decision to replace an asset as part of an area rebuild, and both asset criticality and system design considerations are important influences when it comes to overhead switches. Toronto Hydro's goal for the overhead switch population in 2025-2029 is to maintain health. The utility does not expect to see improvements in health, and there is some risk that asset health demographics

could deteriorate. As with wood poles, the utility will manage the performance risk stemming from this potential deterioration by prioritizing the worst condition and most critical switches.

- **Network Units and Vaults:** The network system is exhibiting a slower rate of deterioration compared to 2018, and with Toronto Hydro's proposed investment plan for 2025-2029, there is an opportunity to potentially improve the health demographics of network units. As discussed in Exhibit 2B, Section E2.2.1.1, there are considerations beyond the current and 2029 health demographics involved in the chosen pacing of unit renewal: (1) the continuing prevalence of non-submersible network units, which are at a higher risk of catastrophic failure due to flooding regardless of their condition; and (2) an anticipated wave of network demographic issues beyond 2029, with over 50 percent of network units projected to be at or beyond end of useful life by 2034 without intervention. With respect to network vaults, there are specific project-level criticality and engineering and design considerations that will drive the ultimate demographic distribution of assets that are rebuilt over the 2025-2029 period. For example, the specific location of a network vault must be considered as the hazards associated with failure will vary. Furthermore, if a network vault needs to be rebuilt in the exact same location, the network units must first be removed from the vault. This requires nearby network units to be upsized to compensate, with the potential result that network units in lower health bands are replaced. There are also efficiency considerations (i.e., given the combined condition of the unit and vault, and the need to take planned outages on critical parts of the network, it may be most cost-effective to replace and rebuild both simultaneously, even if one of the two is not in HI4/HI5 condition), as well as engineering and design considerations (e.g., space restrictions or reconfiguration needs could result in both a vault and network unit having to replaced or relocated, even if the project need was triggered by only one of the assets).

- **Underground Assets:** Exhibit 2B, Section D3, Table 3, summarizes Toronto Hydro's approach to replacing underground system assets.

  - **UG Horseshoe:** While in recent years, Toronto Hydro has been focused on PCB at-risk transformer replacement, the utility is looking forward to returning to the primary purpose of this program in 2026, which is the replacement of underground primary cables and switches at risk of failure. As discussed in Exhibit 2B, Section 6.2, underground cables are the single greatest contributor to outages caused by defective equipment on Toronto Hydro's system. The Underground System Renewal Horseshoe program is also a key example of the impact of design considerations on asset replacement. As Toronto Hydro rebuilds underground areas with large concentrations of direct-buried cable and cable in PVC conduit, it is generally the case that the targeted sections of feeder will need to be rebuilt in their entirety (often on the opposite side of the street from where the existing direct buried plant is being removed and abandoned). This means that when these cables are replaced, new transformers and switches will be installed at the same time, bringing the entire area up to modern standards and capacities simultaneously. Bearing this in mind, while the "simplistic" 2029 results for UG transformers and switches (Table 1) suggest that – after accounting for reactive replacement volumes and other drivers of replacement (e.g., switch replacements in the downtown renewal program) – there could be an opportunity to maintain or even improve condition in these asset classes, it is much more likely that Toronto Hydro will maintain condition or see moderate deterioration. However, by applying the logic of criticality to its decision-making processes (especially for any planned spot replacements of padmount switches outside of cable rebuild projects), the utility can maintain asset risk and performance within the 2025-2029 period, even if health demographics moderately deteriorate.
  - **UG Downtown**: As shown in Table 1, cable chamber condition deteriorates even in the simplistic scenario where all cable chamber units addressed by the Underground System Renewal Downtown program are HI4 and HI5. Toronto Hydro chose to take a

restrained approach to cable chamber renewal in the 2025-2029 period, and will continue to leverage a combination of the downtown renewal program and the Reactive Capital program to manage risks associated with the cable chambers that are observed to be in the worst condition and in the most critical locations of the system.

Regarding Underground Residential Distribution ("URD") assets, as discussed in Exhibit 2B, Section E6.3, Toronto Hydro's goal for 2025-2029 Toronto Hydro's objective for 2025-2029 is to invest the amount needed to maintain average reliability performance for the customers served by these assets. The utility aims to achieve this by targeting the worst condition and most critical assets.

Table 2 below provides results for the set of major discrete asset classes for which Toronto Hydro can forecast a more precise outcome with respect to 2029 asset condition demographics with the application of its proposed 2025-2029 investment plan. For a detailed discussion of the asset management strategies that drive these 2029 outcomes, please refer to Exhibit 2B, Section E6.6.

Table 2: Summary of 2029 Health Demographic Projections (Stations)

ACA Assets	Renewal Program		Sum HI4 & HI5		
			2022	2029 w/o Investment	2029 w/ Investment
Station Power Transformers	Stations Renewal	MS Power Transformers[5]	8	13	5
Air Magnetic Circuit Breaker AirBlast Circuit Breaker Oil Circuit Breaker Oil KSO Circuit Breaker SF6 Circuit Breaker Vacuum Circuit Breaker		MS Air Magnetic Circuit Breaker[6]	14	210	165
		TS Switchgear Breakers	40	239	211
		TS Outdoor Breakers	5	24	9

[5] Represents subset of ACA Asset Class Population

[6] Represents subset of ACA Asset Class Population

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-45

References: Exhibit 2B, Section D3, Appendix B

Preamble:

With respect to the EA Technology, Review of ACA Modelling Enhancements and Customisations:

QUESTION (A):

a) [p.15] Please provide further details regarding the rationale for the calculation of H in the probability of failure formula, specifically, why is it appropriate that if the health score is less than 4 (i.e. it is in better health than an asset with health score of 4) it is given a score of 4.

RESPONSE (A):

Please refer to Toronto Hydro's response to interrogatory 2B-Staff-151 parts (a) and (b).

QUESTION (B):

b) [p.23] EA says: "A small number of ACA models including the SCADAMATE Switches, Air Magnetic Circuit breakers, Air blast Circuit breakers, and SF6 Circuit Breakers have been calibrated to align health score derivations with THESL's tactical asset management practices." Please provide details regarding this calibration process and why it is appropriate.

RESPONSE (B):

As part of Toronto Hydro's maintenance work, when deficiencies are identified on SCADAMATE switches and station circuit breakers through inspections, Toronto Hydro attempts to repair the asset immediately as assets are already de-energized for inspection purposes. As such, in the asset

condition models, Toronto Hydro applies a reduced calibration score which results in a lower health score as the deficiency was addressed at the time of inspection.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-46

Reference: Exhibit 2B, Section D4

With respect to capacity planning:

QUESTION (A) :

a) [p.6] Please provide a copy of the results of the Monte-Carlo Simulation.

RESPONSE (A):

Please see Table 1 for the outputs of the Monte-Carlo Simulation (10th, 50th & 90th percentile: P10, P50, and P90). P50 results were used as Toronto Hydro's System Peak Demand Forecast. Please note that the 10-year System Peak Demand Forecast does not include the decarbonization of heat as modelled load.

Table 1 : Monte-Carlo Simulation Results (MVA)

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
P10 - Summer system Non-Coincident Peak Demand	4768	4944	5097	5243	5329	5510	5666	5759	5843	5924
P10 - Winter system Non-Coincident Peak Demand	4708	4884	5037	5184	5271	5417	5512	5556	5583	5621
P50 - Summer system Non-Coincident Peak Demand	4905	5080	5229	5383	5475	5659	5835	5941	6029	6136
P50 - Winter system Non-Coincident Peak Demand	4812	4988	5142	5290	5383	5537	5642	5699	5740	5795
P90 - Summer system Non-Coincident Peak Demand	5258	5435	5590	5739	5840	6054	6236	6347	6469	6607
P90 - Winter system Non-Coincident Peak Demand	4960	5137	5292	5442	5543	5709	5829	5906	5969	6060

QUESTION (B) :

b) [p.11] Please provide system peak demand for each year between 2022 and 2031, broken down by the categories included in Figure 4.

RESPONSE (B):

Please see table below.

Table 2: Toronto Hydro System Peak Demand Forecast by Driver (MVA)

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Base Forecast	4870	5017	5133	5223	5226	5298	5388	5436	5473	5527
Electric Vehicle	5	10	18	28	45	67	90	114	138	167
Electrified Transit	0	0	0	4	47	114	116	118	118	118
Municipal Energy Plans	0	6	4	10	15	19	60	72	84	96
Data Centres	30	47	74	116	142	162	182	201	216	228
Total Forecast	**4905**	**5080**	**5229**	**5383**	**5475**	**5659**	**5835**	**5941**	**6029**	**6136**

QUESTION (C) :

c) [p.12] Please provide Figure 5 in tabular format. Please also provide in Excel.

RESPONSE (C):

Please see table below. The Excel is attached as an appendix to this IR.

Table 3: Comparison of Planning Forecasts and Future Energy Scenarios (MVA)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Toronto Hydro 2022 Peak Demand[1]	5463	5749	6140	6242	6455	6610	6732	6829	6906	6994
Toronto Hydro 2023 Peak Demand	4760	4905	5080	5229	5383	5475	5659	5835	5941	6029
Regional Planning - Needs Assessment - NET	5667	5934	6259	6297	6458	6541	6604	6643	6676	6707

[1] Note that the 2022 Peak Demand Forecast has general alignment with FES over the 2025-2029 rate period.

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Future Energy Scenarios – CT Low	5638	5974	6334	6565	6746	6903	7041	7149	7260	7378
Future Energy Scenarios - CT	5591	5879	6187	6364	6496	6600	6681	6730	6776	6822

QUESTION (D) :

d) [Appendix A, p.11] Please provide the following figures in tabular format: Figure 3 and 4. Please also provide in Excel.

RESPONSE (D):

Please refer to 2B-Staff-158 parts (a) and (b) for the tabular format. The Excel spreadsheet is attached as an appendix to this response entitled *"2B-SEC-46_Appendix A.xlxs"*.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-47

Reference: Exhibit 2B, Section D5, Page 15

Toronto Hydro cites results of implementation of FLSIR projects by other utilities. If those results (reduce CIs and CMIs) were applied to Toronto Hydro beginning in 2030, after full implementation, what would the forecast reduction in SAIDI and SAIFI be?

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 2B-Staff-162.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-48

Reference: Exhibit 2B, Section D5.5, Page 5, footnote 5

QUESTION:

Does Toronto Hydro have an internal Grid Modernization Roadmap. If so, please provide a copy.

RESPONSE:

The Grid Modernization roadmap is reflected in the Grid Modernization Strategy evidence submitted as part of the 2025-2029 Distribution System Plan in Exhibit 2B, Section D5. The strategy is the product of a multi-year, cross-functional investment planning effort and includes a variety of specific capability building objectives across a number of domains for the 2025-2029 period (e.g., prepare 90% of the Horseshoe distribution system for automatic FLISR implementation beginning in 2030; establish a robust "digital backbone" to create the foundation for the expanded and enhanced application of data analytics and automation solutions in 2025-2029 and beyond). These objectives and the underlying plans to achieve them are built upon Toronto Hydro's lived experience successfully delivering large modernization programs (e.g., Network Condition Monitoring & Control enhancements)[1] and discrete technology enhancement roadmaps (e.g., the continued roll-out of enhancements to customer experience and service tools highlighted in Exhibit 1B, Tab 4, Schedule 1, at pages 10-11). Toronto Hydro's mature corporate and asset management systems provide the tools and frameworks which ensure that various departments involved in delivering these strategic technology objectives remain coordinated and that risks to project and roadmap delivery are appropriately managed over various time horizons.

[1] Exhibit 2B, Section E7.3

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-49

Reference: Exhibit 2B, Section D5, Page 29

Please provide a copy of Figure 6 in tabular format.

RESPONSE:

Year	2021	2022	2023	2024	2025
FES - Low	149	164	179	189	195
FES - Medium	149	172	194	216	231
FES - High	149	178	207	263	300
Rate Application	132	135	182	200	212

Year	2026	2027	2028	2029	2030
FES - Low	203	211	221	232	244
FES - Medium	246	263	282	303	325
FES - High	337	376	420	466	520
Rate Application	225	240	258	280	-

Year	2031	2032	2033	2034	2035
FES - Low	257	270	284	299	314
FES - Medium	349	374	402	432	465
FES - High	574	634	701	771	845
Rate Application	-	-	-	-	-

Year	2036	2037	2038	2039	2040
FES - Low	327	341	355	370	385
FES - Medium	495	531	572	618	667
FES - High	904	965	1,029	1,095	1,163
Rate Application	-	-	-	-	-

Year	2041	2042	2043	2044	2045
FES - Low	401	417	435	454	475
FES - Medium	718	771	825	881	939
FES - High	1,232	1,303	1,375	1,448	1,523
Rate Application	-	-	-	-	-

1

Year	2046	2047	2048	2049	2050
FES - Low	497	523	551	583	617
FES - Medium	999	1,060	1,123	1,188	1,253
FES - High	1,599	1,676	1,755	1,834	1,914
Rate Application	-	-	-	-	-

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-50

Reference: Exhibit 2B, Section D5, Page 55

Toronto Hydro states: "Toronto Hydro is exploring opportunities to leverage analytics in predictive maintenance for its electric assets as well. For example, the utility is currently running a pilot project that will explore the use of high-resolution satellite imagery and artificial intelligence as a basis for creating a risk-based decision-support tool for the Vegetation Management program." Please provide further details regarding what opportunities Toronto Hydro is exploring, as well as further details regarding the referenced pilot project.

RESPONSE:

Toronto Hydro is using analytics tools such as Alteryx to analyze inspection data within its predictive maintenance programs in order to get better insights into its assets. The utility is also exploring AI/ML opportunities to assess feasibility of applying these algorithms to better assess condition of its assets.

Toronto Hydro is exploring the opportunity to implement an Intelligent Vegetation Management System (IVMS) that utilizes satellite/aerial imagery, advanced analytics, and AI-driven algorithms to enhance the efficiency and effectiveness of its vegetation management efforts. Through this innovative approach, the utility aims to accurately identify hazardous trees encroaching upon power lines, ultimately improving the reliability and safety of its electrical infrastructure. As part of this exploration, Toronto Hydro has successfully implemented a pilot project utilizing the IVMS. This project leverages high-resolution satellite imagery and artificial intelligence to create a risk-based decision-support tool specifically tailored for the utility's Vegetation Management program. The IVMS enables the utility to forecast the risk of tree contacts, recommend feeder-specific tree-trimming schedules, and identify high-risk segments that could benefit from spot trimming. In 2024, Toronto Hydro has made progress in integrating the IVMS data and insights into its cycle trim

plan line. This integration is a crucial step towards Toronto Hydro's efforts to modernize and optimize its vegetation management practices.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-51

Reference: Exhibit 2B, Section D7

What specifically has Toronto Hydro's shareholder required of Toronto Hydro regarding the implementation of the City of Toronto TransformTO Net Zero strategy.

RESPONSE:

In April 2021, Toronto City Council requested that Toronto Hydro prepare an action plan regarding what more Toronto Hydro could do to support the City's TransformTO vision and related climate action targets with a focus on electric vehicles (EVs) charging infrastructure, outdoor lighting, renewable energy and storage, and attracting revenue through non-rate solutions. Toronto Hydro submitted its Climate Action Plan[1] in September 2021 and its first Climate Action Plan Status Report in 2022.[2] In July 2022, Toronto City Council approved new climate action mandates for Toronto Hydro[3] as described in the 2022 Climate Action Plan Status Report, including the following mandate for a new (non rate-regulated) climate advisory services business:

> **Climate Advisory Services**
>
> 2. City Council, on behalf of the City of Toronto as shareholder, request Toronto Hydro to expand its business activities beyond electricity distribution services by:
>
> a. establishing a new stream of non-rate regulated operations within its regulated business, specifically Climate Advisory Services (the climate action opportunity that excludes Toronto Hydro owning and operating

[1] Toronto Hydro Climate Action Plan, web: https://www.torontohydro.com/documents/20143/74105431/climate-action-plan.pdf/8fe4406c-7675-76a7-00c9-c0c4e58ae6df?t=1638298942820.
[2] Toronto Hydro Climate Action Plan Status Report, web: https://www.torontohydro.com/documents/20143/74105431/climate-action-plan-status-report.pdf/7fd07b3b-c0da-df7c-7815-2c464b5f8919?t=1658951621213.
[3] City of Toronto Item – 2022.EX34.9, web: https://secure.toronto.ca/council/agenda-item.do?item=2022.EX34.9.

assets), in keeping with the proposal set out in Toronto Hydro's Climate Action Plan received by City Council at its meeting on December 2021 and the Toronto Hydro Climate Action Plan Status Report; and

b. working through the Council-approved Net-Zero Climate Leadership Table to ensure coordination and enhanced investment while avoiding duplication with City programs and services, such as the Home Energy Loan Program and the Mayors Green Will, when implementing Climate Advisory Services.

5. City Council, on behalf of the City of Toronto as shareholder, request Toronto Hydro to deliver publicly to the Executive Committee through the City Manager, the Chief Financial Officer and Treasurer, and the Deputy City Manager, Corporate Services, an annual report on the progress, key performance indicators, and next steps of Climate Advisory Services.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-52

Reference: Exhibit 2B, Section D8, Appendix A

With respect to the Gartner, Toronto Hydro Enterprise IT Cost Benchmark & Functional Maturity Assessment Final Report:

QUESTION (A):

a) What was Toronto Hydro's purpose for undertaking the study? If it was for internal use, as opposed to support for its rate application, please explain how it informed the IT spending included in the plan.

RESPONSE (A) PREPARED BY TORONTO HYDRO:

As discussed in this evidence, Toronto Hydro commissioned Gartner Consulting ("Gartner") to perform a comprehensive benchmarking study to obtain an independent and objective expert evaluation of the process maturity levels within Toronto Hydro's IT functions and establish a baseline for IT spending and various metrics when benchmarked against peer organizations. Toronto Hydro's objective was to leverage this assessment to validate Toronto Hydro's overarching business and IT strategic goals, thereby supporting the continuous improvement of IT capabilities in areas directly impacting IT and business objectives. As discussed in subsection E8.4.4 "Expenditure Plan" of Exhibit 2B, Section E8.4,[1] Gartner concluded that Toronto Hydro's IT expenditures as a 2022 benchmark is competitive against industry peers confirming the utility's IT expenditures are appropriately balanced.

[1] At p. 17-18.

For more information on the study please refer to section 4 "Benchmarking Studies" and in particular subsection 4.3 of Exhibit 1B, Tab 3, Schedule 3,[2] subsection E8.4.4 "Expenditure Plan" of Exhibit 2B, Section E8.4,[3] and Appendix A to Exhibit 2B, Section D8.[4]

QUESTION (B):

b) [p.17] Please list the Custom Peer Group and ITKMD Utilities.

RESPONSE (B) – PREPARED BY GARTNER:

The custom peer group companies used for comparative purposes is a subset of Gartner's IT Key Metrics Data (ITKMD) for the Utilities Industry. Gartner cannot name the members of the peer group due to confidentiality agreements with the peer organizations that are standard for all our benchmarking clients.

QUESTION (C):

c) [p.17] How many companies' that are included in the Custom Peer Group and ITKMD Utilities are: i) distribution only utilities, ii) transmission only utilities, iii) generation only utilities, iv) distribution and transmission only utilities, or v) other?

RESPONSE (C) – PREPARED BY GARTNER:

Gartner has the world's largest data set for organizational IT spending and staffing. Gartner's objective when developing a peer group is to identify between 8 and 12 organizations that are as similar as possible to the client. Having a peer group of 8 to 12 makes it statistically relevant, while maintaining client "likeness". The methodology for peer selection is multidimensional, with nature of operations (e.g., generation / transmission / distribution) being only one of the criteria. Other factors that are considered when selecting organizations for a peer group include Total Revenue, Total Operating Expenses, Total Number of Employees and Geographical location.

[2] At p. 29.
[3] At p. 17-18.
[4] At p. 9.

Given there were not enough "distribution only" utilities in the database that also satisfied the additional criteria discussed above, some organizations with generation and/or transmission operations were included. The mix of the 8 utilities organizations in the peer group are as follows:

- Distribution only = 3
- Generation & Distribution = 2
- Generation, Transmission & Distribution = 2
- Transmission only = 1

QUESTION (D):

d) [p.4] Please confirm that Toronto Hydro's total revenue includes revenue related to pass-through costs (i.e. commodity, transmission, etc.) in addition to distribution revenue.

RESPONSE (D) PREPARED BY TORONTO HYDRO:

Confirmed.

QUESTION (E):

e) [p.4] Please revise the table to show IT Spend as a % of Distribution Revenue only.

RESPONSE (E) – PREPARED BY GARTNER:

This information is not available as Gartner does not collect revenue breakdown from our peer groups. Only the total revenue data point is collected. Therefore, IT spend as a % of distribution revenue is not available for the Peer Group Average and ITKMD Utility Industry.

RESPONSE (E) PREPARED BY TORONTO HYDRO:

Please refer to Toronto Hydro's response to 2B-AMPCO-67(a) for a calculation of the utility's IT spend as a percentage of its distribution revenue and revenue offset.

QUESTION (F):

f) [p.34] For each functional area, please provide the full maturity level description/criteria.

RESPONSE (F) – PREPARED BY GARTNER:

Descriptions for each functional area included in the assessment are as follows:

- Chief Information Officer (CIO): activities performed by the Office of CIO including engaging business and leadership stakeholders, strategy development & planning, innovation, IT finance and IT governance

- Applications: activities performed by the Application Development and Support teams including building and customizing applications, integrating platforms, products and applications, managing the product and application portfolio and managing vendor relationships

- Data & Analytics: activities performed by the Data & Analytics team including creating vision and strategy, aligning to business outcomes, developing organization, creating and maintaining analytics content, integrating and managing data and governing data and analytics assets

- Enterprise Architecture (EA) & Technology Innovation: activities performed by the EA & Technology Innovation team including structuring business strategy, facilitating innovation, planning and managing the IT portfolio, enabling solutions delivery and establishing EA frameworks and tools

- Infrastructure & Operations (I&O): activities performed by the I&O team including evaluating, planning and designing solutions, measuring and optimizing operations, transitioning and operating IT services

- Program & Portfolio Management (PPM): activities performed by the PPM team including partnering with stakeholders, managing strategic portfolios, managing frameworks and standards, driving transformation initiatives, enabling initiative management and delivery

- Security & Risk Management: activities performed by the Security & Risk Management team including engaging and supporting stakeholders, assessing and managing risk, protecting the infrastructure, managing security operations and delivering assurance

QUESTION (G):

g) [p.55] How does Toronto Hydro plan to address each of the Top 25 improvement opportunities?

RESPONSE (G) PREPARED BY TORONTO HYDRO:

The top 25 improvement opportunities identified by Gartner have helped to validate Toronto Hydro's Information Technology Investment Strategy outlined in Exhibit 2B, Section D8. For example, Toronto Hydro intends to address improvement opportunities in the area of data analytics (D&A) by improving reporting, data sharing and making data more accessible.[5] To address the improvement opportunities in the infrastructure & operation (I&O) area, the utility considers forecast capacity requirements to ensure it has the necessary IT hardware to support general business growth and associated increased data storage and data processing requirements. To address the improvement opportunities in the security and risk management (SRM) area, Toronto Hydro will explore and invest in new technology and defence mechanisms to ensure the security of its digital assets.[6] Toronto Hydro's IT Investment Planning Process, the application of Enterprise Technology Portfolio ("ETP") framework[7] and Project Governance Framework[8] will enable the utility to effectively align and prioritize investments and in these areas.

[5] Exhibit 2B Section E8.4.3.2 at p. 13.
[6] Exhibit 2B Section E8.4 and Exhibit 4A Schedule 2 Tab 17 Section 5.1
[7] Exhibit 2B, Section D8 at p. 7-10.
[8] Exhibit 2B Section D8.5.2

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-53

Reference: Exhibit 2B, Section E2, Page 6

Please provide a table that shows, for each year between 2025 and 2029, and by program, the 3 investment strategy options (low, high, draft plan).

RESPONSE:

Please see Table 1, Table 2, and Table 3 below for the investment option low, high, and draft plan respectively.

1 **Table 1: Low Option – 2025-2029 Capital Expenditures Forecast ($ Millions)**

OPTION: LOW		2025-2029 Total Capex Expenditure					
Category	**Programs/Category**	**2025**	**2026**	**2027**	**2028**	**2029**	**Total**
System Access	**Customer and Generation Connections**	$ 87.7	$ 97.4	$ 109.5	$ 117.8	$ 128.0	$ 540.3
System Access	**Externally Initiated Plant Relocations & Expansion**	$ 6.8	$ 7.0	$ 7.3	$ 7.6	$ 7.9	$ 36.7
System Access	**Load Demand**	$ 35.6	$ 28.5	$ 26.3	$ 19.9	$ 25.1	$ 135.4
System Access	**Metering**	$ 67.9	$ 56.2	$ 25.4	$ 34.8	$ 8.9	$ 193.2
System Access	**Generation Protection, Monitoring and Control**	$ 0.3	$ 0.3	$ 1.4	$ 2.6	$ 0.3	$ 4.8
System Access	**System Access Total Expenditures**	**$ 198.2**	**$ 189.4**	**$ 169.9**	**$ 182.7**	**$ 170.2**	**$ 910.3**
System Renewal	**Area Conversions**	$ 71.7	$ 73.9	$ 17.1	$ 19.9	$ 14.9	$ 197.4
System Renewal	**Underground Renewal - Horseshoe**	$ 97.1	$ 74.1	$ 49.8	$ 56.2	$ 55.2	$ 332.4
System Renewal	**Underground Renewal - Downtown**	$ 27.1	$ 28.5	$ 30.2	$ 31.3	$ 32.1	$ 149.3
System Renewal	**Network System Renewal**	$ 11.7	$ 12.8	$ 12.8	$ 12.0	$ 12.5	$ 61.8
System Renewal	**Overhead System Renewal**	$ 42.6	$ 39.6	$ 52.8	$ 64.3	$ 78.8	$ 278.2
System Renewal	**Stations Renewal**	$ 39.2	$ 45.2	$ 44.2	$ 47.3	$ 49.6	$ 225.7
System Renewal	**Reactive and Corrective Capital**	$ 56.7	$ 58.7	$ 61.4	$ 62.6	$ 64.4	$ 303.9
System Renewal	**System Renewal Total Expenditures**	**$ 346.2**	**$ 333.0**	**$ 268.4**	**$ 293.5**	**$ 307.5**	**$ 1,548.6**
System Service	**System Enhancements**	$ 8.4	$ 8.5	$ 41.3	$ 42.2	$ 46.2	$ 146.6
System Service	**Non-Wires Solutions**	$ -	$ 2.2	$ 2.3	$ 2.3	$ 3.5	$ 10.3
System Service	**Network Condition Monitoring and Control**	$ 4.4	$ -	$ -	$ -	$ -	$ 4.4
System Service	**Stations Expansion**	$ 45.0	$ 41.6	$ 27.8	$ 73.9	$ 11.2	$ 199.4
System Service	**System Service Total Expenditures**	**$ 57.8**	**$ 52.3**	**$ 71.3**	**$ 118.3**	**$ 60.9**	**$ 360.7**
General Plant	**Facilities Management and Security**	$ 20.6	$ 21.5	$ 22.2	$ 23.1	$ 23.9	$ 111.2
General Plant	**Enterprise Data Centre**	$ 5.5	$ 5.6	$ 5.7	$ 5.9	$ 6.0	$ 28.7
General Plant	**Fleet and Equipment**	$ 12.1	$ 11.9	$ 14.4	$ 15.8	$ 16.2	$ 70.4
General Plant	**IT/OT Systems**	$ 50.7	$ 53.4	$ 55.6	$ 52.5	$ 58.3	$ 270.5
General Plant	**General Plant Total Expenditures**	**$ 88.9**	**$ 92.4**	**$ 98.0**	**$ 97.2**	**$ 104.4**	**$ 480.8**
Other	**AFUDC**	$ 4.8	$ 6.2	$ 7.9	$ 7.7	$ 7.1	$ 33.8
Other	**Other Total Expenditures**	**$ 4.8**	**$ 6.2**	**$ 7.9**	**$ 7.7**	**$ 7.1**	**$ 33.8**
Total	**Total CAPEX (2025-2029)**	**$ 695.8**	**$ 673.3**	**$ 615.5**	**$ 699.5**	**$ 650.1**	**$ 3,334.2**

1 **Table 2: High Option – 2025-2029 Capital Expenditures Forecast ($ Millions)**

OPTION: HIGH		2025-2029 Total Capex Expenditures					
Category	**Programs/Category**	**2025**	**2026**	**2027**	**2028**	**2029**	**Total**
System Access	**Customer and Generation Connections**	$ 96.9	$ 114.7	$ 124.4	$ 123.9	$ 129.9	$ 589.8
System Access	**Externally Initiated Plant Relocations & Expansion**	$ 22.6	$ 16.7	$ 12.0	$ 12.1	$ 12.6	$ 76.1
System Access	**Load Demand**	$ 63.3	$ 66.9	$ 60.0	$ 56.6	$ 65.2	$ 312.0
System Access	**Metering**	$ 71.7	$ 60.0	$ 33.4	$ 51.6	$ 7.2	$ 223.9
System Access	**Generation Protection, Monitoring and Control**	$ 3.9	$ 4.2	$ 4.3	$ 4.4	$ 0.9	$ 17.7
System Access	**System Access Total Expenditures**	**$ 258.5**	**$ 262.6**	**$ 234.0**	**$ 248.7**	**$ 215.8**	**$ 1,219.6**
System Renewal	**Area Conversions**	$ 91.1	$ 90.2	$ 26.1	$ 26.4	$ 21.8	$ 255.7
System Renewal	**Underground Renewal - Horseshoe**	$ 131.7	$ 102.5	$ 107.4	$ 80.4	$ 83.7	$ 505.7
System Renewal	**Underground Renewal - Downtown**	$ 50.1	$ 54.0	$ 58.1	$ 58.5	$ 61.2	$ 281.9
System Renewal	**Network System Renewal**	$ 26.3	$ 25.5	$ 26.1	$ 26.9	$ 26.8	$ 131.6
System Renewal	**Overhead System Renewal**	$ 84.1	$ 73.0	$ 86.3	$ 98.8	$ 113.6	$ 455.9
System Renewal	**Stations Renewal**	$ 59.1	$ 61.7	$ 63.1	$ 65.5	$ 69.9	$ 319.4
System Renewal	**Reactive and Corrective Capital**	$ 61.6	$ 63.5	$ 65.9	$ 67.5	$ 69.5	$ 328.0
System Renewal	**System Renewal Total Expenditures**	**$ 504.0**	**$ 470.6**	**$ 433.0**	**$ 424.0**	**$ 446.6**	**$ 2,278.2**
System Service	**System Enhancements**	$ 42.0	$ 56.5	$ 90.3	$ 90.4	$ 94.4	$ 373.5
System Service	**Non-Wires Solutions**	$ -	$ 7.7	$ 7.9	$ 9.2	$ 9.4	$ 34.3
System Service	**Network Condition Monitoring and Control**	$ 4.3	$ 0.2	$ 0.4	$ 0.6	$ 0.6	$ 6.0
System Service	**Stations Expansion**	$ 45.0	$ 41.6	$ 37.8	$ 83.9	$ 16.2	$ 224.4
System Service	**System Service Total Expenditures**	**$ 91.2**	**$ 106.0**	**$ 136.3**	**$ 184.0**	**$ 120.6**	**$ 638.2**
General Plant	**Facilities Management and Security**	$ 36.1	$ 37.4	$ 38.8	$ 40.3	$ 41.8	$ 194.3
General Plant	**Enterprise Data Centre**	$ 13.8	$ 14.1	$ 14.4	$ 14.7	$ 15.0	$ 71.9
General Plant	**Fleet and Equipment**	$ 25.8	$ 15.3	$ 16.3	$ 17.2	$ 9.6	$ 84.3
General Plant	**IT/OT Systems**	$ 59.5	$ 62.3	$ 64.8	$ 62.2	$ 66.0	$ 314.7
General Plant	**General Plant Total Expenditures**	**$ 135.2**	**$ 129.0**	**$ 134.3**	**$ 134.3**	**$ 132.4**	**$ 665.2**
Other	**AFUDC**	$ 4.8	$ 6.2	$ 7.9	$ 7.7	$ 7.1	$ 33.8
Other	**Other Total Expenditures**	**$ 4.8**	**$ 6.2**	**$ 7.9**	**$ 7.7**	**$ 7.1**	**$ 33.8**
Total	**Total CAPEX (2025-2029)**	**$ 993.8**	**$ 974.3**	**$ 945.6**	**$ 998.8**	**$ 922.5**	**$ 4,835.1**

1 **Table 3: Draft Plan – 2025-2029 Capital Expenditures Forecast ($ Millions)**

DRAFT PLAN		2025-2029 Total Capex Expenditure					
Category	**Programs/Category**	**2025**	**2026**	**2027**	**2028**	**2029**	**Total**
System Access	**Customer and Generation Connections**	$ 87.4	$ 95.3	$ 103.5	$ 113.5	$ 122.8	$ 522.5
System Access	**Externally Initiated Plant Relocations & Expansion**	$ 22.6	$ 16.7	$ 12.0	$ 12.1	$ 12.6	$ 76.1
System Access	**Load Demand**	$ 44.7	$ 48.4	$ 40.6	$ 37.2	$ 46.2	$ 217.0
System Access	**Metering**	$ 60.5	$ 68.0	$ 71.6	$ 21.2	$ 7.3	$ 228.7
System Access	**Generation Protection, Monitoring and Control**	$ 3.9	$ 4.2	$ 4.3	$ 4.4	$ 0.9	$ 17.7
System Access	**System Access Total Expenditures**	**$ 219.1**	**$ 232.6**	**$ 232.0**	**$ 188.5**	**$ 189.9**	**$ 1,062.0**
System Renewal	**Area Conversions**	$ 68.0	$ 69.5	$ 21.6	$ 26.3	$ 26.2	$ 211.5
System Renewal	**Underground Renewal - Horseshoe**	$ 90.7	$ 79.3	$ 90.1	$ 97.0	$ 100.9	$ 458.0
System Renewal	**Underground Renewal - Downtown**	$ 19.9	$ 24.5	$ 30.5	$ 39.0	$ 42.3	$ 156.1
System Renewal	**Network System Renewal**	$ 13.4	$ 14.4	$ 29.6	$ 30.2	$ 31.9	$ 119.5
System Renewal	**Overhead System Renewal**	$ 49.2	$ 58.9	$ 74.8	$ 82.2	$ 81.0	$ 346.1
System Renewal	**Stations Renewal**	$ 54.7	$ 59.8	$ 56.6	$ 56.7	$ 58.7	$ 286.5
System Renewal	**Reactive and Corrective Capital**	$ 61.7	$ 63.3	$ 65.2	$ 67.0	$ 68.7	$ 325.9
System Renewal	**System Renewal Total Expenditures**	**$ 357.5**	**$ 369.7**	**$ 368.4**	**$ 398.4**	**$ 409.7**	**$ 1,903.7**
System Service	**System Enhancements**	$ 12.7	$ 19.4	$ 47.9	$ 45.3	$ 51.7	$ 176.9
System Service	**Non-Wires Solutions**	$ -	$ 7.7	$ 7.9	$ 9.2	$ 9.4	$ 34.3
System Service	**Network Condition Monitoring and Control**	$ 4.4	$ 0.2	$ 0.4	$ 0.6	$ 0.6	$ 6.2
System Service	**Stations Expansion**	$ 26.0	$ 40.6	$ 47.8	$ 81.9	$ 12.2	$ 208.4
System Service	**System Service Total Expenditures**	**$ 43.0**	**$ 67.9**	**$ 104.0**	**$ 137.0**	**$ 73.9**	**$ 425.7**
General Plant	**Facilities Management and Security**	$ 32.4	$ 26.7	$ 27.7	$ 30.8	$ 34.7	$ 152.2
General Plant	**Enterprise Data Centre**	$ 13.8	$ 14.1	$ 14.4	$ 14.7	$ 15.0	$ 71.9
General Plant	**Fleet and Equipment**	$ 15.0	$ 16.0	$ 15.2	$ 16.2	$ 16.4	$ 78.8
General Plant	**IT/OT Systems**	$ 57.5	$ 60.3	$ 62.8	$ 65.9	$ 64.0	$ 310.4
General Plant	**General Plant Total Expenditures**	**$ 118.7**	**$ 117.0**	**$ 120.0**	**$ 127.6**	**$ 130.1**	**$ 613.4**
Other	**AFUDC**	$ 4.8	$ 6.2	$ 7.9	$ 7.7	$ 7.1	$ 33.8
Other	**Other Total Expenditures**	**$ 4.8**	**$ 6.2**	**$ 7.9**	**$ 7.7**	**$ 7.1**	**$ 33.8**
Total	**Total CAPEX (2025-2029)**	**$ 743.0**	**$ 793.4**	**$ 832.3**	**$ 859.2**	**$ 810.6**	**$ 4,038.6**

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-54

Reference: Exhibit 2B, Section E2, Page. 7

Toronto Hydro states: "From this starting point, an iterative process generated multiple versions of the capital expenditure plan, eventually producing a draft plan that formed the basis of Phase 2 of Customer Engagement." Please provide each capital expenditure plan that was generated as part of the iterative process.

RESPONSE:

Table 1 below details the program level changes and rationale from the initial plan to the draft plan that formed the basis of Phase 2 customer engagement. Table 2 below details the program level changes and rationale from the draft to the final plan that was filed in November 2023. Subsequent to filing the draft plan the utility filed an evidence update on January 29, 2024 reducing its capital expenditures plan by approximately $73.9M.[1]

Table 1: Initial and Draft Capital Expenditure Plans

Draft and Final 2025-2029 Total Capital Expenditures			
Programs/Category	**Initial Plan ($M)**	**Draft Plan ($M)**	**Reason for Change**
Customer and Generation Connections	716.5	522.5	Refined the forecasting methodology and assumptions to achieve a better balance in planning for expected increases in load connections.
Externally Initiated Plant Relocations & Expansion	76.1	76.1	N/A
Load Demand	213.3	217.1	Minor adjustments to estimates
Metering	209.7	215.7	Minor adjustments to estimates
Generation Protection, Monitoring and Control	17.7	17.7	N/A
System Access Total	**1,233.3**	**1,049.1**	

[1] EB-2023-0195, Evidence Update Cover Letter (January 29, 2024)

Draft and Final 2025-2029 Total Capital Expenditures			
Programs/Category	**Initial Plan ($M)**	**Draft Plan ($M)**	**Reason for Change**
Area Conversions	246.7	211.7	Reduced pace of investment in converting rear lot customers, extending the overall time horizon over which rear lot locations will be completed. Refinement to cost estimates also resulted in reductions.
Underground Renewal - Horseshoe	505.9	458.4	Reduced program in order to balance reliability and cost pressures by reducing the pace of direct buried cable replacement and feeder conversions within the rate period.
Underground Renewal - Downtown	179.6	156.3	Reduced Cable Chamber Renewal program to manage rate impacts and overall strategic parameters. The program is scaling back the number of poor condition assets addressed in the next rate period and managing failure risk by concentrating on asset locations that carry the highest level of potential failure consequences.
Network System Renewal	115.7	119.5	Minor adjustments to estimates
Overhead System Renewal	341.7	346.3	Minor adjustments to estimates
Stations Renewal	281.0	286.1	Minor adjustments to estimates
Reactive and Corrective Capital	320.7	325.4	Minor adjustments to estimates
System Renewal Total	**1,991.4**	**1,903.7**	
System Enhancements	342.6	145.9	Constrained investment in Contingency Enhancement to manage execution risks and rate impacts. A substantial reduction for Downtown Contingency, made possible by focussing on creating station switchgear ties between Copeland Station and Esplanade Station to manage a subset of contingency concerns within the downtown system. Toronto Hydro expects to pilot innovative solutions such as the Automated Primary Closed Loop distribution system which has the capability to provide a more effective and relatively economical solution to establish feeder ties between stations.[2]
Non-Wires Solutions	65.3	65.3	N/A
Network Condition Monitoring and Control	6.0	6.2	Minor adjustments to estimates
Stations Expansion	209.4	208.4	Minor adjustments to estimates

[2] For more information, please see Exhibit 2B, Section E2 at page 8

Draft and Final 2025-2029 Total Capital Expenditures			
Programs/Category	**Initial Plan ($M)**	**Draft Plan ($M)**	**Reason for Change**
System Service Total Expenditures	**623.3**	**425.7**	
Facilities Management and Security	163.6	152.2	Toronto Hydro adopted a managed deterioration strategy for its head office during the next rate period.[3]
Enterprise Data Centre	71.9	71.9	N/A
Fleet and Equipment	78.8	78.8	N/A
IT/OT Systems	310.4	310.4	N/A
General Plant Total Expenditures	**624.7**	**613.4**	
AFUDC	33.8	33.8	N/A
Non-EWP Metering	12.8	12.8	N/A
Other Total Expenditures	**46.7**	**46.7**	
Total CAPEX (2025-2029)	**4,519.4**	**4,038.6**	

Table 2: Financial Planning – Draft and Final Capital Expenditure Plans

2025-2029 Total Capital Expenditures			
Programs/Category	**Draft Plan ($M)**	**Final Plan ($M)**	**Reason for Change**
Customer and Generation Connections	522.5	476.5	Refined assumptions and estimates for the load connections segment based on 2022 actuals and updates to the basic connection allowance.
Externally Initiated Plant Relocations & Expansion	76.1	76.0	Minor adjustments to estimates.
Load Demand	217.1	236.3	Increase due to emerging need, resulting in additional scope required to be completed in 2025-2029 as well as refined estimates.
Metering	215.7	234.5	Deferral of work from 2020-2024 carrying over into 2025-2029 due to supply chain delays in procuring AMI2.0 meters.
Generation Protection, Monitoring and Control	17.7	35.0	Increase in program expenditures driven by DER Forecast Change (Net Metering from FIT Program) and updated volumes expected for antenna and switch buybacks.
System Access Total	**1,049.1**	**1,058.3**	

[3] Please see Exhibit 2B, Section D6 at page 7.

2025-2029 Total Capital Expenditures			
Programs/Category	**Draft Plan ($M)**	**Final Plan ($M)**	**Reason for Change**
Area Conversions	211.7	236.7	Increase in scope within the Box Construction segment to complete full conversion of feeders with box framed poles (note, box framed poles are still targeted to be completed by 2026). Inflation-related cost increases for Rear Lot projects.
Underground Renewal - Horseshoe	458.4	475.7	Adjustments to estimates.
Underground Renewal - Downtown	156.3	165.1	Adjustments to estimates.
Network System Renewal	119.5	123.4	Adjustments to estimates.
Overhead System Renewal	346.3	358.4	Adjustments to estimates.
Stations Renewal	286.1	282.7	The following changes resulted in reduction to the program: • Scope refinement resulting in reduced spending in Stations Control & Monitoring • Increase in Sump Pump and AC Panel costs; increase in scope in order to address additional Stations Service Transformers • Scope refinement and reprioritization of work resulting in decreased renewal work at MS Stations • Increase in switchgear unit costs based on updated information from manufacturers, partly offset by a deferral of Station Building work
Reactive and Corrective Capital	325.4	328.1	Refinements to forecast methodology leading to minor reductions, offset by minor adjustments to estimates.
System Renewal Total	**1,903.7**	**1,970.3**	
System Enhancements	145.9	151.2	Minor adjustments to estimates and pacing to begin work earlier in the rate period for system observability investments to allow Toronto Hydro to collect additional data to support future system planning decisions with a focus on new devices integral to support grid modernization.

2025-2029 Total Capital Expenditures			
Programs/Category	**Draft Plan ($M)**	**Final Plan ($M)**	**Reason for Change**
Non-Wires Solutions	65.3	22.5	Reduction in program expenditures due to scope reduction to focus on Renewable Enabling Battery Energy Storage System based on latest experience and execution challenges faced during the current rate period within the Energy Storage segment. Transfer of Advanced Grid Pilots and related investments to an Innovation Fund.
Network Condition Monitoring and Control	6.2	6.0	Minor adjustments to estimates.
Stations Expansion	208.4	173.2	Reduction in investments within this program through the deferral of the second phase of expansion at Basin TS. Updated pacing for Downsview TS, resulting in minor estimate adjustments.
System Service Total	**425.7**	**353.0**	
Facilities Management and Security	152.2	145.5	Refined estimate for reactive repairs and maintenance for the Head Office and reductions to program expenditures in response to Phase 2 Customer Engagement feedback by more reactively managing asset risks.
Enterprise Data Centre	71.9	72.0	Minor adjustments to estimates.
Fleet and Equipment	78.8	43.7	Removal of approximately $32M due to an error for how fleet electrification was accounted for in the initial plan. Reductions to pace of the program in response to Phase 2 Customer Engagement feedback.
IT/OT Systems	310.4	301.3	Reduction in program expenditures due to: • Reallocation of costs from CAPEX to OPEX within the IT Cybersecurity segment resulting from an increase in managed services, cloud security services and associated maintenance and subscription costs. • Minor pacing adjustments within the IT Software program to align with expected S/4 HANA Go Live date. • Reduction in IT Software program in response to Phase 2 Customer Engagement results.
General Plant Total	**613.4**	**562.5**	

2025-2029 Total Capital Expenditures			
Programs/Category	**Draft Plan ($M)**	**Final Plan ($M)**	**Reason for Change**
AFUDC	33.8	44.6	Increases to AFUDC cost estimates due to updated timing of contributions to HONI and associated ISA and updated timing of Downsview TS delaying ISA timing.
Non-EWP Metering	12.8	12.8	N/A
Other Total	**46.7**	**57.4**	
Total CAPEX (2025-2029)	**4,038.6**	**4,001.4**	

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-55

Reference: Exhibit 2B, Section E2

With respect to Toronto Hydro's capital program:

QUESTION (A):

a) For each OEB category (system access, renewal, service, general plant), please provide the percentage of capital spending that has, or is forecast, to be undertaken by external contractors annually between 2020 and 2029.

RESPONSE (A):

Please see table below for a percentage of actual and forecast costs of external contractors compared to total capital expenditures. Toronto Hydro notes that for the forecast years, the percentage of external contractor cost will depend on the mix of work executed each year.

Table 1: 2020-2029 Annual Percentage of Capital undertaken by External Contractors

	Actual				Bridge	Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
System Access	64%	64%	65%	59%	62%	62%	61%	59%	59%	58%
System Renewal	51%	52%	50%	53%	53%	53%	53%	53%	54%	54%
System Service	72%	83%	85%	63%	72%	52%	46%	54%	66%	63%
General Plant	43%	55%	53%	59%	49%	55%	58%	60%	61%	56%

QUESTION (B):

b) With respect to its more programmatic capital work undertaken as part of the system access and renewal categories, please discuss how Toronto Hydro decides if the work will be carried out by third-party contractors or internal resources.

RESPONSE (B):

Toronto Hydro determines the appropriate mix of internal and external work based on maintaining a core internal capability to carry out a work mix that includes planned capital, reactive, customer and maintenance work across the City of Toronto. Please refer to Exhibit 4, Tab 4, Schedule 3, 4.2.4.

Internal crews are allocated work until their available hours for work are balanced to assigned work. Once internal crews are balanced, remaining work is assigned to contracted resources. Work is assigned until all capital portfolios (e.g., load demand, overhead renewal, underground renewal, customer connections, external initiated plant, reactive etc.) and maintenance programs (e.g., preventive, corrective, emergency, customer) are fully allocated for a given time period.

As civil construction is not considered a core capability and as these skills and capabilities are readily available on the market, Toronto Hydro does not maintain its own internal civil construction workforce.

QUESTION (C):

c) Does Toronto Hydro similarly use third-party contractors for its preventive and corrective maintenance programs? If so, for each program, please provide the percentage of spending undertaken, or forecast to be undertaken, by external contractors annually between 2020 and 2029.

RESPONSE (C):

Yes, Toronto Hydro utilizes third-party contractor services for preventive and corrective maintenance programs in a similar manner as other work programs. Table 2, provides the percentage of spending undertaken and forecasted to be undertaken by external contractors annually between 2020-2029.

Table 2: Percentage of External Contractor Spend (%) by Maintenance Programs

Programs	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Preventative and Predictive Overhead Line Maintenance	64%	64%	65%	59%	62%	62%	61%	59%	59%	58%
Preventative and Predictive Underground Line Maintenance	51%	52%	50%	53%	53%	53%	53%	53%	54%	54%
Preventative and Predictive Station Maintenance Program	72%	83%	85%	63%	72%	52%	46%	54%	66%	63%
Corrective Maintenance	43%	55%	53%	59%	49%	55%	58%	60%	61%	56%

QUESTION (D):

d) Please explain the contractual arrangements that Toronto Hydro has with its major third-party contractors.

RESPONSE (D):

Toronto Hydro undertakes a rigorous procurement process for all OM&A and Capital services contracted out as detailed in the Procurement Policy (Exhibit 4A, Tab 3, Schedule 1, Appendix A). Through the competitive procurement process, all bid submissions are assessed using a comprehensive evaluation matrix which is set prior to the Request for Proposal (RFP) or Request for Quote (RFQ) going out to market and includes a detailed cost analysis. The results of the assessment are benchmarked between participants to the procurement process and against any existing contracts to ensure a favourable acquisition cost and the successful respondent's ability to meet or exceed Toronto Hydro's quality, safety and environmental requirements.

In Capital Construction, for example, work assignment to major third-party contractors are completed through the Term Contract Scope Assignment Offer (TCSAO), which is a process that

assesses elements such as work scope's geographical location, synergies with scopes in the vicinity, Contractor's capability, capacity and overall cost effectiveness.

Toronto Hydro continues to utilize Unit Price Contract Management System (UPCMS) to ensure cost effectiveness and containment.

QUESTION (E) :

e) Has Toronto Hydro undertaken any recent analysis regarding the cost effectiveness of in-house or third-party contractors? If so, please provide that analysis.

RESPONSE (E):

Toronto Hydro engaged UMS Group to conduct a unit cost benchmarking study which compared average unit costs for major asset classes and maintenance activities. As further detailed in Exhibit 1B, Tab 3, Schedule 3, Section 4.6 and Appendix C, the results of this study showed that Toronto Hydro's unit cost performance was comparable or better than the peer group.

A composition of Toronto Hydro internal crews and utilizing third-party Contractors is an operational model that has been successfully utilized by Toronto Hydro historically and the Utility intends to continue with this hybrid model in this rate application period.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-56

Reference: Exhibit 2B, Section E3, Pages 9-11

Please explain how a feeder can be restricted due to short circuit capacity, but have no connected customers.

RESPONSE:

The short circuit capacity is based on the station bus limit. As described in the above reference, it's the system or component's capacity to withstand high levels of electrical energy congregated on that point or location without permanent damage. Therefore, once the station bus is at its capacity limit, DER projects can no longer be connected to any of its feeders as all generation sources connected to the bus would contribute to the short circuit current on the bus, in the event of a fault. As such, if a feeder is on a restricted bus, it cannot connect any DERs, regardless of the amount of load connected to it.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-57

Reference: Exhibit 2B, Section E4, Page 7

Please provide a revised version of Appendix 2-AA, that shows Toronto Hydro's annual internal budget (as opposed to the OEB approved budget) for each year between 2020 and 2024.

RESPONSE:

Please see Appendix A to this response for Toronto Hydro's internal budgets by program for each year between 2020 and 2024.

As part of its annual budgeting process, Toronto Hydro continuously assesses the cumulative five-year plan that it is being funded through rates in current rate period. This assessment takes into account historical actual expenditures and updated forecasts out to the end of the rate period based on the best available information known at the time. In keeping with the objective of delivering a five-year cumulative capital plan and recognizing the need for flexibility in the execution of that plan, a mechanism exists to true up/down the annual budget targets to recognize any overspends or underspends relative to the forecast of the immediately preceding year to the annual internal budget. For these reasons, the annual internal budgets presented in the Appendix A do not add up to yield a five-year plan for 2020 to 2024. The most up to date view of the 2020-2024 plan has been detailed in Exhibit 2B, Section E4, and updated April 2, 2024 to include 2023 actuals.

/C

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-58

Reference: Exhibit 2B, Section E4, Page 7

Toronto Hydro states that one of the reasons of the increase in system access spending was "unforeseen emergence of large connections across a broad spectrum of market segments". Please explain why these large connections were unforeseen.

RESPONSE:

The increase in system access spend as a result of large connections (greater than 5MVA demand) were unforeseen including but not limited to the following reasons:

- Emergence of a new segment of customers in the data centre/cloud computing sector, with limited prior investments in the Toronto area and limited-to-no relationship with Toronto Hydro.
- The scale and volume of large connections like hyperscale data centres were unprecedented prior to the 2020-2024 period. Each connection is unique and is highly variable based upon a number of factors including customer specific type, size, required demand load, geographical location of customer's site, geographical availability of Toronto Hydro's distribution system in relation to the customers site and available distribution system infrastructure and capacity provisions. See Exhibit 2B, E5.1 p.7.
- The number of projects submitted to the City of Toronto have remained consistent over the years, however the number of residential units proposed and the overall Gross Floor Area (GFA) has increase substantially over the years, where projects have become larger and more complex overall. See Exhibit 2B, E5.3, p.7.
- New transit mandates, announcements and targets as well as new obligations under *The Building Transit Faster Act, 2020* ("BFTA"). See Exhibit 2B, E5.2.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-59

References: Exhibit 2B, Sections E5, E6, E7, E8

For each program, Toronto Hydro includes an 'Options Analysis'. Many of the options analysis do not include the cost impact of the non-selected option. Please provide a table that shows for each program, the forecast cost of each option between 2025 and 2029.

RESPONSE:

Toronto Hydro developed alternative pacing strategies for its programs through its planning process as described in Exhibit 2B, Section E2. This produced low- and high-side scenarios in addition to the Draft Plan, which formed the basis of Phase 2 engagement. In most cases, these expenditure plan options tie conceptually to the range of options examined in the 'Options Analysis' sections for the programs and should provide a reasonable sense of the cost range associated with the alternatives. Please see Toronto Hydro's response to 2B-SEC-53 for a detailed breakdown of the high, low, and Draft Plan options for the programs in Exhibit 2B, Sections E5 to E8.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-60

Reference: Exhibit 2B, Section E

SEC seeks to understand the relationship between capital expenditures and in-service additions. Please complete Excel file 2B-SEC-60.

RESPONSE:

Please see the completed Excel spreadsheet titled "*2B-SEC-60_AppendixA.xlxs*". Toronto Hydro notes that the Capital Expenditures have been adjusted to include AFUDC costs for each investment category to be comparable to the in-service additions populated in the provided table.

For Distribution capital programs[1], where discrete projects and completion dates are not known, Toronto Hydro applies conversion factors derived from a historical five-year average ratio (2018-2022) to capital expenditures and subsequent CWIP balances. As such, in presenting the in-service additions in the requested format (multi-year in-service additions specific to each Capital Expenditure stream), certain amounts are presented as being in-service in 2030 or later.

Toronto Hydro notes that the Excel file does not capture CWIP balances prior to 2025. Please see Exhibit 2B, Section E4.1.7 and Exhibit 2B, Section E4.2.7 for CWIP balances for the 2020-2024 and 2025-2029 periods respectively.

[1] Distribution capital programs refers to most programs within System Access, System Renewal and System Service investment categories, excluding large projects.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-61

Reference: Evidence Update (January 29, 2024)

On January 29, 2024, Toronto Hydro filed an evidence update. As SEC understands Toronto Hydro updated, among other aspects, the capital expenditures forecast as a result of an update to its system peak demand forecast.

QUESTION (A):

a) Please provide further details regarding the update to the peak demand forecast, including what drove the changes.

RESPONSE (A):

In addition to regular annual updates to reflect 2022 actuals and updates to its feeder request database,[1] Toronto Hydro made the following updates to the System Peak Demand Forecast:

1. **Weather Normalization**: aligned the weather normalization with the Load Forecast Guideline for Ontario published by the Regional Planning Process Advisory Group.[2]
2. **EV Managed Charging**: reduced the system peak to account for the impact of managed charging and the ultra-low overnight electricity rate for light-duty EVs.
3. **Load Refinements**: Refined assumptions between base load growth trends and customer connection requests to ensure no double counting.
4. **Load Materialization Rates**: Toronto Hydro extended its customer load materialization assumptions from a 3-year timeframe to a 5-year timeframe, which resulted in more gradual load growth.

[1] Toronto Hydro notes that the 2025-2029 forecast for customer connections expenditures provided in Exhibit 2B, Section E5.1.4 does include the impact of the 2022 actuals.
[2] Toronto Hydro follows the methodology outlined in Section 6.1.4 with one exception. Toronto Hydro uses the daily maximum temperature rather than the 3-day rolling average of historical daily maximum temperature.

QUESTION (B) :

b) Please explain in detail how the update in the peak demand forecast, resulted in the specific changes to the forecast capital programs costs.

RESPONSE:

The updated System Peak Demand Forecast yielded an overall lower system peak for the 2025-2029 rate period, which reduced the need for investment in the Stations Expansion (Exhibit 2B, Section E7.4) and the Load Demand (Exhibit 2B, Section E5.3) programs by $51.3 million and $19.2 million, respectively. The changes were as follows:

- Prior to the evidence update, the Stations Expansion Program included the proposed construction of a new DESN at Scarborough TS ("Scarborough TS Expansion") over 2026-2030. Following the update, the System Peak Demand forecast showed that capacity needs in this area could be managed in the next decade without upgrading the station.[3] As a result, the Scarborough TS project was removed from the program, resulting in a $51.3 million decrease to the 2025-2029 budget.
- Please note that both prior to and following the evidence update, the Sheppard TS Bus Expansion project has been and is proposed with the same scope of work, schedule, and cost estimate. However, the driver of the project has changed. Prior to the update, the driver was thermal capacity constraints, and following the update the driver is DER enablement.
- Prior to the evidence update, the Load Demand Program needed to make the following investments to manage forecasted growth: (i) undertake bus load transfers at 17 stations that were forecasted to become overloaded during the 2025-2029 rate period, and (ii) relieve the load on 23 priority feeders in the Horseshoe area and 49 in the Downtown area. Following the evidence update, Toronto Hydro needs to: (i) undertake bus load transfers at 11 stations that are forecasted to become overloaded during the 2025-2029 rate period, and (ii) relieve load on 15 priority feeders in the Horseshoe area and 64 in the Downtown

[3] Due to the Golden Mile Secondary Development Plan, the load of the Scarborough area is anticipated to grow substantially over the next 20 years. As a result, long term needs for Scarborough TS and its surrounding area are still being considered as part of Regional Planning.

area. The priority feeders in the downtown area increased due to forecasted increase in customer load in downtown station areas as seen through updates in the feeder request database.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-62

Reference: Exhibit 2B, Section E5.1

With respect to Customer Connections:

QUESTION (A)

a) [p.11-12] Please update Table 4 and 5 to include 2023 information.

RESPONSE (A):

Please see updated tables below.

Table 1: Cumulative Existing Generation Connections by type (Updated Table 4)

Type	2015	2016	2017	2018	2019	2020	2021	2022	2023
Renewable	1296	1547	1749	2072	2094	2126	2185	2280	2492
Energy Storage	1	4	4	10	11	22	24	28	28
Non-Renewable	35	38	44	54	60	87	112	116	118
Total	**1332**	**1589**	**1797**	**2136**	**2165**	**2235**	**2321**	**2424**	**2638**

Table 2: Cumulative Existing Generation Capacity (in MW) by type (Updated Table 5)

Type	2015	2016	2017	2018	2019	2020	2021	2022	2023
Renewable	71.9	86.6	96.6	108.7	110.0	111.3	114.1	116.2	120.2
Energy Storage	0.7	0.7	0.7	4.5	9.1	17.6	18.2	18.7	22.7
Non-Renewable	91.9	98.4	114.4	119.6	127.7	157.4	169.5	170.0	173.1
Total	**164.5**	**185.6**	**211.6**	**232.8**	**246.8**	**286.3**	**301.8**	**304.9**	**316.1**

QUESTION (B):

b) [p.14] Please explain how Toronto Hydro is currently or planning to use DER generation capacity as a system benefit.

RESPONSE (B):

As outlined in Exhibit 2B Section E7.2, Toronto Hydro plans for and procures third-party capacity in the form of dispatchable demand response to complement standard system planning approaches. Toronto Hydro does not procure energy (kWh) from DERs.

DER capacity is considered in Toronto Hydro's forecast for flexibility services and accounted for when making planning decisions. For more information about the flexibility services, please see Exhibit 2B, Section 7.2. In addition, Toronto Hydro will consider DER capacity when assessing capability to connect to the Toronto Hydro Grid.

QUESTION (C):

c) [p.15] Please explain the basis of Toronto Hydro's generation connections/capacity forecast.

RESPONSE (C):

As explained in Exhibit 2B, Section E5.1, Toronto Hydro's DER forecast was based on recent and anticipated growth patterns, considering a combination of historical trends, project pipeline, economic environment and the current energy policies at the time of forecast.

QUESTION (D):

d) [p.20] Toronto Hydro proposes to increase the Basic Connection Fee allowance.
   i. What is meant by Rate Class 1 to 5?
   ii. For each year between 2025 and 2029, please provide the increase in net capital expenditures as a result of the increase in the Basic Connection Fee allowance.

RESPONSE (D):

i. The Rate Class 1 to 5 are based on customer type and demand load as follows:

- Class 1: Residential (single service)
- Class 2: General Service (0<50kW)

- Class 3: General Service (50kW to 999KW)
- Class 4: General Service (1000kW to 4999kW)
- Class 5: General Service (5000kW and above)

ii. See below table for the 2025-2029 net capital expenditure increase as a result of the net capital expenditures as a result of the increase in the Basic Connections Fee allowance.

Table 1: Basic Connection Fee allowance net capital expenditures ($ Millions)

	2025	2026	2027	2028	2029
Basic Connection Fee Allowance	3.4	3.4	3.4	3.4	3.4

Toronto Hydro notes that shortly before the application was filed, Ontario Energy Board ("OEB") Staff issued a bulletin regarding the basic connection for residential customers.[1] The utility notes that the net increase only reflects the impact of new connections (which have been steady over the last few years) and not to upgrades (which are trending upward). Should the Basic Connection Fee allowance be applied to upgrades, this would require an increase to the proposed spend. At this time, Toronto Hydro is not proposing to deal with the impact of this change as the variances could be tracked under the DRVA.

[1] OEB Staff Bulletin re: Residential Customer Connections & Service Upgrades (August 24, 2023)

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-63

References: Exhibit 2B, Section 5.3, Page 27

Toronto Hydro states that "Based on studies and analysis, the Station Load Forecast considered factors with a probabilistic approach when forecasting for peak loads of all Toronto Hydro buses of the station within the City of Toronto." Please describe the studies and analysis that Toronto Hydro undertakes and provide a copy of any of those studies or analysis (or internal summaries if they are undertaken on a bus-by-bus basis).

RESPONSE:

Please refer to Section D4.1.1 System Peak Demand, where the studies and analysis used for the basis of the Station Load Forecast are explained in detail.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-64

Reference: Exhibit 2B, Section E5.4

Preamble:

With respect to Metering:

QUESTION (A):

a) [p.9] By meter type used by Toronto Hydro, please provide their: i) expected useful life, and ii) failure rate by their year of service (i.e. failure rate of meter in each of year 1, year 2, etc.).

RESPONSE (A):

The expected useful life for all meter types is 15 years.[1]

The following table shows the number of meters replaced due to failures in the 2020-2023 period:

Table 1: Meter Replacements due to Failures 2020-2023

	2020	2021	2022	2023	Total
Residential Meters	4,323	2,430	1,963	3,087	**11,803**
Suite Meters	534	751	421	606	**2,312**
Commercial Meters	494	526	464	745	**2,229**
Total	**5,351**	**3,707**	**2,848**	**4,438**	**16,344**

QUESTION (B):

b) [p.10] What analysis has Toronto Hydro undertaken to determine what the actual end of useful life is for these meters are.

[1] Exhibit 2A, Tab 2, Schedule 1, Appendix D "2022 Depreciation Study" by Concentric Advisors, at pages 3-20-3-21.

RESPONSE (B):

Toronto Hydro's asset management practices with respect to metering assets entail the replacement of meters that are at or beyond their expected useful life. As discussed in the response to 2B-Staff-144(a), Toronto Hydro does not operate its metering assets on a run-to-fail basis, since the operational and regulatory compliance risks, as well as the customer inconvenience, associated with such an approach would be significant. As noted in the response to 2B-Staff-144(b), the condition of metering assets is determined on a pass or fail basis and there is no intermediate health status, unlike most other utility assets. When meters fail, consumption data is lost and replacement takes time, putting the accuracy and timeliness of customer billing are at risk. In addition to the asset failure risk, Toronto Hydro's fleet of smart meters are technologically obsolete and therefore pose a barrier to the achievement of AMI 2.0 and associated benefits until the majority are replaced, as discussed in 2B-Staff-194. In Toronto Hydro's assessment, these risks are material enough to justify proactive replacement of meters exceeding their expected useful life, regardless of the hypothetical possibility of the meters far outlasting their lifespan.

QUESTION (C):

c) [p.10] Please provide a copy of the internal business plan for AMI 2.0.

RESPONSE (C):

Toronto Hydro began replacing its current generation of smart meters in the 2020-2024 rate period, as laid out in the 2020 rate application.[2] The continuation of that plan in the context of the AMI 2.0 initiative is discussed in Exhibit 2B, Section E5.4 of this proceeding.

The utility also consulted with Ernst & Young ("EY") to develop a strategic plan for the AMI 2.0 initiative to prioritize potential benefits and use cases of most value to Toronto Hydro. The utility is in the process of obtaining disclosure consent from EY and will file the strategic plan report as an appendix to this response as soon as reasonably possible.

[2] EB-2018-0165, Exhibit 2B, Section E5.4, at p. 8-11.

QUESTION (D):

d) [p.16-17] Please provide a version of Table 5 and 6 that show for each segment, the number of meters replaced pear year.

RESPONSE (D):

Please refer to the below tables, which indicate historical and planned proactive meter replacements, which exclude reactive meter replacements shown in part (a).

Table 2: Historical and Planned Meter Replacements 2020-2024

	2020	2021	2022	2023	2024	Total
Residential and Small C&I Meter Replacement	421	0	0	0	104,370	**104,791**
Suite Metering	4,924	2,974	2,559	3,576	2,581	**16,614**
Large Customer and Interval Metering	10	2	2	4	4	**22**
Remote Disconnect	2,742	2,627	1,389	1,388	3,022	**11,168**
Sampling/Meter Replacement	16,587	6,628	15,653	4,326	12,962	**56,156**
Wholesale Metering	4	10	0	2	2	**18**
System Upgrades	NA	NA	NA	NA	NA	NA
Total	**24,688**	**12,241**	**19,603**	**9,296**	**122,941**	**188,769**

Table 3: Planned Meter Replacement 2025-2029

	2025	2026	2027	2028	2029	Total
Residential and Small C&I Meter Replacement	157,893	173,710	179,708	68,985	0	**580,296**
Suite Metering	2,623	2,363	2,131	1,924	1,740	**10,781**
Large Customer and Interval Metering	8	20	18	17	13	**76**
Sampling/Meter Replacement	10,464	13,201	14,783	15,396	11,311	**65,155**
Wholesale Metering	0	2	0	0	0	**2**
System Upgrades	NA	NA	NA	NA	NA	NA
Total	**170,988**	**189,296**	**196,640**	**86,322**	**13,064**	**656,310**

RESPONSE (E):

e) [p.22] Did Toronto Hydro undertake a competitive procurement for the AMI 2.0 program? If so, please provide details.

RESPONSE (E):

Yes, Toronto Hydro is nearing the end stages of a competitive procurement process for the AMI 2.0 program, which involved issuing a request for proposals from all major meter manufacturers which have a presence in Canada. Prior to issuing the RFP, Toronto Hydro undertook a market assessment of AMI capabilities to align the RFP with the utility's strategic objectives. This assessment was completed by UtilAssist and can be found in Appendix A to this response.

Toronto Hydro-Electric System Limited
EB-2023-0195
2B-SEC-64
Appendix A
FILED: March 11, 2024
(52 Pages)

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AMI 2.0 Technology Assessment Report for Toronto Hydro

December 15, 2021

Util-Assist Inc.
www.util-assist.com

470 Harry Walker Parkway South
Newmarket, ON, Canada, L3Y 0B3
905.952.0477
1-855-263-2898

Confidentiality Statement

This document has been prepared by Util-Assist Inc. to provide Toronto Hydro with an introduction to Advanced Metering Infrastructure (AMI) 2.0 technology, a summary of the current market offerings from leading AMI vendors, and a preliminary financial assessment of replacement AMI costs. This document is intended to be used for planning and educational purposes only and should not be construed as a recommendation of any vendor or vendors over others. The representations of vendor products and capabilities are informed by publicly available information, as well as knowledge gained by Util-Assist in the course of its business. The content of this report represents Util-Assist's best understanding and interpretation of the information available but may not represent what vendors can or would propose to Toronto Hydro should it undertake a formal request for proposal process.

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Section 1: Executive Summary

This document introduces the next generation of advanced metering infrastructure (AMI) and summarizes the current market offerings for Toronto Hydro (referred to as the "Utility") as it prepares to replace its current AMI system. This document includes information on the leading AMI vendors and their current technology, summarizes the components and capabilities of newest generation AMI as compared to the previous generation, and provides a financial assessment and estimate of replacement AMI costs for the Utility's consideration.

Over a decade ago, the first generation of AMI Technology ("AMI 1.0") changed the operational landscape of Ontario's electricity distribution utilities. The transition from conventional meter reading and automated meter reading (AMR) to AMI transformed virtually the entire meter-to-cash process with new operational benefits. The next generation of AMI, commonly referred to as AMI 2.0, is poised to replace AMI 1.0 with another leap in benefits available to utilities and their customers as the older technology reaches the end of its service life.

AMI 1.0 Technology focused on basic operational capabilities using two-way communications to support the meter-to-cash process and some exception management activities such as enhanced outage detection and remote meter disconnect/reconnect. Incremental to these capabilities, AMI 2.0 delivers secure, standards-based, big-data analytics, and distributed intelligence (DI) to support new use cases and provide greater "future proof" interoperability.

AMI 2.0 will allow utilities to meet new and evolving expectations of consumers for the next 15 to 20 years, who are now more environmentally conscious and digitally mature with interests in home energy management technology and personalized energy services. AMI 2.0 offerings are interchangeable platforms that allow utilities to support enhanced Distribution Automation (DA), Demand-Side Management (DSM), smart streetlights, smart cities initiatives, Industrial Internet of Things (IIoT) applications, and behind-the-meter opportunities. AMI 2.0 expands integration with third-party solutions from industry standards such as Multi-Speak and CMEP to web services and JMS queues.

Where AMI 1.0 use cases relied on using external systems to analyze metering and operational data, AMI 2.0 software can include pre-built analytics in addition to enabling standards-based integration with third-party analytics solutions within the utility enterprise. AMI 2.0 "distributed intelligence" framework is a significant development as it extends analytics out to the network edge (i.e., at meter or sensor level) providing both faster operational insight with a higher trust level due to greater data granularity (i.e., 1 second grid edge data in AMI 2.0 compared to 1 hour data from AMI 1.0) and vastly lower latency and network traffic.

Standards developed by government agencies, industry alliances and manufacturing groups have always played a key role in the safe, reliable, and secure operation of Ontario's electricity distribution network. These standards cover the full range of AMI hardware and software functions, including meter and/or system accuracy, interoperability, data, protocol, security, and safety. AMI 2.0 further embraces both legacy and emerging industry standards such as Wi-SUN, IPv6, 6LoWPAN and IEEE 802.15.4 to ensure safe and secure operation, as well as device interoperability across the AMI and

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other networks to future-proof significant utility investments in AMI. These emerging industry standards opens the proprietary networks from the past allowing vendor innovation and interoperability to be achieved by the utility severing the dependency on their AMI partner to be their sole source of innovation over the life (15 to 20 years) of this new investment.

With current AMI technology rapidly approaching end-of-life in Ontario, an investment in AMI 2.0 is needed as part of regular asset lifecycle management. Current economic and market conditions have provided a strong incentive for AMI vendors to improve the value proposition of the technology. This document is intended to provide the Utility with an overview of the AMI 2.0 technology offerings that can position them to address a near end-of-life AMI 1.0 system, future operational requirements, and respond to a changing consumer and energy marketplace.

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Section 2: AMI Technology

Since its initial mass deployment in North America nearly two decades ago, AMI has advanced much the way other consumer and communications technologies have, in terms of both hardware and software capabilities. As a result, AMI offerings have evolved from the incumbent AMI "1.0" technology, and the latest generation of AMI technology on the market represents a fundamentally different product, often referred to as AMI 2.0. This section will summarize the technology fundamentals and highlight the differences between AMI 1.0 and AMI 2.0.

2.1. Current AMI Technology Fundamentals

North American utilities began transitioning from manual reading and AMR systems to AMI in earnest just after the turn of the century and in Ontario more specifically, between 2004 and 2010. AMI 1.0 technology introduced true, two-way communications and sophisticated capabilities to integrate within the distribution network as part of grid modernization initiatives across North America. Toronto Hydro transformed its electromechanical meter fleet into an Elster AMI 1.0 fleet as part of Ontario's government mandated migration to AMI.

Originally, conventional metering (electromechanical) devices measured only consumption and/or demand and were read manually or via drive-by systems typically once a month. Currently, AMI 1.0 infrastructure collects meter data including registers, intervals, and events via two-way communication with the utility's "smart" meters and sends that information back to the utility.



Figure 1: Electromechanical Meter vs. AMI meter

2.2. Next Generation AMI Technology Fundamentals

AMI 2.0 is the "next generation" metering solution. It provides a communication medium that leverages open standards-based communication to ensure interoperability of additional systems and applications. These capabilities allow utilities to respond to new challenges, expectations, and opportunities within their service territories.

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AMI technology has now become the new norm and is widespread across North America. As of 2018, Natural Resources Canada estimated that 82% of electric meters in Canada were smart meters, and the U.S. Energy Information Administration estimated that electric AMI meter saturation reached 70% of the market as of 2020.

The prevalence of AMI and the data it provides has in turn increased customer expectations and awareness of energy usage. In its article, "AMI 2.0: A Catalyst for Expanding Consumer Relationships and Benefits", the National Association of Regulatory Utility Commissioners discusses the maturing consumer and how 52 percent of its consumers are interested in home energy management technology, and close to 62% percent are interested in receiving customized reports with energy-saving tips[1]. Consumers are a key driver of the increasing implementation of AMI 2.0, which can help manage distributed energy resources (DER) and distributed intelligence (DI) to deliver the "right information at the right place at the right time so utilities can meet the demands of new use cases and create value for the customer."[2]

AMI 2.0 is the "next generation" of smart metering technology, which includes more advanced metering hardware as well more advanced software in vendors' head end systems and available modules and applications. Some of AMI 2.0's key capabilities include wider interoperability using a standards-based solution, greater options for remote meter disconnect/reconnect, distributed intelligence, cloud and data analytics, advanced outage detection, integrated distribution automation network support, smart city applications/support, remote power quality monitoring, and mass personalization.

Some of the operational benefits offered to utilities through AMI 2.0 include the following:

- Ability to leverage data for improved outage/restoration notifications
- Support of customer energy disaggregation functionality
- Ability to leverage the meter fleet as advanced end of line sensors for distribution monitoring and analytics
- Improved operational performance
- Improved reliability

Some of the primary advanced AMI 2.0 use cases and components include:

- Distributed intelligence
- Home automation
- Distribution automation
- Smart cities and extended use applications (e.g., connected streetlights, traffic monitoring, etc.)

[1] Source: *AMI 2.0: A Catalyst for Expanding Consumer Relationships and Benefits*, the National Association of Regulatory Utility Commissioners.
[2] Source: *The Possibilities of Distributed Intelligence are Endless*, PowerGrid International, 2020

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As first-generation AMI meters reach their end of life and are replaced with AMI 2.0 meters and supporting technology, utilities will be able to support customers' demands for a more fulsome digital experience and facilitate organizational changes that can capitalize on digital maturity and the exponential increase in quality data for data-driven decision making.

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Section 3: AMI 2.0 Suppliers

The AMI market is occupied by many vendors but dominated by a few primary competitors. This report focuses on the market-leading AMI vendors in North America, and compares the technology offered by these vendors. While many vendors claim AMI 2.0 capabilities in their products only a few offer the stability, scale, and maturity required to support large-scale utility projects. This section introduces the five primary AMI 2.0 providers – the vendors are not ranked and are discussed in alphabetical order.

3.1. Honeywell Elster (Honeywell)

Honeywell, founded in 1885, is a Fortune 100 diversified technology and manufacturing company whose global portfolio includes aerospace products and services, building technology, performance materials and technologies and safety and productivity solutions. Elster, who was an early producer of gas meter technology, was acquired by Honeywell in 2016.

Honeywell's end-to-end electricity, water and gas offerings include advanced meters/sensors, secure communications, data collection, grid management, and analytics. They also provide solutions for demand response, DA, smart street lighting, data disaggregation and more.

In 2004, Honeywell was first-to-market with a full two-way AMI system and has since deployed over 200 AMI projects in North America. Honeywell solutions can be found in 150 million residential homes, 10 million small business buildings and 1000+ commercial and industrial sites.

Further information about Honeywell can be found at the following website:

https://www.honeywell.com/us/en

3.2. Itron

Itron was founded in 1977 by a small group of engineers who were intent on finding more efficient ways to read meters in Hauser Lake, Idaho. Today, their portfolio consists of smart networks, software, services, meters, and sensors enabling cities and utilities to better manage energy and water.

Itron's product offerings include measurement and sensing hardware, network hardware, software, and services, all which enable AMI, advanced meter reading, analytics, distributed energy management, distributed intelligence, DA, meter data management (MDM), smart city solutions and industrial IoT solutions. Utilities have the option of managing their own solutions or can take advantage of Itron's Managed Services offerings.

In 2005, Itron had 45 million meters automated worldwide as well as 3000 utility customers in 65 countries. Today, they have over 250 partners and now 200+ million communicating endpoints with 8,000+ customers in more than 100 countries. As a pioneer for distributed intelligence, Itron's utility customers have also deployed 2 million DI-enabled endpoints with another 6 million under contract. In early 2018, Itron completed the acquisition of Silver Spring Networks as

a wholly owned subsidiary of Itron, Inc. and have taken steps to integrate the Silver Spring Networks' platform and solutions into a comprehensive smart utility, smart city, and industrial IoT solution offering.

Further information about Itron is available at the following website:

https://www.itron.ca/na

3.3. Landis+Gyr (L+G)

In 1896, Landis+Gyr was founded in Zug, Switzerland where they began manufacturing electricity meters for European utility companies. They became a global company in 1924 with the creation of their first overseas offices in New York and Melbourne, Australia. They developed and launched their first range of digital meters in 1981. Since then, Landis+Gyr continues to develop quality metering products but also provides other energy management products and services.

Landis+Gyr's product offerings include gas, electric and water meter hardware, streetlight sensors and controllers, network hardware and load control switches. It also offers a wide range of software solutions such as smart grid applications, demand-management technologies, data analytics, and renewables integration. Some Landis+Gyr applications, such as its MDM, can be owned and run by the utility or can be run as Software as a Service (SaaS).

Over 60 million AMI endpoints have been deployed or are under contract worldwide at hundreds of utilities. Additionally, with its Gridstream RF Mesh IP solution implementation and deployment of over 5 million smart grid devices at Tokyo Electric Power (TEPCO), Landis+Gyr has built the largest IoT network in the world.

Further information about Landis+Gyr can be found at the following website:

https://www.landisgyr.com

3.4. Sensus

Sensus has been a global force in the meter industry for more than 100 years. Over the last several decades it has transitioned from a metering business to a provider of telecommunications, metering, and DA for utilities. Today, Sensus offers many hardware and software solutions which enable AMI, AMR, cathodic protection, conservation voltage reduction, customer portal, data analytics, DR, DER, DA, ERT meter reading, leak management, lighting control, non-revenue water, outage management, PLC migration and pressure regulation. The Sensus managed services include options for both SaaS and Network as a Service (NaaS).

Sensus' FlexNet AMI solution debuted in 2006 and has now been deployed at nearly 1,000 utilities across North America. Today, Sensus has deployed 20 million+ FlexNet endpoints, 20,000 Sensus DA devices as well as 80 million metering devices. They have also been a partner in 655 FlexNet AMI projects, 500 SaaS projects and over 200 DA projects.

Further information about Sensus can be found at the following website:

https://www.sensus.com

3.5. Trilliant

Trilliant was founded in 2004 and introduced the world's first 2.4 GHz wireless mesh AMI platform in 2005. Trilliant supplies the necessary network infrastructure, endpoints, and software to support analytics, demand response, lighting control, suite metering, AMI, and DA. Their products are meter and endpoint agnostic which allows market leaders in metering equipment such as Itron, Landis+Gyr and Aclara to deploy their meters using the Trilliant communications platform.

Trilliant has more than 75 customers in 10 countries around the world. They have more than 30 million consumer endpoints deployed, including 12 million endpoints in the United Kingdom.

Further information about Trilliant can be found at the following website:

https://www.trilliant.com

Section 4: AMI 2.0 Technology

AMI 2.0 technology is an end-to-end solution consisting of meters, network infrastructure, and software. This report additionally assesses the operational data, integration, security, and enabling capabilities recognizing that these capabilities could span each of the primary components of an AMI 2.0 network.

4.1. Metering

The aggregate cost of meters is by far the largest line item in an AMI investment, in some cases greater than 70%. As a key lesson learned from AMI 1.0, utilities will focus on future-proofing their AMI 2.0 investment with a more detailed assessment of meter hardware. The combination of meter compute (processor), memory, and bandwidth with industry standards has become a key criterion to assess a solution's ability to evolve with the industry over a 20-year lifecycle.

AMI 2.0 meters differ greatly from AMI 1.0 at the architecture-level. Suppliers have embraced **standards-based technologies** with **more powerful hardware** in their AMI 2.0 meters. Standards enable interoperability, flexibility and extensibility across an AMI network that could include metering, in/at-home, Smart City, and DA devices. Improved hardware supports needs for higher fidelity data and distributed intelligence to enable new capabilities at the network edge.

In addition to meter safety and performance standards, several AMI 2.0 suppliers have moved to embed **industry standard operating systems (OS)** including Linux and RTOS in the meter. This moves away from a proprietary OS and provides more flexibility to the future use of a meter's intelligence hardware. It aligns with the global software industry and developer ecosystem and supports extensibility of AMI meters through development and implementation of AMI 2.0 distributed intelligence.

A similar move to **industry standard communication** options is found in AMI 2.0. Suppliers have begun introducing support for Wi-SUN FAN, Wi-Fi IEEE 2030.5, ZigBee SEP 2.0, and in some cases optional Bluetooth xxx PAN which provide the key to interoperability for in/at-home devices and Smart City initiatives. The Network Interface Cards (NICs) supporting these standards are incorporated into the AMI 2.0-meter hardware, contributing to the overall meter cost. When considering communication standards, the incremental up-front cost (if any) of hardware to support a standard against costs for a potential future field retrofit (i.e., remove/replace) in the future must be carefully assessed.

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Capability	Honeywell	Itron	L+G	Sensus	Trilliant
User-to-Network Interface (UNI)[3]					
UNI-N1 – 802.15.4g Wi-SUN 1.0 Mesh	Yes	Yes	Yes	No	Yes
UNI-N2 – 802.11 Wi-Fi Direct	No	No	Yes	No	No
UNI-N3 – 802.15.4 ZigBee	Yes	Yes	Yes	No	Yes
UNI-N4 – 802.3 Ethernet	No	Yes	Yes	No	No
UNI-N5 – Serial (RS232/RS485) Interface	Yes	Yes	No	No	Yes
FAN Network-to-Network Interfaces (NNI)					
NNI-F1 – 802.15.4g Wi-SUN Mesh	Yes	Yes	Yes	No	Yes
NNI-F2 – IEEE P1901.2 Powerline Carrier	No	Yes	No	No	No
WAN Network-to-Network Interfaces (NNI)					
NNI-W1 – Cellular data	Yes	Yes	Yes	No	Yes
NNI-W2 – Ethernet/IPv4/IPv6	Yes	Yes	Yes	No	Yes

Table 1: Network Interface Protocols

Advances in hardware technology have benefitted the AMI industry through more powerful on-board processors, memory, and network interface hardware. AMI 2.0 suppliers are moving to **RISC** (reduced instruction set computer) based CPUs from Advanced RISC Machines (ARM) that operate at **higher speeds** (up to 600MHz) to support high-speed waveform data, sampling adaptive communication path (re-) routing, true IPV6 addressing and distributed intelligence at the network edge. When assessing the relative compute power, its important to consider the level, speed and type required by each offering to support both current operational Service Level Agreements (SLAs) and future initiatives.

Memory architecture within AMI 2.0 meters typically consists of RAM, NVRAM and Flash found within the metrology and DI boards and NIC. This memory is utilized for temporary storage, persistence, and re-writable space for firmware (respectively). While the memory configurations vary widely between AMI 2.0 suppliers, when considering on-board memory options, utilities should require the **meter memory to maintain** 35 days, 4 channels of 15-minute Interval data plus Event and Alarm data as a minimum.

In addition to embracing communication standards, AMI 2.0 NICs support full two-way communications for over-the-air (OTA) firmware management and active disconnect/reconnect/load limiting tasks. NICs available in AMI 2.0 meters support higher bandwidth (data transfer rate), and shorter latency (time delay) at the NAN and WAN level than most AMI

[3] UNIs intended to interface locally between end equipment and associated AMI 2.0 device (e.g., meter)

applications require today. While these performance characteristics have improved, utilities should consider that implementing improved security measures such as IPsec and TLS to secure connected assets, conversely **slow the (improved) bandwidth** requirements by a factor of 2-3 times [4].

Unlike the headend or network equipment, the utility gets one chance at selecting the right meter hardware due to the expected 20-year life and high costs of premature field replacement. A higher-level review of the meter hardware is critical to ensure assets will achieve the merging goals of the utility in the coming years based on business needs. Examples include, ensuring the bandwidth is upgradable to keep up with standards (e.g., 300 Kbps to 2.4 Mbps[5]), ensuring the memory and processor have enough headroom for future firmware upgrades (e.g., 2x the size of the initial deployment), and planning for hardware to support DI applications that will allow the loading of future vendor or third-party applications to support evolving utility business case needs. The following figure shows network bandwidth use and latency for common AMI 2.0 and smart city applications.

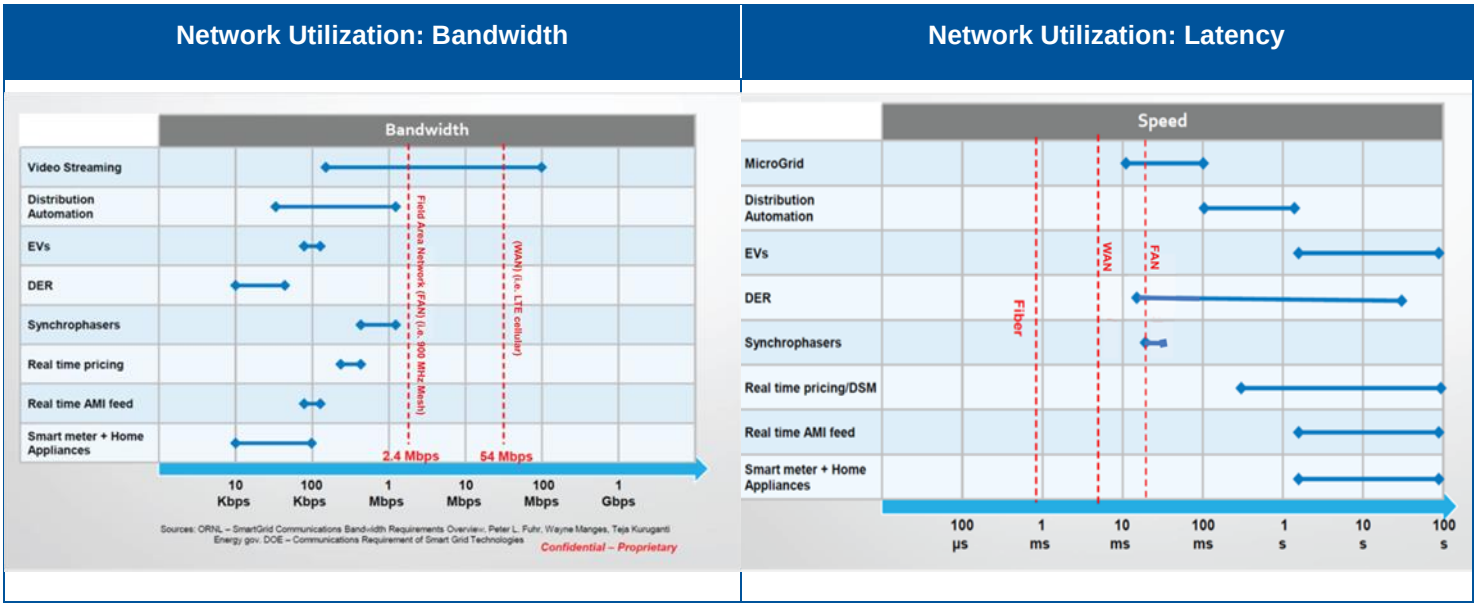

Figure 2: Smart Grid Communications Bandwidth and Latency

It should be noted that suppliers offer AMI 2.0 devices in most meter forms (see Appendix C) to satisfy North American electric services. However, Toronto Hydro is an example of an electric utility that operates (~7,000) 600V-Delta services

[4] Reference: *Bandwidth and Security Requirements for Smart Grid*, 2020 IEEE PES Innovative Smart Grid Technologies Europe (ISGT-Europe)

[5] As a guiding principle or, "rule of thumb" the bandwidth **must be upgradable** beyond what is required to support today's Use Cases to allow for future memory requirements to support undefined Use Cases although the cost of field replacement must be also considered.

which is unique to Canada and in particular older services. Two electric meter manufacturers have offered this meter type in the past, but they are not among the AMI 2.0 suppliers addressed in this report and this offering may no longer be available.

Therefore, if Toronto Hydro requires a single, cohesive AMI platform, Toronto Hydro would need to incorporate the requirement for these meters into an RFP, and assess the options proposed by AMI providers. Based on experience, the option most likely to be proposed would be an AMI 2.0 module fitted on a specialty meter, which would likely be more costly in terms of hardware and integration and would also be limited in its capabilities compared to a fully integrated AMI 2.0 meter.

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4.2. Distributed Intelligence

Distributed Intelligence is an AMI system's capability to locate specific elements ("apps") of its analytic processing anatomy at any node within its architecture. Technology advances found in the compute, memory, and bandwidth of AMI 2.0 meters combined with non-proprietary operating systems allow the utility to deploy **discrete**, analytic applications onboard the meter, reducing latency, storage, and network traffic overhead. Multiple apps can be deployed to AMI 2.0 meters as needed, which operate simultaneously locally while reporting to the utility back office for centralized action (e.g., further analysis, workflow) or storage.

Apps can be **developed by the utility, AMI supplier, or third parties** with specialized skillsets and expertise through partnership programs using Software Development Kits (SDK) / development environments created and provided by AMI suppliers. Meters with non-proprietary operating systems such as Linux, offer a **large developer ecosystem** which the utility could leverage more easily for development of DI apps than meters with a proprietary OS.

Submission, acceptance, and certification of apps are performed by the suppliers (or third-party certifiers) to ensure performance, operability, security, and privacy requirements remains in compliance. **Risk to the utility** related to the use of 3rd party DI apps is equivalent to use of existing app marketplaces in other technology sectors. App marketplaces provide the submission, certification, monitoring and control workflow for the supplier, app developer, and utility. Before an app can be deployed to an AMI 2.0 meter, the utility can approve it for use by its respective operating groups (depending on licenses purchased).

A particularly innovative AMI 2.0 capability that distributed intelligence can leverage is the AMI 2.0 meter's **location awareness** (where offered). Using Power Line Carrier (PLC), AMI 2.0 meters can identify the distribution transformer to which it's connected along with other characteristics (e.g., phase angles) as individual meters or single representative of meters downstream of the transformer. This allows AMI 2.0 meters to form analytic "clusters" at the distribution transformer level to support true real-time, active grid operations such as feeder phase balancing and real-time maintenance of GIS connectivity models.

Apps are managed (licensing, policy, versioning, monitoring etc.) and delivered through competitive app **marketplaces** managed and maintained by the supplier, styled after the Apple App Store or Google Workspace Marketplace models. This allows developers of certified apps to market to specific or all utilities.

At this stage of the Utility's AMI 2.0 journey, it is important for any considered AMI hardware and platforms to support apps without the obligation to purchase them immediately. Future DI apps should be driven by a utility business case with a clear understanding of the AMI supplier's governance model for app certification. The Utility should also ensure that future AMI analytics capabilities through apps can be **downloaded without any firmware code** or meter configuration changes. To this end, utilities should require that AMI 2.0 suppliers offering DI apps **include pilot projects** to familiarize themselves with the technology and approach (vs. traditional, centralized analytics models).

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The table below shows the current state of the five primary vendors' meter app offerings. "Roadmap" items are areas where vendors do not have offerings currently on the market but have indicated they are pursuing these as roadmap items for future.

	Honeywell	Itron	L+G	Sensus	Trilliant
Distributed Intelligence Apps	Roadmap	Yes	Yes	Roadmap	Roadmap
App Marketplace	Roadmap	Yes	Yes	Roadmap	Roadmap
Software Development Kit	Roadmap	Yes	Yes	Roadmap	Roadmap
App Developer Program	Roadmap	Yes	Yes	Roadmap	Roadmap
Supplier Apps	Roadmap	Yes (19)	Yes (6)	Roadmap	Roadmap
Third-party App Developers	Roadmap	• Utilidata • Grid4C • Bsquare	• Sense • Utilidata	Roadmap	Roadmap

Table 2: Current Vendor DI and App Support

Four of the main suppliers currently or intend to provide and manage future grid edge capabilities with DI apps. Only Sensus currently plans to offer these capabilities through the alternate means of device firmware updates, which introduces risk because any changes to "software properties regulated by legal metrology[6]" may require Measurement Canada review. In general, Itron is leading the market with its app offerings, as it has the most mature "app store" with an open platform for third-party development and is the furthest along in terms of apps that are presently available for utility use. Landis+Gyr is in the process of enhancing its app offerings, but its app store is still in development with no apps that are commercially available as of the time of writing.

DI apps offer low latency local analytics on high-fidelity data (1 second) and peer-to-peer capabilities that are not possible with a centralized analytics model where data and resulting decisions must transit the network. **Where immediate action is required** based on analytics results, the fully distributed model is the best choice to leverage speed and discrete

[6] Reference: *Measurement Canada S-EG-05 - Specifications for the approval of software-controlled electricity and gas metering devices*.

conditions. Real time action requirements such as immediately opening the meter's disconnect switch when detecting a broken neutral or performing active load control based on load reduction targets are examples where DI apps alone is appropriate.

However, a centralized analytics model can offer incomparable scalability, processing power, storage, user tools and access to enterprise data completely impractical for field deployment. In some cases, the centralized model can be a necessary 2nd tier of analytics that consumes DI app results **with other enterprise data** to make decisions or inform the enterprise of data integrity issues. Engaging with consumers with more informed targeted marketing programs by identifying high usage appliances through load disaggregating or identifying GIS data integrity issues through location awareness are examples where a centralized analytics model is appropriate.

The choice between centralized and distributed analytics models is use case dependent and depends on the action required. DI apps alone do not necessarily offer the end-to-end solution and DI app results may require additional analysis or manipulation centrally in cases when logic is split between edge and back office. It is likely that a hybrid approach is more appropriate as multiple DI apps can operate on one or more meters simultaneously and the utility creates and evolves its DI app network.

4.3. Suite-Metering

Urban centers typically include multi-unit residential and/or commercial complexes served by a bulk metered service by individual, discrete consumers. Originally, consumer billing obligations were apportioned by property owners either based on a proportional calculation (square foot of suite) or un-sanctioned measurement system which led to discrepancies and inequities. As part of Ontario's Energy Consumer Protection Act, suite metering has been legal since about 2009.

Of the five primary AMI competitors, **only Trilliant offers its own suite-metering solution** for which they recently acquired the Canadian and international rights from Quadlogic. Trilliant has described a strategic roadmap that would merge its suite-metering and AMI strategies, but these could be integrated through conventional digital mechanisms.

Trilliant's suite metering solution is available for all three commodities (electric, water, gas) with most voltage configurations (120, 220, 240, 277, 347, 380, 480, **600 Delta** or Wye 50/60 Hz) and, compliant with ANSI (C12.1, C12.16), IEC 687, Measurement Canada (AE-1042, AE-1148) and UL-C (E 204142) certifications. The inter-building communication system uses Power Line Carrier to a hosted Data Management Services center through Ethernet, Telco, RS-232, and RS-485.

The lack of suite-metering solution alternatives to Trilliant presents an imbalance to compare to the other primary, North American AMI 2.0 suppliers. However, considering the independence between Trilliant's AMI 2.0 and Suite Metering offerings the other AMI 2.0 suppliers could justifiably claim similar integration capabilities with third-party suite metering partners.

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4.4. Network

The network consists of wireless network components that enable meters and other devices to communicate to the AMI software installed on poles, streetlights, etc., to increase range and reduce impact on the customer's premises during troubleshooting. AMI 2.0 networks incorporate technology and methods that ensure **simple**, **secure**, **interoperable**, and **resilient** operation using traffic segmentation, adaptive routing, communication standards, automation, automatic fail-over, and redundancy.

Generally, AMI networks consist of three network levels:

1. Neighbourhood Area Networks (NAN) used for local communications in primarily point-to-point with some point-to-multipoint topologies.
2. Field Area Networks (FAN) primarily used for communications between meters, clients, repeaters, and routers in primarily point-to-multipoint topologies.
3. Wide Area Networks (WAN) primarily used to communicate from backend systems to FAN connected field devices in primarily point-to-point (e.g., cellular meters) with some point-to-multipoint topologies

The AMI 2.0 NANs allow communications between meters and in-home display units or field-technician devices and with their peer meters. NAN security zones can be configured to **enforce and secure**[7] traffic flow such as control signals or in-home display messages to consumers. Support for standards at the NAN provides the flexibility to expand beyond AMI into other utility operational or smart city networks. Leveraging onboard intelligence, AMI 2.0 meters can communicate peer-to-peer wirelessly, or alternatively, some offer PLC communications options for creating behind-the-distribution-transformer communication networks for hard-to-reach or multi-suite dwellings.

To help simplify the process of network growth and management, AMI 2.0 FANs can support automated configuration and neighbour discovery, streamlining some administrative tasks. The **resilience** of these networks relies on the Routing Protocol for low-powered lossy networks (RPL) to adapt to unplanned outages, enact bandwidth restrictions, and prioritize network traffic to respect data sensitivities. To maintain communication **interoperability** across AMI network nodes, FANs are certified with the Wi-SUN FAN 1.0 certification by Wi-SUN Alliance and use Differentiated Services Code Point over IPv6/6LowPAN per Wi-SUN 1.0 as a Quality of Service (QoS) mechanism. AMI 2.0 suppliers use Low Power Wide Area Networks (LPWAN) to communicate with hard-to-reach devices such as those located in underground or basements.

WANs utilize existing large scale private or public networks ("backhauls") to enable the communication from backend systems to FAN connected field devices. Regardless of network choice (private versus public), AMI 2.0 WANs should

[7] Traffic should be encrypted via AES256 to defend against/mitigate threat vectors.

support **redundant** WAN providers with automatic fail over to ensure **resilience** of the network with a target of 99.7% availability (annually) or better. Cellular networks of the three primary Canadian providers (Bell, Rogers, Telus) used as the WAN system should have the ability to extend network from a location with good cellular data coverage to an area without coverage up to 15 km away with Line of Sight (LoS) or 5 km in non-Line of Sight (nLOS) conditions.

For interoperability, security, and performance, all levels within AMI 2.0 networks comply with industry standards and protocols. Viewing these networks from the perspective of the ISO OSI model, the standards these networks comply with are found in the table below:

Number	Layer	Standards		
		NAN	**FAN**	**WAN**
7	Application	• ANSI C12.22 • ANSI C12.21	• ANSI C12.22 • ANSI C12.21	
6	Presentation			
5	Session			
4	Transport	• TCP • UDP	• TCP • UDP	• TCP • UDP
3	Network	• IPv4, IPv6 • 6LowPAN • RPL • ICMPv6	• IPv6/6LowPAN/RPL (IETF RFC 6550)/ ICMPv6 • IPv4 (for interfacing non-IPv6 devices) • DNP3 (legacy devices) • Modbus (legacy devices)	• IPv4 • IPSec • ICMPv4
2	Data Link	• Mesh – IEEE 802.15.4g Wi-SUN TPS, 900 MHz PHY • Wi-Fi – IEEE 802.11 • Optical – ANSI C12.18 • ZigBee - 802.15.4 • PLC - IEEE 1901.	• Mesh – IEEE 802.15.4g Wi-SUN compliant, 900 MHz PHY • SCADA over serial link: DNP3 to IP protocol translation	

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Number	Layer	Standards		
		NAN	FAN	WAN
1	Physical	• Mesh – IEEE 802.15.4g Wi-SUN TPS, 900 MHz PHY • Wi-Fi – IEEE 802.11 • Optical – ANSI C12.18 • ZigBee - 802.15.4 • PLC - IEEE 1901.2		

Table 3: Standards Compliance by Network Level

4.5. AMI Headend Software

Commonly referred to as the AMI Headend System (HES), this software is offered by all vendors as an on-premises[8], subscription, or hybrid model. The HES can provide a central, **multi-tenant** operations platform of, in some cases, multiple **time-synched** applications for use by outside organizations. AMI 2.0 headend software can provide **automation** of regularly performed tasks and **business intelligence** and **analytics** capabilities to support self-serve models and extract further value from AMI metrology or network data collected.

To support future initiatives, the HES should support a true multi-tenant model for separation of systems and capabilities. In some cases, **data cannot be co-mingled,** or **security access** factors restrict how and what in the HES is available by users from outside organizations. For example, in a smart city initiative, the Utility may provide another organization (e.g., City of Toronto) access to data or capabilities within the HES that relates to smart streetlighting. Multi-tenant capabilities allow segregation of data and access between organizations.

The HES can consist of multiple, separate applications using a platform approach depending on the supplier's design including data collection, configuration (device, rate, and network), task execution and limited data validation. When separate applications are operationalized, it is critical that **time synchronization** is maintained across all applications using a standard protocol such as Simple Network Time Protocol (SNTP). Examples of flawed AMI designs have been observed in which multiple vendor applications do not maintain time synchronization causing delays and frustration for the utility operators.

[8] It is worth noting that ~ 90% of Sensus current customers use the Sensus hosted or managed services model.

Once fully operational, daily operations and device management tasks occupy the bulk of activities performed by HES users. To streamline repetitive sequence of tasks, the HES should provide a mechanism to **automate the workflows** of configuring, collecting, processing, and exception management.

Each of the primary AMI 2.0 suppliers offer a reporting or Business Intelligence (BI) solution to provide value to operations or customer service. Integration of these solutions (if required) with the AMI system offers the obvious benefit of a **single supplier with a unique insight** into characteristics of the data. However, a disadvantage of this integrated approach is equally obvious as a **lack of supplier choice** may mean the reporting or business intelligence solution does not meet utility requirements.

The HES[9] should support the secure management of Universal Service Delivery Point (UDSP) relationships including current and historical relationships. The HES User Interface should allow users to view, create, void, and modify the UDSP and, track date/time and user performing the change. HES should have the ability to update the UDSP relationships by importing the IESO MDM/R Incremental Sync Files and produce detailed failure reports. The HES should validate unique USDP-meter relationship for both a given and overlapping time slices and produce detailed failure reports.

The HES should securely support running user-prioritized Tasks (e.g., Meter Interrogation Schedule) on a schedule as frequently as every 4-hours and on demand through a single interface to view, modify, run, delete, and cancel tasks.

Device parameters should be managed through the HES over the AMI network and the HES should have a method to import a Comma Separated Value (csv) file to add or remove single or mass volume of devices from HES groups. The HES should also support upgrade and downgrade of firmware on all devices and produce detailed failure reports. Firmware upgrades should occur automatically without impacting meter data collection and, users should be able to control firmware versions/releases to the individual asset level.

The HES will allow users to set which events are transmitted in real time to the HES (i.e., “alarms”) and support delivery of real time events from all devices. Users should be able to view events that were received in real time vs. standard download and over the air versus collected locally from the meter. The HES should also track the performance of Network Equipment and Read Interval Success highlighting any equipment that failed throughout its life, what has failed and number of failure types per asset. The HES will allow download of all missing metering registers and intervals and network diagnostic data.

The HES should allow users to perform the following basic functions on the AMI network:

- Meter Ping function

[9] This report only includes information gathered from publicly available information, as well as knowledge gained by Util-Assist during its business. It does not provide a feature-by-feature comparison by supplier.

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- Retrieve current read (e.g., KWH, KW, KVAR, KVA, V).
- Determine current switch state.
- Collect current demand read and reset demand remotely
- Collect the meter's time
- Reconfigure meter over the air (as allowable by Measurement Canada)
- Operate disconnect switch in a Remote Disconnect Meter

4.6. Operational Data

The current AMI technology introduced utilities to significantly larger volumes and a richer variety of metering data made available at higher velocity, but many utilities struggled to capitalize and manage its scale. AMI 2.0 leverages technology advances to sample faster, analyze, and store more data locally to create more granularity and reduce network traffic. **Choice** and **configuration** of network devices is critical as they generate most of the data and are costly to change once deployed as is the state of data (raw, transformed) when made available.

As noted, (see Section 4.1 Metering) the meter represents an AMI investment's largest line item, so the assessment of optional meter hardware features must consider the need for Operational Data **dependent on the feature**. As an example, distribution network outages can be identified through Outage Alarm (Operational) data but requires that meters include the ability to transmit the alarm before or while losing power. If the Outage Alarm ability requires an optional feature, the feature becomes mandatory.

Beyond the library of Operational Data that AMI 2.0 suppliers make available, the way they are provided to the HES is important to consider. More specifically, can the data be consumed as is or does it first require **other transformation or handling** for consumption by other operational systems (e.g., OMS)? As an example, Outage Alarm (operational) data is typically broadcast as a series of messages in the hope that one (or more) messages reach the HES. However, receiving more than one (1) message may "confuse" an OMS and require that middleware be created to filter out these duplicates. Additional or middleware processing increases complexity and costs.

A list of AMI 2.0 Events and Alarms is provided in Appendix A - Operational Data Examples as an indication of the typical Operational Data made available by the AMI 2.0 suppliers. However, when considering data that is available, utilities should begin the analysis with their requirement and request that suppliers create a solution to meet this standard within the terms of a Service Level Agreement.

4.7. Enterprise Integration

While AMI headend software offers powerful and sophisticated capabilities, investment in existing, very specialized software almost always requires that the AMI systems and data be integrated into a utility's IT enterprise. AMI 2.0 software offers industry standard mechanisms to enable this integration. Each integration mechanism has its own pro and con list, but choice is typically dictated by **existing IT environment** or **software being integrated.**

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4.7.1. Data Export/Import

Using a legacy text file export/import approach is simple but may not support use cases requiring low latency response. Use cases that do not require low latency responses are better suited to the text file export/import approach form of Enterprise Integration. This mechanism is not appropriate for low latency integration requirements such as Outage Management System (OMS) and only offer a snapshot in time.

Files exported from the AMI headend software in CSV or XML formats can be queued on secure FTP sites or other IT zones for consumption by Operational Data Storage (ODS) or Meter Data Management System (MDMS) in cases where urgency is not important. Files made available by other systems can be consumed by the AMI Headend to ensure synchronization with other systems such as updates from Asset Management.

Many of these mechanisms have become industry accepted standards used in the utility and other industries as typical in the evolution of standards. The following table identifies the industry-accepted standard data export formats available from each supplier's AMI Headend software. Data contained within these export formats originates in the meter, network, or other sources (e.g., CMEP administrative data "Direct Access Service Requests").

Export Formats	Honeywell	Itron	L+G	Sensus	Trilliant
CIM – Common Information Model	No	Yes	Yes	Yes	Yes
CMEP – California Metering Exchange Protocol	Yes	Yes	Yes	Yes	Yes
COMTRADE – Common format for Transient Data Exchange	No	No	No	No	Yes
CSV – Generic file including Registers and Intervals	No	Yes	Yes	Yes	Yes
HHF – Itron Handheld file	No	Yes	No	Yes	Yes
Itron Import Reading XML	No	Yes	Yes	Yes	Yes
MDEF – Meter Data Exchange Format	No	No	No	No	Yes
MultiSpeak XML	Yes	Yes	Yes	Yes	Yes
PQDIF – Power Quality Data Interchange Format	No	No[10]	No	No	Yes

Table 4: Vendor HES Data Export Formats

[10] Requires incremental hardware/software cost.

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4.7.2. Web Services

Web service APIs including XML 1.0, SOAP 1.1 over HTTPS are more sophisticated to set up but may not be supported by the software being integrated. Industry standard messaging protocols such as Java Message Service (JMS) are offered to integrate with messaging solutions and back-office interface mechanisms. Most suppliers also offer integration through exposure of the MultiSpeak 4.1 integration interface API.

These protocols are capable of bi-directional communication between systems and provide low-latency communications where near-real-time action is required. As a best-practice, Web Service messages are typically transported across a commercially available Enterprise Service Bus (ESB) that abstracts between the AMI headend software and back-office system such as Customer Information, Meter Data Management or Outage Management.

Access to a suppliers' **full library of web service APIs** represents another important factor to utilities to **future-proof** their AMI investments. While many of the use case applications and related benefits will be evident early in the systems' lifecycle, it is important for utilities to have access to the API library to use future APIs as their needs change and library evolve.

4.8. Security

AMI 2.0 offerings use many different and layered standards, technologies, and approaches to secure the data, device, field tool, network, and headend software landscape. Securing software employs encryption to conceal message contents, access control to prohibit unauthorized users, and authentication to ensure validity of all users and requests.

AMI 2.0 offerings use **public key infrastructure (PKI) digital certificates** to prevent malicious or unintentional interference on the data, device, field tools, and network of AMI networks. PKI certificates based on ITU X.509 manage the identity and security for AMI 2.0 data, devices, and networks. Certificates apply AES-256 encryption with message integrity using keyed message authentication codes (HMAC). Across the Wide Area Network between FAN and back-office, AMI 2.0 network traffic can be encrypted and authenticated within a discrete VPN with end-to-end IPsec tunnels.

The use of digital certificates requires that the AMI 2.0 supplier have a clearly defined and illustrated capability to securely create, assign, and input digital certificates to devices and headend systems from the supplier's factory to field. The system should be capable of managing device certificates over-the-air (OTA) via an automated process for efficiency and security.

The HES architecture should employ port connectivity restrictions and encrypted channels to prevent unauthorized applications from intercepting data. Secure HTTPS connections to presentation layers and SOAP-based web services over the HTTPS transport between presentation and application layer should be implemented. HES tasks should be captured in audit logs along with security related logs available for capture by a Security Information and Event Management (SIEM) solution.

Access control for Wi-Fi enabled AMI network devices is implemented through Wi-Fi Protected Access II (WPA2) certification which includes the benefit of AES encryption. In addition, MAC, or IP Access Control Lists (ACL) are used to further control access to the network for individual AMI 2.0 devices based on these addresses.

At the HES user level, AMI 2.0 leverages enterprise user/network resource directory services to authenticate users for Single-Sign On (SSO) against corporate Microsoft Active Directory/LDAP services. SSO combined with role-based access prevents user access to unauthorized functions. AMI 2.0 solutions should comply with the confidentiality and privacy of data found in the AMI-SEC Task Force, System Security Requirements and in particular, sections related to confidentiality and privacy.

For SaaS, hosted or managed service HES offerings, suppliers need to have security controls and procedures necessary to attain data center and security industry certifications including ISO 27001, SSAE 18 SOC 1 and SOC 2 Type 2 audits. In addition, suppliers should have attestations for applicable controls for colocation data center services PCI DSS 3.2, HIPAA, and FISMA Moderate based on the NIST Special Publication 800-53.

4.9. Smart Cities

The AMI 2.0 network can be extended beyond metering operations to enable smart city services for utilities and municipalities, including smart lighting, transportation, economic development, emergency response, health, and public safety. AMI 2.0 systems offer software and hardware solutions that leverage existing municipality assets to build out a safer, healthier, and more efficient community.

Maximizing the value of existing infrastructure is a particularly interesting area of opportunity for utilities and municipalities, which together can create smart city platforms where sensors and gateways are installed on light poles and a shared network infrastructure is leveraged for non-pole-based systems. The figure below shows some of the most common smart cities use cases, using both connected devices and light-pole mounted hardware.

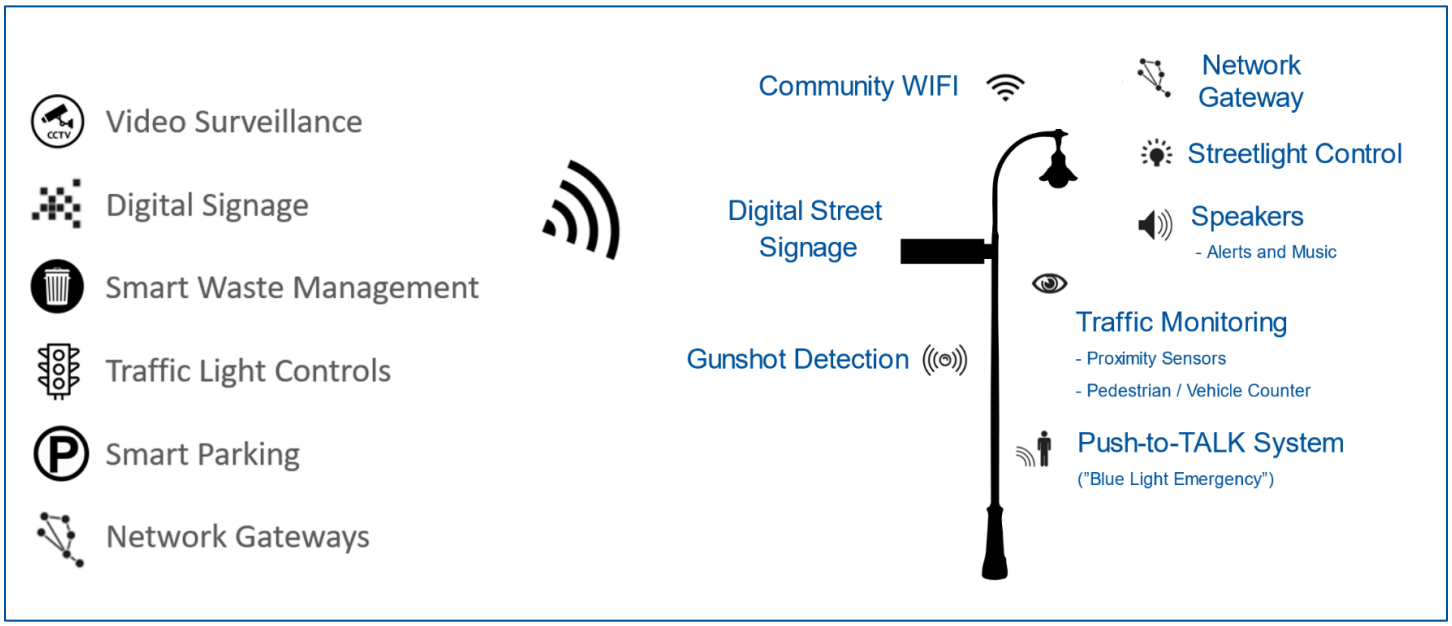

Figure 3: Common Smart Cities Use Cases

4.9.1. Lighting

Intelligent lighting found in a smart city implementation offers municipalities the ability to schedule or manually control ON/OFF status or dimming of individual or lighting device groups using the AMI 2.0 network. This helps lower energy consumption, maintenance costs, and enhance wellbeing for residents and businesses. Some systems have been built on the TALQ smart city device network communication and Open Smart City Protocol to communicate securely and provide future opportunities to extend and integrate with other smart city lighting solutions.

Some suppliers offer retrofit devices that enable communication on their AMI 2.0 network for existing lighting control nodes. This approach allows the utility to avoid stranding lighting control assets in the field, but obviously requires a field visit to perform the retrofit. These retrofit devices operate as nodes on the AMI 2.0 network like other meters, routers etc. from a network traffic perspective. Deployment and management of intelligent streetlighting can be coordinated through centralized platforms that can integrate with CMS, GIS, asset management systems. This integration provides access to inventory, location, and work crew information with mobile capabilities.

AMI 2.0 suppliers may provide their own hardware or have **partnerships** allowing third-party nodes to connect and communicate with the network. In October 2021, Itron acquired SELC, which produces network lighting controllers for an end-to-end solution while Sensus and L+G have indicated their own hardware is available.

Additionally, recognizing the need to accurately measure usage, many streetlight nodes now include measurement capabilities with 0.5%-1% revenue grade metrology depending on supplier. In early September 2020, MC provided a draft policy on granting conditional permission for the installation and use of metering without approval, verification, and sealing

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for streetlight luminaires incorporating adaptive controls **with embedded metrology**. Suppliers are following the progress, and some intend to meet accuracy requirements and conditions for installation upon the finalization of policies.

4.9.2. Public Services

Passive or active video surveillance programs have been implemented widely for high-crime or otherwise sensitive areas. These programs can leverage the AMI 2.0 network footprint to expand the coverage areas without having to deploy additional network infrastructure such as gunshot detection use cases. To support these Public Safety initiatives, push-to-talk or Blue Light Emergency can also use the same AMI 2.0 network.

Some AMI 2.0 suppliers have partnered with domain experts to incorporate gunfire detection in AMI 2.0 networks. Using acoustic sensor arrays mounted on walls, poles or embedded into lighting, these systems can detect gun shots, approximate the location and in some cases weapon type and trajectory. This data plus optional video or still imagery can be transmitted over the AMI 2.0 networks (and mobile if configured) in real time (<5 seconds).

Digital signage of real-time public service and emergency messaging using Flash or HTML5 provides sophisticated and flexible messaging platforms across AMI networks. Alerts to the public of Amber Alerts, Blue Alerts, Weather Alerts and Traffic Alerts can be delivered locally and messaging content and format managed centrally using tools of 3rd parties with which some AMI 2.0 suppliers have aligned.

Using shared or municipal infrastructure such as light poles, community Wi-Fi can be offered to the public. In this case, Wi-Fi network traffic can utilize the AMI 2.0 network overlapping the public area where the light poles are located to interconnect with its own back-haul networks to the Internet.

4.9.3. Health

Air quality monitoring is essential in the effort to understand the environment and changes in pollutant levels in urban areas. Some AMI 2.0 suppliers have partnered with 3rd parties that have expertise in environmental sensory technology to provide solutions that perform measurement of noxious gases such as hydrogen sulfide and other environmental elements including carbon dioxide, ozone, nitrogen dioxide etc. These sensors leverage the AMI network to provide measurements in real time to 3rd party software solutions.

4.9.4. Transportation

Smart parking deployments have shown how drivers can find available on-street parking more efficiently using data from sensors monitoring on-street parking spaces, ensuring less congestion and emissions. The intelligence includes the ability to discern special parking such as accessible spaces or delivery zones to ensure availability as required.

The proliferation of electric vehicles has brought with it the need for distributed charging stations. These systems not only need to be connected to the distribution grid but also monitored and managed as intelligent devices for software

maintenance, account reconciliation, smart-charging controls etc. Pilots using the AMI 2.0 networks to allow communication with EV charging stations are becoming more prevalent across North America. Open Charge Point Protocol (OCPP) is the standard communication protocol used between EV charging stations and a central management system in Europe, and it is approved throughout North America, although the debate for a set standard is ongoing.

4.9.5. Vendor Smart City Offerings

To satisfy customer needs, the Utility should consider smart city partnerships and an ever-expanding "platform-ready" partner ecosystem of domain-centric expert partners. AMI 2.0 suppliers are building out their partner models with non-traditional supply chain partners to support global smart city initiatives. The table below highlights the most common applications of smart city technology and which suppliers are currently offering devices and/or services in these areas.

Item	Honeywell	Itron	L+G	Sensus	Trilliant
Digital Signage	Yes	Yes	No	No	Yes
Environmental/Air Quality Measurement	Yes	Yes	Yes	No	Yes
Gas Meter Network	No	Yes	Yes	Yes	Yes
Gunshot Detection	Yes	Yes	Yes	No	Yes
Lane, Speed, and Vehicle Detection	No	Yes	Yes	No	Yes
Parking Monitoring	Yes	Yes	No	No	Yes
Streetlight Controls	Yes	Yes	Yes	Yes	Yes
Support for CCTV	Yes	TBD	TBD	TBD	Yes
Waste Management	Yes	Yes	TBD	TBD	Yes
Water Meter Network	Yes	Yes	Yes	Yes	Yes

Table 5: Vendor Smart City Offerings

4.10. Distribution Automation

While automation of the electrical distribution network is a mature market and technology, these systems operate discretely from AMI 1.0 systems with separate communication networks and command and control software. Devices that a utility distribution operation group manages such as RTUs, line sensors, and capacitor bank controllers require a **much**

higher degree of security and **lower latency** response capabilities. The reliability and stability of these operational assets ranks higher than AMI 1.0 metering systems as their operational failures have a wider-reaching impact on the consumer base.

Today, AMI 2.0 offerings enable utilities to share the AMI network between their metering and distribution operation group **while complying with the security and latency requirements**. Through field located AMI 2.0 DA equipment and centrally located software, these AMI 2.0 DA solutions allow DA device command and control traffic to securely traverse the AMI 2.0 network with priority to satisfy low latency requirements. AMI 2.0 suppliers offer solutions that support centralized models through a utilities SCADA Master Station and peer-to-peer, de-centralized solutions through equipment typically located at utility substations. As DA devices can communicate using one of many different protocols, these AMI 2.0 DA solutions support industry standards such as IPv6/IPv4, serial DNP3 and Modbus. With support for more stringent security and standards, the sensitivity of the DA device command and control traffic is protected while within the AMI network. DA traffic is secured using AES-256 encryption with integrity checking using keyed-HMAC/SHA2-256.

The priority of DA device command and control traffic is respected by AMI 2.0 DA solutions through **network cooperation and prioritization**. Using peer-to-peer capabilities of AMI 2.0 DA equipment, DA device command and control traffic can be routed across the AMI 2.0 network avoiding congestion or outages. Prioritization configuration settings and AMI 2.0 DA equipment monitoring allow utilities to ensure that latency sensitive DA traffic is prioritized over regular meter readings.

Section 5: AMI Technology Standards

Utilities have long depended on standards to operate safely within acceptable levels of performance. As utilities embrace new technologies including the latest AMI releases, they face challenges which have led the industry to consider and debate the benefits and drawbacks of industry-wide standards; however, while there are both pros and cons for adhering to specific standards compliance for communication has become prevalent because its key upsides include ensuring interoperability and security of multi-domain network communications and multi-vendor device fleets.

This section provides an overview of current industry standards, highlights some of the standards active or under review in the context of AMI, compares vendor interoperability standards compliance, and provides recommendations for how utilities can future proof their investment in next generation AMI.

5.1. Standards and Future Proofing

Because AMI represents a critical fifteen to twenty-year investment, utilities need to ensure that the investment is protected from risk and obsolescence for the lifetime of the solution. This protection, often referred to as “future-proofing,” involves making sure that the solution is purchased and implemented in a way that makes it compatible with and adaptable to future changes in protocol.

The first step is taken in the contracting phase, where contract and warranty terms with the AMI vendor ensure that the AMI will remain operational and supported for the lifetime of the assets. In terms of system design and implementation, industry standards for both hardware and software play a key role in ensuring solution compatibility with future releases and upgrades from the AMI vendor and third-party vendors.

5.2. Scope of Standards in AMI Networks

A wide range of standards are both active and under-review to ensure a safe, secure electricity and communication network that perform and interoperate as expected. One key smart grid trend and best practice is the move away from proprietary communication protocols to industry-wide standards. This ensures that the AMI meters and network are compatible with the widest range of future releases and third-party devices.

Compliance with other standards for device manufacturing, operation and safety, data management, and metrology can ensure that the purchased solution is as robust, flexible, secure, and resilient as possible at the time of implementation. The table below shows the key industry and manufacturing groups and government agencies that are active in the metering and AMI industry to provide an overview of the key standards that apply to AMI.

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Standard or Organization	Description	Examples
Wi-SUN	**International non-profit association** composed of industry members that promotes certified communication standards to coordinate wireless systems and provide interoperability on smart utility network.	Wi-SUN FAN 1.0 Wi-SUN FANWG
Distributed Management Task Force's (DMTF)	**International non-profit association** composed of member companies and alliance partners that creates open manageability standards for IT infrastructures.	CIM 2.54
American National Standards Institute (ANSI)	**Private non-profit organization** composed of industry and government stakeholders that provide frameworks for fair standards development and quality conformity assessment systems.	ANSI C12.1 ANSI C12.10 ANSI C12.18-22
Standards Council of Canada (SCC)	**Government Corporation** that promotes the value of standards and conformity assessment including electricity metering.	CAN/CSA-C22.2 60950-22:17 CAN3-C17
International Electrotechnical Commission	**International non-profit association** composed of technical experts delegated by their Country's National Committee that prepares and publishes standards for all electrical, electronic, and related technologies.	IEC 60068-x IEC 61000-x IEC 62053-x IEC 62059-x

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Standard or Organization	Description	Examples
Institute of Electrical and Electronics Engineers (IEEE)	**Professional association** for electronic engineering and electrical engineering with standards for metrology, power quality monitoring, surge resistance and handling, and communication.	IEEE 1159 IEEE 802.11 IEEE C62.x
Internet Engineering Task Force (IETF)	**Open standards organization** composed of network designers, operators, vendors, and researchers that develops and promotes voluntary Internet and communications standards, in particular the Internet protocol suite.	IETF RFC 4301 IETF RFC 4443 IETF RFC 5905 IETF RFC 791
International Organization for Standards (ISO)	I**nternational organization** composed of representatives from various national standards organizations that develops and publishes worldwide technical, industrial, and commercial standards.	ISO/IEC 16388 ISO 8601
Measurement Canada	**Government agency** that approves and inspects measuring devices and investigates related complaints	MC LMB-EG-07 MC PS-E-18 MC S-E-06
National Institute for Standards and Technology (NIST)	**Government agency** that promotes innovation and industrial competitiveness in measurement science, standards, and technology.	NISTIR 7823
Underwriter Laboratories (UL)	I**nternational safety certification company** that sets and certifies safety standards for electric utility meters	UL 2735C UL 508 UL 60950-1

Table 6: Key AMI-Related Standards Organizations

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Key standards that apply to AMI 2.0 networks and the advantages over current AMI systems are referenced throughout this document. Illustrated in the diagram below are the three key layers of the AMI network and which organizations set the primary standard for safety, performance, security, and interoperability at each layer.

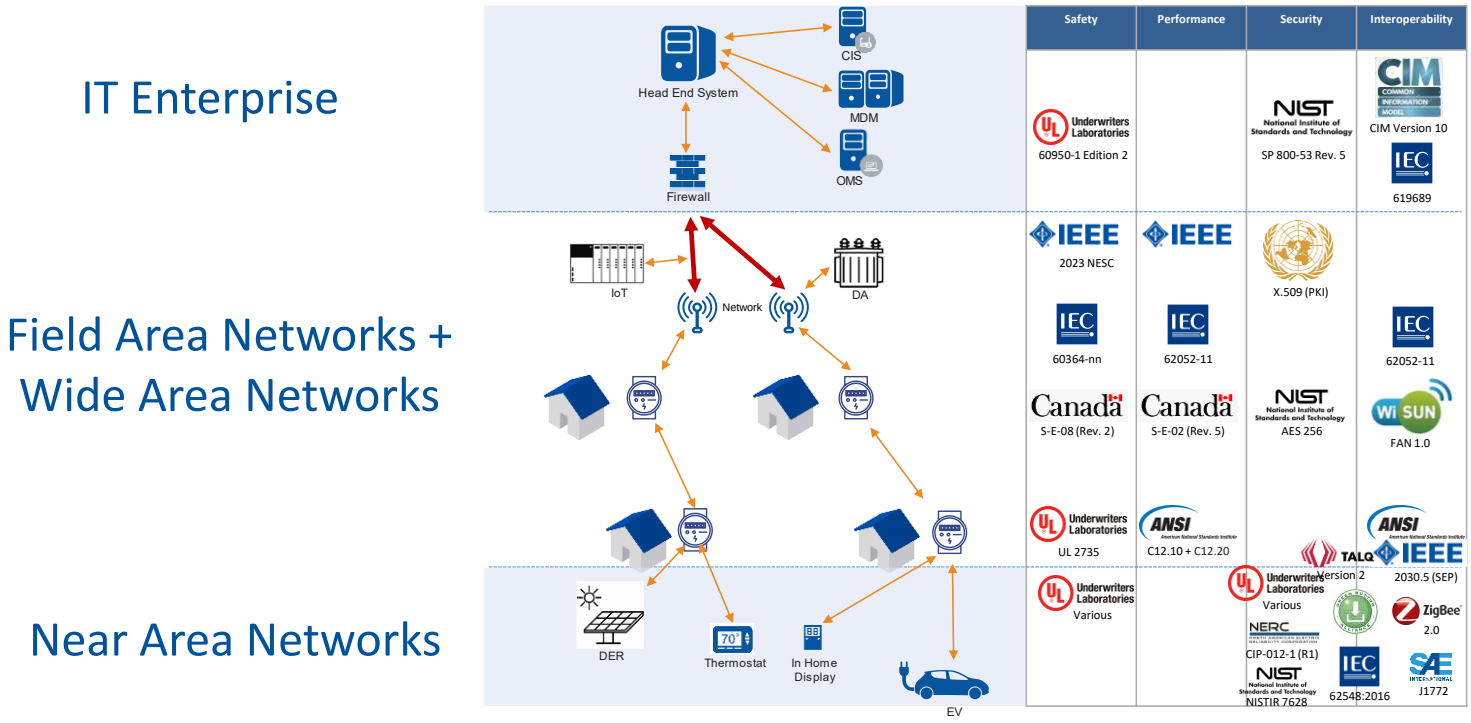

Figure 4: Standards Organizations Governing AMI

5.3. Current Standards

Standards governing AMI continue to evolve as the technology and its use continues to change. Each government agency, industry association and manufacturing group continues to monitor industry changes and respond to input from their constituent members or customers to adapt their standards. However, the table below can be used as a reference of the current key standards across four basic categories applicable to AMI 2.0.

Category	Organization	Domain	Current Standard
Safety	MC	Meter install	S-E-08 (Rev. 2)
	UL	IT Enterprise	60950-1 Edition 2
	UL	FAN - Meters	UL 2735

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Category	Organization	Domain	Current Standard
Performance	MC	FAN - Meters	S-E-02 (Rev. 5)
	ANSI	FAN - Meters	C12.10, C12.20
Security	NIST	IT Enterprise	SP 800-53 Rev. 5
	NIST	FAN	AES 256
	ITU	Multiple	X.509 (PKI)
	IEC	FAN - Meters	61850
Interoperability	NERC	NAN	CIP-012-1 (R1)
	ANSI	FAN	C12.19 + C12.22
	IEC	IT Enterprise	619689
	Wi-SUN Alliance	FAN	Wi-SUN FAN 1.0
	DMTF	IT Enterprise	CIM 2.54

Table 7: Key Current AMI Standards

As one would expect, most critical applicable standards are indeed standard across the industry and the AMI market leaders are vigilant to stay compliant with most of them. There are some minor variances in compliance and commitment to standards between vendors, which can be assessed in detail during evaluation of AMI vendor proposals. As an example, while Itron, Landis+Gyr, and Trilliant are all promoter members of the Wi-SUN alliance, Itron is currently fully compliant with Wi-SUN, but Trilliant is still in the early stages of commitment to the Wi-SUN standards. However, where vendors are not compliant to a given standard, they are proactive in offering alternatives or roadmap solutions to the item in question. For example, Landis+Gyr is partnered with Cisco, and through this partnership is able to offer a Wi-SUN compliant network immediately, which they would not be able to do solely with their own technology and solution. Where specific standards are deemed critical by a utility, vendors will do their best to meet utility these standards or else commit to a timeline or propose an alternate approach (e.g., a proprietary protocol that achieves the same specifications) to meet utility needs.

Section 6: Value Proposition of AMI Technology

The scope of an AMI 2.0 business case extends beyond operational processes and financial benefits to include customer-focused programs and services, and next-generation capabilities like enhanced data analytics. While each utility's AMI business case and value proposition will vary based on a variety of factors including the utility's size, structuring, needs, financial inputs, and the solution it implements, there is value in examining trends in other utilities' business cases to see overall trends in costs and values.

In the transition from manually read meters or AMR to AMI, a lot of the benefits realized were around the labour that would be no longer required under an automated meter reading system. To demonstrate the benefits and costs realized in the first generation of AMI, Util-Assist compared total costs and benefits included in four other publicly available AMI business cases. This comparison includes business cases from three Canadian utilities—New Brunswick Power (2018), Nova Scotia Power (2018) and BC Hydro (2011) - and two American utilities: Con Edison (2015) and National Grid (2018)[11]. The following table shows a summary of the implementations' key project, financial, and benefit metrics. Note that quantified benefits shown in the table were normalized on a per-meter basis for comparison between utilities.

An AMI 2.0 implementation will provide broad benefits across Toronto Hydro's current and future operations, as well as provide benefits to its end customers. However, the business cases and overarching value propositions will differ between AMI 1.0 and AMI 2.0 implementations in several ways. The increased memory and RAM of the newer meters allows the utility to integrate applications at the meter level that allow for enhanced insights related to outages, connectivity, and theft. From a customer perspective, the enhanced metering hardware allows customers to view detailed insights into their energy consumption through load disaggregation and allows the utility to offer a wider ability of self-serve functionality.

[11] Dollar values for Con Edison and National Grid were adjusted from USD to CAD at a rate of 1.3280

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AMI Business Case Comparative Summary (All dollar figures shown in CAD)	BC Hydro	Con Edison	National Grid	Nova Scotia Power	NB Power
Year of AMI Application	2011	2015	2018	2018	2019
Number of Meters	1,930,000	4,700,000	2,330,000	495,000	360,000
Meter Type	Electric	Electric & Gas	Electric & Gas	Electric	Electric
Successful Application	YES	YES	NO	YES	TBD
Financial Metrics					
All-In Cost Per Meter	$404	$353	$282	$269	$304
All-In Savings Per Meter	$844	$590	$358	$385	$372
Discount Rate Used	8.00%	6.10%	6.45%	6.96%	5.25%
Opt-Out Rates	N/A	<1%	1%	1-2%	N/A
Notable Financial Differences					
Net Savings Per Meter	$440	$237	$50	$116	$86
BCA Ratio	2.09	1.67	1.27	1.43	1.28
NPV Forecast (years)	20	20	20	20	15
Top Five Benefit Streams (total benefit per meter over the project term)					
Reduced Manual Meter Reading	$115	$147	$21	$117	$111
Avoided Cost of Meter Replacements	$32	$116	$145	$49	$61
Conservation Voltage Reduction	$108	$98	$9	$0	$45
High Bill Alert	$114	$0	$70	$27	$43
Distribution Network Losses	$379	$110	$29	$20	$42
Benefits with Notable Differences (total benefit per meter over the project term)					
Outage Restoration (Crew Management)	$5	$24	$3	$33	$4
Unbilled/Uncollectable Accounts	$0	$21	$17	$15	$3
Reduced Overtime for Meter Service Orders	$24	$67	$47	$0	$2
Voluntary Time of Use Rates	$57	$25	$78	$55	$0
Uncommon Benefit Streams (total benefit per meter over the project term)					
Meter Services Manager Salary	$0	$0	$0	$0	$5
Avoided Cost of Meter Reading Vehicles	$0	$0	$0	$0	$5
Avoided Cost of Handheld System	$0	$0	$0	$0	$4
Avoided Cost of Meter Reading Supervisor	$0	$0	$0	$0	$3
Remaining Benefit Streams (total benefit per meter over the project term)					
Meter Accuracy Losses	$0	$139	$0	$0	$32
Load Research Meters	$3	$0	$0	$0	$14
Net Metering	$0	$10	$6	$9	$13
Reduced Customer Inquiries	-$1	$16	$6	$9	$4

Table 8: Summary of Five Utilities' Business Cases

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Section 7: AMI 2.0 Financial Assessment

This AMI 2.0 financial assessment will provide lower and upper bounds for the estimated capital and operation, maintenance, and administration (OM&A) costs associated with procuring an AMI 2.0 solution. The scope of the financial assessment is limited to the estimated AMI procurement cost only and excludes meter installation costs and all other ancillary cost categories associated with the business case.

7.1. Market Pricing for AMI 2.0 Technology

The methodology used for determining market pricing for the AMI 2.0 technology was estimated with vendor market prices for recent AMI 2.0 procurements, pro-rated for Toronto Hydro's scale at 686,774 meters. Meter capital costs were estimated using a pricing grid subcategorized by form type and quantity as provided in the Toronto Hydro meter inventory.

Network equipment capital and OM&A costs were estimated based on the required wireless pole mounted and phone line/socket mounted collectors, repeaters, cellular meters, and phone line connected meters as provided in the Toronto Hydro Meter Inventory. Headend system capital and OM&A costs were estimated on a per-meter basis, with one-time costs incurred for HES setup and configuration. Professional services costs were estimated on an hourly-cost basis, with the quantity of hours proportionately adjusted for Toronto Hydro's relative size.

7.2. Pricing Estimate for Toronto Hydro

Depending on project size and timing, Ontario utilities can transition to the next generation of AMI and enable new capabilities at an estimated price of $127.67 to $202.78 (CAD) for all-in vendor capital costs per meter[12]. Cost estimates for Toronto Hydro, including the capital and first-year OM&A estimates for a current generation AMI technology platform, are summarized in the table below. Dollar figures were calculated from an aggregate collection of vendors and are shown in CAD, converted from vendor USD pricing to CAD at a rate of 1.28 USD/CAD.

[12] Estimated prices not including installation; converted from American dollar estimates to Canadian dollars at 1.28 USD/CAD.

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Category	Low Estimate (Capital)	High Estimate (Capital)	Low Estimate (1st Year OM&A)	High Estimate (1st Year OM&A)
New Electric Meters	$82,193,920	$118,986,240[13]	N/A	N/A
Network Equipment	$1,318,400[14]	$8,435,200	$5,632	$6,784
Headend System	$2,023,680[15]	$3,729,920	$537,984	$657,408
Professional Services	$2,140,160[16]	$8,112,640	N/A	N/A
Total	**$87,676,160**	**$139,264,000**	**$543,616**	**$664,192**

Table 9: Estimated AMI Pricing for Toronto Hydro.

[13] Assumes latest generation meter with DI board (~US$50/meter) and remote disconnect capabilities
[14] Assumes point-to-point network
[15] An option exists with the incumbent vendor that this cost will be negligible
[16] Assumes that the incumbent vendor is chosen, and professional service hours do not need to encompass a solution built from scratch

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Section 8: Strategies for Transition to AMI 2.0

During Ontario's implementation of AMI 1.0, utilities executed sector-by-sector[17] acceptance processes as conventional meters were removed, and AMI networks installed and operationalized. The transition from AMI 1.0 to AMI 2.0 will require a more carefully orchestrated deployment and sector acceptance process as implementation of the AMI 2.0 network affects the operational integrity and service levels of the existing AMI 1.0 network. A detailed and well executed transition plan will be required in advance of operationalizing the first AMI 2.0 device.

8.1. High-Level Best Practices

High-level best practices for AMI-to-AMI transition include:

- Plan to have meters complete activation as soon as possible after installation, e.g., compete meter to cash integration activities before meter deployment starts
- Plan and continuously analyze deployment activities to identify in advance meters and areas that may have trouble connecting to the network
- Develop a proactive plan to address sites and meters that will have connectivity issues
- Develop a response plan to address any unforeseen communication gaps that arise

Utilities need to work with the AMI vendor to develop a deployment plan and network stabilization plan that carefully balance the needs of both the new network and the old. The deployment vendor and potentially system integrator will also have to be involved in planning, as their activities and responsibilities will also factor into the final deployment and network plan. While all parties on the project should be aligned with the overall common goal of project success, each vendor may have different restrictions or priorities in their planning and performance of day-to-day activities. For example, a deployment vendor may look to prioritize deployment routes and processes that maximize how quickly meters can be exchanged, along logical walking and driving routes for its field personnel. However, the deployment may have to proceed in a less direct or more restricted manner to accommodate network and stabilization activities.

In general, guidelines for effective transfer from an existing AMI network to a new one is as follows:

When removing the old network:

- Focus on removing all old meters in one sector

[17] A sector is a legacy, industry term used to identify a regional sub-set (typically) of the utility service territory which historically consisted of Meter Reading Routes (or "walks") defined by the utility in terms of geographic size and number of meters. Sectors should be used to manage and control AMI Network Performance Acceptance processes for Service Level Agreement compliance by isolating groups ("Sectors") of AMI meters.

- Within the sector, remove meters moving inward, i.e., starting with the devices furthest from the collectors and moving inward

When deploying the new network:

- Ensure all network collectors are installed and activated before meter deployment begins
- Deploy meters moving outward, i.e., starting with meters closest to the collector and moving outward

The figure below shows the ideal meter exchange and collector placement pattern. With a new collector installed roughly in between two old collectors, meters can be exchanged outward from the new collector and inward towards the old collectors, which is ideal for the stability of both networks.



Figure 5: AMI to AMI Deployment Pattern

In areas with low meter density, it may make sense for the new collectors to be installed in the same general locations as the old collectors as they were likely installed in the best positions to cover the region with the least amount of infrastructure. In these situations, meters would be exchanged from the outer, least dense areas inwards towards the new collectors to avoid disrupting the original mesh, and would be planned for completion in a relatively short time frame to avoid stranding new meters at the edges of the collector's service area.

8.2. Sector and Deployment Planning

In general, AMI vendors recommend having three sectors in active deployment at any one time: one in planning and assessment, one in mass deployment, and one in sector acceptance. There will need to be concessions and exceptions made to the guidelines above, for logistical, communications, or other reasons. To ensure connectivity during deployment, vendors may recommend providing a resource to conduct a radio frequency analysis or deployment and connectivity simulation for each new deployment area, or on a set schedule (e.g., weekly, or bi-weekly). In any areas where new meters are expected to have connectivity issues based on this analysis, the proactive mitigation plan can be deployed.

At a high level, AMI vendors can help plan the new network device locations and possible meter deployment routes using the following methodology:

1. Existing meter and network device locations can be mapped and analyzed by the AMI vendor
2. Using radio frequency communications modelling software, the vendor can simulate the existing network's connectivity layout and determine its functional statistics
3. The proposed new network design (i.e., collector and repeater locations) can be overlaid on the map, and the service territory can be divided into appropriate sectors or deployment zones based on density, geography, network device locations and connectivity, etc.
4. Specific deployment routes can be formulated for individual areas or neighbourhoods in the sector, which account for both old and new network device locations in attempting to minimize potential connectivity issues for both old and new meters

The following are basic steps used in planning an area before its deployment, and assessing it for potential connectivity issues:

1. Approximately four weeks before an area is to undergo meter changes, the utility provides the AMI vendor with the following data about the meters in the area:
    - Meter location coordinates and notes (e.g., indoor/outdoor, etc.)
    - Meter types to be deployed
    - Anticipated exchange date
2. The meter and network device connectivity for the area is simulated to help refine the best deployment routes and to identify any potential connectivity issues.
3. Based on timing factors and projections, like how long meters may be without connectivity and how quickly the network will be built out in the area, the AMI vendor and utility can decide whether mitigation measures should be taken to pre-empt or address the predicted connectivity issues. These measures could include the installation of temporary network access points or use of manual meter reading to collect meter reads for the problem meters until they can be covered by the new network.

8.3. Mitigation of Connectivity Issues

The primary mitigation method offered by AMI vendors to address any expected or encountered connection issues is the use of temporary network access points, (e.g., meter socket mounted access points), to fill gaps in the mesh until the network can be fully saturated in the area. In the case of socket access points, these temporary devices are installed in a meter socket and can provide cellular, or mesh backhaul communication for several hundred meters within range. These access points can help bridge the gap and provide connectivity to meters until adequate mesh coverage is achieved by other meter installations, at which point the socket access point can be removed and redeployed as needed.

AMI vendors may also offer software and professional services to perform endpoint management and network optimization. These services and software help diagnose and fix connectivity issues including those for meters that were

registered on the new network but lose connectivity over time. Endpoint management activities can help restore connectivity remotely, or else direct activities for restoration, for example by using temporary network devices in the field. In rare circumstances, it may be necessary to read meters that aren't connecting using a reading device during a field visit, which, while not ideal, is another available temporary reactive measure to ensure reading continuity until the new mesh can be saturated and stabilized.

In general, a successful transition from AMI 1.0 to AMI 2.0 from a network perspective requires an added layer of planning and contracting, particularly with the chosen AMI vendor. Advanced planning will ensure there are mitigation strategies in place, both for preventing instances of stranded meters, and for addressing connectivity issues if they should arise unexpectedly. Careful discussion and contracting with the AMI vendor will ensure that there is accountability for maintaining the required network service levels throughout the deployment and allow the vendor to plan for and quote both the hardware (e.g., temporary network devices) and the resources (e.g., an engineer to anticipate and address connection issues) necessary to ensure stable communications and continued reading capabilities throughout the deployment of the new AMI.

8.4. AMI 2.0 Supplier Transition Experience

Assessing the experience level of AMI 2.0 suppliers in migrating from an automated meter reading infrastructure to AMI 2.0 is more nuanced than it first appears. While this report highlights the primary differences between AMI 1.0 and 2.0, much of the nuance is created by both the definition of AMI 2.0 and the state of automation in place.

To-date, over 100 million[18] smart meters (AMI 1.0) have been deployed across North American utilities including those in Ontario, California, and Texas, which led the move to AMI. As this older technology reaches the end of its service life, utilities in these jurisdictions are evaluating the upgrade to AMI 2.0 or are in late stages of supplier selection. Currently, there is not an adequate sample of suppliers experienced in the move from AMI 1.0 to 2.0.

However, similar challenges related to sector acceptance, operational integrity and service levels of the existing network exist in older meter reading systems. The state of meter reading automation **from which a utility transitions** should include AMI 1.0 and fixed-wireless[19] automated meter reading systems (pre-AMI) in this assessment.

Also, this report includes Distributed Analytic Applications, Interoperable-Standard Communications and Robust Network performance as differentiating pillars of AMI 2.0. As expected, alignment with this specific distinction is not comprehensive

[18] Electric Company Smart Meter Deployments: Foundation for a Smart Grid (2021 Update), Edison Foundation
[19] Drive-by or walk-by AMR operations do not require a fixed wireless network and are therefore not subjected to the same transition challenges as fixed network AMR.

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across AMI suppliers. Therefore, the definition of AMI 2.0 **to which a utility transitions** has room for interpretation. AMR or AMI 1.0 systems from which utilities are transitioning include:

- Silver Spring Networks to L+G
- Itron ERT to L+G
- Itron ERT to Itron
- L+G (Cellnet) to Itron

While there is currently inadequate evidence of experience in current, mass migrations from electric AMI 1.0 to 2.0, Itron and L+G have ongoing projects moving from fixed-wireless, automated meter reading systems to their respective AMI 2.0 offering. These vendors also have stated experience in smaller scale transition projects, for example helping a utility deploy a newer AMI solution when the utility determined that the solution, they were in the middle of deploying would be insufficient to meet its needs. Including these projects, the vendors have experience facing the following challenges, which are relevant to full-scale replacements of an old AMI solution with a new AMI 2.0 solution:

- Overlapping HES instances, with the new eventually replacing the old
- Co-occurring AMI solutions and service level maintenance during transition
- Network to network migration during meter deployment
- Back-office system and protocol migration to new standards

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Appendix A - Operational Data Examples

1. Tamper Cleared
2. High Temperature Detection
3. Hot Socket Detection
4. Dead Battery
5. Meter Status/Self-Test Errors
6. Measurement Error
7. Time Change
8. Security Change
9. Various Logs Cleared Flag (History Log, Event Log)
10. Disconnect Switch Closure
11. Demand Reset
12. Disabling of Communications
13. Outage
14. Restoration
15. Time Changed
16. Set Time
17. Clock Drift
18. Clock Lost
19. Low Battery
20. DC Detected
21. Loss of Phase
22. Phase Voltage Deviation
23. Inactive Phase Current
24. Cross Phase
25. Phase Angle Displacement

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Appendix B - Glossary of Terms

Acronym	Description	Definition
ASN	Advance Shipping Notice	A document that supplies specific information about an expected delivery, including time, type of item, weight, and amount being shipped.
	Alarm	An alarm is an event at a device that has been configured to notify the HES in real-time.
ANSI	American National Standards Institute	A private non-profit organization that presides over the development of voluntary consensus guidelines for services, products, systems, and processes.
	AMI System	The entire AMI system, inclusive of all components (e.g., HES, meters, network equipment, software, firmware)
CMEP	California Metering Export Protocol	An industry standard data formats first mandated by the State of California in 1998. CMEP is intended to transmit gas and electric utility metering, billing, and administrative information between companies. It is a common file format for export of meter data from the AMI.
COMTRADE	Common format for Transient Data Exchange	The general configuration for data files and exchange channels. Utilized for the interchange of multiple types of faults, test, or simulation data for electrical power systems.
CIS	Customer Information System	System used to manage customer, account, consumption, and billing data.
DER	Demand Energy Response	Demand Energy Response refers to the tools and processes to operate programs designed to change the utility's power consumption, to better match the demand for power with the supply.
	Device	This refers to all field-deployed hardware (including, but not limited to meters, repeaters, collectors, DA devices, external antennas).
DSCP	Differentiated Services Code Point	The field in an IP packet that specifies the per hop behavior for a given flow of packets and enables varying levels of service to be assigned to network traffic.
DA	Distribution Automation	Real-time adjustment to changing loads, generation, and failure conditions of the distribution system, usually without operator intervention.
DMS	Distribution Management System	Used to monitor, control, and analyze the distribution network, a DMS provides improved operator awareness and decision-making, and improves safety and protects assets.
EMS	Element Management System	We use the term Element Management System as a generic category, but do not intend it to define a separate solution. Any proponent may elect to fulfill these requirements natively within their core product.
	Endpoints	An endpoint is one end of a communication channel. In this context, it describes all field mounted devices excluding those that only serve a communication purpose (i.e., includes meters, DA devices, but not repeaters).
	Event	An event is an occurrence on the device that is tracked. It may be configured to notify the HES when interrogated, immediately (as an alarm), or both.
FAN	Field Area Network	The FAN is primarily used for communications between meters, clients, repeaters and routers within an area that reaches further than the NAN. The intended network topology will be point-to-multipoint for this segment.
	FAN Hop Path	The network path in which the device, meter or network equipment, is associated within FAN.
HES	Headend System	A headend system is hardware and software that receives the stream of meter data brought back to the utility through the AMI.

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Acronym	Description	Definition
	Hot Socket	A condition where the connection between the meter and meter base experiences an elevated temperature and causes a potential fire hazard. This may be due a variety of conditions such as loose wire termination, meter blade not seated in socket jaw, exceeding socket capacity, etc.
IESO	Independent System Operator	Runs the exchange for the sale and purchase of electricity and oversees electricity system operations in Ontario. IESO is responsible for the Smart Metering Initiative and oversees the MDM/R.
ISM	Industrial, Scientific, and Medical	Radio bands that are dedicated for international use on radio frequency energy specifically intended for scientific, medical, and industrial needs and not communication.
IED	Intelligent Electronic Device	Microprocessor-based controllers of power systems equipment
	Interval	An Interval Meter measures how much (electricity) is being used, and when it is being used. An interval is a pre-configured slice of time across a day (e.g., a meter may be configured to twenty-four hourly intervals or ninety-six 15-minute intervals each day)
	Interval Overflow	This occurs if the energy consumption in any interval exceeds the meter's ability to capture the consumption in that interval.
IDE	Integrated Development Environment	An integrated development environment (IDE) is a software suite that consolidates basic tools required to write and test software.
LOS	Line Of Sight	A kind of propagation that is used to transmit and receive data between transmit and receive stations that are in clear view of each other and without any physical interference.
	Line Sensor	A device installed on a feeder that is used to determine the real-time voltage, current and identify line fault conditions.
LQI	Link Quality Index	A process where measurements of signal quality are made, assessed, and analyzed.
	Load Interruption	This feature would allow the utility to disconnect a customer remotely for a defined period of time.
	Load Limit	This feature would limit the amount of power the customer may utilize at one time, below the nameplate rating of the meter.
	Mesh	A mesh network is a local network topology in which the infrastructure nodes (i.e., bridges, switches, and other infrastructure devices) connect directly to as many other network devices as possible and cooperate with one another to efficiently route data from/to the HES.
MDEF	Meter Data Exchange Format	Consists of binary files enclosed with channel header data, meter header data, interval data, and trailer record.
NAN	Neighbourhood Area Network	The NAN is primarily used for local communications. The primary purpose of this network is to allow clients/users to access their devices locally (e.g., in home display, field technician device, etc.). The intended network topology will primarily be point-to-point; point-to-multipoint topologies may be supported depending on implementation.
NNI	Network-to-Network Interface	NNI's are intended to provide connectivity between networks as defined by the different segments. They are not intended to provide direct user/client connectivity to the device but allow for an overall path such that a utility server can access the device. The overall path will consist of a mix of different network technologies, as such, NNIs will be connected across different physical (Layer 1) and hardware (Layer 2) mediums while maintaining consistency at upper layers of the network.
PLC	Power Line Carrier	A communication technology that enables carrying data on a conductor that is also used for electric power transmission.

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Acronym	Description	Definition
PQ	Power Quality	A power quality meter is used to measure electric power signals to determine the load's ability to function properly with that electric power
	Register	A register shows a meter's total cumulative consumption from the date the meter was manufactured.
	Register Read	A register read shows the total cumulative consumption at a particular point in time.
RDR	Remote Disconnect/Reconnect	This feature allows the utility to disconnect and reconnect a premise OTA.
	SCADA Master	The term refers to a single computer responsible for communicating with the field devices.
	Takeout Point	A takeout point is any connection point that connects back via the WAN.
	Throughput	Total number of packets received as measured between source and destination.
TOU	Time of Use	TOU refers to the sale of electricity based on rates established for certain times of day, days of week, and/or season.
USDP	Universal Service Delivery Point	This refers to the point at which delivery is metered or calculated. The USDP is the point at which billing occurs based on input from one or more smart meters.
UNI	User-to-Network Interface	UNIs are intended to interface locally between end equipment and the associated AMI 2.0 device (e.g., meter). UNI's do not have direct routing access to other parts of the AMI 2.0 network (e.g., the user-connected device does not become part of the AMI 2.0 network). Given the point-to-point nature of this connectivity, a single network technology will be used per instance of an UNI.
WAN	Wide Area Network	Primarily used to communicate from the backend systems, which reside at the utility's data centers, to the field devices attached to the FAN across the province. The network topology is anticipated to be mainly point-to-point on this network segment, though point-to-multipoint topologies could work on certain technologies.

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Appendix C - Available Meter Forms

Form	Current Rating	Honeywell	Itron	Landis+Gyr	Sensus	Trilliant
12S	200	RexU	Gen5 Riva	Revelo (Residential)	1θ - I-210+c (Aclara)[20] 3θ - A3 (Honeywell)	Libra
12S (No Disconnect)	320	N/A[21]	Gen5 Riva	N/A	A3 (Honeywell)	Libra
16S	200	A4CI	N/A	N/A	A3 (Honeywell)	Libra
16S (No Disconnect)	320	A4CI	N/A	N/A	A3 (Honeywell)	Libra
1S	200	RexU	Gen5 Riva	Revelo (Residential)	N/A	Libra
1S	100	N/A	N/A	N/A	I-210+c (Aclara)	N/A
1S	200/320	N/A	N/A	N/A	A3 (Honeywell)	N/A
25S	200/320	N/A	Gen5 Riva	Revelo (Residential)	I-210+c (Aclara)	N/A
2S	200	RexU	Gen5 Riva	Revelo (Residential)	I-210+c (Aclara)	Libra
2S (No Disconnect)	320	N/A	Gen5 Riva	N/A	I-210+c (Aclara)	N/A
2S	200/320	N/A	N/A	N/A	A3 (Honeywell)	N/A
2SE	320	N/A	N/A	Revelo (C+I)	N/A	N/A
35S	20	A4CI	N/A	N/A	A3 (Honeywell)	Libra
36S	20	N/A	N/A	N/A	A3 (Honeywell)	N/A

[20] Sensus AMI communications incorporated into electric meter manufactured by another supplier.
[21] In this table, “N/A” indicates that this meter type / configuration was not available at the time of publishing this report.

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Form	Current Rating	Honeywell	Itron	Landis+Gyr	Sensus	Trilliant
4S	20	RexU	N/A	N/A	A3 (Honeywell)	Libra
4S (No Disconnect)	20	N/A	N/A	N/A	A3 (Honeywell)	N/A
9S	20	A4CI	N/A	N/A	A3 (Honeywell)	Libra
35S/45S	20	N/A	N/A	N/A	N/A	Libra
36S/46S	20	N/A	N/A	N/A	N/A	Libra
3S	20	RexU	Gen5 Riva	Revelo (Residential)	1θ - I-210+c (Aclara)[22] 3θ - A3 (Honeywell)	Libra
5S	20	A4CI	Gen5 Riva	N/A	I-210+c (Aclara)	N/A

[22] Sensus AMI communications incorporated into electric meter manufactured by another supplier.

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Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
2B-SEC-64
Appendix B
UPDATED: March 21, 2024
(54 Pages)

AMI 2.0 Strategy

November 2022



The better the question. The better the answer.
The better the world works.

TORONTO HYDRO

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Building a better working world

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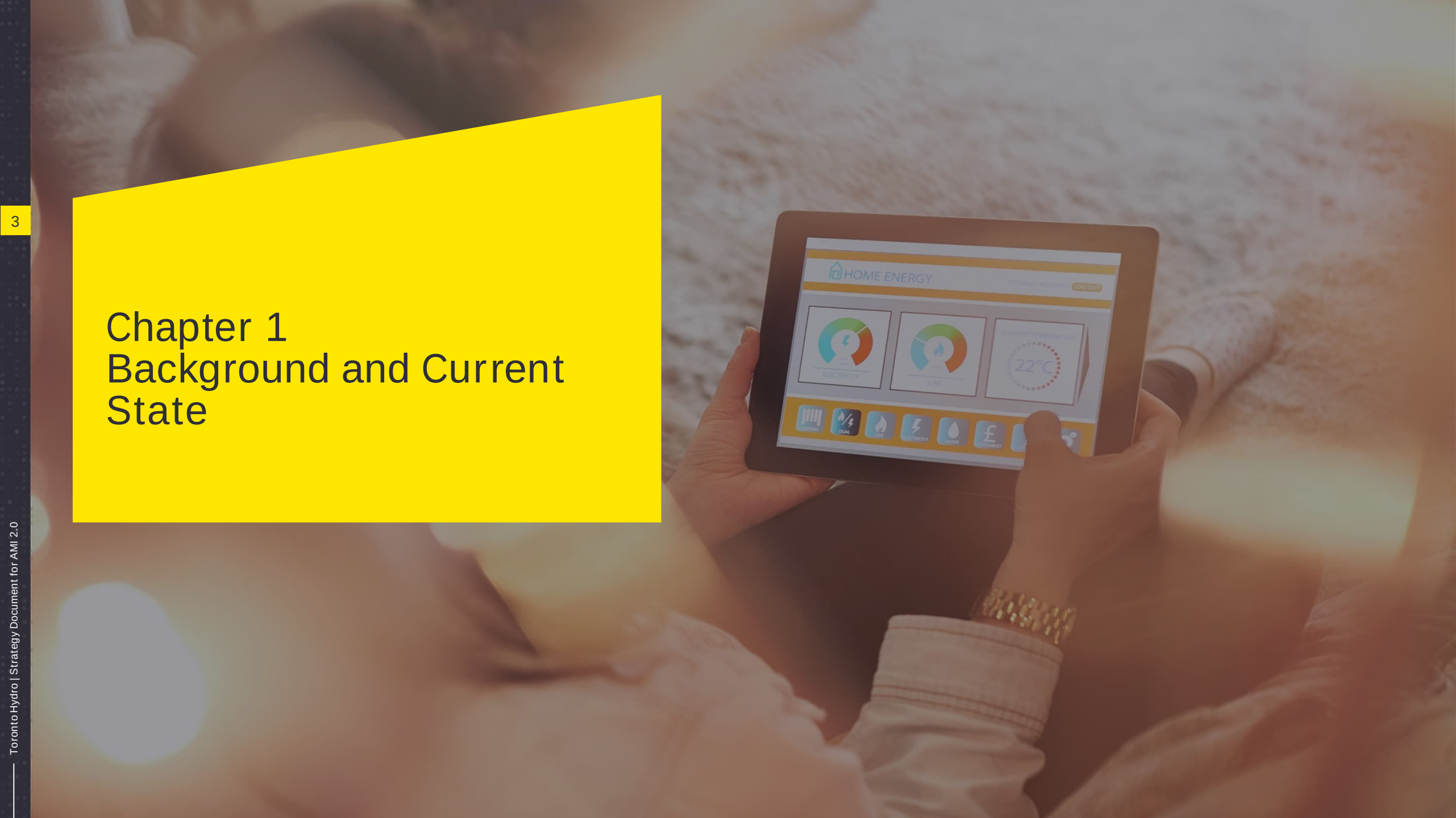
Chapter 1
Background and Current State



Background

Background and context

Toronto Hydro owns and operates $5 billion of capital assets comprised primarily of an electricity distribution system that delivers electricity to approximately 787,000 residential, commercial and industrial customers in the City of Toronto.

Toronto Hydro operates approximately 686,000 Elster smart meters (640,000 residentials smart meters & 46,000 commercial smart meters) deployed across its service territory in a hybrid network of both point-to-point and mesh systems. These smart meters are used to gather energy consumption and demand data to ultimately bill its customers. Most of the smart meters were installed between 2006 to 2008 and have a useful life of 15 years. Those smart meters will reach their end of life or will have their seal expired between 2022 and 2027 and must be replaced. Without intervention, 90% of these meters will be operating beyond their expected useful life as of 2023, presenting an increased risk of failure.

Toronto Hydro intends to replace the current AMI system with modern metering infrastructure and establish the foundation for its grid modernization and customer experience enhancement strategic priorities. This will be done through a comprehensive AMI program over the next several years.

Report structure

As Toronto Hydro moves forward in its AMI 2.0 journey to replace its existing population of smart meters, EY was engaged by Toronto Hydro to provide consulting services focused on meter technology and Advanced Metering Infrastructure(AMI) upgrades from a strategic perspective, including opportunities, use case prioritization and deployment strategies. As part of this consulting engagement, Toronto Hydro participated in a collaborative facilitated workshop “EY Wavespace session”. This report is an output from various discussions and workshops executed with Toronto Hydro participation. The report is structured into the following Chapters:

- Chapter 1: Background and Current State
- Chapter 2: AMI 2.0 Use Cases
- Chapter 3: Deployment Considerations
- Chapter 4: Program Structure Considerations
- Chapter 5: Next steps and Recommendations.

Current AMI capabilities

Toronto Hydro's current smart metering system supports the following business capabilities:

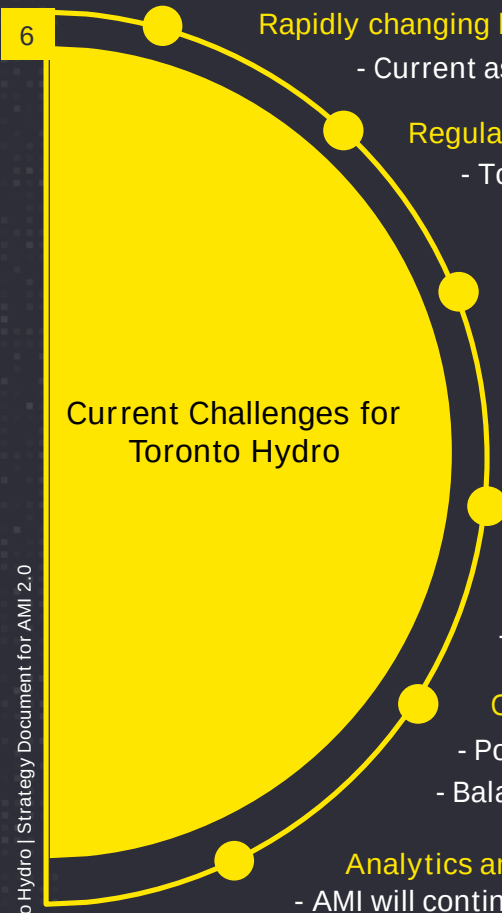
- Remote Disconnect / Reconnect: Toronto Hydro currently has the capability for remotely disconnecting and reconnecting meters for specific meter types. This feature is being used only where the customers default on bill payment and Toronto Hydro is unable to reach such customers. Toronto Hydro is interested in using this capability.

- Remote meter pings: Toronto Hydro has deployed meter pinging capability. When a customer calls Toronto Hydro for a power supply issue, the dispatch group pings the meter using the Batch Request Tool feature to check the status of the meter, working backwards, to assess the extent of a potential outage.

- Meter alerts: Various meter alerts are received from the meter population. The volume of alerts is significant, and information provided is not used in a sustaining manner. Tamper alerts are not reliable.

Challenges to be managed while deploying AMI 2.0

While AMI 2.0 presents significant opportunities for utilities in their modernization journey, challenges will need to be addressed towards readiness for deployment.



Rapidly changing landscape :

- Current assets are required to be able to sustain long term growth with increasing DER penetration and EV growth

Regulatory requirements :

- Toronto Hydro (and other Ontario utilities) have a significant reliance on regulatory requirements, which change frequently

Supply Chain & Quality:

- With significant global supply chain issues, timely access to metering and communications equipment will need to be managed actively with the vendor
- Warehousing capacity of the install vendor will need to be considered in conjunction with Toronto Hydro warehousing capacity to align with inventory of meters to be maintained at any point

Privacy and Security:

- Customers are concerned that the utility owns a lot of information about them and don't know how they wish to use it. This may need to be factored into the Customer Engagement approach for smart meter deployment
- With increased reliance on data at the edge, security of data and prevention of unauthorized intrusion become critical requirements

Operational Agility

- Policy changes, frequent rate changes and regulation changes requires agility at an Operational level including a better ability to leverage data for insights
- Balancing operational agility with safety will continues to be a challenge and an area of focus

Analytics and Insights

- AMI will continue to enable downstream functions and insights. The ability to govern and manage data, including the ability to draw insights from data for grid and customer benefits will become central
- Customers require and need to be presented with actionable insights as active stakeholders

Chapter 2
AMI 2.0 Use Cases

The Chapter discusses AMI 2.0 Use Cases and capabilities required to enable AMI 2.0

AMI 2.0 Use Cases

With the digitization and rise in connected devices, the AMI network of the future is moving to become an IoT ‘platform’ which will connect ecosystems of utility and customer-owned devices and services.

AMI 2.0 expected to deliver base capabilities beyond AMI 1.0, which was predominantly focused on meter to cash efficiencies. These benefits include improved network range, enhanced security against cyber-threats, increased grid transparency, edge computing capabilities and improved customer experience. Beyond the base-case capabilities, AMI 2.0 will also deliver benefits for asset management and grid operations through advanced analytics capabilities, as well as integration of AMI data into smart grid systems such as ADMS, DERMS etc.

In addition to advanced benefits being enabled by AMI 2.0, new operating models are also emerging, with opportunities for Managed Services as opposed to the traditional in-house meter operations, as well as cloud-based AMI systems.

Smart base-case



Capabilities that come ‘out-of-the-box’ for Smart implementations

Sample capabilities:

- *Remote meter reading*
- *Remote connect / disconnect*
- *Interrogation / on demand read*
- *Remote asset management*
- *Billing / retail integration*

Data-driven insights



Insights & business value are delivered when applying analytics to Smart & other data

Sample analytics:

- *Theft detection*
- *Load profiling*
- *New connection sizing*
- *Meter mapping / LV visibility*
- *Transformer load management*
- *Outage calculation & trends*

Tech-enabled operations



Integrating Smart monitoring & command functionality into business operations

Example integrations:

- *Advanced Distribution Mgmt (ADMS)*
- *Distr. Energy Resource Mgmt (DERMS)*
- *Demand response (DRMS)*
- *Interactive Voice recog. (IVR)*
- *Call Center operations*

AMI 2.0 Use Cases

AMI 2.0 also provides utilities with opportunities to support the prosumer and meet new customer expectations and drive behaviours.



Do the basics well
Fix existing process issues to deliver an efficient process with reliable service

Enhance digital
Continue to enhance the range and functionality of our digital channels

Provide additional services
Integrate 3rd party solutions/services for an end-to-end experience

Saving money
Customers expect utilities to proactively offer solutions to help lower bills

Data availability
Provide customers with customized insights and options

Privacy and data security
Protect customers' personal information from misuse and hacking

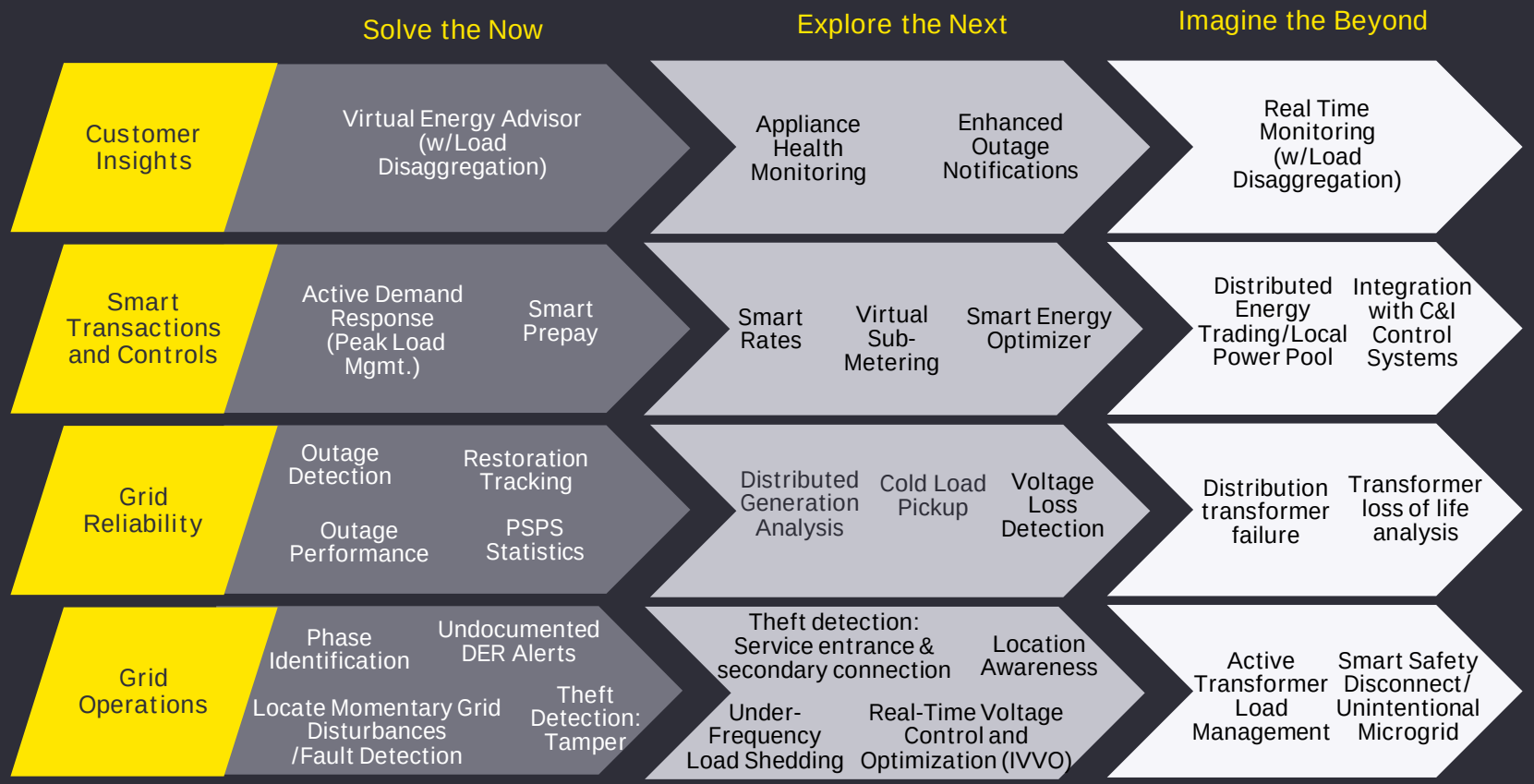
Safety
Proactively monitor unsafe situations and alert customers

AMI 2.0 Use Cases: Expanded capabilities

AMI 2.0 will enable advanced capabilities to support grid modernization and customer experience agendas for utilities – over a period of time.

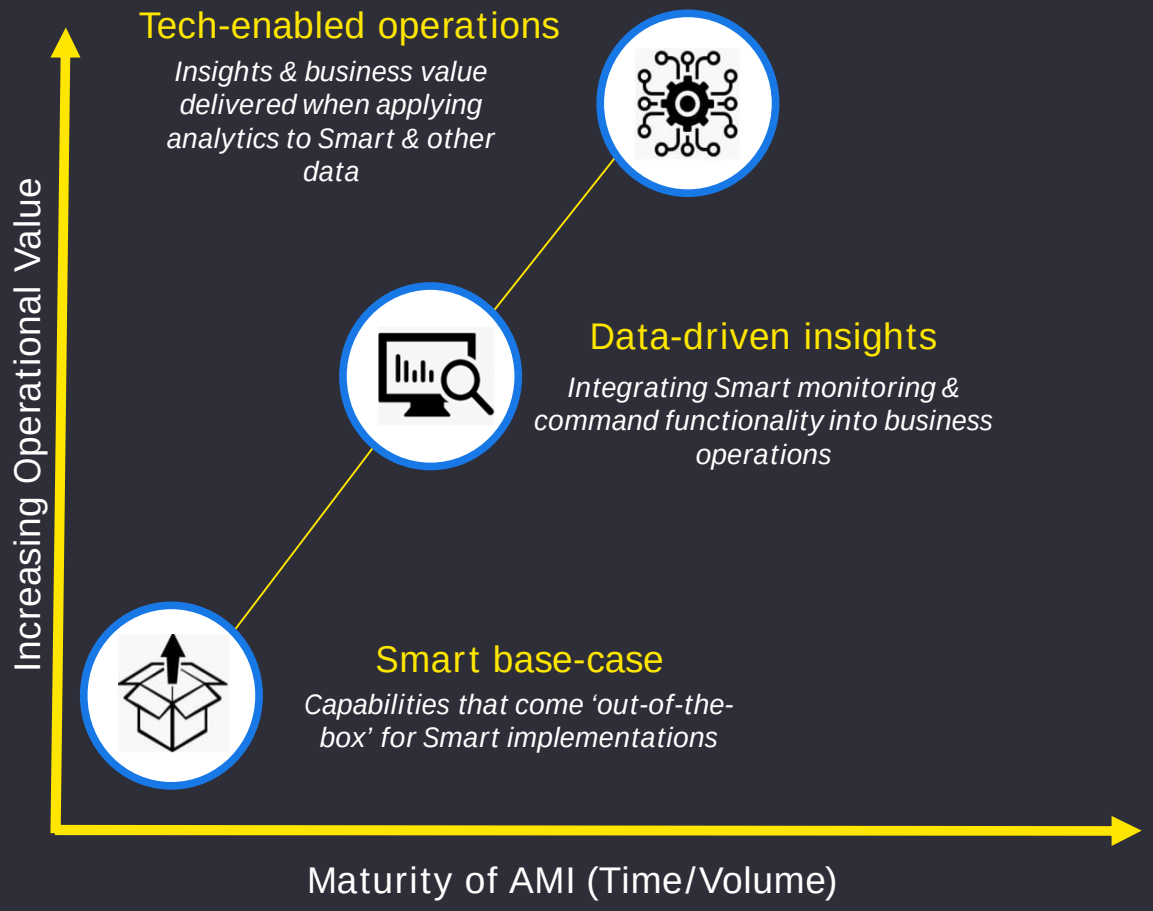
AMI 2.0 is expected to enable advance capabilities for utilities. These capabilities will be delivered as out-of-the-box, through enabling data-driven insights, as well as through leveraging AMI data in conjunction with operational systems.

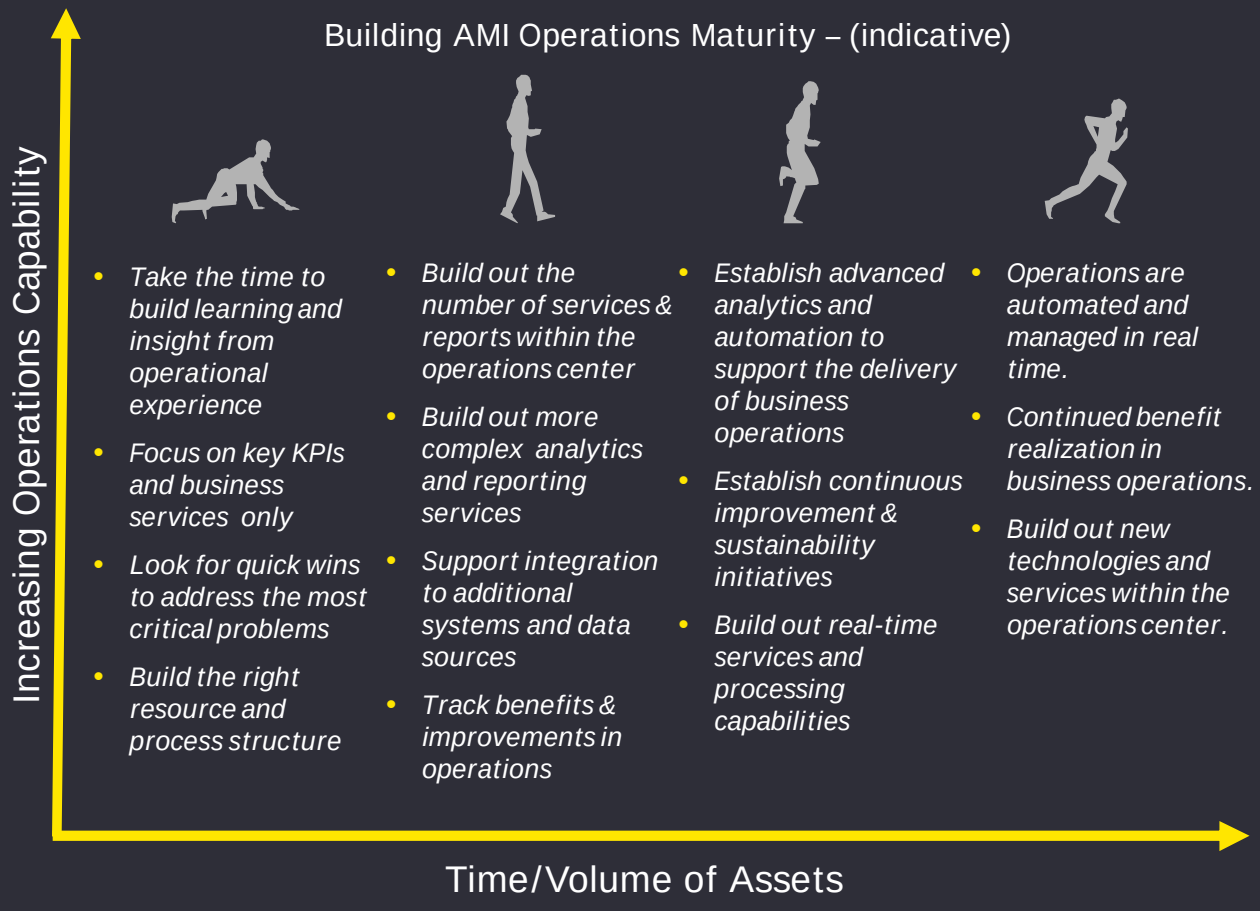
Benefits associated with AMI 2.0 can start being rolled out with AMI 2.0 smart meters for base-case scenarios. Other benefits will require investment in technology (such as DERMS), development of organizational capabilities (such as advanced analytics and data governance) and alignment across multiple organizational stakeholders to be realized.



AMI 2.0 Use Cases: A Transformational Journey

Realization of AMI 2.0 benefits beyond the out-of-box capabilities is a transformational journey, achieved over a period of time. This transformation will require Toronto Hydro to invest in technology and systems, as well as advance/mature its capabilities across several domains. Developing a list of use cases/benefits that Toronto Hydro elects to deliver over a specific time period is the first step. This will facilitate the identification of systems and capabilities required over a time horizon to ultimately realize the benefits.





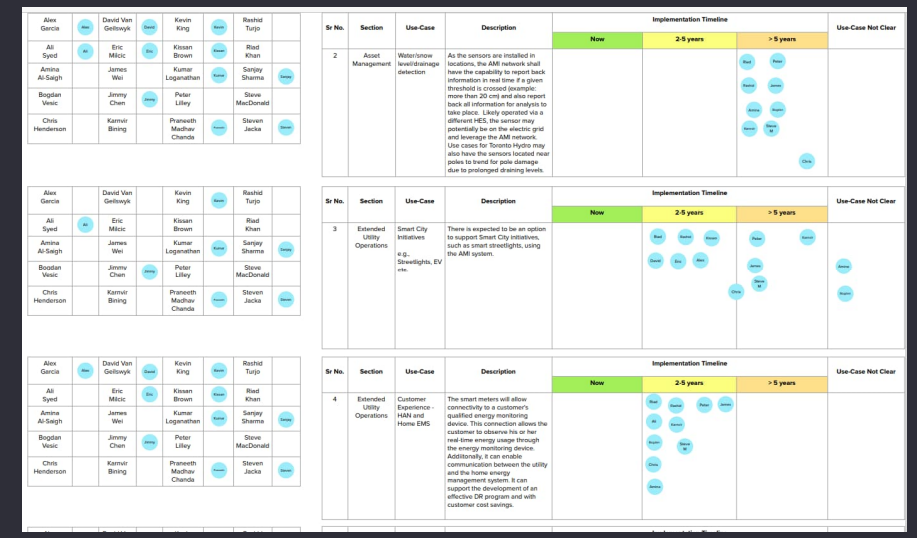
AMI 2.0 : Toronto Hydro Use Cases

Toronto Hydro has identified 49 use cases as a part of their AMI 2.0 readiness activities

Toronto Hydro has identified 49 use cases, within the following domains – Core requirements, Asset Management, Operations/Extended Utility Operations, Network, Predictive Analytics, Smart City/Grid modernization and Smart Controls. In absence of a roadmap for the use cases & enabling capabilities, EY recommended a prioritization of the 49 use-cases over a timescale in preparation for the evaluation of responses from the AMI RFP . In addition, prioritization of the 49 use cases against Toronto Hydro's business strategy (customer and grid modernization strategies) as well as an analysis of additional complexity to implement the use cases will be informative towards evaluating the RFP responses, as well as defining a use-case roadmap.

Output of the preliminary prioritization exercise

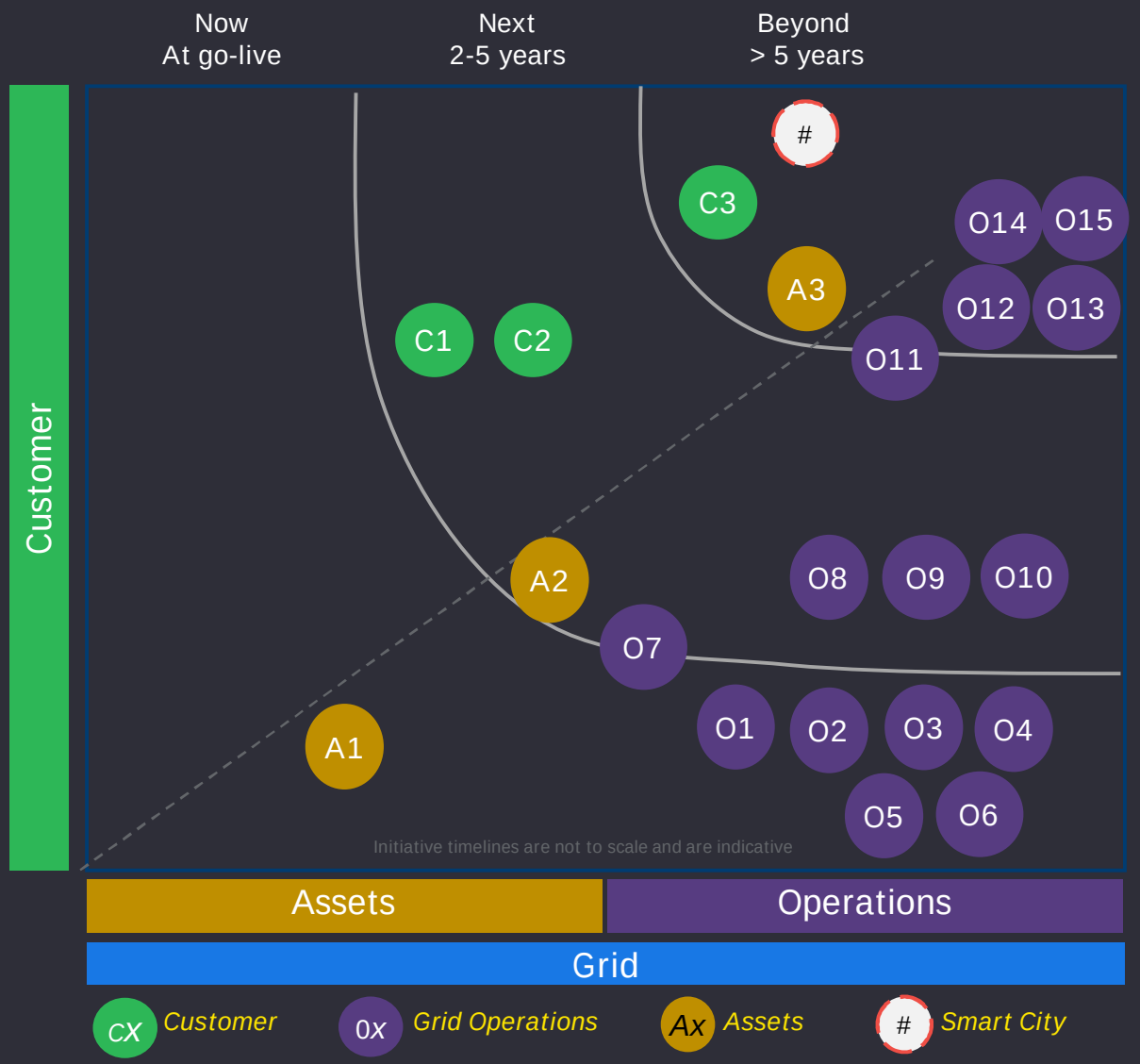
- A cross-functional Toronto Hydro team reviewed and prioritized the 49 use cases over a "Now" / "Next" / "Beyond" timeline. Many of the use cases were split across 2 timelines. These use-cases have been placed under the timeline based on majority inputs.
- The output of this prioritization activity has been shared in the next page. The Figure to the right is a partial snapshot of the prioritization exercise. The full results are provided in the Appendix.



AMI 2.0 : Toronto Hydro Use Cases - Prioritized

The charts shown here reflect the results of Toronto Hydro's use cases prioritized over a time scale. The full list of Toronto Hydro Use Cases is provided on the next page.

AMI 2.0 use-cases			
Asset	A1	Non-technical Loss detection	Now
	A2	Feeder and Transformer Loading Analysis	Next
	A3	Pole damage monitoring	Beyond
Customer	C1	Home energy usage monitoring capability	Next
	C2	Energy budgeting and optimization	Next
	C3	Customer Safety Services	Beyond
Grid Operations	O1	Customer Load Data Disaggregation for load analysis	Now
	O2	Remote Disconnect/ Load Limiting/Load Interrupting capabilities	Now
	O3	Outage Management	Now
	O4	Phase identification analysis	Now
	O5	Power flow optimization	Now
	O6	EV control and monitoring capability	Now
	O7	Integration capability with customer DERs	Now/Next
	O8	Demand Response support capability	Next
	O9	Fault Location, Isolation, and Service Restoration (FLISR)	Next
	O10	Voltage Optimization	Next
	O11	Edge Network Computing	Next/Beyond
	O12	Cold Load Pick up capability	Beyond
	O13	Decentralized FLISR aggregation from meters	Beyond
	O14	Load/Demand Forecasting	Beyond
	O15	PSPS Statistics	Beyond



Note: Use- cases have been logically grouped into 3 categories: Customer, Asset and Grid Operations. All the use-cases that fall under 'Smart City' were prioritized under 'Beyond'. Customer Safety Services proposed as a "new" use- case.

AMI 2.0 : Toronto Hydro Use Cases - Mapping

The full list of Toronto Hydro Use Cases is highlighted under 5 categories in the below chart. All the use-cases that have been listed under ‘Smart City’ were mapped ‘beyond’ during the team exercise. The ‘Requirements’ form the baseline use-cases for AMI 2.0 implementation.

AMI 2.0 use-cases			TH Use-Case No.
Asset	A1	Non-technical Loss detection	20
	A2	Feeder and Transformer Loading Analysis	24
	A3	Pole damage monitoring	42
Customer	C1	Home energy usage monitoring capability	28
	C2	Energy budgeting and optimization	31
	C3	Customer Safety Services	New
Grid Operations	O1	Customer Load Data Disaggregation for load analysis	29,30
	O2	Remote Disconnect/ Load Limiting/Load Interrupting capabilities	8
	O3	Outage Management	14
	O4	Phase identification analysis	26
	O5	Power flow optimization	27
	O6	EV control and monitoring capability	19
	O7	Integration capability with customer DERs	17
	O8	Demand Response support capability	18
	O9	Fault Location, Isolation, and Service Restoration (FLISR)	23
	O10	Voltage Optimization	49
	O11	Edge Network Computing	2
	O12	Cold Load Pick up capability	15
	O13	Decentralized FLISR aggregation from meters	16
	O14	Load/Demand Forecasting	22
	O15	PSPS Statistics	25

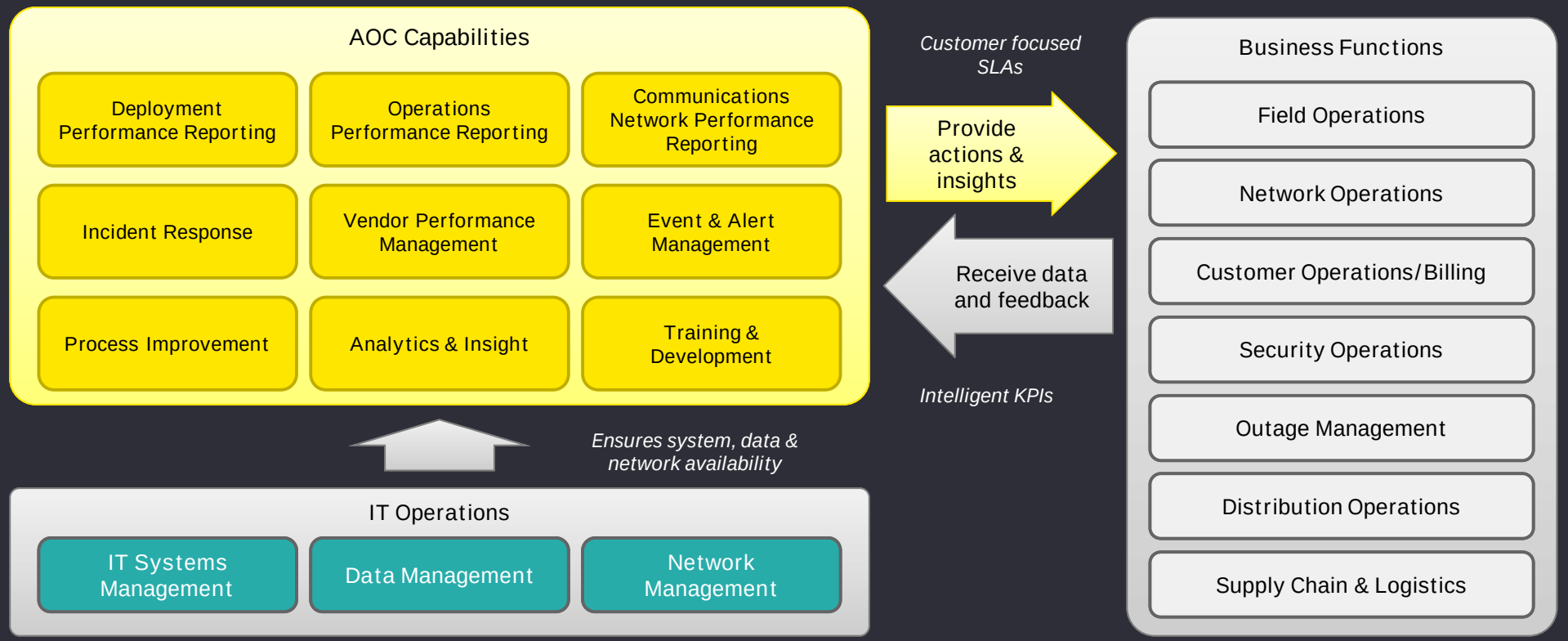
AMI 2.0 use-cases			TH Use-Case No.
Smart City	S1	Leverage Lighting network for AMI	32
	S2	Street Light Dimming capability	33
	S3	Street Light controls capability	34
	S4	Street Light controls for emergency response capability	35
	S5	Parking Monitoring	36
	S6	Traffic Monitoring	37
	S7	Adaptive lighting capability	38
	S8	Community wi-fi capability	39
	S9	Digital Street Signage	40
	S10	Street lighting repair monitoring	41
	S11	Environmental/Air Quality Monitoring, CO2 detections	43,44
	S12	Video surveillance	45
	S13	Emergency support capability	46
	S14	Intrusion detection	47
	S15	Gun shot detection	48
	S16	Smart City Initiatives (Streetlight, EVs, etc.)	21
Requirement (Core)	R1	Remote troubleshooting and diagnostics tool	10
	R2	Remote configuration capability for PQ	13
	R3	Remote management capability for AMI devices	4
	R4	Self-diagnostics for failure identification	5
	R5	Alternatives to address RF sensitivity	6
	R6	Manual meter reading capabilities	9
	R7	Configuration and bi-directional metering capability	11
	R8	Meter Data Storage capability	12
	R9	Minimal human intervention for multi-layer network and data security	1
	R10	Separate path for DA traffic to back-end	3
	R11	DA devices as repeaters	7

Note: Customer Safety Services (temperature monitoring, arc monitoring, broken neutral, etc. for a meter at consumer premises, proposed as a “new” use- case.

AMI 2.0 business integration capabilities

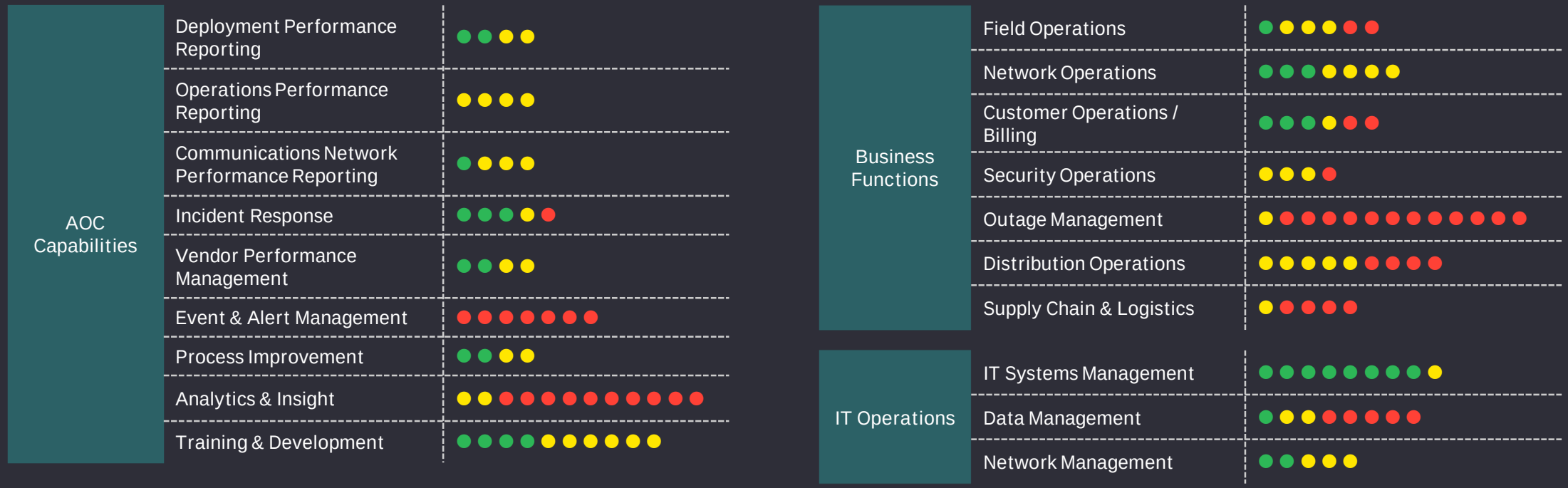
AMI 2.0 will require advanced organizational capabilities to support metering infrastructure. In addition to Business Functions and IT Operations capabilities, utilities also need to establish capabilities and a focus on managing deployment performance, vendor performance, event and alert management etc, to support the metering infrastructure and drive value realization. The Figure below illustrates a typical set of capabilities required to support AMI.

The AMI Operation Center (AOC) provides a bridge between AMI and other business functions ensuring that they have the right information to make key business decisions....



AMI 2.0 business integration capabilities

The figure below is a current state representation of Toronto Hydro's capabilities to support AMI 2.0. This view is based on direct input from Toronto Hydro business and IT stakeholders during the "Wavespace" session held on 19 August 2022. This view is not atypical of the readiness levels of utilities. Utilities should carefully assess their capability maturity in these areas carefully as they embark on their AMI journeys.



Key Focus Areas for AMI

- Events and Alert Management
- Analytics & Insights
- Outage Management
- Distribution Operations
- Supply Chain & Logistics
- Data Management

Legend: *Doing great* *Could be improved* *Should be a focus*

AMI 2.0 Case Studies



The following sub-section illustrates case studies from utilities across the globe with respect to how AMI has been used to enable business capabilities.

AMI 2.0 Case Studies: Capabilities deployed by Utilities globally

The table below provides a summary view of services and capabilities deployed by various utilities. Additional details for selected utilities are provided in the following pages.

#	Services/Capabilities	[redacted]									
1.	High Bill Alert to Customers	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2.	Outage Alert to Customers	✓	✓	✓	✓	✓	✓	✓	✓		✓
3.	Net Energy Metering (Renewable Energy)	✓	✓		✓	✓	✓	✓	✓		✓
4.	Outage Integration with ADMS	✓				✓	✓	✓			
5.	Outage Visualisation		✓			✓		✓			✓
6.	Technical & Non-Technical Loss	✓	✓	✓		✓	✓	✓	✓	✓	✓
7.	Demand Response – Customer		✓	✓	✓	✓	✓	✓	✓	✓	
8.	Demand Response – Operations	✓						✓	✓	✓	
9.	Volt/ Var Optimisation		✓			✓	✓	✓	✓		
10.	Power Quality	✓	✓		✓	✓	✓			✓	✓
11.	Peer-to-peer (P2P)Trading				✓						

Note: Definitions of these services/capabilities are provided in the Appendix

AMI case study: [redacted]

[redacted] is involved in generation, transmission, distribution and retail of electricity [redacted] is headquartered in [redacted]

[redacted] Poles

[redacted] km transmission lines

[redacted] substations

[redacted] km distribution lines

Smart meters installed [redacted] million (as of 2021)

Generation | Transmission | Distribution | Retail

Capabilities

[redacted]

Source: utilities documents and website

AMI case study: [redacted]

[redacted] is involved in generation, transmission, distribution and retail of electricity. As of 2018, [redacted] reported [redacted] million customers.

[redacted] Poles

[redacted] km transmission lines

[redacted] substations

[redacted] km distribution lines

Smart meters installed [redacted] million (as of Jul'19)

Generation | Transmission | Distribution | Retail

Capabilities

[redacted]

Source: utilities documents and website

AMI case study [redacted]

[redacted]s an energy utility and through its subsidiaries is involved in electricity generation, transmission, distribution and retail. It provides its services in [redacted]. It is also involved in gas and distribution business.

[redacted] Poles

[redacted] area sub-stations

[redacted] of distribution lines

Smart meters installed (gas and electric)
[redacted] million
(as of Apr'21)

Generation | Transmission | Distribution | Retail

Capabilities

[redacted]

Source: utilities documents and website

AMI case study: [redacted]

[redacted] is a subsidiary of [redacted], and is involved in transmission and distribution of electricity through retail electric suppliers (RES) to [redacted] million customers. It is headquartered in [redacted]

[redacted] Poles

[redacted] substations

[redacted] miles of power lines

Smart meters installed
[redacted] million
(as of 2021)

Transmission | Distribution

Capabilities

[redacted]

Source: utilities documents and website

AMI case study: [redacted]

[redacted] is an integrated utility which serves over [redacted] million customers globally. It operates via four business segments namely networks, renewables, generation and supply and other businesses including gas and real estate activity

[redacted] of electricity produced

[redacted] transformer substation

[redacted] distribution lines

Smart meters installed [redacted] million (as of 2021)

Generation | Transmission | Distribution | Retail

Capabilities

[redacted]

Source: utilities documents and website

AMI case study: [redacted]

[redacted]s is a wholly owned subsidiary of [redacted] that manages 95% of the electricity distribution network in [redacted]. It serves ~[redacted] million customers.

[redacted] of electricity distributed

[redacted] generation facilities connected to grid

[redacted] electric network

Smart meters installed [redacted] million (as of 2021)

Distribution

Capabilities

[redacted]

Source: utilities documents and website

Recommended next steps

- Continue to develop a prioritized list of use cases to secure value from AMI 2.0
- Develop a clear view of requirements (people/process/technology) to support the “Now” use cases
- Consider performing a maturity assessment of key capabilities required to support AMI 2.0 and develop a plan to address gaps

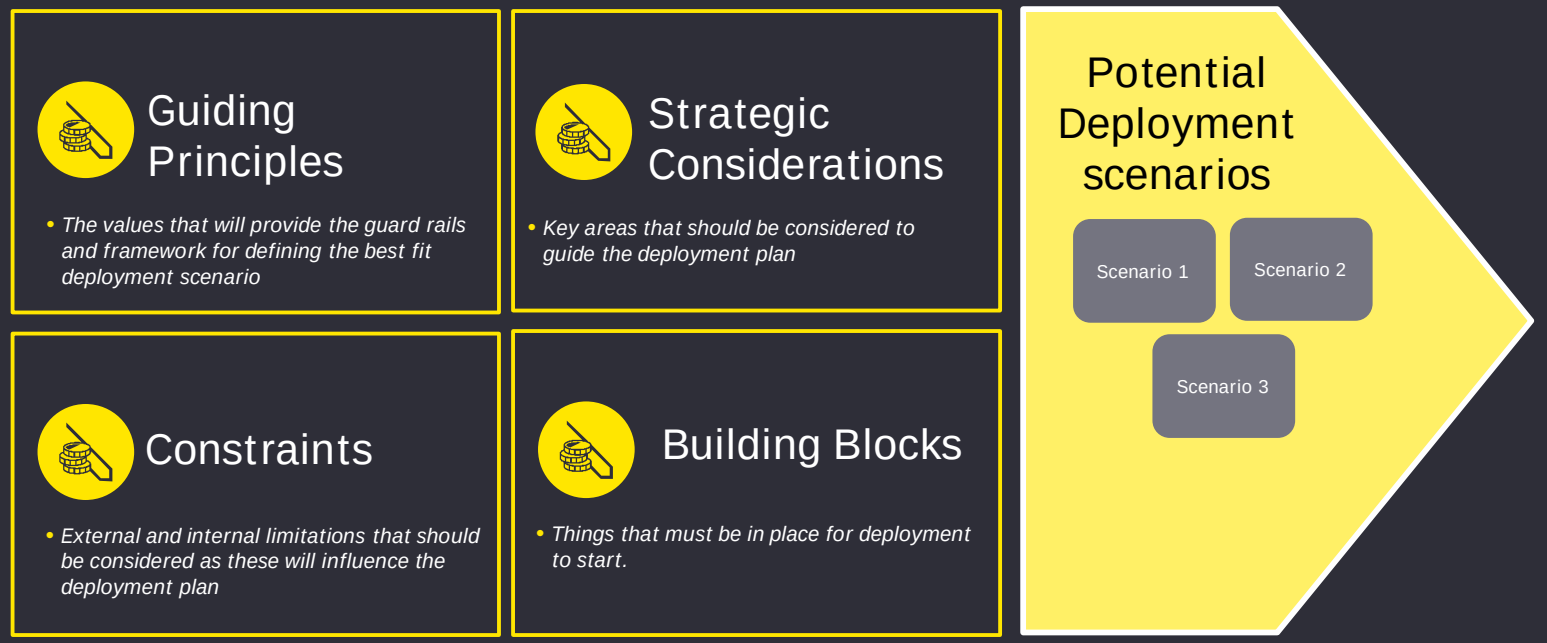
Chapter 3
Deployment Considerations

Deployment is a significant aspect in the roll-out of AMI implementations. There are many moving parts and AMI deployment requires discipline, to mitigate reputation risks. This Chapter discusses typical deployment considerations.

AMI 2.0 Deployment

Building a risk-informed Deployment Plan: Meter deployments costs are a significant portion of the total cost of an AMI project. As such, careful consideration should be given to deployment scenarios to arrive at the best-fit deployment plan for Toronto Hydro.

A deployment framework such as the one shared below provides a structured approach to evaluating deployment options and associated risk profiles. Careful consideration should be given to specific constraints, strategic considerations, things that must be in place (building blocks) to enable execution. Successful deployment planning and execution requires the engagement of multiple stakeholders – and using a framework such as the one below allows for stakeholder engagement in the definition of a Deployment Strategy.
In the following pages, we share some typical considerations for Toronto Hydro's review as you develop your Deployment Strategy.



Deployment Framework

AMI 2.0 Deployment Considerations

Illustrative

Guiding principles and a clear understanding of any constraints provide the guard rails to build a realistic, risk-managed deployment plan. The guiding principles and constraints articulated below are a starting /draft list for Toronto Hydro, and should be expanded.

Guiding Principles

Billing accuracy metrics are maintained or improved

New capabilities to be tested or piloted prior to roll-out

AMI 2.0 will drive minimal customer impact as new smart meters are rolled out.

Add

Add

Constraints

End of life meters will need to be prioritized for deployment

---

Meter inventory and deployment resources will be required to support the deployment scenario

---

Suite-meters…..

686,000 meters to be replaced

Add

AMI 2.0 Deployment: Strategic Considerations

Illustrative

Strategic considerations need to be carefully reviewed to mitigate any deployment risks.

Segmentation

What is the approach for deploying the network across the Toronto Hydro territory

Toronto Hydro Current state: The current driver for meter deployment is meter life. Beyond replacing meters, the roll-out will be by geography, across all customers.

- Have all scenarios been considered, and risks identified and mitigated?
- Will deployment be executed across multiple geographies and customer segments in parallel? Or will the deployment be sequential?
- Supply chain considerations should be factored into the Deployment Plan – will meter inventory be matched to the deployment
- Install vendor capacity should be factored into the Deployment Plan

Meter/Network Deployment Strategy

What is the approach for the comms network to meter roll out

Toronto Hydro Current state: This will be driven by the outcome of the meter vendor.

- What is the proposed approach for upgrading the network ?
- What is the proposed approach for validating meter communications and issue resolution?

Customer Engagement Approach

What is the messaging strategy and customer communications strategy

Toronto Hydro Current state: Customer engagement strategy is being defined

- Changing customer demographics and customer expectations should be factored into the approach for managing customers as a part of AMI 2.0
- When will customer communications start? When will the strategy and plan for customer communications be established?
- How will customer segmentation impact the Deployment Strategy?

Revenue Assurance

What controls need to be established to mitigate potential billing issues

- End to end testing must be executed even if back-end systems are not changing
- Clear accountability should be assigned to assess field meter and communications issues to mitigate any downstream billing impacts

AMI 2.0 Deployment: Monitoring

Monitoring is a critical success factor for the effective management of deployment activities. Effective deployment also requires pre and post-instal activities across multiple domains, such as Finance, HR etc. The Figure below illustrates typical considerations to prepare for deployment execution. The chart on the next page illustrates the complex coordination of activities that are required for deployment, across different stakeholder groups. This level of complex coordination drives the need for effective program management as well.

Monitoring Dimensions	Pre-Install	Install	Post Install
Customers [Customer services]	Are customers engaged and bought in to the upgrade?	Does our customer journey positively impact customer satisfaction?	What is our approach to address customer concerns and queries?
Operations [Field, Supply Chain, Operations]	Is our scheduling function performing effectively?	Are we installing meters efficiently?	Is Field performance being effectively managed and continuously improved?
People	Are our people engaged and bought into smart?	Do our people have the right skills and training to fulfil their roles?	What is our approach to delivering change?
Finance	Are we operating at a level which is financially viable?	What is our unit cost per installation?	What are our major cost areas and revenue opportunities?
H&S and compliance	Are we operating safely?	Are we fully compliant with smart metering codes of conduct?	Are we on track with volume targets?

Illustrative

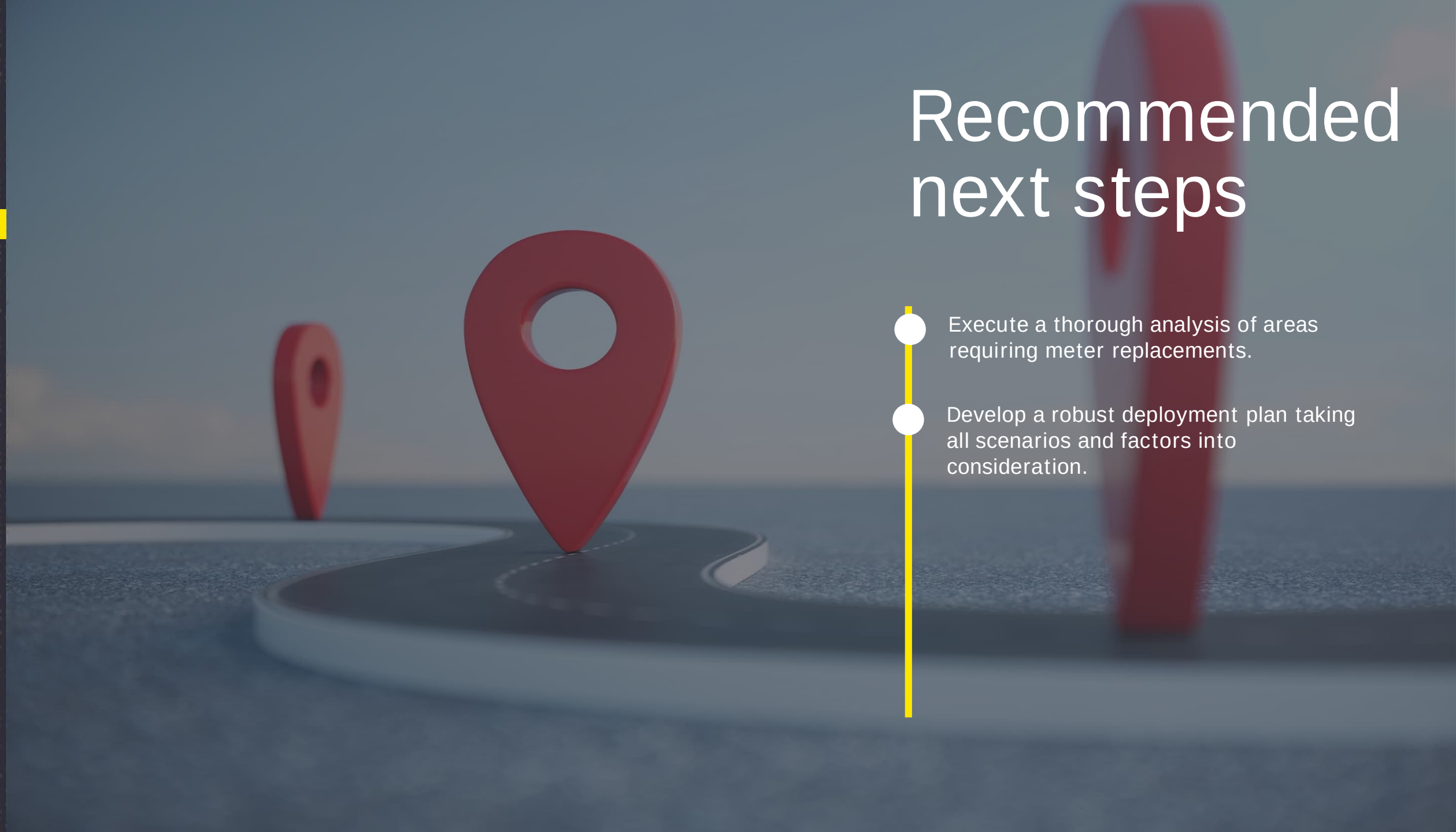
Typical KPIs to be tracked:

- Abandonment rate
- Customer complaints
- Installation and travel time
- Conversion rate
- Meter failures
- Customer eligibility
- Assets and logistics
- Staff headcount
- Response rate
- Unit cost

AMI 2.0 Deployment: Major Execution Activities

Illustrative

Business Process	Manage Deployment								
Value Chain	Plan to Pre-Install					Install to Enable			
Business Process Flow	Define Deployment Strategy	Plan Meter Deployment	Plan Network	Plan Operations	Execute Pre-Installation Activities	Prepare Meter Installation	Install Meter	Commission & Enable Meter	Manage Smart Meter Customer
Operational Process Flow	Set project objectives and targets	Develop deployment plan	Develop network plan	Manage asset plan	Develop Service Order (SO) plan	Execute SO plan	Perform site inspection	Manage post installation plan	Manage SRs & complaints
	Establish deployment strategy	Develop OPC list	System dimensioning	Manage supply chain (meter, network, installer etc)	Schedule appointment	Perform toolbox briefing	Perform meter replacement	Photo audit post installation	Manage adhoc customer queries and complaints
	Define network levers and requirements	Conduct customer analysis	Nominal design approval	Procurement of assets	Brief installers	Perform equipment checks	Log RTU cases (unable to complete work)	Manage meter commissioning and exceptions	Analyze VoC sentiments and feedback
	Define customer levers and requirements	Confirm network technologies for deployment areas	Line of sight study	Prepare list of addresses for letter rendering	Commission network sites	Log RTU cases (unable to access meters)	Perform quality check	Monitor and report AMI network health	Monitor social media
	Define change management levers and requirements	Engage customers for RF pole installation	Finalize network design	Install network	Verify network coverage		Perform QA (Supervisor spot check)	Assess tuning readiness	Educate customers on smart meter offerings
	Define technical levers and requirements	Engage customer (planning, engagement, unlock)	Network design approval	Assign manpower according to plan	Print customer letters		Manage meter scrap	Perform network tuning	Manage billing and invoicing
	Set project KPIs	Conduct stakeholder analysis	Handle stakeholder rejection (AMI Network)		Render letter		Meter discovery	Manage updates to business	Monitor bill estimation
		Conduct change impact assessment	Develop engagement plan		Inform business stakeholders		Monitor meter healthiness (e.g registry read, load profiles etc)	Manage business escalations and feedback	
		Register master monitoring parameter	Execute engagement		Obtain network status for planned deployment areas		Process daily SitRep data	Transition areas / meters to BAU	
		Consolidate integrated project plan	Confirm SMOC and IT&S alignment on monitoring plan					Manage global key exchange exceptions	
		Engage internal and external stakeholders						Commission, clear alarm, GKE etc	Prepare management reports and review
								Manage meter enablement	Monitor budget



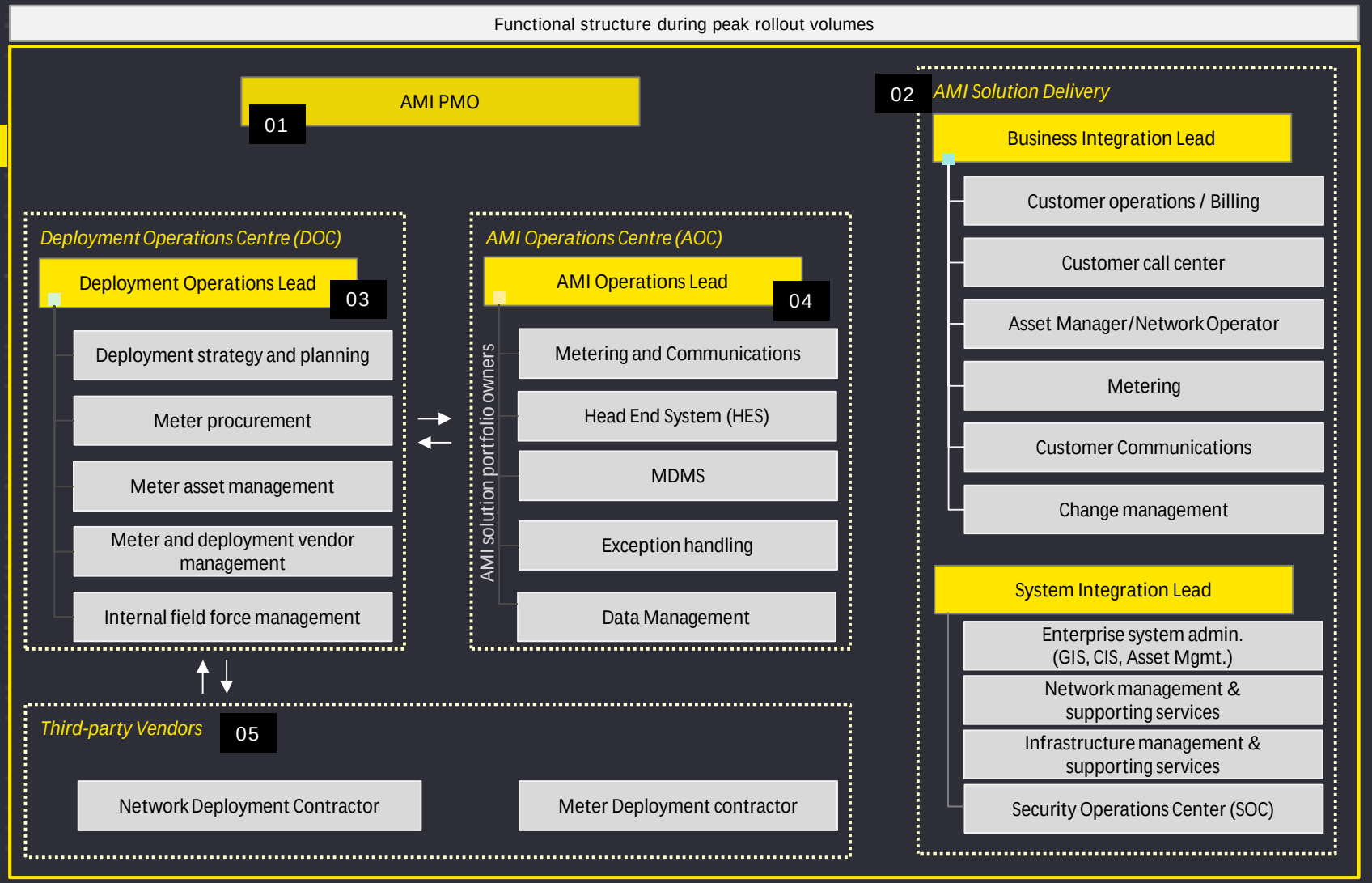
Recommended next steps

- Execute a thorough analysis of areas requiring meter replacements.
- Develop a robust deployment plan taking all scenarios and factors into consideration.

Chapter 4
AMI 2.0 Program Structure Considerations

AMI programs are more than an infrastructure roll out or upgrade. They drive change across the organization. The level of change is driven by the business capabilities proposed to be deployed by the Utility as well as fundamental business process changes required by an AMI 2.0 implementation. Careful consideration should be given to the anticipated change, and an AMI project execution organization should be established to implement and sustain AMI 2.0. This chapter identifies a typical AMI 2.0 program organization for Toronto Hydro's consideration.

Typical AMI Program Organization Model



Procurement

1. Meter orders are submitted by procurement (in partnership with the Deployment Operations center (DOC) to the meter vendor
2. Meters are delivered to warehouses (provided by the install vendor), where the DOC performs meter acceptance testing
3. Upon the shipment being accepted, the order is processed into MDMS and the HES by the DOC

Installation

4. The DOC determines installation routes and provides batches of work orders to the deployment contractor
5. Appointment scheduling is managed by the installation vendor in partnership with the DOC
6. Meter technicians receive work assignment and process each completed installation

Commissioning

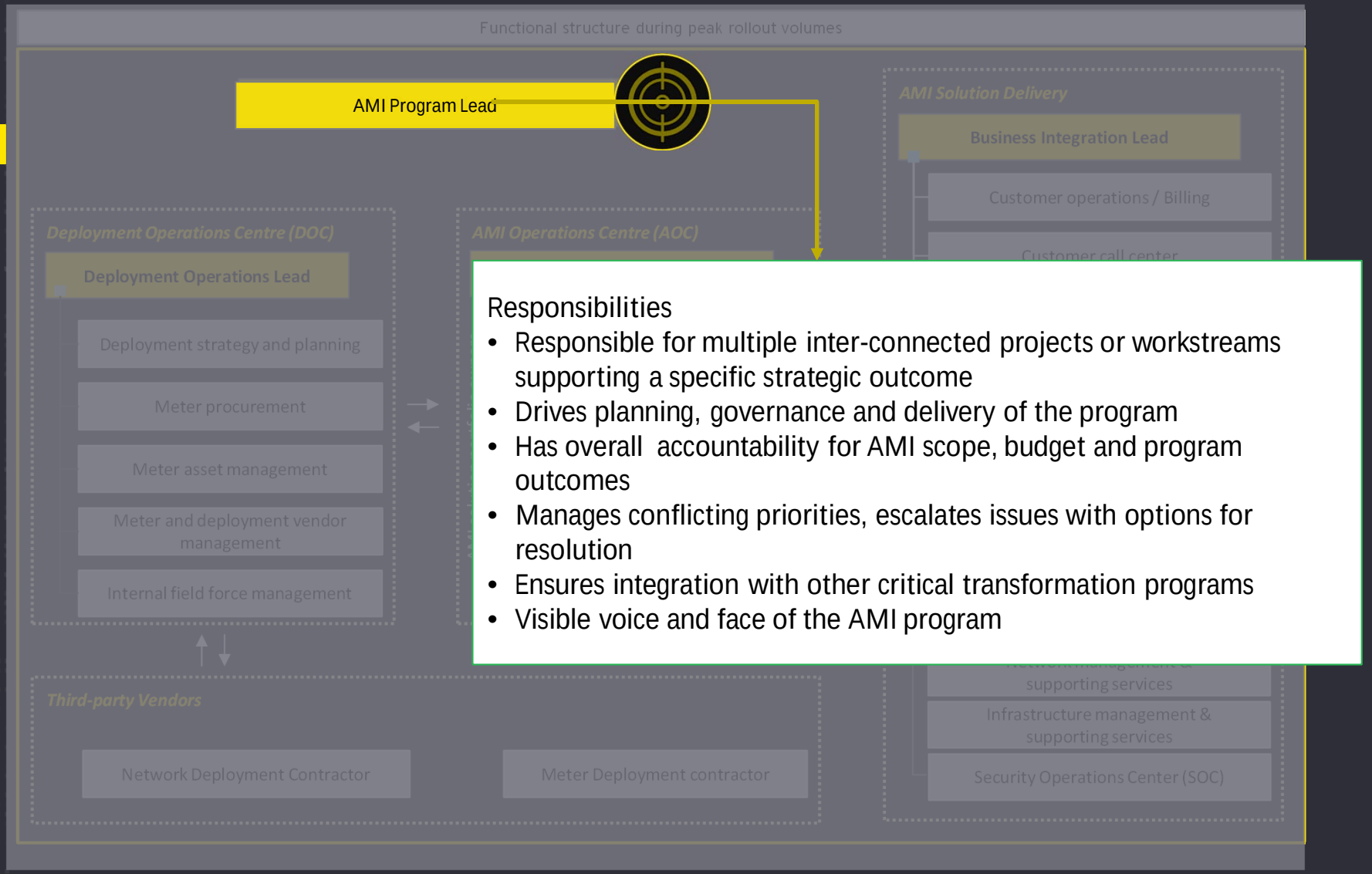
7. These meters enter a *QA Ready* status, and photos of the installation are reviewed by the AOC
8. If this review stage is passed, the meters enter a *QA Accepted* status, and a nightly batch process moves them over into the CIS and the MDMS
9. The meters undergo two validation tests once within the MDMS: (1) Successful first read, (2) 80% read quality over 5 day period. If successful, they now enter an *Installed* status

Operations

10. The AMI Operations center (AOC) undertakes reporting and data analysis to identify and resolve exceptions
11. The SOC and IT Support Services functions have dedicated smart program resources to handle specific AMI-related activity
12. Customer complaints are handled by the customer call center. Smart-related issues are handled on an ad-hoc basis via calls and emails to the AOC

*Revenue protection role will come across from the business

Typical AMI Program Organization Model – Program Management



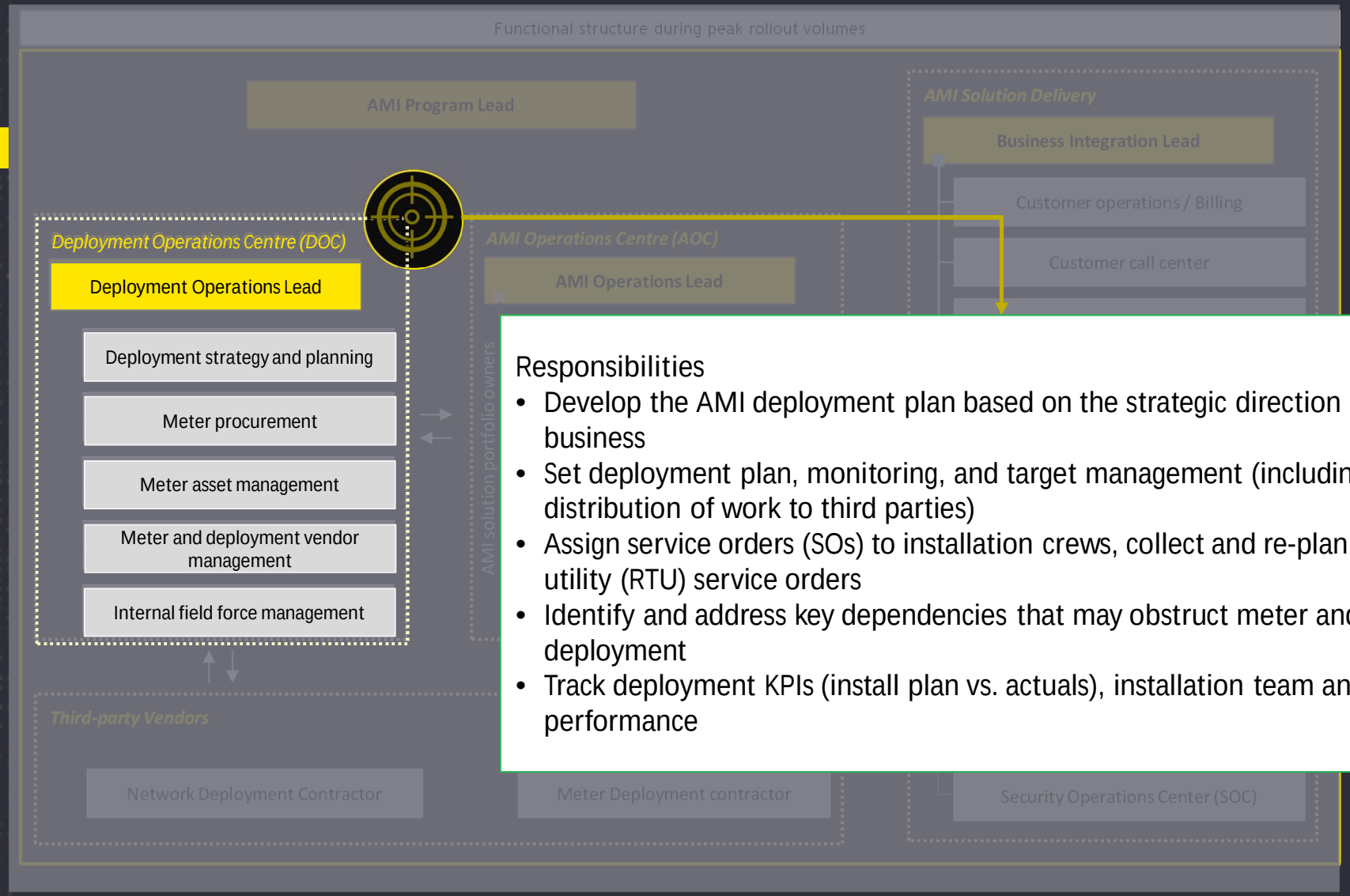
Responsibilities

- Responsible for multiple inter-connected projects or workstreams supporting a specific strategic outcome
- Drives planning, governance and delivery of the program
- Has overall accountability for AMI scope, budget and program outcomes
- Manages conflicting priorities, escalates issues with options for resolution
- Ensures integration with other critical transformation programs
- Visible voice and face of the AMI program

The AMI Project Management function is accountable for managing all aspects of the program.

AMI programs are a multi-year journey, impacting multiple stakeholders. A project management function is a critical success factor to coordinate across multiple workstreams and stakeholders.

Typical AMI Program Organization Model – Deployment Operations



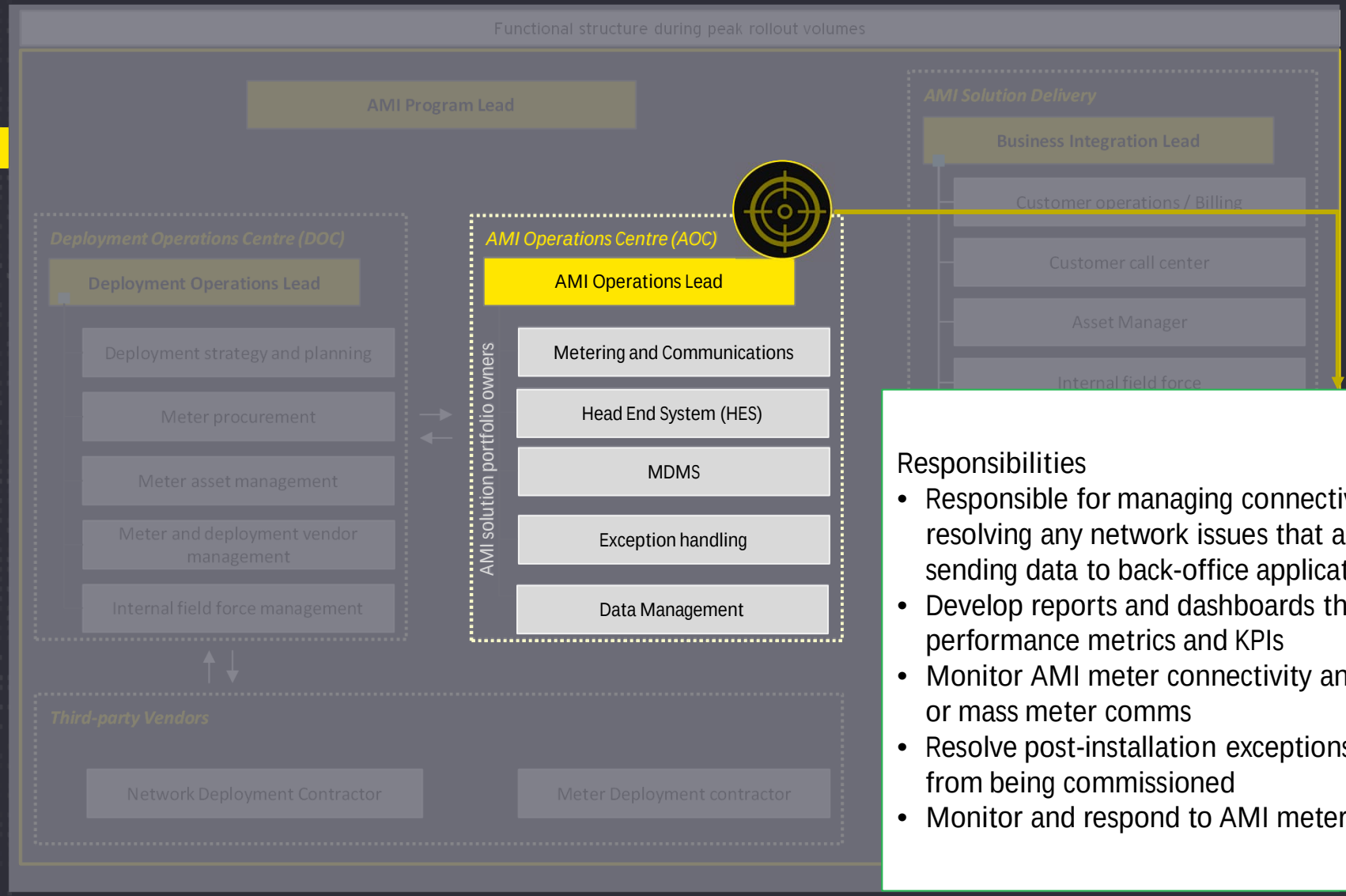
Responsibilities

- Develop the AMI deployment plan based on the strategic direction of the business
- Set deployment plan, monitoring, and target management (including distribution of work to third parties)
- Assign service orders (SOs) to installation crews, collect and re-plan return to utility (RTU) service orders
- Identify and address key dependencies that may obstruct meter and network deployment
- Track deployment KPIs (install plan vs. actuals), installation team and vendor performance

The Deployment Operations Center is accountable for the install of meters and comms per the Deployment Plan.

Meter and network deployments account for a significant portion of the total costs of an AMI program. A carefully evaluated deployment plan is a must-have to avoid cost overruns as well as to mitigate any customer issues.

Typical AMI Program Organization Model – AMI Operations



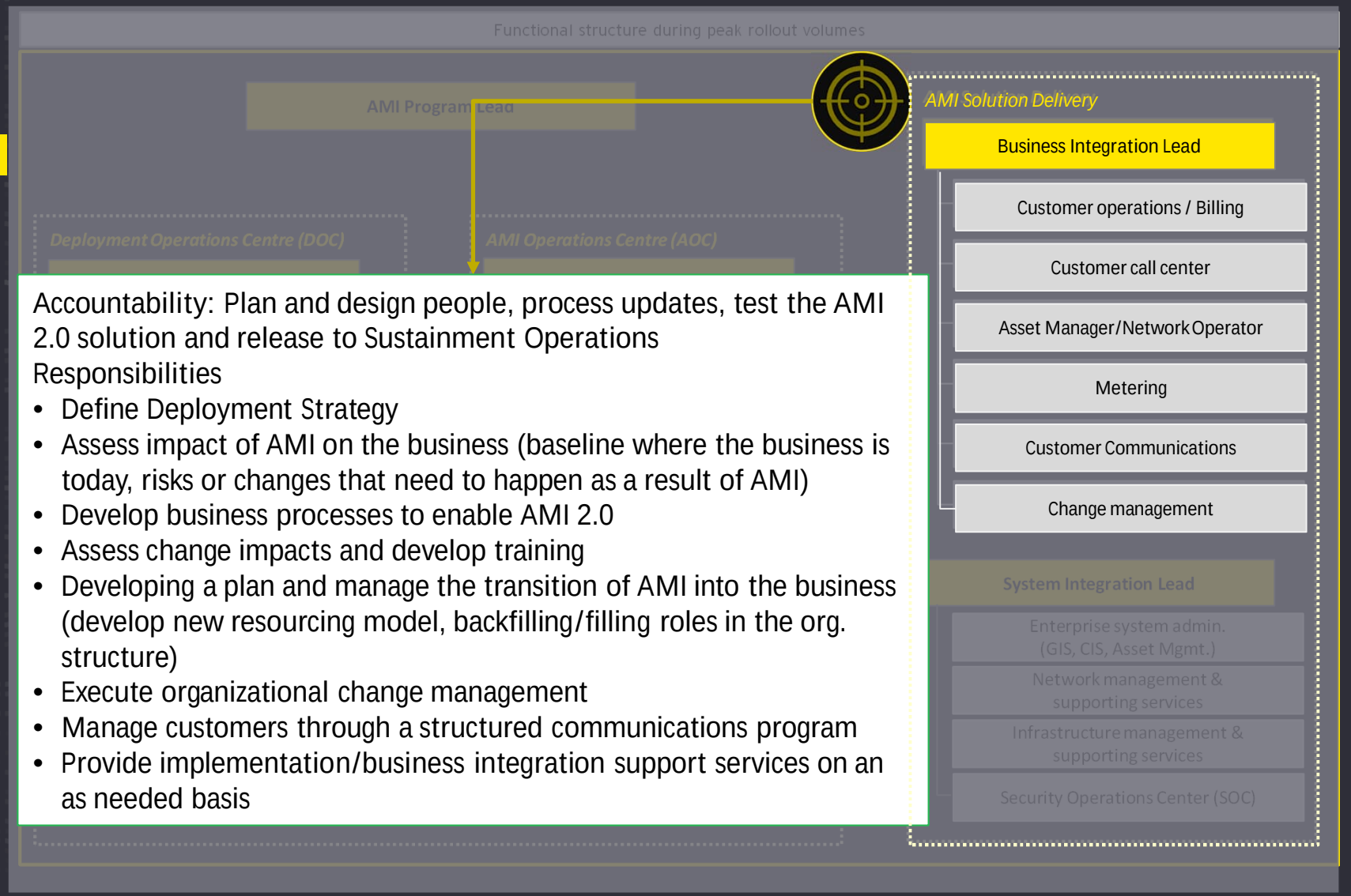
The AOC is accountable for revenue assurance, meter incident support.

Monitoring of installed meters to validate communications, alerts and other designed capabilities, as well as ability to generate accurate bills requires coordination across multiple systems and stakeholders. Lack of end to end ownership will result in incomplete root cause analysis and issues not being resolved in a timely manner.

Responsibilities

- Responsible for managing connectivity of the AMI system and resolving any network issues that are preventing AMI meters from sending data to back-office applications
- Develop reports and dashboards that support with monitoring performance metrics and KPIs
- Monitor AMI meter connectivity and respond to issues with individual or mass meter comms
- Resolve post-installation exceptions that are preventing AMI meters from being commissioned
- Monitor and respond to AMI meter events and alarms

Typical AMI Program Organization Model – Business Integration

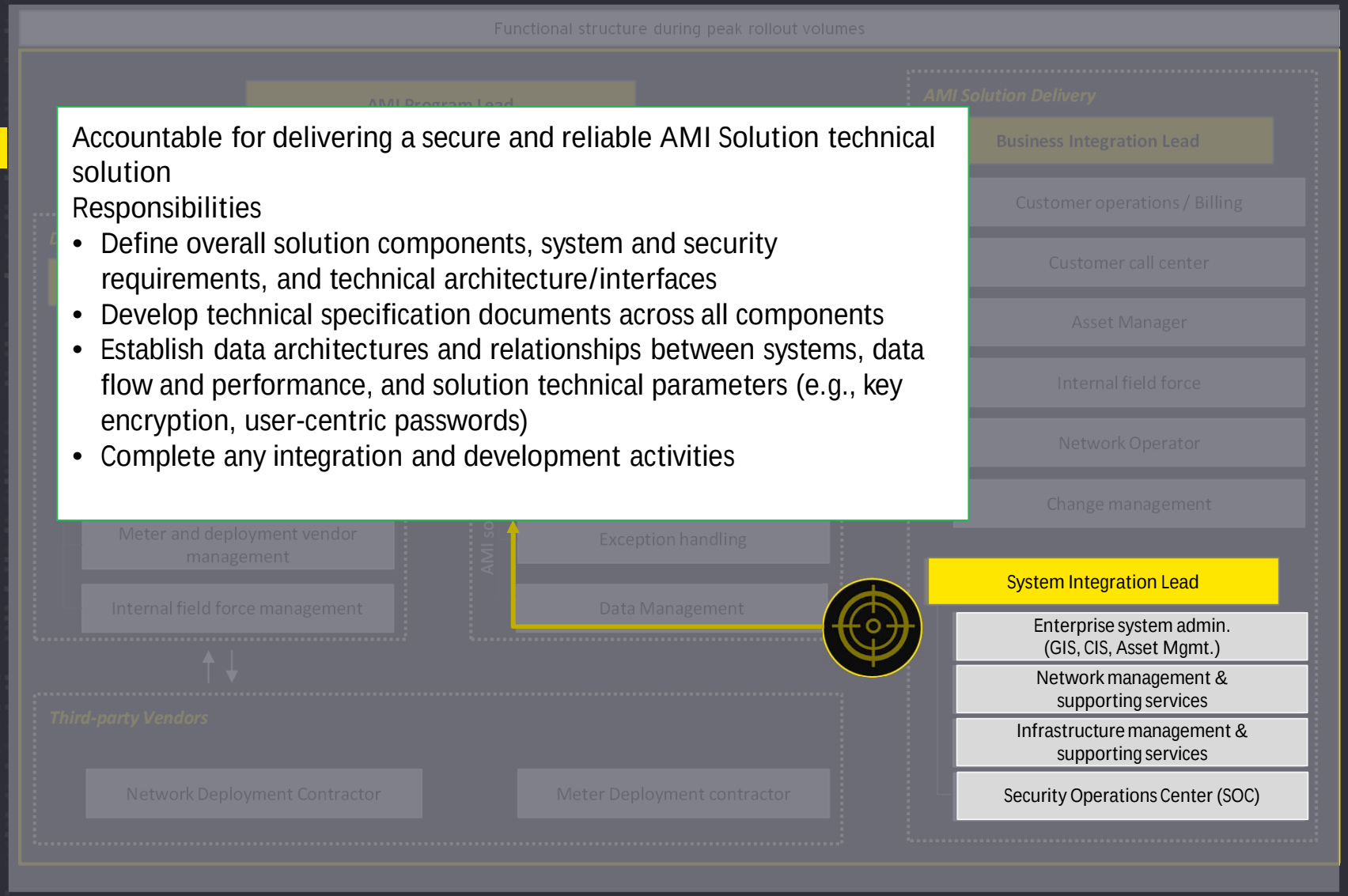


Accountability: Plan and design people, process updates, test the AMI 2.0 solution and release to Sustainment Operations

Responsibilities

- Define Deployment Strategy
- Assess impact of AMI on the business (baseline where the business is today, risks or changes that need to happen as a result of AMI)
- Develop business processes to enable AMI 2.0
- Assess change impacts and develop training
- Developing a plan and manage the transition of AMI into the business (develop new resourcing model, backfilling/filling roles in the org. structure)
- Execute organizational change management
- Manage customers through a structured communications program
- Provide implementation/business integration support services on an as needed basis

Typical AMI Program Organization Model – System Integration



Accountable for delivering a secure and reliable AMI Solution technical solution

Responsibilities

- Define overall solution components, system and security requirements, and technical architecture/interfaces
- Develop technical specification documents across all components
- Establish data architectures and relationships between systems, data flow and performance, and solution technical parameters (e.g., key encryption, user-centric passwords)
- Complete any integration and development activities

AMI 2.0 Program Structure Case Studies



The following sub-section shares case studies from utilities across the globe with respect to organizational constructs deployed to implement their smart meter programs.

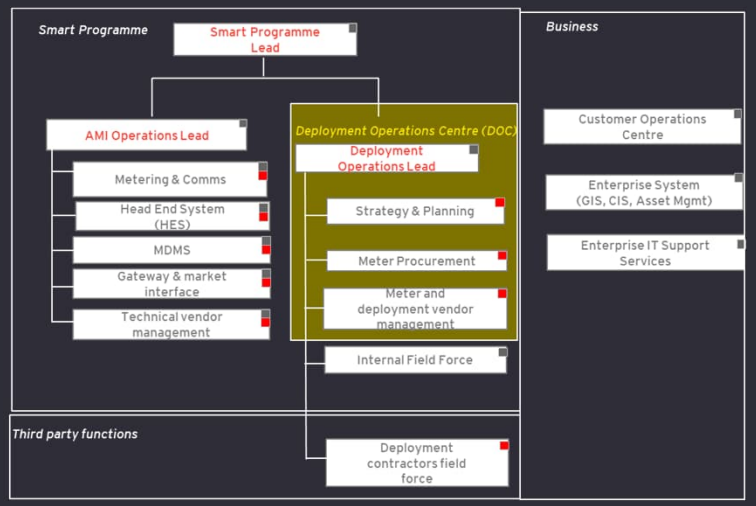
Case Study 1

- Utility-1 deployed 700,000 smart meters over a span of 8 years. The utility established its AMI, Deployment and Vendor Management capabilities within the smart meter deployment programme. AMI and Deployment resources were centralised within two Operations Centres (AOC and DOC) which sat on the same floor and interacted closely. Vendor Management capabilities were split across the Deployment and AMI teams.

Key takeaways:

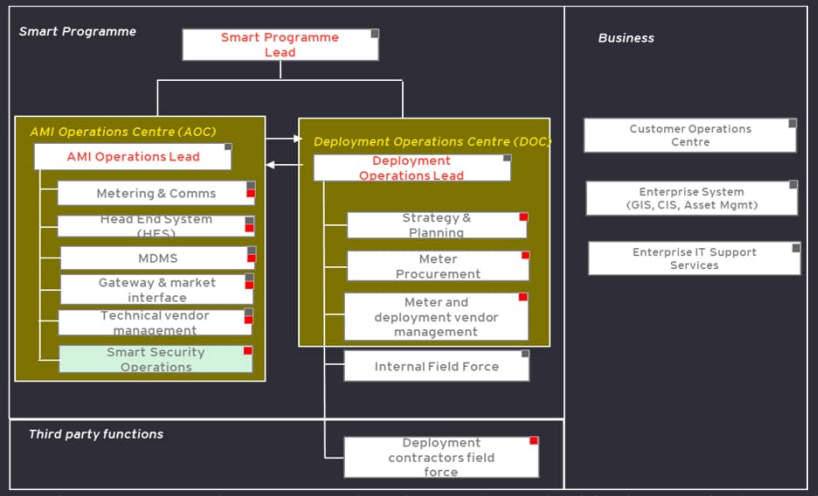
- ✓ Ensure close coordination between Deployment & AMI teams.
- ✓ Establish Security Operations Centre within the programme.
- ✓ Flex team resourcing as requirements change.
- ✓ Develop and maintain an operational reporting dashboard.

Early rollout



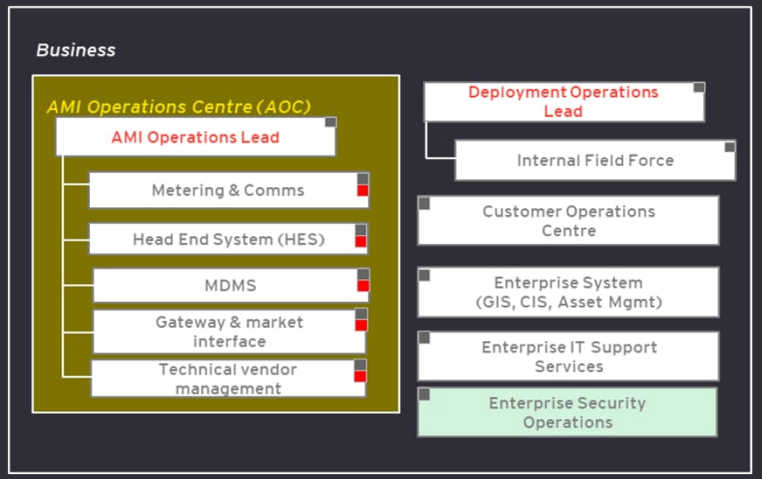
- During the early roll-out phase, the utility heavily outsourced its deployment operations early on due to a lack of internal capability. The deployment strategy and planning, meter procurement, management for the utility's field force and vendor management of the deployment contractors was managed by the third-party.
- AMI teams were not centralised into an operations centre, which resulted in a lack of coordination and difficulty in identifying the source of issues. As a result, these AMI teams were brought together into an operations centre situated on the same floor as the Deployment Operations Centre (DOC) during the mass roll-out.
- There was no Security Operations capability until a major breach incident occurred around two years into deployment.

Peak rollout volumes



- The AMI Operations Centre (AOC) was formed with the Leads for each technology to represent their respective teams. The AOC Lead would coordinate an investigation of any major issues across the entire team. It was evenly split between internal and external resources.
- The AOC coordinated closely with the DOC and field force during mass rollout after issues began to arise from a lack of communication (majorly due to the inability to accurately anticipate and mitigate installation issues).
- A generalist Vendor Management function sat within the DOC, focused on meter procurement, hardware faults and managing the relationship with the deployment contractors. A technical Vendor Management function sat within the AOC, with specialised resources focused on each technology vendor
- A team of IT security (Security Operations) were brought into the AOC to identify and mitigate security issues following the major breach.

Programme Completion



- As the smart programme neared completion, most non-AMI functions were absorbed into the wider business.
- The AOC remains as a standalone function in the same organisational structure as during the rollout. Resourcing for each technology area varied based on requirements.
- Security Operations were moved out of the AOC into the wider business, called the Enterprise Security Operations.
- The DOC was disbanded and capabilities were dispersed into the wider business, while all vendor management capabilities were absorbed into the AOC.

Legend
Internal teams | External teams | Mixed teams

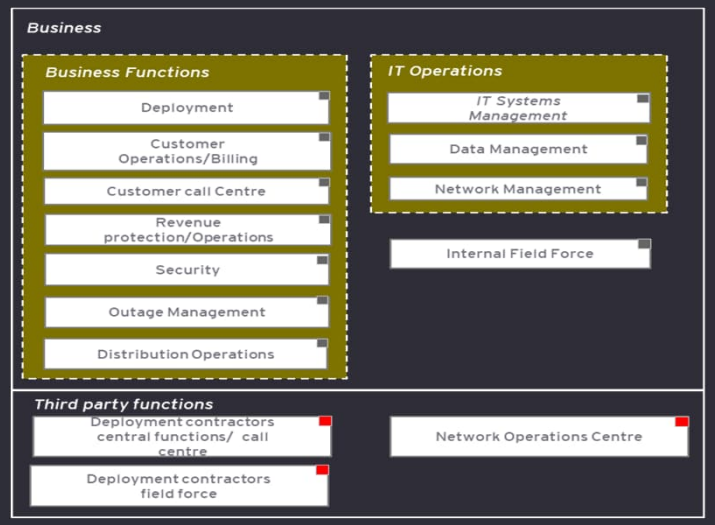
Case Study 2

- Utility-2 deployed 1.6 million electric smart meters over a span of 9 years. Majority of the meter deployment was performed by the deployment contractors. Most business functions were resourced internally, with some external support from the network operator and systems integrator. The utility formed an Insight and Control Centre as the hub of its smart meter deployment programme, performing the activities of both a DOC and SMOC and acting as an integration layer across the various business functions, using data insights to inform decision making. Its role expanded over time as various issues were experienced.

Key takeaways:

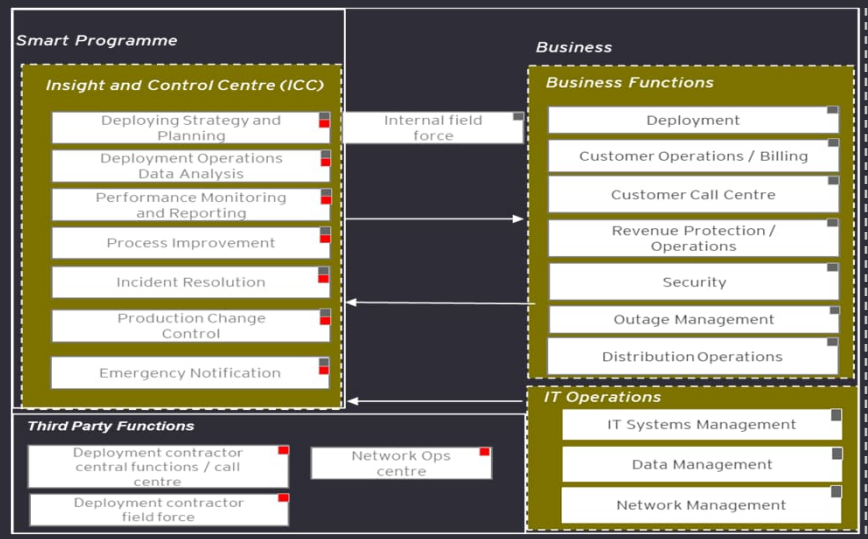
- ✓ Maintain a close working relationship with AMI / Comms vendors.
- ✓ Place data insights at the centre of decision making.
- ✓ Adopt an agile approach to allow capabilities to flex over time.
- ✓ Build ownership for outcomes into the organisational structure.
- ✓ Anticipate and plan for a large volume of exceptions.

Early rollout



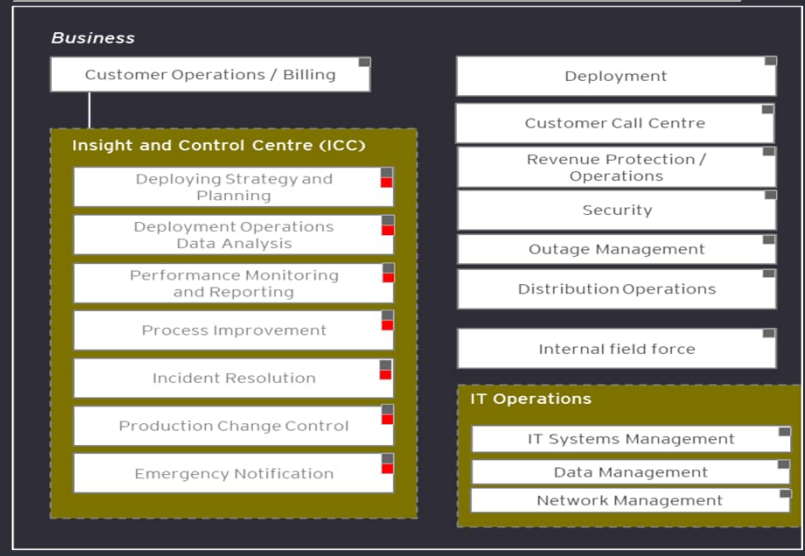
- During the smart meter kick-off, there was no central team sitting within a smart programme to coordinate across business units
- This dispersed model came under strain after an influx of major exceptions and operational issues during early deployment where there was an inability to identify the root cause. Thereafter the Insight and Control Centre (ICC) was set up.
- The leads for each of the business functions would attend meetings hosted by the ICC with a focus on resolving cross-functional issues. However, these meetings were often unproductive during the early rollout due to poorly defined ownership of outcomes and a lack of data to drive accountability
- Vendor management was the responsibility of the Deployment team, but the ICC would support this activity through delivering data insights to challenge their performance.

Peak rollout volumes



- The ICC was fully scaled during the peak roll out. It was successful due to its ability to analyse data to identify the most critical issues and drive rapid resolution.
- As more data became available, cross-functional issue resolution became more productive, and the ICC was able to drive accountability for outcomes and issue resolution.
- The AMI network vendor, deployed dedicated resources to the utility to perform data extracts and assist with network issue resolution
- Commissioning of installed meters was initially the responsibility of the Customer Operations team, but this became a ICC function after a large number of meters were unable to attain a billing read.

Programme Completion



- Due to the sustained volume of exceptions, ICC capabilities were not dispersed into the business, but were maintained within a scaled down ICC.
- The Network Operations Centre was moved out of the utility premises.

Legend
Internal teams
External teams
Mixed teams

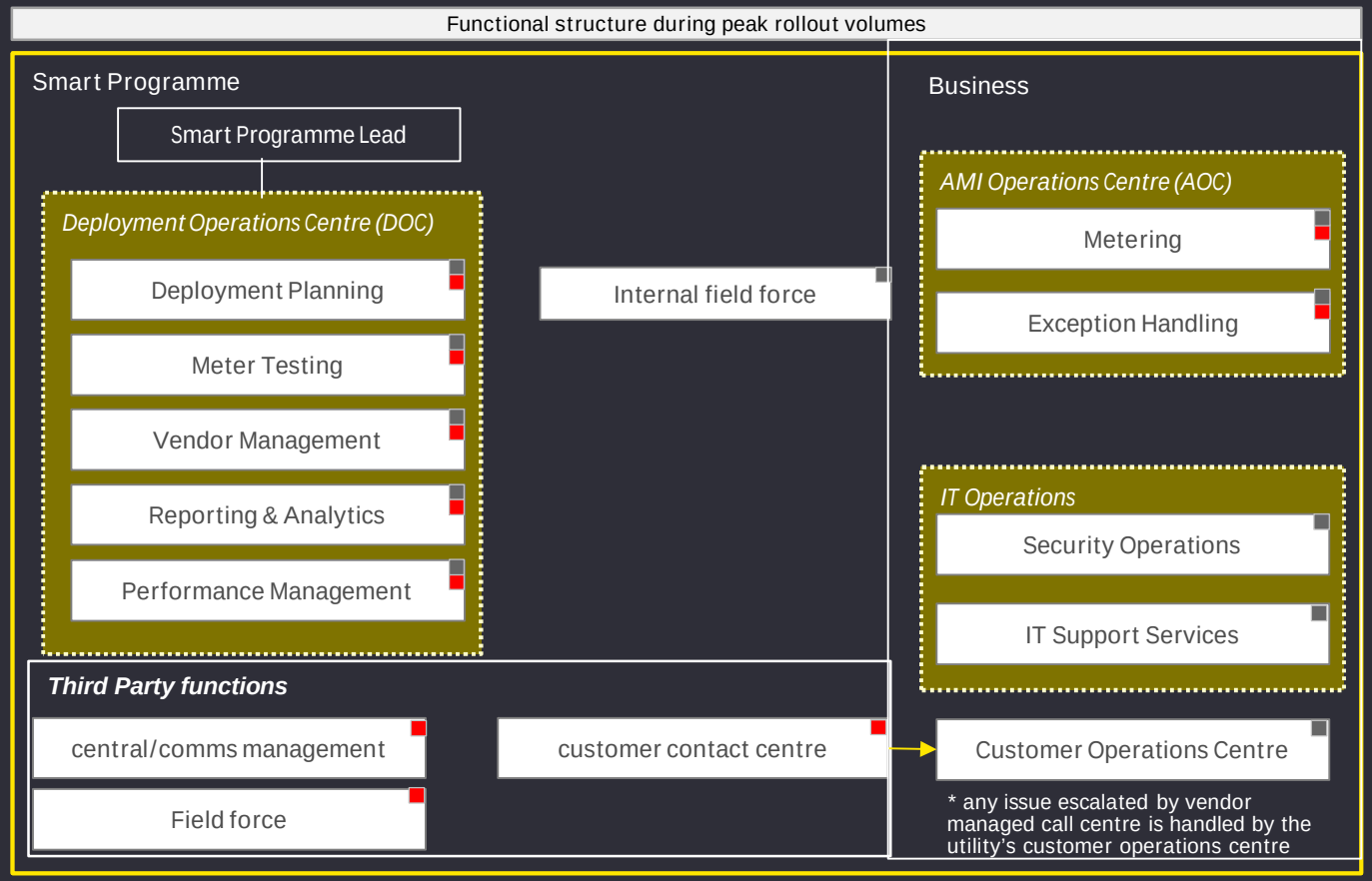
Case Study 3

- Utility-3 is currently on its journey of deploying 1.1million electric smart meters for its customers. The AMI 2.0 deployment kicked off in 2016 is expected to see completion by the end of 2022. The utility already implemented AMI1.0 in its network operations. The utility has adopted a lean operating model, whereby most activity is coordinated by the Deployment Operations Centre (DOC), and operations are heavily outsourced to the deployment vendor. The AMI Operations Centre (AOC) has been established from the existing AMI (1.0) Operations Centre within the wider business. Almost all meter deployment activity has been outsourced to the vendor with the remainder undertaken by the internal field force within the utility.

Key takeaways:

✓ Monitor less metrics – but make sure they are the right one.

✓ Ensure there is shared ownership for operationalising meters.



Chapter 5
Next steps and recommendations

The Chapter provides recommendations related to some next steps for Toronto Hydro consideration, as Toronto Hydro transitions from the AMI Preparation phase to the AMI Execution phase.

AMI 2.0 Roadmap

STAGE: INITIATE ››› STAGE: PREPARE ---------- STAGE: EXECUTE

1 High-level AMI Execution Plan
- Major activities
- Timelines
- Dependencies
- Accountabilities

2 Use Case prioritization
- Align on “next” use cases
- Determine what is needed to enable “next” use cases

3 Secure Meter Vendor
- Release RFP
- Complete evaluation
- Secure contract

4 Establish Deployment Strategy & Plan
- Develop Strategy
- Define scenarios
- Align on plan

● *Meter vendor selection will drive refinement to the deployment plan – incumbent vs new*

5 Detailed AMI Execution Plan
- Major activities
- Timelines
- Dependencies
- Resources

● *Deployment Plan: timelines for install*

● *Use cases: people/process/technology changes required*

6 Secure Install Vendor
- Develop requirements
- Execute procurement

● *Deployment Plan will establish requirements*

7 Establish Project Operating Model
- Define project organization
- Define resource requirements

● *Use Cases will impact Operating model: change required*

● *Meter vendor will impact Operating model: change required to upgrade network*

8 Secure resources
- Identify skills
- Develop resource plan
- Secure resources

9 Complete Solution Design
- Complete approach for solution design
- Execute Solution Design

● *Use cases/AMI 2.0 capabilities proposed to be delivered*



AMI 2.0 brings your strategies to life

- Grid modernization roadmap
- Customer experience roadmap

AMI 2.0 Roadmap: recommended early start activities

#01

AMI 2.0 Project Roadmap

Establish an overall execution plan for AMI 2.0 that will enable Toronto Hydro to orchestrate the right activities and resources at the right time across the organization as well as externally. Such a plan should address a variety of elements including:

- Major program activities required to initiate execution
- Procurement of 3rd party vendors for deployment (D on Deployment Strategy)
- High-level change impacts as a result of AMI 2.0 to(people /process /technology (dependency on capabilities to be delivered by AMI 2.0 "Now")
- Program execution structure required to execute AMI 2.0
- Identify roles and resources required

#02

Use Case Prioritization

Validate and align on AMI 2.0 use cases across Toronto Hydro stakeholders.

- Align on capabilities and functionality to be delivered "now", "Next" and "Beyond"
- Assess implications across people, process, technology and data to identify any gaps
- Develop a roadmap for capabilities to be delivered over time

#03

Deployment Strategy and Plan

Establish a Deployment Strategy and Plan based on a structured approach, considering various options and risk profiles for each option.

- Define overarching guiding principles
- Align on the Customer Communications strategy
- Define revenue protection strategy
- Identify deployment constraints
- Identify and evaluate potential deployment scenarios and associated risk profiles to arrive at the best-fit Deployment Plan
- Finalize Deployment Strategy and Plan

Value to Toronto Hydro

- ✓ A well-articulated plan will provide a clear and common understanding of major activities, dependencies and timelines.
- ✓ Will enable resource fulfilment as well as execution to well-understood timelines.
- ✓ Visibility to major activities will allow for any course-correction of proposed activities and clear communications across all internal and external stakeholders

- ✓ Alignment on AMI 2.0 use cases to enable Toronto Hydro Grid Modernization and Customer strategies
- ✓ A roadmap of use cases and capabilities that will support an actionable plan for Toronto Hydro

- ✓ A carefully-developed deployment strategy will provide Toronto Hydro with confidence in your execution approach.
- ✓ It will allow Toronto Hydro to provide clear requirements to 3rd party vendors through any formal procurement actions (such as peak install volumes).

Appendix



Toronto Hydro smart meters overview

Source: information provided by Toronto Hydro

CLASS	# OF METERS
1-PHASE	561643
3-PHASE	37041
3-PHASE DELTA	6803
NETWORK	78970
TOTAL	684,457

CLASS	TX or SC	FORM_NBR	# OF METERS
1-PHASE	SC	1S	606
1-PHASE	SC	2S	556671
1-PHASE	TX	3S	4366
3-PHASE	SC	12S	26
3-PHASE	SC	16S	33443
3-PHASE	TX	N/A	83
3-PHASE	TX	35S	1223
3-PHASE	TX	36S	1553
3-PHASE	TX	9S	713
3-PHASE DELTA	SC	12S	6803
NETWORK	SC	12S	78970

MODEL	# OF METERS
A3_ILN	3914
A3RL	33260
A3TL	1134
R1S	434297
R2S	109999
R2S600	6803
R2SD	73381
RU	302
RUD	21367

Tentative Meter Deployment Timeline

Source: information provided by Toronto Hydro

CLASS	2023	2024	2025	2026	2027	2028
1-PHASE	84841	114362	142664	98903	92379	28494
3-PHASE	83	0	3856	5733	24713	2656
3-PHASE DELTA	0	0	0	0	0	6803
NETWORK	0	0	12084	53843	8165	4878
TOTAL	84924	114362	158604	158479	125257	42831

Toronto Hydro AMI 2.0 Use Cases Prioritization activity output

Page 12 of this report provides a summary of the approach used to prioritize Toronto Hydro use cases. The attached file is the output from that use case prioritization session.



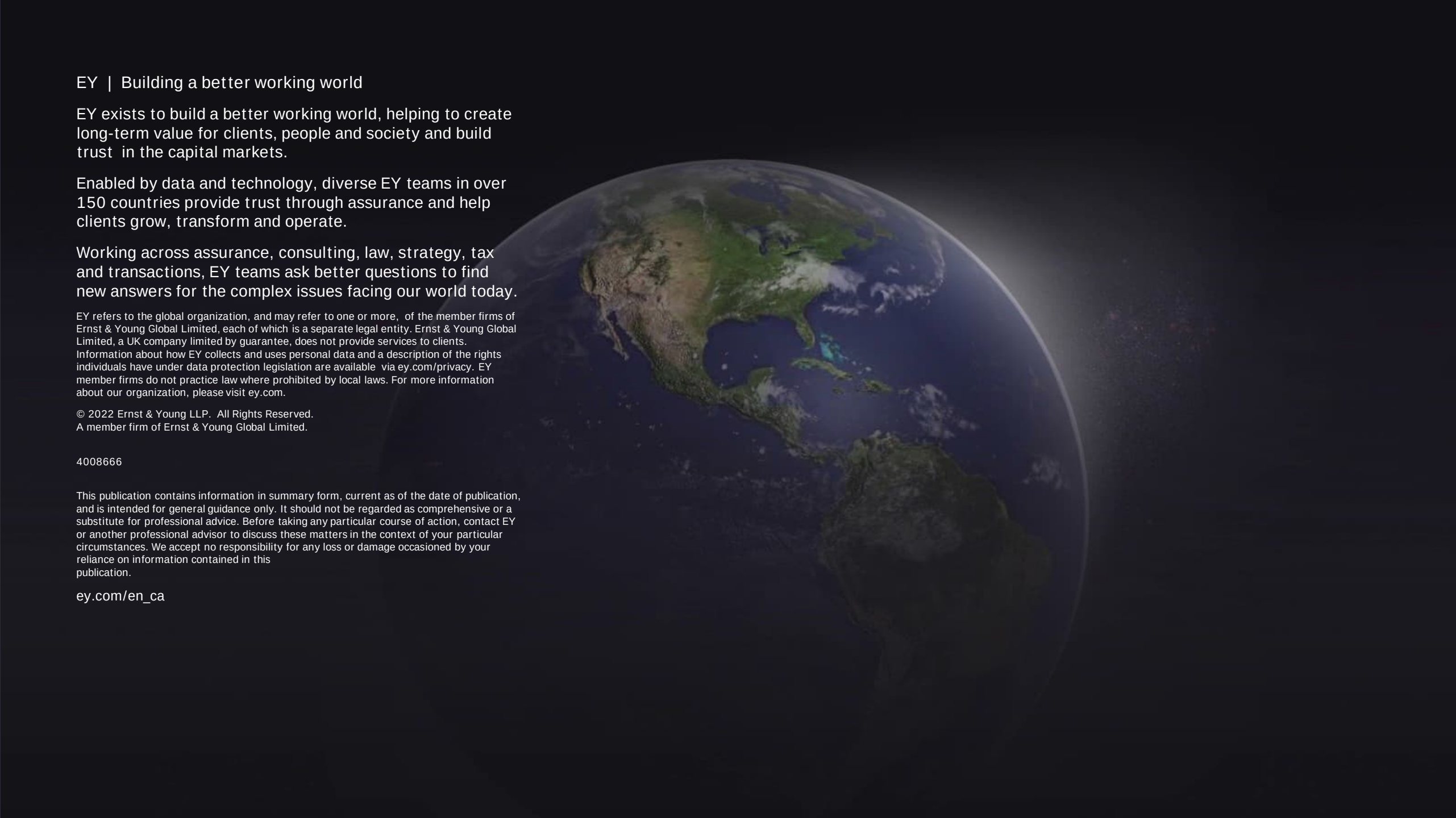
EY - TH AMI 2.0 Use Cases Prioritization & Discussion 8.11.2022.pdf

MURAL Session Link:
https://app.mural.co/t/eystarter4106/m/eystarter4106/1660053179853/0e5008f5bc11044d5ae952895449cac7bb320f65?sender=u4c81af43644093e85a438865

AMI 2.0 Case Studies: Summary of the capabilities deployed by Utilities globally

Page 20 of this report provides a summary of some use cases deployed by utilities globally. The Table below provides a definition of the use cases listed on Page 20.

#	Services	Description
1.	High Bill Alert to Customers	Notification to customers once bills/consumption exceeds set thresholds
2.	Outage Alert to Customers	Notification to customers of planned and unplanned outages
3.	Net Energy Metering (Renewable Energy)	Energy produced from the solar PV installation will be consumed first, and any excess will be exported to utility at prevailing displaced cost.
4.	Outage Integration with ADMS	Ability to manage outages detected (received) from smart meters, respond accordingly to restore power
5.	Outage Visualization	Visualization of outage information on a dashboard
6.	Technical Losses and Non-Technical Losses	Analysis and analytics to reduce Technical Losses and Non-technical Losses
7.	Demand Response – Customer	Enable DR offering to commercial OPC customers (allow utility to control buildings and enact voluntary DR)
8.	Demand Response – Operations	Enable DR capability to address immediate operational emergencies to stabilize grid operations
9.	Volt/ Var Optimization	Increase Grid Efficiency through Regulation of voltage to optimum levels and adjust power factor to reduce distribution losses
10.	Power Quality	The degree to which the voltage, frequency, and waveform of a power supply system conform to established specifications
11.	Peer-to-peer (P2P) Trading	P2P trading platform to allow prosumers to trade energy with each other



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Ernst & Young LLP
Ernst & Young Tower
100 Adelaide St W, P.O. Box 1
Toronto ON, M5H 0B3

Tel: +1 416 943 3000
Fax: +1 416 943 3767
www.ey.com/ca

Building a better working world

Toronto Hydro Corporation
14 Carlton Street #6
Toronto, Ontario
MB5 1K5, Canada

14 March 2024

Re: Toronto 2025-2029 General Rate Application

To whom it may concern,

This covering letter is provided in respect of the EY documents, described below, which are being disclosed in respect of the above-noted rate application hearing (the "Hearing"):

1. **AMI 2.0 Strategy_EY 2022 November.pptx**
2. **AMI.20 Program Outline_EY 2023 October.pdf**

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EY reserves the right (but will not be obligated) to revise these Reports in light of any relevant information that comes to our attention after the date of issuance.

Yours faithfully,

Ernst & Young LLP

per Sonika Sood, Partner
Email: sonika.sood@ey.com

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-65

References: Exhibit 2B, Section E6.1

Preamble:

With respect to Area Conversions:

QUESTION (A):

a. [p.18] Please provide a revised version of Table 8, broken down by specific box construction asset, and includes 2017 ACA information, as well as 2029 ACA information based on the proposed investments included in the DSP. Please provide in Excel format.

RESPONSE (A):

Please see Appendix A to this response, '2B-SEC-65_App A ACA Information.xlsx', for a revised version of Table 8. Note that ACA information is only available for wood poles on box construction feeders and no other asset classes.

QUESTION (B):

b. [p.22] Toronto Hydro states that for its rear-lot conversion program it has "applied an average cost of $0.058 million per customer in developing the segment cost forecasts for the 2025-2029 rate period. This is a significant increase over the previous cost per customer estimated in the 2020-2024 DSP due to externally-driven escalations of labour, material, and other (e.g. vehicle) costs over recent years having a particularly high impact on the costs to plan and execute this complex conversion work." Please provide a table that shows, by category (e.g. labour, material, other), the per customer cost:
   i. forecast as part of the 2020-2024 DSP,
   ii. actual cost during the 2020-2024 period, and
   iii. forecast costs for the 2025-2029 rate period.

RESPONSE (B):

Please see Table 1 below. Toronto Hydro can only provide the breakdown based on actual costs incurred 2020-2023. The utility does not forecast costs at the level of labour, materials etc. and therefore is unable to provide the data for parts i. and iii.

Table 1: Breakdown of Actual Cost per Customer Converted

Cost/Customer	Labour	Materials	Other
i. 2020-2024 DSP Forecast	-	-	-
ii. 2020-2023 Actual	$43,007	$4,552	$4,909
iii. 2025-2029 Forecast	-	-	-

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-66

Reference: Exhibit 2B, Section E6.2

With respect to Underground System Renewal – Horseshoe:

QUESTION (A):

a) Please update Figures 1-3, 6-8, 13-16, and 22-24 with 2023 information.

RESPONSE (A):

Please see figures below.

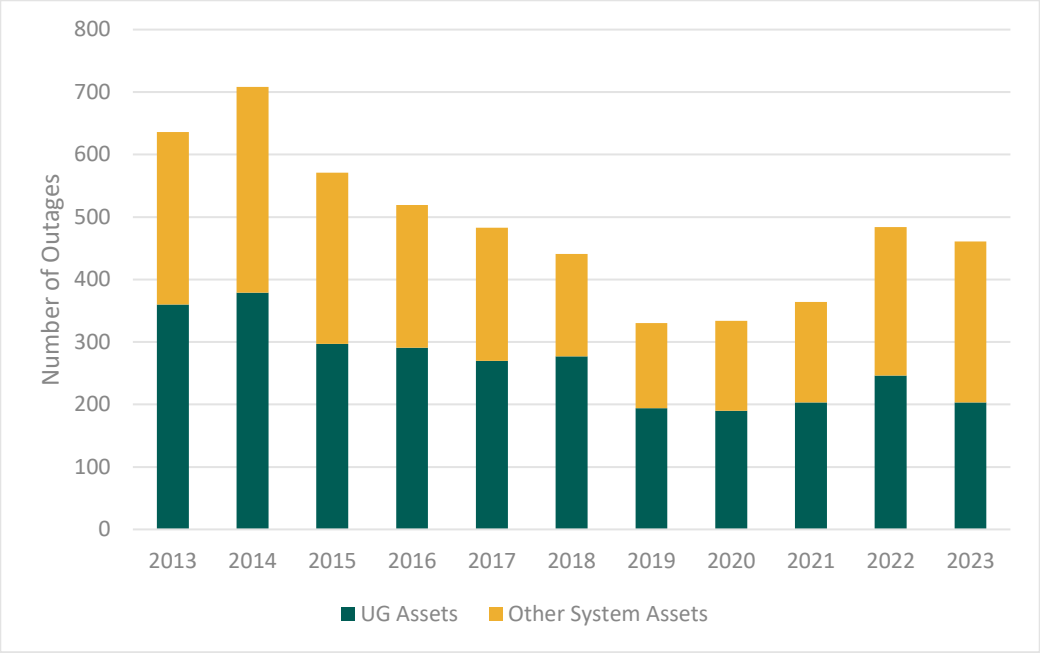

Figure 1: Ten-year Trend of Underground System Contribution to Overall System Outages

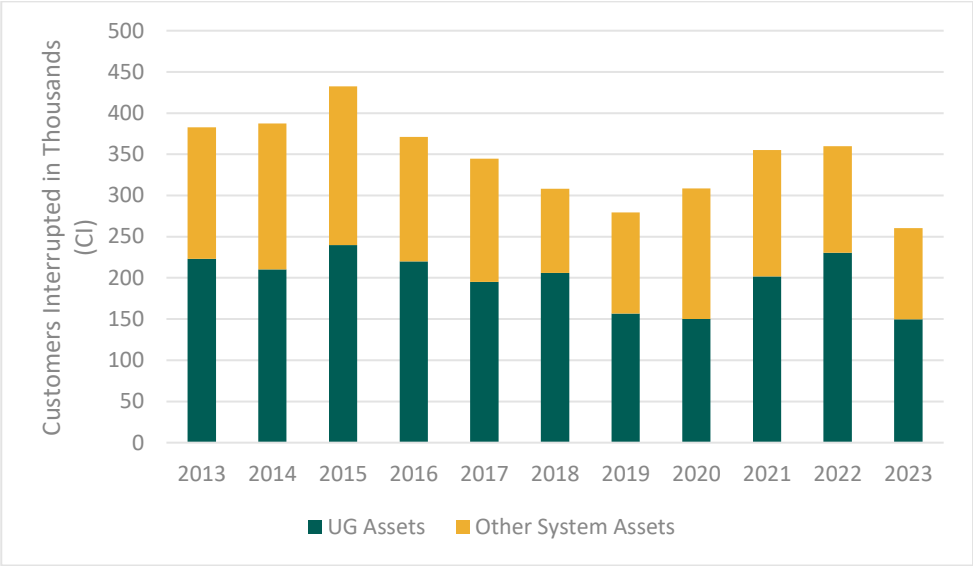

Figure 2: Ten-year Trend of Underground System Contribution to Overall System Customers Interrupted ("CI")

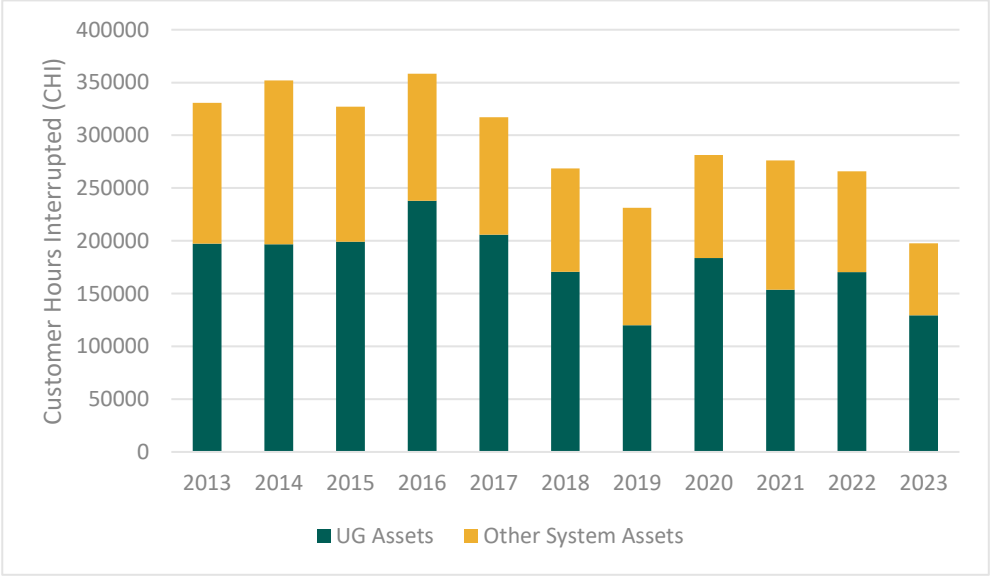

Figure 3: Ten-year Trend of Underground System Contribution to Overall System Customer Hours Interrupted (CHI)

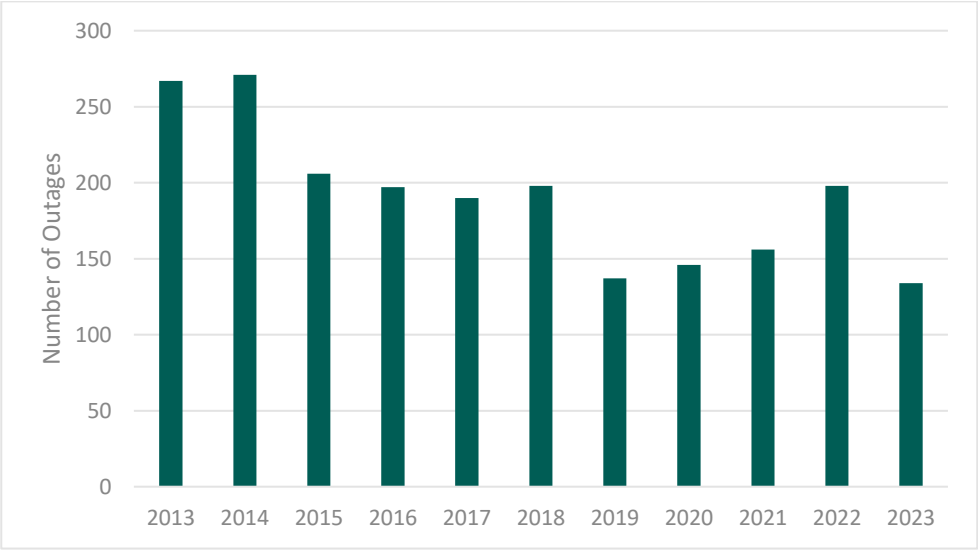

Figure 6: Ten-Year Trend of Outages due to Underground Cable Failure

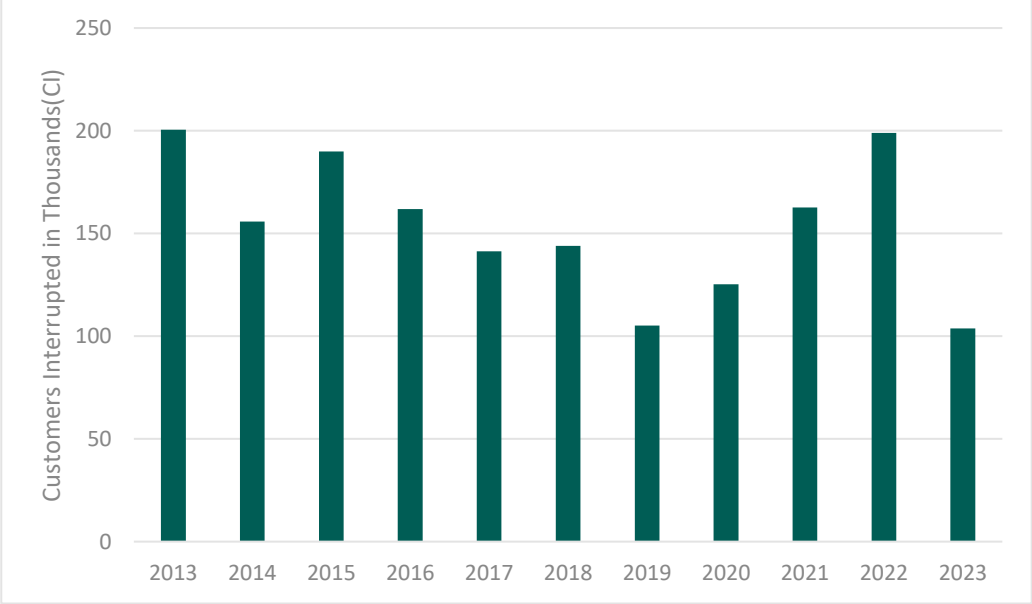

Figure 7: Ten-Year Trend of Total Customers Interrupted (CI) due to Underground Cable Failures

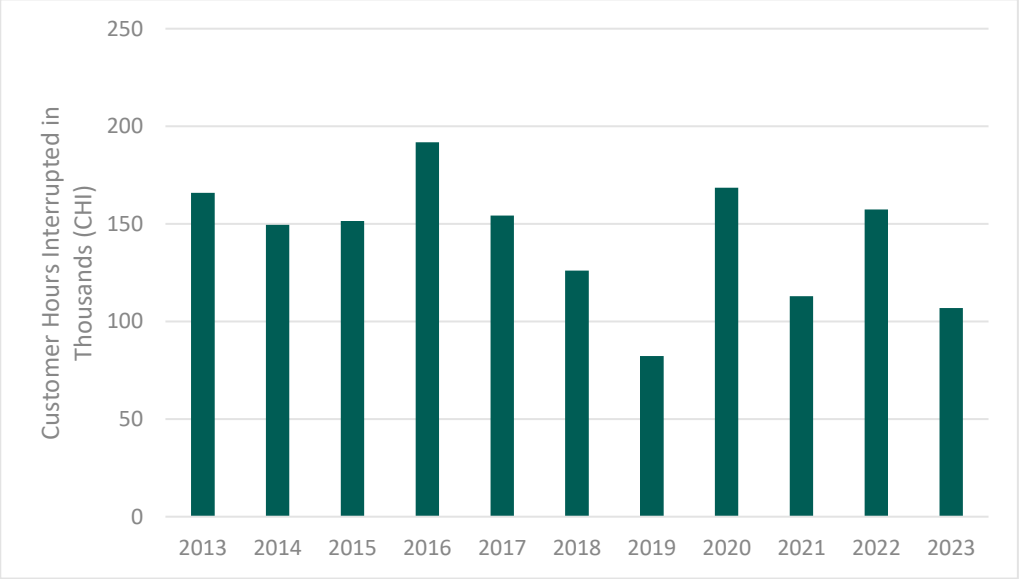

Figure 8: Ten-Year Trend of Total Customer Hours Interrupted (CHI) due to Underground Cable Failures

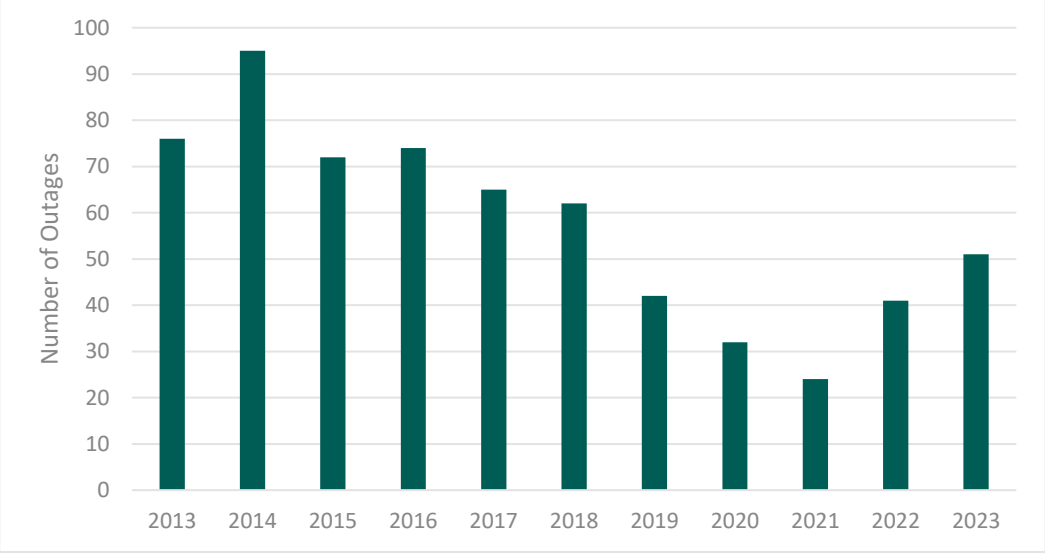

Figure 13: Ten-Year trend of Outages Due to Underground Transformer Failures

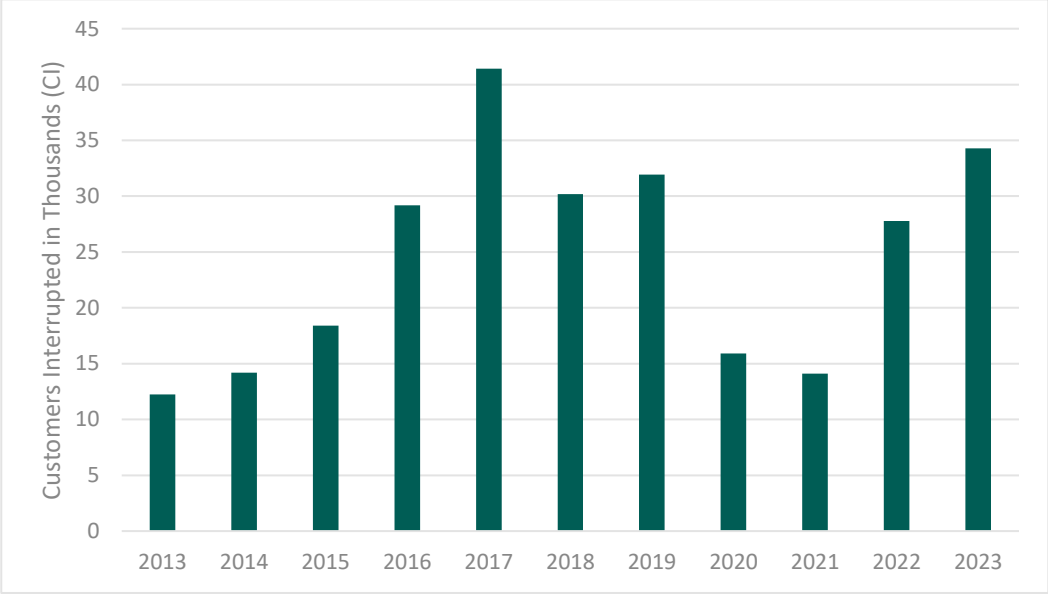

Figure 14: Ten-Year Trend of Total Customers Interrupted (CI) Due to Underground Transformer Failures

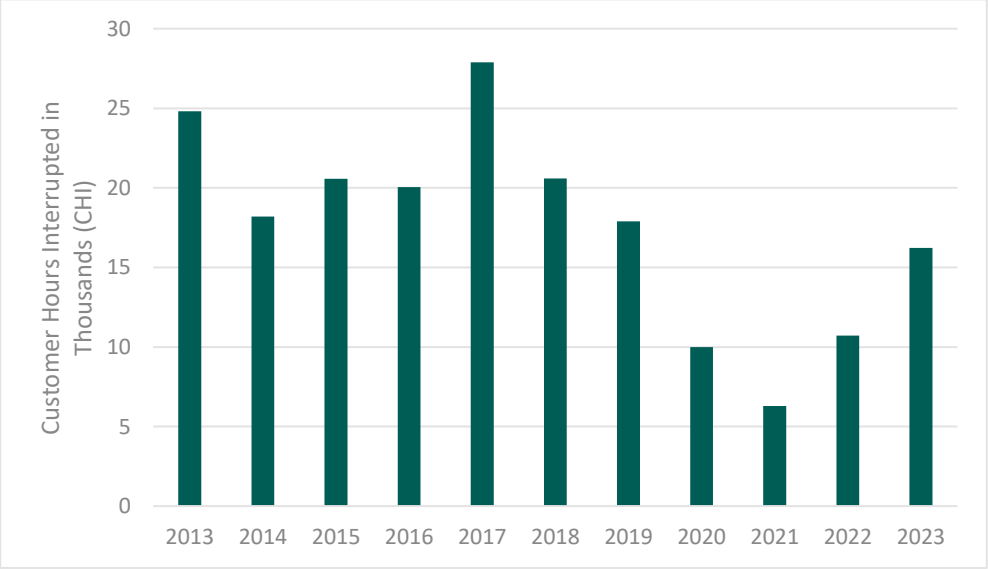

Figure 15: Ten-Year Trend of Customer Hours Interrupted (CHI) Due to Underground Transformer Failures

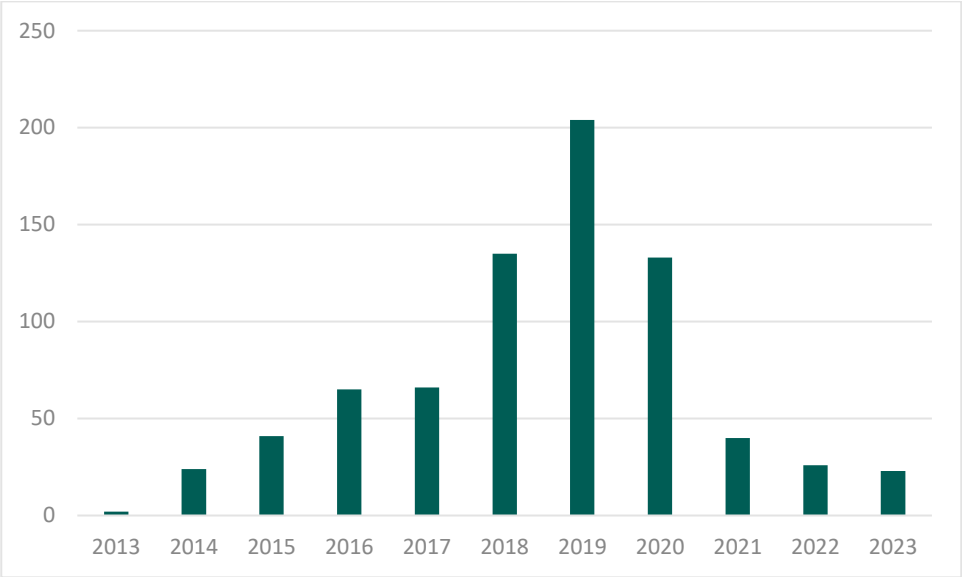

Figure 16: Number of Externally-Reported Oil Spills on Underground Transformers in Underground Horseshoe System

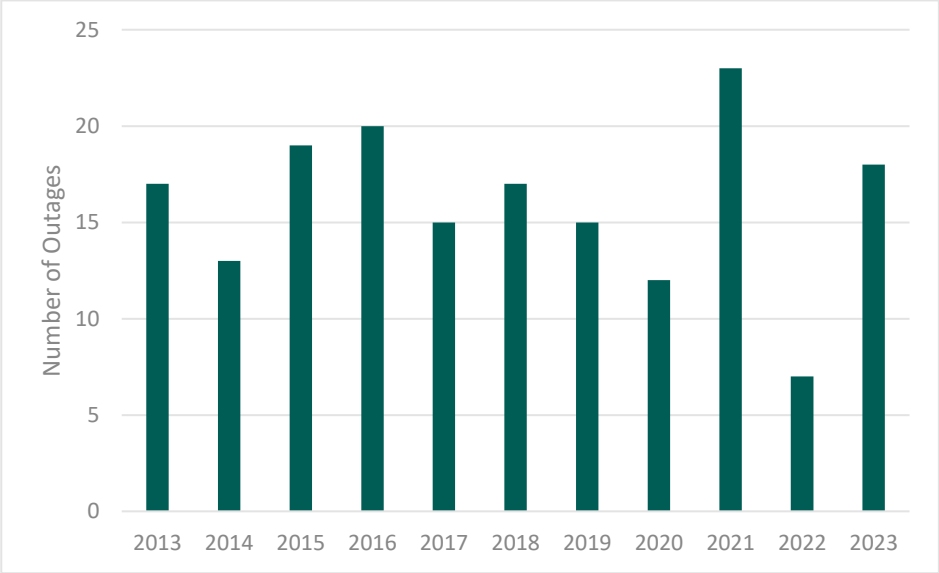

Figure 22: Ten-Year Trend of Outages due to Underground Switch Failures

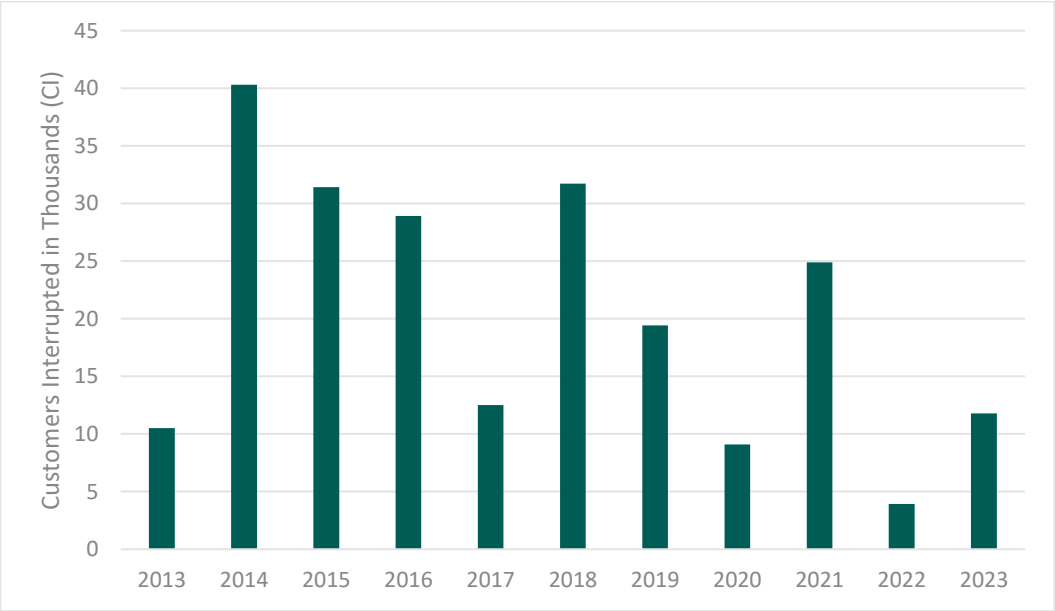

Figure 23: Ten-Year Trend of Total CI due to Underground Switch Failures

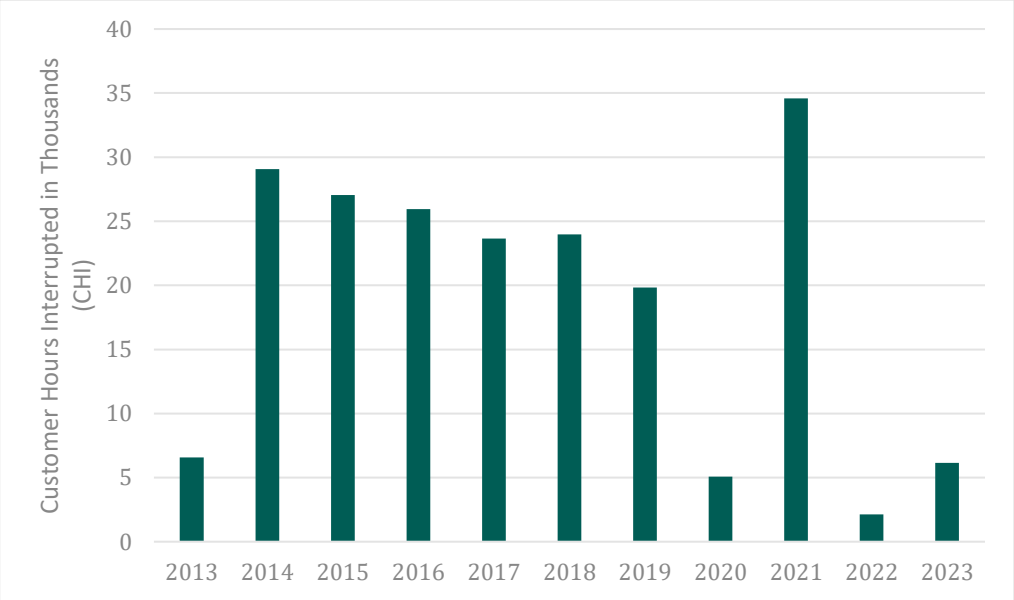

Figure 24: Ten-Year Trend of Total CHI due to Underground Switch Failure

QUESTION (B):

b) [p.22, 28] Please provide a revised version of each of Table 5 and 6 that includes 2017 ACA information, as well as 2029 ACA information based on the proposed investments included in the DSP. Please provide the response also in Excel format.

RESPONSE (B):

Please see Tables 5 and 6 below and Appendix A to this response with 2017 data included. Unlike the information provided in the original tables in Exhibit 2B, Section E6.2, the 2017 data does not distinguish between Horseshoe and Downtown assets and therefore these tables include system-wide ACA demographics for all years. Toronto Hydro does not model Assets Past Useful Life based on its investment plan. For a comprehensive discussion of expected changes in asset demographics over the 2025-2029 period, please see Toronto Hydro's response to 2B-SEC-44.

Table 5: Asset Condition Assessment for Underground Transformers System-Wide in 2017, 2022, and 2029 without Investment

Condition	UG TX – Padmounted			UG TX – Submersible			UG TX – Vault			Total 2017	Total 2022	Total 2029
	2017	2022	2029	2017	2022	2029	2017	2022	2029			
HI1 – New or Good Condition	5547	5142	4451	7816	8120	7330	6807	6799	5220	20170	20061	17001
HI2 – Minor Deterioration	656	1085	542	588	699	642	4315	3869	1668	5559	5653	2852
HI3 – Moderate Deterioration	283	527	887	271	162	635	450	571	3595	1004	1260	5117
HI4 – Material Deterioration	113	233	595	172	133	240	214	247	587	499	613	1422
HI5 – End-of-Serviceable Life	18	24	536	55	47	314	45	11	427	118	82	1277
Grand Total	**6617**	**7011**	**7011**	**8902**	**9161**	**9161**	**11831**	**11497**	**11497**	**27350**	**27669**	**27669**

Table 6: Asset Condition Assessment for System-Wide Underground Padmounted Switches (Air and SF_6 Type) in 2017, 2022, and 2029 without Investment

Condition	UG Switch Padmounted Air			UG Switch Padmounted SF6			Total 2017	Total 2022	Total 2029
	2017	2022	2029	2017	2022	2029			
HI1 – New or Good Condition	404	359	350	402	663	663	**806**	**1022**	**1013**
HI2 – Minor Deterioration	20	4	11	0	0	0	**20**	**4**	**11**
HI3 – Moderate Deterioration	73	64	2	2	0	0	**75**	**64**	**2**
HI4 – Material Deterioration	30	24	13	0	1	0	**30**	**25**	**13**
HI5 – End-of-Serviceable Life	45	29	104	6	16	17	**51**	**45**	**121**
Grand Total	**572**	**480**	**480**	**410**	**680**	**680**	**982**	**1160**	**1160**

QUESTION (C):

c) [p.29-31] Please provide a breakdown of annual costs included in Table 7 based on the asset categories included in Tables 8 and 9.

RESPONSE (C):

In the process of preparing this interrogatory response, Toronto Hydro identified an error with the numbers reported for transformers for 2020 and 2021. Toronto Hydro also identified that the volumes of cable shown for the 2020-2024 period were incorrectly entered as conductor-kms instead of circuit-kms. An updated Table 8 with the corrected actuals, as well as 2023 actuals and an updated 2024 forecast, has been provided below:

Updated Table 8:

Asset Class		Actuals				Bridge	Total
		2020	2021	2022	2023	2024	
Total Cable	*cct-km*	45	33	51	33	22	184
Transformers	*Units*	260	251	281	321	886	1,999
Switches	*Units*	55	20	52	14	3	144

Annual Asset Cost based on Asset Counts in Updated Table 8 ($ Millions)

	2020 Actual	2021 Actual	2022 Actual	2023 Actual	2024 Bridge
Total Cable	7.82	5.95	12.9	10.9	5.45
Transformers	6.69	10.0	7.60	12.1	32.3
Switches	7.49	2.94	6.45	2.02	2.72

Annual Asset Cost based on Forecasted Asset Volumes in Table 9 ($ Millions)

	2025 Forecast	2026 Forecast	2027 Forecast	2028 Forecast	2029 Forecast
Total Cable	7.65	18.8	22.5	21.7	21.2
Transformers	32.1	14.6	14.7	19.6	21.8
Switches	1.97	3.7	4.8	4.6	5.1

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-67

Reference: Exhibit 2B, Section E6.3

Preamble:

With respect to Underground System Renewal – Downtown:

QUESTION (A):

a) Please update Figures 9, 18, and 19 with 2023 information.

RESPONSE (A):

Please see Figures 1, 2, and 3 below (original figure numbers noted in captions).

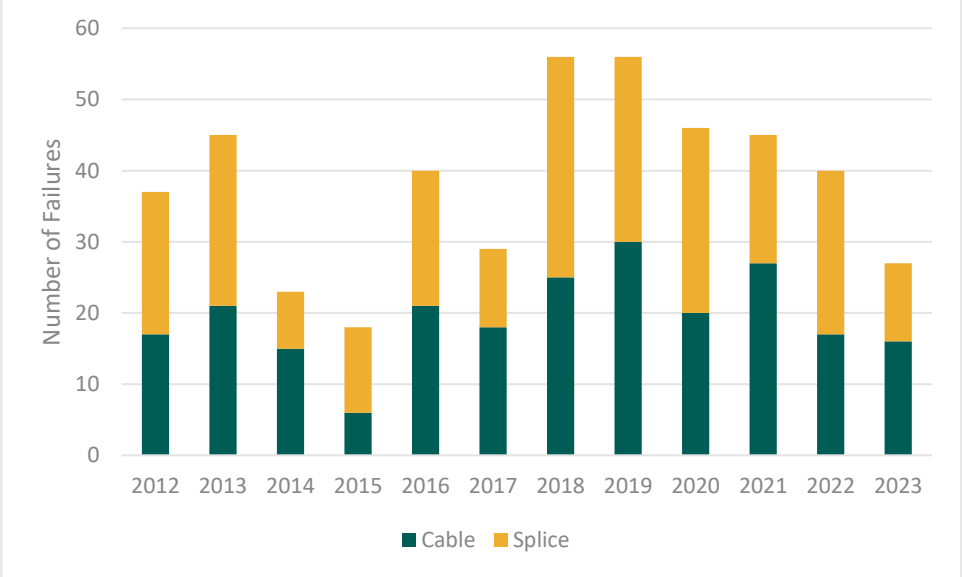

Figure 1: Number of PILC Cable/Splice Failures per Year (Figure 9)

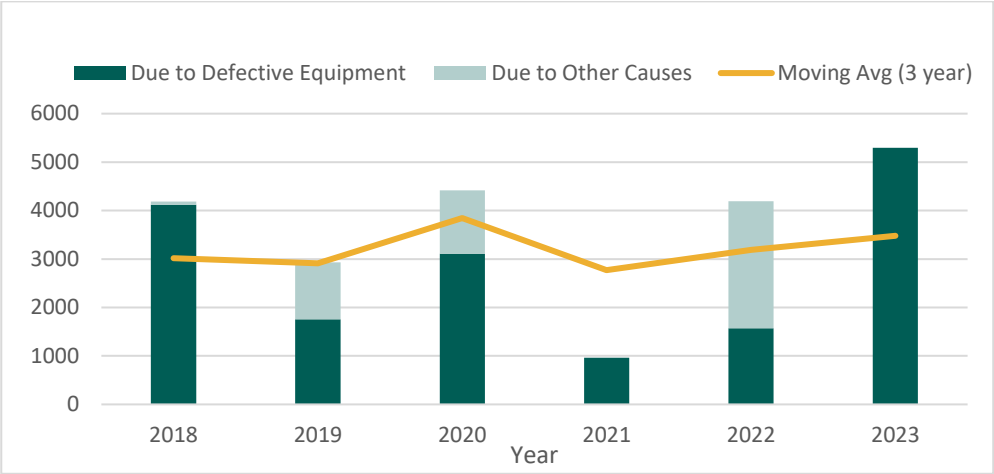

Figure 2: Customers Interrupted — URD System (Figure 18)

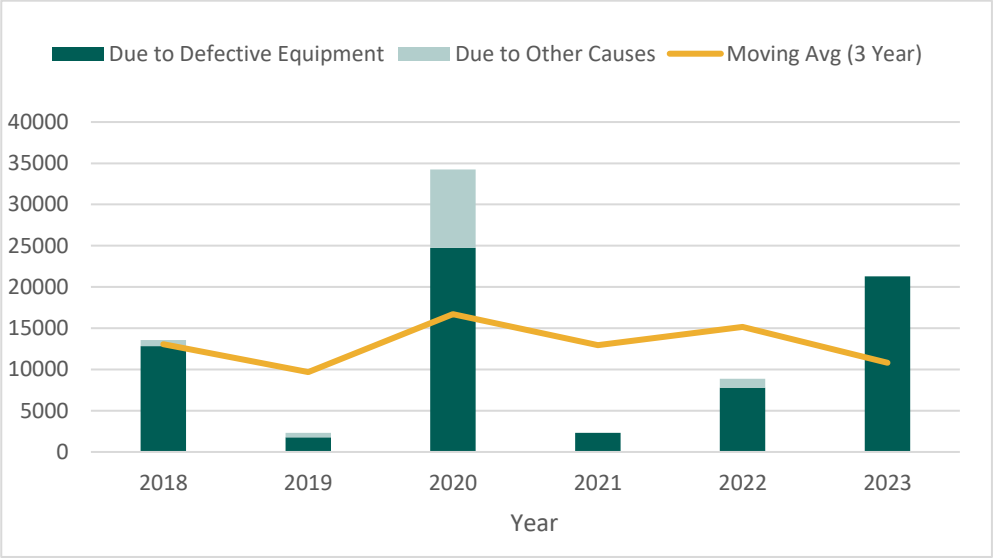

Figure 3: Customer Hours Interrupted — URD System (Figure 19)

QUESTION (B):

b) Please provide a version of the information included in Figures 12, 26, 30, 33 and 35 in tabular format, that also includes 2017 ACA information, as well as the 2029 ACA information based on the proposed investments included in the DSP. Please provide in Excel format.

RESPONSE (B):

Please see Appendix A to this response, '2B-SEC-67_App A ACA Information.xlxs' for the information in Figures 12, 26, 30, 33, and 35 in tabular format and for 2029 ACA projections with investment for URD switches (Figure 30), URD transformers (Figure 33), and Underground Switchgear (Figure 35). For 2029 ACA projections with investment for cable chambers and URD Vaults and for the context and underlying assumptions regarding all projected health demographics in 2029 with investment, please refer to Toronto Hydro's response to interrogatory 2B-SEC-44.

QUESTION (C):

c) [p.36-37] Please provide a breakdown of annual costs included in Table 6 based on the asset categories included in Table 7.

RESPONSE (C):

Please see Table 1 below.

Table 1: Updated Underground Cable Renewal Costs Broken Down by Asset Category ($ Millions)

	Actual				Bridge	Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Underground Cable Renewal	3.1	5.2	10.2	11.3	9.7	8.6	10.8	11.7	13.4	16.5
PILC Cable	3.1	4.4	9.2	11.2	9.5	7.8	9.7	10.5	12	14.7
AILC Cable	0.0	0.8	1.0	0.1	0.2	0.8	1.0	1.1	1.3	1.6
Fiber Optic Cable	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2

QUESTION (D):

d) [p.39-40] Please provide a breakdown of annual costs included in Table 8 based on the asset categories included in Table 9.

RESPONSE (D):

Please see Table 2 below.

Table 2: Updated Cable Chamber Renewal Costs Broken Down by Asset Category ($ Millions)

	Actual				Bridge	Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Cable Chamber Renewal	4.0	2.9	9.4	15.8	4.6	10.4	13.6	19.1	26.3	27.1
Cable Chamber	2.3	0.9	6.2	1.0	1.7	1.7	2.3	5.3	8.9	9.2
Cable Chamber Roof	0.5	0.2	0.4	0.5	0.3	1.3	2.6	3	3.2	3.3
Cable Chamber Abandonment	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2
Cable Chamber Lid	1.2	1.8	2.8	14.3	2.6	7.3	8.5	10.7	14	14.4

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-68

Reference: Exhibit 2B, Section E6.4

Preamble:

With respect to Network System Renewal:

QUESTION (A):

a) [p.7, 9] Please provide a version of the information included in Figures 3 and 6 in tabular format, that also includes 2017 ACA information, as well as the 2029 ACA information based on the proposed investments included in the DSP. Please provide in Excel format.

RESPONSE (A):

Please see Appendix 2B-SEC-68_App A ACA Data for the information in Figures 3 and 6 in tabular format with 2017 ACA information. For 2029 ACA information please refer to Toronto Hydro's response to interrogatory 2B-SEC-44.

QUESTION (B):

b) [p.18-19] Please expand Table 9 to include the forecast units replaced in each year between 2025 and 2029.

RESPONSE (B):

Please see Table 1 below.

Table 1: Network Units Replaced – 2020-2029 Actual/Bridge/Forecast

	Actuals				Bridge	Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Network Units	20	30	32	40	35	17	17	30	32	34

QUESTION (C):

c) [p.22] Please provide a similar table as Table 12 that shows both the number of actual/forecast units replaced as part of the Network Vault Renewal segment between 2020 and 2024, as well as the forecast number of units to be replaced in EB-2018-0165.

RESPONSE (C):

Please see Table 2 below.

Table 2: Network Vault Renewal 2020-2024 Plan (EB-2018-0165) and Actuals/Bridge

		2020	2021	2022	2023	2024
2020-2024 Actual/Bridge	**Vault Rebuild**	9	3	4	7	6
	Roof Rebuild	0	0	3	5	1
	Vault Decommissioning	0	1	0	0	1
	Total	9	4	7	12	8
Plan Per EB-2018-0165	**Total**	7	7	7	7	5

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-69

Reference: Exhibit 2B, Section E6.5

Preamble:

With respect to Overhead System Renewal:

QUESTION (A):

a) Please update Figures 3,4, 7, 8, 13, 14, 21, 22, 26 and 27 with 2023 information.

RESPONSE (A):

Please see the updated figures below.

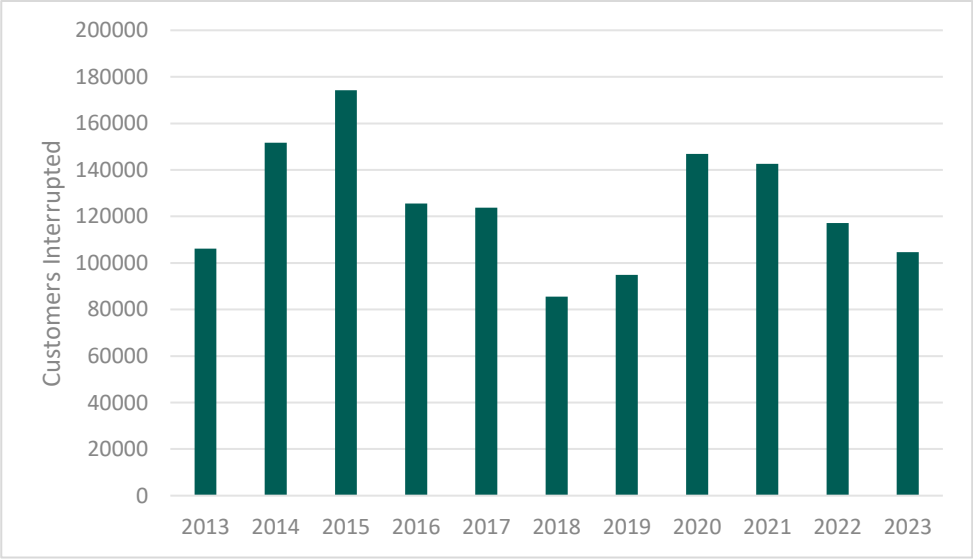

Figure 1: Updated Figure 3 Customers Interrupted ("CI") on the Overhead System (2013-2023)

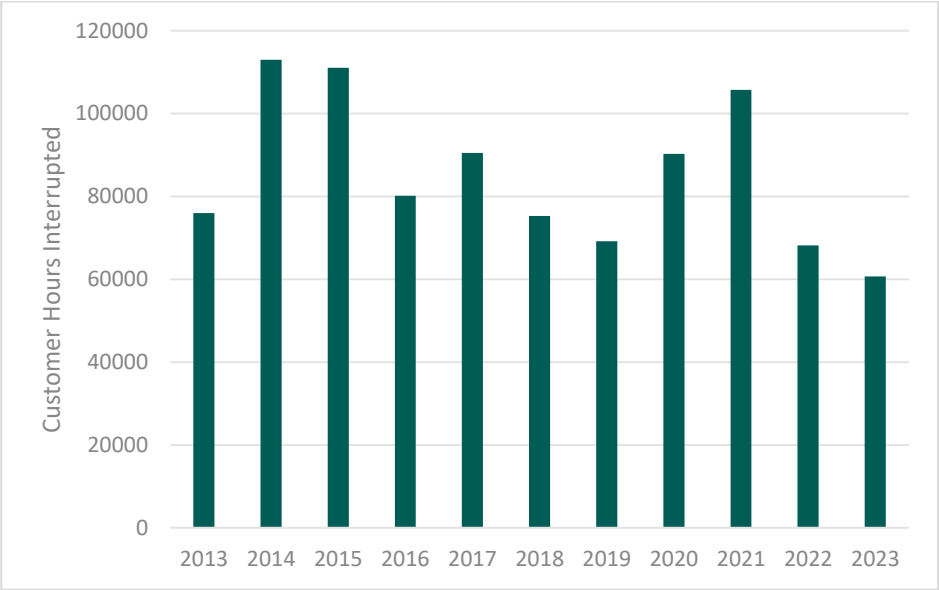

Figure 2: Updated Figure 4 Customer Hours Interrupted ("CHI") on the Overhead System (2013-2023)

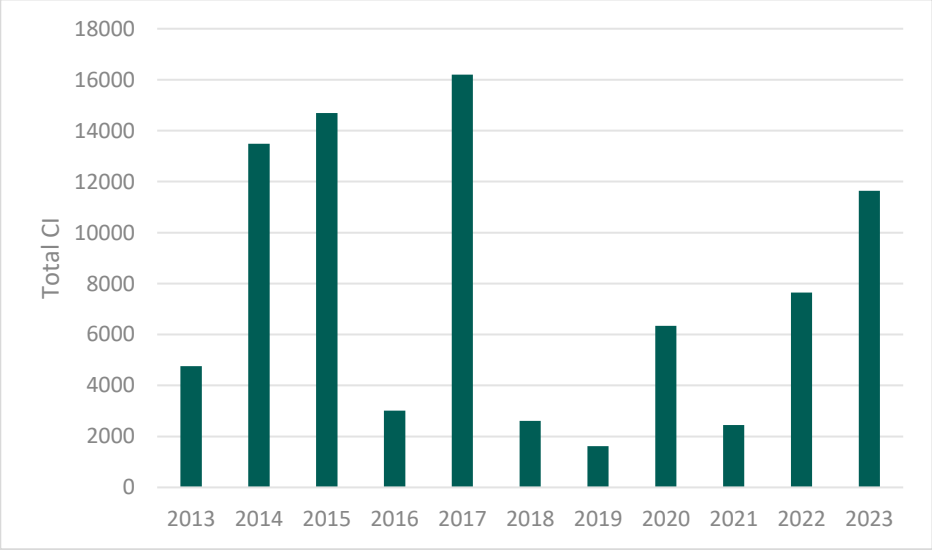

Figure 3: Updated Figure 7 Customers Interrupted ("CI") for Pole-top Transformers[1]

[1] Added 2013-2017 results for Figure 7 and Figure 8 in response to interrogatory 2B-Staff-222 (b).

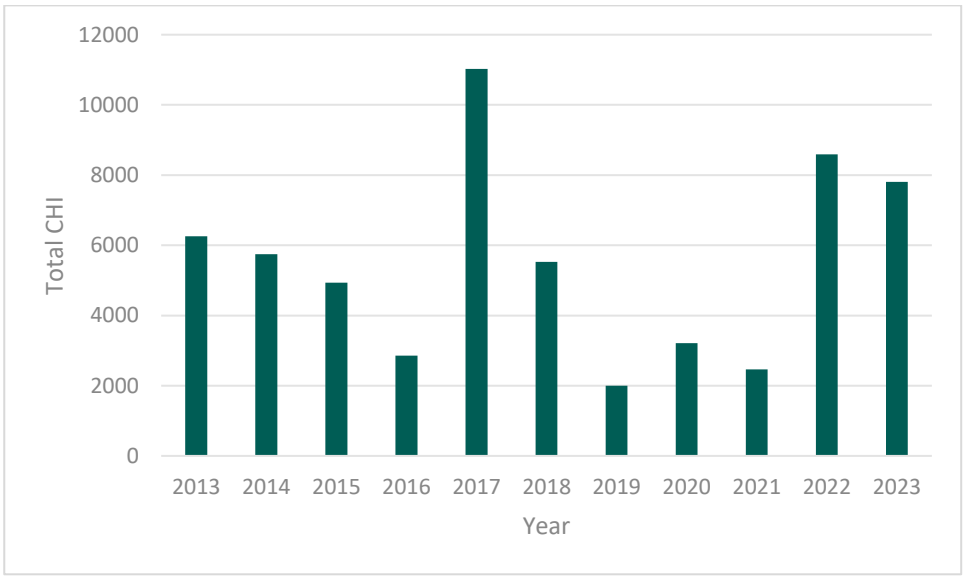

Figure 4: Updated Figure 8 Customer Hours Interrupted ("CHI") for Pole-top Transformers

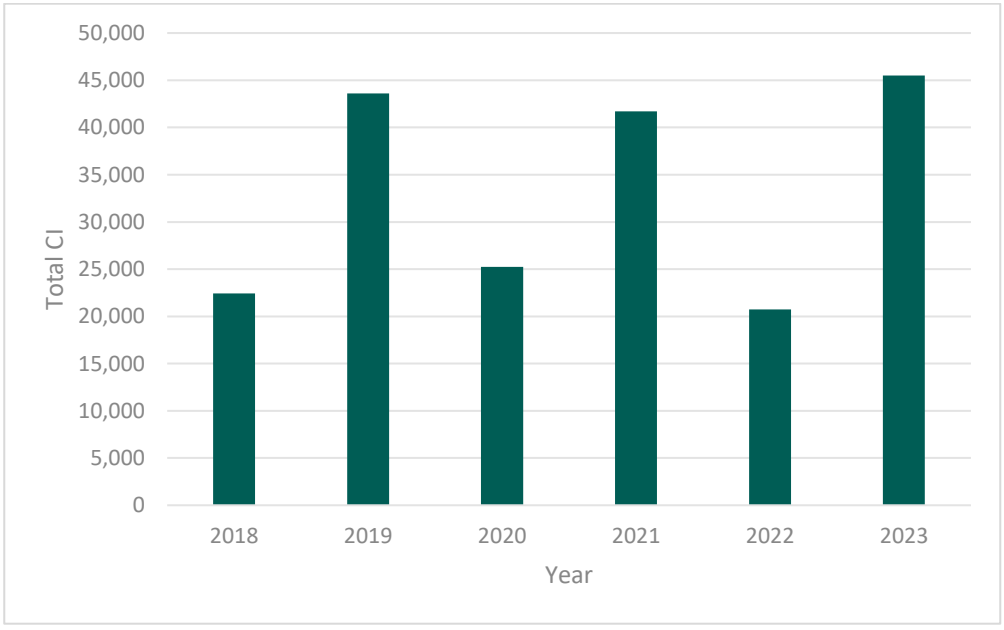

Figure 5: Updated Figure 13 Customers Interrupted ("CI") for Poles and Pole Accessories

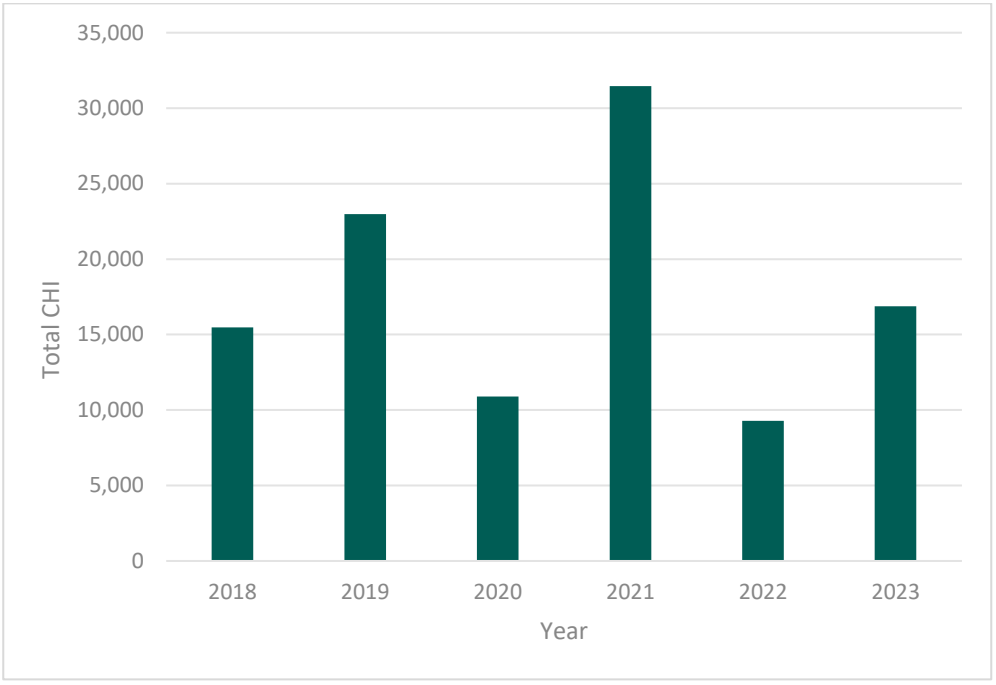

Figure 6: Updated Figure 14 Customer Hours Interrupted ("CHI") for Poles and Pole Accessories

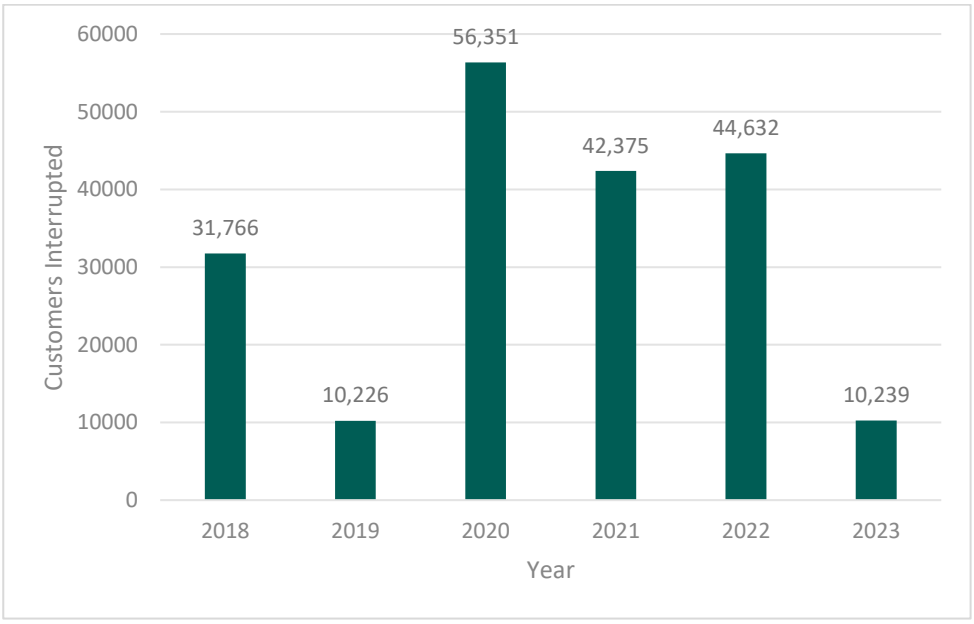

Figure 7: Updated Figure 21 Customers Interrupted ("CI") for Overhead Switches

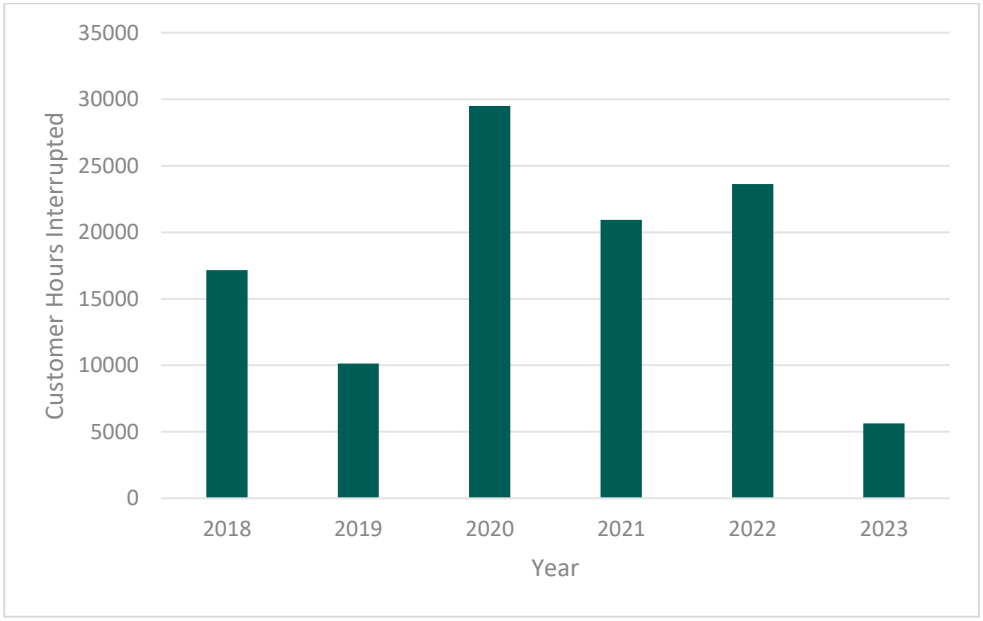

Figure 8: Updated Figure 22 Customer Hours Interrupted ("CHI") for Overhead Switches

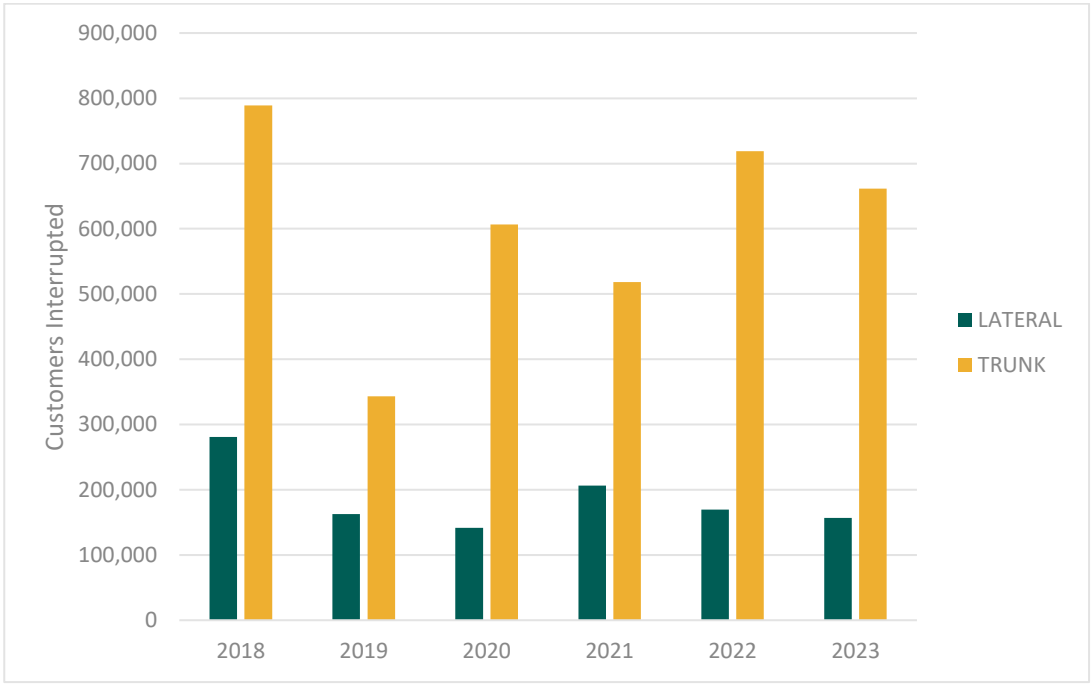

Figure 9: Updated Figure 26 Total Customers Interrupted (CI) – Trunk Versus Lateral

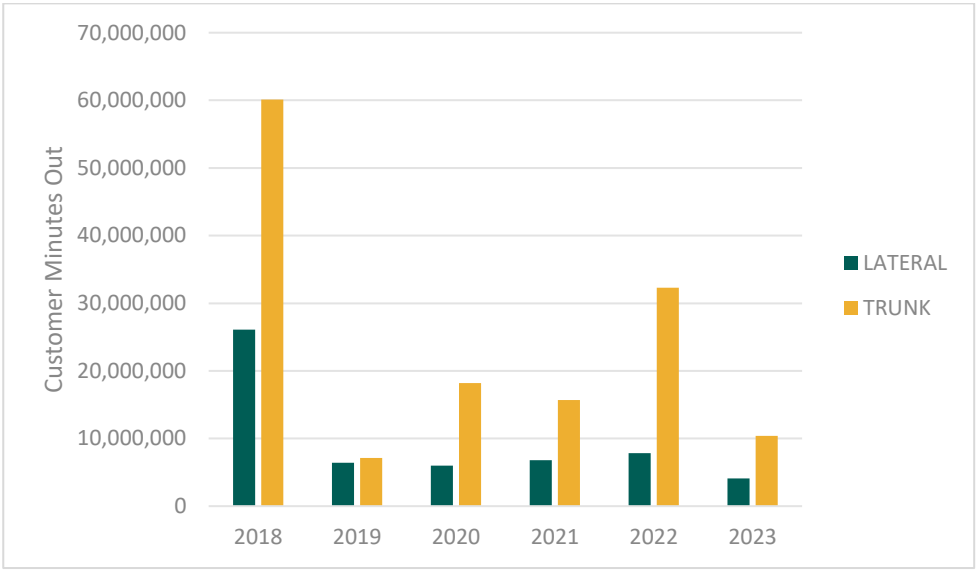

Figure 10: Updated Figure 27 Total Customer Minutes Out – Trunk Versus Lateral

QUESTION (B):

b) [p.9] Please provide a revised version of Table 4 that includes 2017 ACA information, as well as 2029 ACA information based on the proposed investments included in the DSP. Please provide in Excel format.

RESPONSE (B):

Please see the revised version of the requested table below including 2017 ACA information.

Table 1: Condition Data for Wood Pole

Asset Condition Index	2017	2022	2029 (Without Investment)
HI1 – New or Good Condition	63,526	68,193	60,253
HI2 – Minor Deterioration	7,354	7,536	8,310
HI3 – Moderate Deterioration	29,779	21,015	5,544
HI4 – Material Deterioration	5,687	8,918	24,404
HI5 – End-of-serviceable Life	722	504	7,655

For a comprehensive discussion of expected changes in asset demographics over the 2029 period, please see Toronto Hydro's response to 2B-SEC-44.

QUESTION (C):

c) [p.25-26] Please provide a version of the information included in each of Figures 24 and 25 in tabular format, that also includes 2017 ACA information, as well as the 2029 ACA information based on the proposed investments included in the DSP. Please provide in Excel format. e. [p.34] Please provide a breakdown of annual costs included in Table 7 based on the asset class included in Table 8.

RESPONSE (C):

Please see the tables below of based on Figures 24 and 25 including 2017 ACA information.

Table 2: Condition Data for Overhead Gang Operated Load Break Switches

Asset Condition Index	2017	2022	2029 (Without Investment)
HI1 – New or Good Condition	854	659	517
HI2 – Minor Deterioration	27	98	106
HI3 – Moderate Deterioration	76	88	111
HI4 – Material Deterioration	3	10	91
HI5 – End-of-serviceable Life	9	13	43

Table 3: Condition Data for Overhead SCADA-Mate Switches

Asset Condition Index	2017	2022	2029 (Without Investment)
HI1 – New or Good Condition	1,084	1,078	724
HI2 – Minor Deterioration	1	9	65
HI3 – Moderate Deterioration	26	66	69
HI4 – Material Deterioration	0	4	149
HI5 – End-of-serviceable Life	8	13	163

For a comprehensive discussion of expected changes in asset demographics over the 2029 period, please see Toronto Hydro's response to 2B-SEC-44.

QUESTION (D):

d) [p.37] Please provide a similar table as Table 9 that shows the volume of assets replaced each year as part of the Overhead Infrastructure Resilience segment.

RESPONSE (D):

Please see Table 4 below.

Table 4: Volume of Assets Replaced as part of the Overhead Infrastructure Resiliency

Asset Class	2025	2026	2027	2028	2029	Total
Poles	0	164	346	356	368	1235
Transformers	0	44	93	96	99	333
Overhead Switches	0	22	47	49	50	169
Conductors* (km)	0	27	58	59	61	205

*Primary conductor only

QUESTION (E):

e) [p.34] Please provide a breakdown of annual costs included in Table 7 based on the asset class included in Table 8.

RESPONSE (E):

In the process of preparing this interrogatory response, Toronto Hydro identified administrative errors with the numbers reported for overhead switches in 2020 and conductors in 2021 in Table 5 of Exhibit 2B, Section E6.5, as well as the pacing of transformer replacements entered into Table 6 for the years 2025-2029. Note that the total number of transformer replacements over the period is unchanged.

Please see the updated tables below:

Table 5: Updated 2020-2024 Overhead Asset Replacement Volumes

Asset Class	Actual				Bridge	Total
	2020	2021	2022	2023	2024	
Poles	1,418	1,263	1,137	1,892	2,093	7,803
Transformers	401	584	579	558	1,377	3,499
OH Switches	194	290	71	105	97	757
Conductors* (km)	53	106	76	38.8	48.6	323

*Primary cables only

Table 6: Updated 2025-2029 Volumes (Forecast): Overhead System Renewal

Asset Class	Forecast					Total
	2025	2026	2027	2028	2029	
Poles	2,113	1,556	1,556	1,556	1,556	8,337
Transformers	924	984	988	985	966	4,847
OH Switches	123	91	91	104	102	511
Conductors* (km)	66	49	49	45	44	253

*Primary cables only

Please see Table 7 below for the breakdown of annual costs by asset class.

Table 7: Annual Cost Breakdown by Asset Class ($ Millions)

Asset Class	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Poles	12.5	8.8	9.7	13.8	18.4	21.1	15.9	16.3	16.8	17.3
Pole Top Transformers	7.7	10.6	10.5	11.2	33.6	20.9	22.8	23.4	24.1	24.3
Overhead Switches	0.9	2.0	1.2	1.2	1.6	1.1	0.8	0.9	1.0	1.0
Primary Conductor (km)	2.1	3.5	2.7	2.2	3.3	2.9	2.2	2.2	2.1	2.1

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-70

Reference: Exhibit 2B, Section E6.6

With respect to Station Renewal:

QUESTION (A):

a) Please provide a version of the information included in each of Figures 3, 8, 14, and 16, in tabular format, that also includes 2017 ACA information, as well as the 2029 ACA information based on the proposed investments included in the DSP. Please provide in Excel format.

RESPONSE (A):

Please see Tables 1-4 for the data underpinning Figures 3, 8, 14, and 16. This information is also provided as an Excel spreadsheet in Appendix A to this response. Please refer to Toronto Hydro's response to interrogatory 2B-SEC-44 Table 2 for a summary of the 2029 health demographic projections for stations assets.

Table 1: TS Switchgear Breakers Condition from Figure 3 including 2017 ACA

	2017	2022	2029 w/o Investment
HI1	633	688	631
HI2	78	46	58
HI3	302	255	101
HI4	7	12	200
HI5	49	28	39

Table 2: TS Outdoor Breakers Condition Figure 8 including 2017 ACA

	2017	2022	2029 w/o Investment
HI1	44	72	52
HI2	8	8	12
HI3	21	7	4
HI4	13	5	16
HI5	3	0	8

Table 3: MS Air Mag Circuit Breakers Condition from Figure 14 including 2017 ACA

	2017	2022	2029 w/o Investment
HI1	97	13	4
HI2	70	27	10
HI3	141	251	22
HI4	20	1	202
HI5	39	13	8

Table 4: MS Power Transformer Condition from Figure 16 including 2017 ACA

	2017	2022	2029 w/o Investment
HI1	83	86	61
HI2	77	64	5
HI3	61	12	45
HI4	13	8	6
HI5	8	0	7

QUESTION (B):

b) Please explain why Toronto Hydro does not track the condition of RTUs, and battery and ancillary systems.

RESPONSE (B):

Toronto Hydro conducts routine maintenance and inspection of station RTU's and battery and ancillary systems as part of the station maintenance program (refer to Exhibit4 Tab 2 Schedule 3 - Preventative and Predictive Station Maintenance). In its development of the CBRM approach, Toronto Hydro concluded that extending the methodology to encompass communication devices,

batteries and ancillary systems was not appropriate as these assets have inherent self-monitoring capabilities which are monitored by Toronto Hydro through its SCADA system.

QUESTION (C):

c) Please provide a revised version of each of Tables 15, 16, and 17 that shows 2017 information, as well as 2029 information based on the proposed investments included in the DSP. Please provide in Excel format.

RESPONSE (C):

Toronto Hydro is unable to provide relay information from the 2020-2024 rate application as the utility started to proactively replace these assets in 2022 (with the exception of Pilot Wire relays). Table 15 has been updated below to include the impact of the investments.

Table 15: Relay Type, Quantity, and Useful Life (Revised)

Relay Type	No. of Assets	Obsolete / Past UL 2024	Obsolete / Past UL 2029 (w/ Program)	Obsolete / Past UL 2029 (w/o Program)	% Obsolete / Past UL 2024	% Obsolete / Past UL 2029 (w/ Program)	% Obsolete / Past UL 2029 (w/o Program)
TS Relay	1063	419	307	407	39%	29%	38%
MS Relay	724	365	85	215	50%	12%	30%
Pilot Wire Relay	71	14	0	14	20%	0%	20%
Transfer Trip Relay	33	7	0	7	21%	0%	21%
Total	**1891**	**805**	**392**	**643**	**43%**	**21%**	**34%**

Please see below table for battery and chargers. Toronto Hydro is unable to provide 2019 information as the utility began tracking battery and charger demographics separately in 2020, as their useful life differ. Toronto Hydro notes that Table 16 (in Exhibit 2B, Section E6.6) also includes AC panels, which the utility began tracking in 2023.

Table 16: Battery and Ancillary Systems Demographics (Revised)

Asset Type	No. of Assets	Useful Life	Assets Past UL (2024)	Assets Past UL w/o Investments (2029)	Assets Past UL w/ Investments (2029)
Battery	148	10	18	69	14
Charger	148	20	11	20	16
Station Service Transformers	44	45	3	3	0
AC Panels	21	-	5	5	0
Air Compressors[1]	14	15	0	0	0
Total	**361**		**37**	**97**	**30**
Percentage			**10%**	**27%**	**8%**

Please see below Table 17 showing 2029 information in the last column. Toronto Hydro is unable to provide 2019 information from the last filing since the Utility began to track Battery and Charger Demographics separately in 2020 (after last filing).

Table 17: Battery and Charger Systems Demographics (Revised)

Asset Type	Assets Past UL (2024)	Assets Past UL w/o Investments (2029)	Assets Past UL w/ Investments (2029)
MS Battery	11%	43%	11%
TS Battery	19%	62%	0%
MS Charger	9%	16%	13%
TS Charger Systems	0	4%	0%

Tables 15, 16 and 17 have also been provided as an Excel spreadsheet in Appendix A to this response.

[1] No work is planned for in 2025-2029 as no air compressor is beyond useful life. During 2020-2024 one Air Compressor was replaced reactively and the other station was sold to a third party.

QUESTION (D):

d) [p.45] For each year between 2020 and 2024, please provide the number of TS switchgear units replaced.

RESPONSE (D):

Please refer to Toronto Hydro's response to interrogatory 2B-AMPCO-61.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-71

Reference: Exhibit 2B, Section E6.7

Preamble:

With respect to Reactive and Corrective Capital:

QUESTION (A):

a. [p.13] Please expand Table 7 to include 2020 to 2024 information.

RESPONSE (A):

Please refer to Toronto Hydro's response to Interrogatory 2B-AMPCO-62 part (f).

QUESTION (B):

b. [p.18] Please provide a table that shows, for each year between 2020 and 2029, for each asset type shown in Figure 11, the number of assets replaced/planned to be replaced, under the worst preforming feeder segment.

RESPONSE (B):

Please see Toronto Hydro's response to interrogatory 2B-AMPCO-62 part (k). Due to the reactive nature of this work in addressing deficiencies and trends as they emerge, Toronto Hydro is unable to forecast asset replacements in future years.

QUESTION (C):

c. [p.25] Please provide a table that shows, for each year between 2020 and 2029, for each asset type, the number of assets replaced/planned to be replaced, under the Reactive Capital segment.

RESPONSE (C):

Please see Table 1 below. Toronto Hydro notes that it does not plan asset replacements under Reactive Capital due to the unpredictable nature of asset failures. However, in Table 1 below Toronto Hydro has provided a forecast of the approximate number of assets to be replaced in 2024 and the average annual replacements over 2025-2029 based on historical trends and condition information. Actual volumes will fluctuate year-to-year, similar to what has occurred over 2020-2023.

Table 1: Actual and Forecast Asset Replacements under Reactive Capital

Asset Type	Actual				Forecast	
	2020	2021	2022	2023	2024	2025-2029 Avg
Transformers	1,287	651	483	469	~591	540
Poles	287	309	336	466	~378	394
Overhead Switches	565	451	447	389	~436	425
Switchgear	66	55	28	50	~46	45

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-72

Reference: Exhibit 2B, Section E7.2, p.14-16

QUESTION:

With respect to Toronto Hydro's Flexibility Service Program, please explain why an option was not considered to significantly increase the procurement target to further avoid and/or defer capital expenditures.

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 1B-Staff-88 (a) and (b).

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-73

Reference: EB-2018-0165, Exhibit 2B, Section E7.4, Page 41

Please provide a revised version of Table 29 and 30 that show the actual cost effectiveness test results for local demand response at the Cecil TS and Basin TS. Please provide all underlying assumptions and calculations.

RESPONSE:

In Toronto Hydro's 2020-2024 CIR Application (EB-2018-0165), the LDR program proposed to target a total of 10 MW at Cecil TS and Basin TS. Both of these stations were evaluated for inclusion in the LDR program, but were ultimately not selected (in favor of Manby TS and Horner TS). Cecil TS was not selected due to loading changes between 2018 and 2020. In 2018 Toronto Hydro forecasted that Cecil TS would reach about 85% of its capacity by 2024; however, this outlook changed to about 78% when re-evaluated in 2020. As a result, Cecil TS was no longer suitable for LDR. Basin TS was excluded for different reasons. A switchgear replacement at Carlaw TS (adjacent to Basin TS) enabled permanent load relief in this area, which alleviated issues at Basin TS during this rate period. Furthermore, Hydro One has a replacement plan for the transformers at Basin TS in the 2025-29 period and as part of the replacement intends to upsize the transformers adding new capacity to the station.

With Basin and Cecil no longer suitable for LDR, and with more acute capacity constraints emerging in the Manby and Horner TS area, Toronto Hydro adjusted its program to target 10 MW of demand response at these stations. The goal of the program was to avoid the need for incremental load transfers from Manby TS and Horner TS to surrounding stations. The assumed and actual results of the Benefit Cost Analysis (BCA) for LDR in the current rate period, using the methodology appended to 1B-Staff-49, are summarized in Tables 1 and 2 below.

Table 1: Assumed Benefit-Cost Analysis for Manby/Horner TS Program

	Avoided Capital
Parameters	**$4.00 Millions** in load transfer capital investment avoided over the life of the assets beginning in 2021 (48 years) at an operational cost of **$2.40 Millions**
Costs	NPV of the operational costs of the non-wires solution (2025-2029): **$1.99 Millions**
Benefits	NPV of revenue requirement associated with capital investment avoided in 2025 over the 48-year EUL: **$3.67 Millions** *Less (-)* NPV Costs: **$1.99 Millions** *Equals (=)* **$1.68 Millions** NPV Benefits
Total	**Total Assumed NPV Benefits =** **$1.68 Millions**

The Manby/Horner TS LDR work was launched in 2022, along with the pursuit of the Benefit-Stacking Pilot as part of IESO's Grid Innovation Fund, which layered the exploration of bulk-system value on top of the planned LDR program (see Exhibit 2B Section E7.2 for details). Toronto Hydro contracted and dispatched 4 MW of demand response in summer 2023, and has thus far contracted 6 MW of demand response for summer 2024 dispatch. Table 2 outlines the actual benefits based on the most up-to-date information.

Table 2: Actual Benefit-Cost Analysis for Manby/Horner TS Program as of February 29, 2024

	Avoided Capital
Parameters	**$4.00 Millions** in load transfer capital investment avoided over the life of the assets, beginning in 2023 (48 years) at an operational cost of **$1.20 Millions**
Costs	NPV of the operational costs of the non-wires solution (2025-2029): **$0.93 Millions**
Benefits	NPV of revenue requirement associated with capital investment avoided in 2025 over the 48-year EUL: **$3.29 Millions** *Less (-)* NPV Costs: **$0.93 Millions** *Equals (=)* **$2.36 Millions** NPV Benefits
Total	**Total Actual NPV Benefits =** **$2.36 Millions**

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-74

Reference: Exhibit 2B, Section E7.4, Page 33

Please provide a revised version of Table 19 that shows the Downsview TS expenditures on an in-service additions basis.

RESPONSE:

Following Toronto Hydro's update filed on January 29, 2024 Table 19 [Section 2B, Section E7.4, at page 33] referenced above is now Table 16 [Section 2B, Section E7.4 at page 28]. Please see the table below with Downsview TS expenditures on an in-service additions basis.

Table 1: 2025-2034 Downsview TS Expenditure on an In-service Additions Basis ($ Millions)

	Forecast – Planning and Preparation					Forecast – Construction & Energization				
	2025	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**
Downsview TS	--	--	6.5	--	8.4	--	--	--	--	147.8

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-75

Reference: Exhibit 2B, Section E7.4, Page 55

Toronto Hydro has provided estimated station expansion investment costs based on the Low Efficiency Scenario included in the Future Energy Scenarios Report. Please provide similar estimates, in the same format, based on all the scenarios included in that report.

RESPONSE:

Toronto Hydro notes that the referenced Flexibility Considerations section (at page 55) was updated on January 29, 2024 (see Exhibit 2B, Section E7.4.8, pages 45-47). The table below provides the estimated stations expansion investments needed under the other Future Energy Scenarios.

Table 1: Estimated Stations Expansion Investment Needed under Future Energy Scenarios

CIR Period	NZ40-Low (Jan 29, 2024)	CT	CT-Low	NZ40	SP	ST
2025-2029	95	73	89	76	88	80
2030-2034	192	23	104	40	61	40
2035-2039	527	40	219	97	91	105

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-76

References: Exhibit 2B, Section E8.1

Please provide a copy of the internal business case for the EDC Relocation program.

RESPONSE:

The options analysis presented in subsection E8.1.4 of Exhibit 2B, Section E8.1 represents Toronto Hydro's internal business case analysis for the EDC relocation program.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-77

References: Exhibit 2B, Section E8.3

With respect to Fleet and Equipment Services:

QUESTION (A):

a) [p.10] Please provide a more detailed explanation of the change in fleet utilization methodology and how both the old and current metric are calculated.

RESPONSE (A):

Please refer to Toronto Hydro's response to 2B-Staff-266(b).

QUESTION (B):

b) [p.10] Please update Figure 4 to provide 2023 year-end actuals and provide the underlying data used in the calculation of the revised table. Please provide in Excel format.

RESPONSE (B):

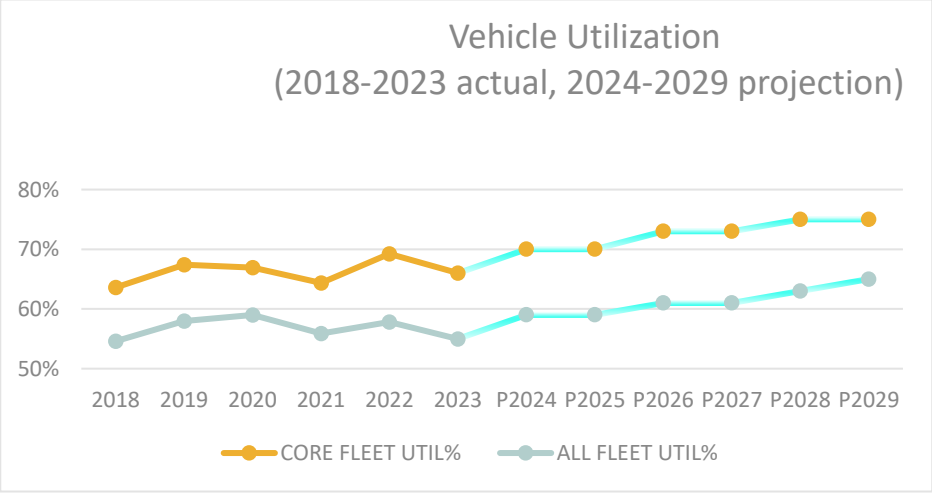

Figure 4: "Days Used" Vehicle Utilization Metric (Updated)

Please refer to the appendix of this interrogatory response for the underlying data in Excel format.

QUESTION (C):

c) [p.12] Please expand Table 5 to include 2020 to 2024 information.

RESPONSE (C):

Table 5: 2020-2024

Description	2020		2021		2022		2023		2024	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
Heavy Duty	8	5.1	10	1.1	5	8.8	8	2.3	26	6.3
Light Duty	20	1.3	22	1.1	52	5.5	24	1.2	15	1.6
Equipment	0	0.1	1	0.1	10	1.1	3	0.4	3	0.7
Total	**28**	**6.5**	**33**	**2.3**	**67**	**15.4**	**35**	**3.9**	**44**	**8.6**

Toronto Hydro has discovered summation errors in the annual columns and the total cost allocation between the Light Duty and Equipment categories of the original Table 5 submitted as part of Exhibit 2B, Section E8.3, which have been corrected in the table below. There is no change to the aggregate program cost of $43.7 million for 2025-2029.

Table 6: 2025-2029

Description	2025		2026		2027		2028		2029		Total Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Heavy Duty	10	6.2	13	6.4	23	7.2	11	5.4	12	3.8	**29**
Light Duty	17	2	26	3.3	10	0.9	12	1.8	40	4.6	**12.6**
Equipment	2	0.4	1	0.2	1	0.2	1	0.2	10	1.1	**2.1**
Total	**29**	**8.6**	**40**	**9.9**	**34**	**8.3**	**24**	**7.4**	**62**	**9.5**	**43.7**

QUESTION (D):

d) [p.12] What is the total size of Toronto Hydro's fleet by type (heavy, light, equipment).

RESPONSE (D):

There are currently 149 heavy duty vehicles, 210 light duty vehicles, and 69 equipment units in Toronto Hydro's fleet.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-78

Reference: Exhibit 2B, Section E

For all material capital projects undertaken or forecast to be undertaken between 2020 to 2024, please provide a table that includes the following: i) project name, ii) Toronto Hydro program (and segment), iii) original budget costs (or cost budgeted in EB-2018-0165 application), iv) actual or revised forecast cost, v) original forecast in-service year, vi) actual or revised forecast year in-service year, and vii) explanation for any project where the variance between (iii) and (iv) is +/- 10%.

RESPONSE:

Please see Appendix A to this response which shows the actual and budgeted costs between 2020 to 2024 for material capital projects undertaken.

2B-SEC-78: Appendix A

Question		HONI Contributions	Copeland Phase 2	ERP	Control Room Operations Reinforcement	CIS Upgrade
i)	Project name	CCRA Horner TS	Copeland Transformer Station - Phase 2[1]	Enterprise Resource Planning	Control Room Operations Reinforcement	CIS Upgrade
ii)	Toronto Hydro program (and segment)	Stations Expansion	Stations Expansion	IT/OT Systems	Control Room Operations Reinforcement	IT/OT Systems
iii)	Original budget costs (or cost forecast in EB-2018-0165 application) ($ Millions)	34.4	78.5	46.3	40.2	38.5
iv)	Actual or revised forecast cost ($ Millions)	27.9	79.5	24.4	40.1	38.0
v)	Original forecast in-service year	2023	2022 - 2025	2020 - 2024	2022	2022
vi)	Actual or revised forecast year in-service year	2022	2022 - 2024	2020 - 2025	2021-2024	2022-2024
vii)	Explanation for any project where the variance between (iii) and (iv) is +/- 10%	At the time of the 2020-2024 rate application (EB-2018-0165), the project estimate in the forecast was provided by Hydro One as a Class C estimate. This estimate was produced prior to the completion of a CCRA, and to the detailed scope of work.	Variance within +/-10%	Toronto Hydro's prudent decision to delay the SAP S4Hanna initiative to the 2025–2029 rate period was a key factor that contributed to the variance. SAP announced in February 2020 that the SAP ECC Support will be extended until 2027. Based on this announcement, Toronto Hydro made the decision to delay the SAP S4Hanna initiative to the 2025–2029 rate period. (See Exhibit 2B, Section E4, P.10, and Exhibit 2B, Section E8.4, p. 21.) Given the access to reliable support for the existing solution, Toronto Hydro focused its efforts in the 2020–2024 rate period on SAP ECC improvements and enhancements. These initiatives included applying the latest release from the vendor and ensuring the backend infrastructure is effectively maintained and supported as per Toronto Hydro's IT standards. In addition, Toronto Hydro also implemented various SAP enhancements, such as SAP Business Planning and Consolidation Enhancements, SAP Warehouse Management Solution, SAP Payroll Enhancements, and 400+ SAP small enhancements.	Variance within +/-10%	Variance within +/-10%

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 2B-VECC-12

Reference: Exhibit 2B, Section A3.4

QUESTION (A):

a) THESL highlights the potential for incremental costs due to climate change in this section. While the section emphasis negative extreme weather impacts (e.g. severe storms) it does not discuss any offsetting benefits. For example, with milder weather there may be fewer severe snow days or fewer freezing rain days. Such a phenomena might be amplified by Toronto's proximity to Lake Ontario and the amount by which it has a winter freeze over. Has THESL studied the number of days of severe snowfall (e.g., snow in excess of 5cm in a 24 hour period) or the number of days with severe freezing rain (e.g. accumulating as opposed to non-accumulating freezing rain) or other aspects of weather which affect distribution service?

RESPONSE (A):

In June 2015, Toronto Hydro completed a vulnerability assessment following Engineers Canada's Public Infrastructure Engineering Vulnerability Committee ("PIEVC") protocol. The assessment identified areas of vulnerability to Toronto Hydro's infrastructure as a result of climate change. This study did analyze various climate parameters including, but not limited to, snowfall, extreme rainfall, freezing rain, high temperature and high winds. In 2022, this study was updated. Please refer to Exhibit 2B, Section D2, Appendix A.

QUESTION (B):

b) It is unclear to us the relevance Figure 4 - Cumulative rainfall. Why is the annual cumulative rain amount of importance? The descriptive evidence speaks to weather severity (i.e., the amount of rain in a 24 hour period). Please clarify.

RESPONSE (B):

Cumulative rainfall in this section is presented as an indicator of trend. An increase in heavy rainfall days and freezing rain may be a correlated with the upward trend of cumulative rainfall.

QUESTION (C):

c) While climate change has an effect of whether so do other phenomena, for example the El Nino and La Nina Pacific Ocean oscillations. How are these other weather effects taken into account in THELS' analysis of the data attempting to correlate weather risk to distribution system risk?

RESPONSE (C):

Toronto Hydro does not take into account other weather phenomena. The steps Toronto Hydro has taken relative to the study of climate change is the completion of a Climate Change Vulnerability Assessment, see Section 2B, D2, Appendix A.

QUESTION (D):

d) Please provide the number of outages due to Adverse Weather, Lightning, and Tree Contacts for the period shown in Figure 4 -1998 to 2022.

RESPONSE (D):

Toronto Hydro only has outage data dating back to 2002. Table 1 below shows the number of sustained interruptions (excluding MEDs).

Table 1: Number of Outages due to Adverse Weather, Lightning and Tree Contacts from 2002-2022

Year	Adverse weather	Lightning	Tree contacts
2002	294	88	105
2003	324	79	148
2004	77	64	92
2005	170	48	127
2006	129	90	166
2007	130	45	116
2008	111	90	114
2009	88	67	91
2010	79	25	119
2011	115	64	113
2012	120	50	61
2013	177	16	112
2014	82	12	112
2015	89	7	57
2016	58	7	69
2017	41	14	67
2018	129	4	81
2019	57	3	48
2020	49	2	70
2021	79	22	104
2022	80	5	120

QUESTION (E):

e) Please provide the number of Major Event Days (MEDs) for the period 1998 to 2022.

RESPONSE (E):

Toronto Hydro only has MED data dating back to 2002 – see Table 2.

1 **Table 2: Number of MEDs from 2002-2022**

Year	Number of MED's
2002	0
2003	3
2004	0
2005	3
2006	2
2007	2
2008	0
2009	4
2010	1
2011	0
2012	2
2013	8
2014	3
2015	1
2016	0
2017	1
2018	5
2019	0
2020	1
2021	0
2022	1

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 2B-VECC-13

Reference: Exhibit 2B, Section E5.4

QUESTION (A):

a) Please provide a table showing the number of new meters installed and, separately, the number of meters reverified/resealed for the residential and GS<50 rate classes

RESPONSE (A):

Please see Tables 1 and 2 below.

Table 1: New Meter Installation for Residential and GS<50, Suite Meters

New Meter Installation	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Residential and GS < 50, Suite Meters	18,922	14,242	11,667	13,270	106,370	159,946	175,514	181,285	70,354	1,177

Table 2: Meter Reverification/Resealing for Residential, GS<50, Suite Meters

Reverified/ Resealed	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Residential and GS < 50, Suite Meters	16,162	6,745	16,095	9,207	11,066	9,782	12,195	13,816	14,994	12,023

QUESTION (B):

b) THESL notes that most smart meters were installed between 2006 and 2008 (E5.4.3.3). What strategy is the Utility employing in order to avoid a repeat of the "bunching up" of expired meters as has occurred due to concentrating meter replacements within a short

time frame?

RESPONSE (B):

As noted in Exhibit 2B, Section E5.4,[1] Toronto Hydro's historical smart meter deployment strategy was in support of provincial policy objectives concerning the rollout of smart meters and time-of-use billing in Ontario. Building on the strategy approved in the 2020 Rate Application,[2] Toronto Hydro intends to replace meters surpassing their expected lifespan over a five-year period. Mass deployment of meters over a period greater than five years results in future risks to billing and customer experience, while delaying the benefits of AMI 2.0 that can only be realized once a majority of next generation meters have been installed, as shown in Toronto Hydro's response to interrogatory 2B-Staff-194. Toronto Hydro will assess the timing and pace of future metering programs closer to the implementation of those programs based on the risk of failure, ability to reseal, and benefits of any replacement meters at that time.

[1] At page 9, lines 9-10.
[2] EB-2018-0165, Exhibit 2B, Section E5.4; see especially lines 16-27 at page 16.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 2B-VECC-14

Reference: Exhibit 2B, Section E5.3

Table 5: Station Buses Planned for Relief within 2025-2029

Station	Bus	Estimated Load to Transfer (MVA)	Area
Basin	*A7-8*	15 – 25	Downtown
Bathurst	*J&Q*	5 – 20	Horseshoe
Bermondsey	*B&Y*	10 - 25	Horseshoe
Bridgman	*A1-2B*	5 -15	Downtown
Copeland	*A1-2CX*	5 – 15	Downtown
Dufferin	*Note 1*	5 – 15	Downtown
Esplanade	*Note 2*	10 - 20	Downtown
Fairbank	*B & Q*	15 – 30	Horseshoe
Finch	*B&Y, J&Q*	25 - 55	Horseshoe
Horner	*B&Y*	25 - 40	Horseshoe
Leslie	*B&Y*	25 – 40	Horseshoe
Manby	*B&Y, Q&Z*	20 - 50	Horseshoe
Rexdale	*B&Y*	5 - 20	Horseshoe
Runnymede	*J&Q*	15 – 30	Horseshoe
Sheppard	*E&Z*	5 – 20	Horseshoe
Terauley	*Note 2*	10 - 20	Downtown
Windsor	*Note 2*	10 - 20	Downtown

Table 5: Station Buses Planned for Relief within 2020-2024 FROM: EB-2018-0165 Section E5.3

Station	Bus	Target Year	Estimated Load to Transfer (MVA)	Planned Transfer Type
Cecil	*A5-6CE*	2020	2.5 - 10	Downtown Intra-station
Wiltshire	*A5-6W*	2020	5 - 20	Downtown Intra-station
Esplanade	*A1-2X*	2023, 2024	5 - 20	Downtown Inter-station
Basin	*A5-6BN*	2022, 2023	10 - 40	Downtown Inter-station
Horner	*B&Y*	2022, 2023	10 - 40	Horseshoe
Strachan	*(Note 1)*	2023,2024	5 - 20	Downtown Inter-station
Manby	*Q&Z, V&F*	2024	10 - 40	Horseshoe
Windsor	*(Note 2)*	2023,2024	5 - 20	Downtown Inter-station

QUESTION (A) :

a) Please confirm or correct that the Station Buses for Basin, Esplanade, Horner, Manby and Windsor are the same (or substantively the same) in both tables.

RESPONSE (A):

The Station Buses referenced for Esplanade, Horner, Manby QZ, and Windsor are the same in both tables, with the exception of Basin. Basin is not included in the planned Bus Station Relief for the 2025-2029 period, as indicated in Section E5.3.3.4 Table 5 in the Load Demand narrative (updated January 29, 2024).

Table 1: Station Buses

Station	EB-2018-0165 Proposed	EB-2018-0165 Completed	EB-2023-0195 Proposed
Basin	A5-6BN	N/A – no longer required	N/A – no longer required per Jan 29, 2024 update
Esplanade	A1-2X	Yes, including incremental transfers for Windsor buses A5-6WR, A13-14WR, A17-18WR	Scheduled for relief as part of Copeland TS – Phase 2
Windsor	Bus supplying feeders in area bounded by Bathurst St, Adelaide St W, Yonge St, and 7 Railway Corridor		
Horner	B&Y	In Progress	B&Y (Continuation)
Manby	Q&Z; V&F	No – Deferred	Q&Z

QUESTION (B):

b) Specifically identify what costs related to these station buses are incremental to the work planned in the prior DSP and what amounts in the new DSP are for work that was not completed as previously planned.

RESPONSE (B):

There is approximately $9.8 million in load transfers initiated during the 2020-2024 period which are expected to be completed in 2025-2029. Additionally, load transfers not initially planned but completed during the 2020-2024 rate period due to changing needs of the system, are provided in the table below. As a result, load transfers originally planned for Manby QZ in the 2020-2024 period were reprioritized and deferred to 2025-2029, which is forecasted to amount to $8.4 million.

Table 2: Load Transfers Completed in 2020-2024

Station	Buses	Completed Year
Windsor	A5-6WR, A13-14WR, A17-18WR	2021
Terauley	A1-2A, A3-4A	2021, 2024
George & Duke	A1-2GD	2021
Dufferin	A5-6DN	2022
Leaside	Q1&Q2	2022

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 2B-VECC-15

Reference: Exhibit 2B, Section E6.1

Preamble:

Table 11: Planned Rear Lot Projects for 2025-2029

Rear Lot Area	Number of Customers	Expected Date of Completion	Number of Outages (2012-2022)	Number of Outages Greater than 5 Hours (2012-2022)
Thorncrest Phase 12	147	2025	1	0
Markland Woods	285	2025-2026	17	8
Martin Grove Gardens	307	2025-2027	7	2
Willowridge	201	2027-2028	11	3
Mount Olive	61	2027-2028	2	2
Kingsview	156	2028-2029	11	2
Eringate Centennial-West Deane	130	2028-2029	18	2
Richview Park	263	2028-2029	1	0

QUESTION (A):

a) Please provide a table showing for the period 2020 through 2023 the number of non-momentary outages in backlots which excludes MEDs.

RESPONSE (A):

Please see Table 1 below.

Table 1: Number of Non-Momentary Rear Lot Outages (Excluding MEDs) 2020-2023

	2020	2021	2022	2023
# of Outages	18	20	26	23

QUESTION (B):

b) Please show the same as a) but for the period 2012 through 2019.

RESPONSE (B):

Please see Table 2 below.

Table 2: Number of Non-Momentary Rear Lot Outages (Excluding MEDs) 2012-2019

	2012	2013	2014	2015	2016	2017	2018	2019
# of Outages	27	35	30	22	18	25	35	15

QUESTION (C):

c) Please provide the budgeted capital cost for each of the projects listed in Table 11. Please clarify which of these projects entails replacement of rear lot with underground plant.

RESPONSE (C):

Please see Table 3 below. All Rear Lot projects entail conversion to an underground front lot system. Note that some of the customer counts in the table have been updated based on more recent detail design data.

Table 3: Budgeted Capital Costs for Planned Rear Lot Projects[1]

Rear Lot Area	Number of Customers	Expected Date of Completion	Number of Outages (2012-2022)	Number of Outages Greater than 5 Hours (2012-2022)	Project Cost $
Thorncrest Phase 12*	139	2025	1	0	$7,511,700
Markland Woods*	285	2025-2026	17	8	$20,635,271
Martin Grove Garden*	307	2025-2027	7	2	$16,590,590
Willowridge	201	2027-2028	11	3	$14,447,838
Mount Olive	61	2027-2028	2	2	$4,288,653
Kingsview	156	2028-2029	11	2	$11,295,096
Eringate Centennial-West Deane*	133	2025-2027	18	2	$7,187,454
Richview Park	263	2028-2029	1	0	$19,042,373

* Projects with cost incurred in both the 2020-2024 and 2025-2029 periods.

[1] Please note that the sum of these project budgets will not equal the proposed 2025-2029 costs for the Rear Lot segment due to project costs incurred in 2020-2024 and the inclusion of approximately $24 million to begin the conversion of five new rear lot areas towards the end of the rate period, which Toronto Hydro will determine using reliability metrics closer to the time of project planning.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 2B-VECC-16

Reference: Exhibit 1B, Tab 3, Schedule 1

Exhibit 2B, Section C - Reliability Performance

a) Please provide the annual audit reports completed by or for the ESA under Ontario Regulation 22/04 for each year 2020 through 2023.

RESPONSE:

Please see Appendices A-D to this response for the annual audit reports.

Toronto Hydro-Electric System Limited
EB-2023-0195
2B-VECC-16
Appendix A
FILED: March 11, 2024
(27 Pages)

REPORT OF THE ANNUAL AUDIT
AND DECLARATION OF COMPLIANCE
UNDER ONTARIO REGULATION 22/04

SUBMITTED TO THE ELECTRICAL SAFETY AUTHORITY

SUBMITTED BY

Hani Taki, P.Eng.
Director, Standards & Technical Studies
Toronto Hydro-Electric System
500 Commissioners Street
Toronto, ON M4M 3N7

July 14, 2020

Report Due Date: July 31, 2020

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2.0 2019/2020 AUDIT RESULTS AND ACTION PLANS 3
3.0 DECLARATION OF COMPLIANCE 4
4.0 APPENDIX A – REPORT OF THE AUDITOR 6

The information in these materials is based on information currently available to Toronto Hydro Corporation and its affiliates (together hereinafter referred to as “Toronto Hydro”), and is provided for information purposes only.
Toronto Hydro does not warrant the accuracy, reliability, completeness or timeliness of the information and undertakes no obligation to revise or update these materials. Toronto Hydro (including its directors, officers, employees, agents and subcontractors) hereby waives any and all liability for damages of whatever kind and nature which may occur or be suffered as a result of the use of these materials or reliance on the information therein. These materials may also contain forward-looking information within the meaning of applicable securities laws in Canada ("Forward-Looking Information"). The purpose of the Forward-Looking Information is to provide Toronto Hydro’s expectations about future results of operations, performance, business prospects and opportunities and may not be appropriate for other purposes. All Forward-Looking Information is given pursuant to the "safe harbour" provisions of applicable Canadian securities legislation. The words "anticipates", "believes", "budgets", "could", "estimates", "expects", "forecasts", "intends", "may", "might", "plans", "projects", "schedule", "should", "will", "would" and similar expressions are often intended to identify Forward-Looking Information, although not all Forward-Looking Information contains these identifying words. The Forward-Looking Information reflects the current beliefs of, and is based on information currently available to, Toronto Hydro’s management. The Forward-Looking Information in these materials includes, but is not limited to, statements regarding Toronto Hydro’s future results of operations, performance, business prospects and opportunities. The statements that make up the Forward-Looking Information are based on assumptions that include, but are not limited to, the future course of the economy and financial markets, the receipt of applicable regulatory approvals and requested rate orders, the receipt of favourable judgments, the level of interest rates, Toronto Hydro’s ability to borrow, and the fair market value of Toronto Hydro’s investments. The Forward-Looking Information is subject to risks, uncertainties and other factors that could cause actual results to differ materially from historical results or results anticipated by the Forward-Looking Information. The factors which could cause results or events to differ from current expectations include, but are not limited to, the timing and amount of future cash flows generated by Toronto Hydro's investments, market liquidity and the quality of the underlying assets and financial instruments, the timing and extent of changes in prevailing interest rates, inflation levels, legislative, judicial and regulatory developments that could affect revenues, and the results of borrowing efforts. Toronto Hydro cautions that this list of factors is not exclusive. All Forward-Looking Information in these materials is qualified in its entirety by the above cautionary statements and, except as required by law, Toronto Hydro undertakes no obligation to revise or update any Forward-Looking Information as a result of new information, future events or otherwise after the date hereof.

1.0 SUMMARY - 2019/2020 AUDIT AND DECLARATION OF COMPLIANCE

This report is submitted to the Electrical Safety Authority by Toronto Hydro-Electric System Limited ('Toronto Hydro'), as required under Ontario Regulation 22/04, "Electrical Distribution Safety" issued under the Electricity Act, 1998 (the 'Regulation').

This report covers the period from May 1, 2019 through April 30, 2020.

This report contains the report of the Auditor, and if applicable an Action Plan to further improve compliance with Ontario Regulation 22/04, and the Declaration of Compliance.

For this reporting period, Toronto Hydro hired Acumen Engineered Solutions International Inc. (AESI) to perform the audits.

Les Stoch, an ESA approved auditor, performed the audit on behalf of AESI. The audit covered sections 4, 5, 6, 7, and 8 of Ontario Regulation 22/04. Les Stoch also performed an audit in support of the Declaration of Compliance.

2.0 2019/2020 AUDIT RESULTS AND ACTION PLANS

The 2019/2020 Audit was performed by Les Stoch on May 5, 6, 12, and 13, 2020 to verify the extent of Toronto Hydro's compliance with Ontario Regulation 22/04. There were no opportunities for improvement and no non-compliances found during this year's Ontario Regulation 22/04 audit. A copy of the audit report is included in Appendix A.

Even though no opportunities for improvement and non-compliances were found during this year's Ontario Regulation 22/04 audit, Toronto Hydro is still very committed to continuous improvement.

3.0 DECLARATION OF COMPLIANCE

Toronto Hydro employed an external auditor (AESI) to assess the Company's compliance to Sections 3, 9, 10, 11 and 12 of the Regulation.

The Declaration is included here.

Toronto Hydro-Electric System Ltd.

Annual Declaration of Compliance

Year 2019/20

Period May 1, 2019 to April 30, 2020.

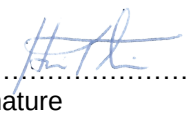
This Declaration of Compliance is submitted by Toronto Hydro-Electric System Ltd. (THESL) in accordance with Ontario Regulation 22/04, Section 14.

I Hani Taki, P. Eng., of Toronto Hydro-Electric System Ltd. state that, to the best of my knowledge and belief and having made reasonable inquiries, Toronto Hydro-Electric System Ltd. has complied with the following sections of Ontario Regulation 22/04:

1) Section 3 – Change of ownership;
2) Section 9 – Deviations from required standards;
3) Section 10 – Proximity to distribution lines;
4) Section 11 – Disconnection of unused lines;
5) Section 12 – Reporting of serious electrical incidents.

Ont. Reg. 22/04 Section10 (4) states that "The distributor shall provide reasonable information with respect to the location of its underground distribution lines and associated plant within a reasonable time." Furthermore, Section 2.6 of the ESA Guideline for Excavation in the Vicinity of Utility Lines states that "Except in cases of an emergency, or when the response for the *locate* request has been agreed with the *Excavator,* the *utility* shall make every reasonable effort to respond to notification requests and provide *locates* within 4 working days of receiving the notification, and 5 working days during peak times." THESL confirms its commitment to achieving these levels of performance. In the 2018/2019 declaration, THESL stated its intention to hire a third locates service provider to help improve locates performance. In 2019, a third locates service provider was brought on board, resulting in improved performance in this reporting period as compared with the 2018/2019 reporting period (while volumes remained relatively steady). THESL's average monthly 5-day completion time during this reporting period was 90.3%. THESL will continue to monitor performance of its locates service.

Toronto Hydro-Electric System Ltd. has used a methodology of review and validation of processes by an independent external auditor, appointed by Toronto Hydro-Electric System Ltd. to assess and verify compliance. Documentation to support this review and validation process is available to the ESA, upon request.



…….
Signature

Hani Taki, P. Eng.
Director, Standards & Technical Studies

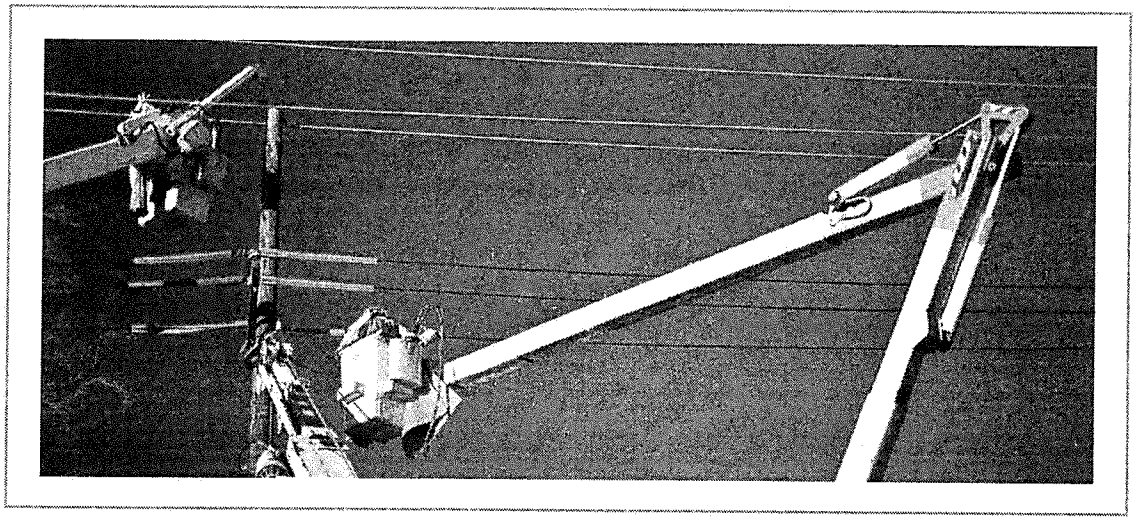
June 29, 2020
…….
Date

4.0 APPENDIX A – REPORT OF THE AUDITOR

The enclosed report was provided by the external auditor (Sections 4 to 8 of Ontario Regulation 22/04)

REMOTE AUDIT REPORT

Ontario Regulation 22/04 Sections 4 to 8



Client
Toronto Hydro Electric System

4ate
May 27, 2020

Prepared by
L. Stoch and Associates

AESI

775 Main Street E
Suite 1B
Milton, Ontario
Canada L9T 3Z3
P · 905.875.2075
F · 905.875.2062

1990 Lakeside
Parkway
Suite 250
Tucker, Georgia
USA 30084
P · 770.870.1630
F · 770.870.1629

www.aesi-inc.com

PRIVATE
AND

Remote Audit Report
May 1, 2019 to April 30, 2020
Ontario Regulation 22/04
Sections 4 to 8

Toronto Hydro Electric System,
500 Commissioners Street,
Toronto, ON M4M 3N7

Prepared by: Leslie Stoch **Date:** May 28/20

L. Stoch, P.Eng.

Reviewed by: _____ **Date:** _____

Toronto Hydro-Electric System Limited

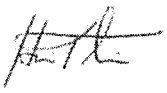
Ontario Regulation 22/04 Compliance

Period May 1, 2019, to April 30, 2020

I, Hani Taki, of Toronto Hydro-Electric System Limited state that to the best of my knowledge and belief and having made reasonable inquiries, Toronto Hydro-Electric System Limited has complied with the following Sections of Ontario Regulation 22/04.

1. Section 4 Safety standards
2. Section 5 When safety standards met
3. Section 6 Approval of electrical equipment
4. Section 7 Approval of plans, drawings, and specifications for installation work
5. Section 8 Inspection and approval of construction

Toronto Hydro-Electric System Limited has used an internal methodology of review and validation of processes to assess and verify compliance.



Hani Taki, P.Eng.
Director, Standards & Technical Studies
Engineering

May 25, 2020

Description and Scope of Remote Audit

An Ontario Regulation 22/04 remote audit of Toronto Hydro Electric System was carried out on May 5, 6, 12 and 13, 2020 by Les Stoch of L. Stoch and Associates. The audit closing meeting was held on May 27, 2020.The purpose of the audit was to assess the distributor's extent of compliance with respect to OR 22/04, Sections 4 to 8 to measure whether the distributor has appropriate processes in place to comply with the safety standards set out in the regulation and whether the organization correctly follows its processes. The time period audited was May 1, 2019 to April 30, 2020.

The Toronto Hydro Electric System distributes electricity in the City of Toronto, serving approximately 778,000 residential, commercial and industrial customers. Ownership is by the City of Toronto. The scope of this audit involved processes concerning 144 municipal substations, 27.6 kV volts to 4160 volts, overhead and underground primary and secondary lines. The distributor also contracts out work to qualified consulting engineers and contractors, and such work was included within the scope of the audit. The distributor maintains a staff of approximately 1360 persons. The LDC owns 36 transformer stations that are not within the scope of the audit.

The remote audit plan, shown in the attached audit checklist/report covers the distributor's policies and procedures concerning OR 22/04. Standard auditing methods and procedures were used including interviews with personnel, examining documents and records for a relevant sample of work activities.

Although the emphasis of this audit was directed toward noncompliances and aspects that should be considered for improvement, nothing in this report should be construed as criticism of neither the distributor's staff nor the services provided.

Auditor Qualifications and Experience

Les Stoch is a professional electrical engineer, qualified quality management system auditor and consultant. Since 1993, he provides electrical engineering services under a PEO Certificate of Authorization, and quality management consulting services for organizations working toward ISO 9001 registration. He is a member of Professional Engineers Ontario, the American Society for Quality, the International Association of Electrical Inspectors and the Ontario Electrical League.

His electrical industry experience includes 21 years with Electrical Inspection, Ontario Hydro in electrical engineering and management positions. He is a past member of the Ontario Provincial Advisory Committee, developing recommendations on Ontario's electrical code. Through Dalhousie University, he provides professional development and training seminars on the electrical code and code-related subjects across Canada.

Auditor Independence

L. Stoch and Associates declares itself to be independent from the Toronto Hydro Electric System and the work to be audited, and free of any potential threats to the auditor's independence including self-interest, self-review, advocacy, familiarity and intimidation.

Executive Overview

A remote audit of the Toronto Hydro Electric System was performed on May 5, 6, 12 and 13, 2020 to verify the organization's extent of compliance with OR 22/04, to identify any gaps and to evaluate the effectiveness of procedures in place for compliance purposes.

The audit covered the organization's existing processes and new ones developed in response to the regulation. The distributor's processes are in good compliance with the regulation.

The Toronto Hydro Electric System is an effective organization, concerned about public safety, and protecting the public from any harm that might result from its operations. The professionalism and dedication of its employees was clearly evident throughout the audit.

Noncompliances

No noncompliances were found:

Opportunities for Improvement

No opportunities for improvement were noted:

General Observations

Several general observations are included:

1. The LDC employs services of a consulting engineers and a quality management system registrar for inspection of work by contractors and design-build contractors.

2. The LDC should revise the equipment re-use approval procedure in accordance with ESA Bulletin DB-01-19 if from time to time reusable equipment is stored on a construction site or on a truck rather that returned to stores.

3. Bell Mobility installs Wireless Antennae on the LDC's pole lines. A Wireless Permit Application form is used as a work instruction. The form does not identify the designer or the reviewer of the work instruction. The form also indicates that Bell Mobility (not confirmed by a person) is in compliance with OR 22/04 and Toronto Hydro Standard SKE-221. Work instructions need to be signed.

4. Substation design may be carried out by the LDC or by a consulting engineer. No design or contraction was done in 2019; work was limited to minor improvements.

Management Response to ESA

The Electrical Safety Authority will ask the distributor to submit a copy of this audit report. Management will be asked to prepare a response to the audit findings, which should include actions on any identified issues with a timetable to address each issue. An action plan should be submitted to ESA along with the audit report.

ESA will respond directly on receiving the distributor's report. An audit review meeting with ESA may take place. The audit findings listed in the report will be reviewed, and any items that require action will be addressed along with the distributor's action plan and any timelines.

If any actions are required, the distributor will be asked to submit a progress report to ESA to provide information on progress in addressing any issues identified in the audit and action plan.

Opening Meeting

No opening meeting was held.

Closing Meeting

A remote closing meeting was held May 27, 2020

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
4(3)	A maintenance and inspection program for equipment **up to 750 volts not part of distribution** to ensure proper operation and safety (ancillary equipment) (Maintenance and inspection schedules, logs, checklists)	Inspection and PM low voltage ancillary equipment: • Municipal street lighting maintained by LDC's contractor, recorded in Work Activity Log (WAL) and inspected by ESA under Roadway Lighting permit. Reactive work signed off by contractor and LDC's Contract Administrator (red folder). Planned work is signed by contactor and Contract Administrator (green folder). • Substation lighting, heating, ventilation and batteries checked during monthly inspections • Battery and charger maintenance twice annually Inspection and PM records available		X		
4(4)	A maintenance and inspection program for **overhead primary and secondary distribution** lines to ensure proper operation and safety • Maintenance schedule • Maintenance records • Asset management	Inspection and PM overhead systems: • LDC's inspection and maintenance programs are planned and documented • Line patrols by contractor, – 3-year cycle; deficiencies recorded electronically, summarized and deficiencies corrected under reactive work program • Annual IR inspection by contractor – over 4160 V • Twice annual insulator washing by contractor • Pole testing by contractor – 10-year cycle (11,198 poles tested in 2019) • Fault indicators installed • Tree trimming by contractor – 3 to 5-years • Porcelain insulation replacements with capital work • PCB testing and elimination program • SCADA switch maintenance by contractor – 4-year cycle Inspection and PM records available		X		

	Audit Plan	Audit Results	NA	C	NI	NC
4(5)	A maintenance, inspection and testing program for **underground primary and secondary distribution** lines to ensure proper operation and safety • Maintenance schedule • Asset management • Maintenance records	Inspection and PM underground systems: • Padmount transformers inspected, results collected electronically and IR inspection by contractor - 3-year cycle (in 2019 inspections 2300 padmount transformers, 960 switches and 3448 submersible transformers) • Submersible transformers inspected by contractor – 3-year cycle • Padmount switchgear – annual visual and IR inspection; dry ice cleaning by contractor as required • Fault indicators installed • Voltage upgrades and underground rebuilds • Vaults checked annually; cleaning as necessary • Cable chamber inspections and IR scan by contractor – 10-year cycle • PCB testing and elimination program • Network systems (electrical and civil) checked annually by contractor and LDC Inspection and PM records available		X		
4(6)	A maintenance, inspection and testing program for **distribution stations** to ensure proper operation and safety • Maintenance schedule • Asset management • Maintenance records	Inspection and PM substations: • Monthly substation inspections and two seasonal, more detailed inspections annually by contractor • IR inspection twice annually • Stations shut down for maintenance by LDC 3-year cycle; relays, switches and circuit-breakers tested during shutdowns (31 maintained in 2019) • Vegetation control by contractor • PCB testing and elimination program • Annual oil sampling and gas analysis by contractor • Network breakers checked – 3-year cycle Inspection and PM records available		X		

	Audit Plan	Audit Results	NA	C	NI	NC
6	Distribution equipment approved when approved by **certification or field inspection;** or approved under **Rule of Distributor** • Documented outline of equipment approval process including identification of competent persons, review of test reports • List of approved major equipment up-to-date and reference to standards • Major equipment specifications approved by a competent person or P.Eng. • Approval records • Non-major equipment – Good Utility Practice	The major and non-major equipment approval procedures are documented and flow-charted. New equipment proposals are assessed by the Standards Department. Technical Specifications display P.Eng. signatures and seals, and reference equipment standards as applicable. The approved equipment list is maintained in electronic format.		X		
6(1)(a)	**Specifying** equipment approved by **certification or field evaluation**	Equipment may be approved when certified or approved by field approval.		X		
6(1(a)	**Checking** that supplied ancillary equipment ordered is approved by **certification or field evaluation**.	Warehouse personnel check for inventory codes to confirm approval.		X		
6(1)(b)	**Major distribution equipment** approval under **Rule of the Distributor**: • Documented approval process • Meets industry standards acceptable to ESA; or • Meets distributor specifications approved by a P.Eng., competent person and no undue hazard; or • Supporting record of approvals • Certified tests reviewed by a competent person	Major equipment proposals are reviewed by the Quality and Standards Engineers. Certified test data is reviewed to ensure that a recognized national or international standard is met. Technical Specifications reference equipment specifications, signed and sealed by a P.Eng. Observations – Reviewed: • South Wire 600 V Neutral Supported and Field Lashed XLPE cable – certified to CSA Standard C22.2 No. 129 and certified test report • ABB 4160 V Padmount Transformers, 4160 V, 13.8 kV and 27.6 kV – 120/240 V- certified test report		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
6(1)(b)	**Re-Use of Major Equipment** • Documented process identifies competent person • Used major equipment approved by competent person or a P.Eng. and no undue hazard • Competent person records no undue hazard • Testing or repair – competent person records no undue hazard • Must fail safely • Otherwise approve as new	The procedure for approving equipment for re-use is documented. Transformers, network protectors and load-break switches may be re-used. Returned equipment is tagged, recorded in an Equipment Re-Use Consent form and dispositioned by a Quality and Standards Engineers. Transformers are sent to the manufacturer for testing, repair or refurbishment before return to inventory. Manufacturers' testing and repair records are provided in detail. Transformers may also be tested ibn-house. Observations – the LDC should revise the equipment re-use approval procedure in accordance with ESA Bulletin DB-01-19 if from time to time equipment is stored at construction sites or on trucks rather than returned to stores.		X		
6(1)(b)	**Non-major Equipment** approval under **Rule of the Distributor** (no undue hazards)**:** • Documented approval process • Meets industry standards; or • Distributor developed specifications; or • Good utility practice – 2 years or more, documented confirmation by a competent person, no undue hazards. • GUP may include successful use in comparable systems • Supporting documentation • Composite cross-arms	The non-major equipment approval procedure is documented in a manual and flow-charted. Non-major equipment is approved by Quality and Standards Engineers when recognized standards are met or under Good Utility Practice after a 2-year observation period. Observations- reviewed approval records: • Ilsco Copper Ground Clamp – certified by CSA • PLP Oval Eye Nut – type test report displayed P.Eng. seal • Channel Bulk Tap Box – installed for 2-year field trial		X		
6(1)(b)	Equipment is **specified** to meet **Rule of Distributor** standards (Purchase orders, reference to standard by model numbers, engineering specifications, technical data)	Tender documents and requests for proposals for major equipment reference the LDC's Technical Specifications and for non-major equipment, manufacturer's part numbers and stock codes. Purchase orders show Technical Specifications, stock codes, manufacturer's part numbers, equipment descriptions and ratings.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
6(1)(b)	Supplied equipment **meets Rule of Distributor** requirements • Inspection procedure • Dealing with vendor noncompliances	Equipment is checked against packing slips and purchase orders to ensure accuracy and satisfactory condition. Bar code scanning checks receipts against purchase orders and enters equipment into inventory. Packing slips are stamped and initialed.		X		
6(2)	**Inspection and testing** of equipment supplied based on **Rule of Distributor** requirements (Inspection and testing records)	The distributor has not developed any unique equipment standards and relies on existing industry standards.	X			
6(2)	**Determining inspection and testing methods** for equipment supplied to distributor (Records of analysis, conclusions, manufacturers declaration, witness testing, third party or distributor testing)	The distributor has not developed any unique inspection or testing methods.	X			
6(1)(a) 6(2)	Dealing with **vendor noncompliance** (Field evaluation, rejection, communications)	Nonconforming shipments are quarantined and tagged, vendors are contacted and equipment is returned if necessary.		X		
7	Work Instructions and Plans: • Prepared by a P.Eng.; and/or • Based on standard design drawings and specifications or Sect. 75 OESC • Reviewed and approved by a P.Eng. or ESA • Subdivision developers • External consultants • Temporary power plans • Deviation of approval	Standard design drawings are certified by Standards Engineers. The standards manual displays a certificate of approval and P.Eng. seals for all standards. Personnel access the standards in a Construction Standard E Book. Deviations are made as sketches that may become standards. Sketches display P.Eng. seals. Construction changes are classified as major or minor. Major changes are reviewed with engineering. Deviations from the LDC's overhead and underground standards are approved by a P.Eng. Deviations from the CSA construction standards are reported to ESA in a Certificate of Deviation Approval form signed by a P.Eng. Observations – construction by LDC - drawings reviewed: • Brimley Rd. & Scagway Ave., Scarborough - 27.6 kV overhead and underground commercial/industrial rebuild, construction by THES, signed off by Design Supervisor		X		

Audit Plan		Audit Results	NA	C	NI	NC
		• 1792 Birchmount Ave., Scarborough - 150 kVA, 27.6 kV- 600/347, padmount transformer, signed off by Design and Construction Supervisors • 56 Boywood Lane, Toronto – 27.6 kV underground residential rebuild. Certificate of Deviation by civil engineer for replacement of padmount transformer pad. • Mercer St. – New Temporary 13.8 kV Underground Supply Service for 1500 kVA, 13.8 kV-600/347 V Padmount transformer. Civil and electrical design by LDC signed off by designer and reviewed by Design Supervisor. • College & Beverly St. – 120/208 V Secondary Buss Relocations signed off in Customer Service Order. Design work may also be done by the LDC's design-build contractors using the LDC's design standards. Drawings are reviewed by the LDC's design supervisors and Contract Administrator and display P.Eng. seals. The LDC's contract inspector completes a close out checklist to ensure that all design details have been fulfilled All LDC's design processes are followed. Observations – by design-build contractor reviewed: • Project X14597 Isabella St. Network Transformer Underground Vault Rebuild, civil and electrical re-design by same firm. Drawings display P.Eng. seal. Project Supervisor and design –build P.Eng. sign off on drawings. • Scarborough Golf Club, 27.6 kV and 4160 V Overhead Project and Underground Rebuild. Drawings display contract P.Eng. seal. Drawings reviewed by the LDC's Design Supervisor.				

	Audit Plan	Audit Results	NA	C	NI	NC
		Substation design may be carried out either by the LDC or a consulting engineer. No substation design or construction was carried out in 2019; substation design was limited to improvements. Observations – reviewed: • Renforth MS - RTU Replacements - changes to the existing circuit diagrams. Drawings showed certificates of approval. Final certificate of inspection on green folder signed off by Technologist and Supervisor. • Brimley Shaddock Station – battery chargers designed by engineering firm and installed by contractor – drawings showed certificates of approval. Certificate of inspection signed off by contractor and LDC supervisor.				
7	Approved plans or standard designs required except for: • Like-for-like construction • Emergency work • Legacy construction	Approved drawings are provided except for like-for-like, emergency and legacy construction		X		
7	Ensure third party attachments are: • Authorized; and • No adverse affect on distribution system safety • Engineering plans certified by LDC or third party P.Eng. (no gaps in certification) • Certified third party standards – evidence of certification • Third party generation • Bell Canada plans	Third party attachers are Bell, Rogers, Cogeco, Telus, Enbridge, Mahoney, BIA, U of T, and Toronto Police. On submitting an application, the third party surveys the subject lines and submits construction drawings. The LDC reviews the third party's plans and provides any required make ready work. The LDC tracks third party construction through an electronic tracking system. Third parties are permitted 6 months to complete work and 90 days to vacate mid-span structures. Observations – reviewed plans: • Bell, Bayview-Heathcott Ave. – drawing showed certificate of approval and P.Eng. seal.		X		

Audit Plan		Audit Results	NA	C	NI	NC
		• Bell Wireless Antenna, Florence Ave. and Circuit-breaker – the Wireless Permit Application form is not a work instruction for the following reasons.. The form does not the signatures of the designer and the reviewer. The form specifies that Bell Mobility (not a person) is in compliance with OR 22/04 and THES standard SKE-221.				
7	Up-to-date copies of internal specifications and identified standards available to approving P.Eng. – examples: • Electrical Safety Code • CSA Std. O/H Systems • CSA Std. U/G Systems • National Electrical Safety Code • Equipment Standards	Engineering staff has access to all necessary codes and standards including equipment standards.		X		
7	Ensure P.Eng. memberships valid and current	P.Eng. memberships are subsidized maintained current.		X		
7	Identify competencies of identified competent persons and ensure they have the required competencies (training records, position descriptions, resumes)	Sample of qualifications of identified competent staff reviewed and confirmed. The LDC requires College certificate or OACETT membership and previous design experience. Qualifications are listed electronically. CVP training and refresher training is provided every 3 years.		X		
7(1)(a)	Installations based on plans by a P.Eng.: • Reviewed and approved by a P.Eng; or • Reviewed and Approved by ESA	Installations are based on plans reviewed and approved by a P.Eng. Plans by consultants and as-built contractors are reviewed by the LDC's P.Eng.		X		
7(1)(b)	Installations based on standard drawings and specifications assembled by a P. Eng., engineering technologist or competent person (Sample of drawings and specifications)	Installations are based on standard drawings and specifications assembled by engineering technicians and technologists. Plans may be produced by an external P.Eng. or design-build contractor.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
7(2)(a) 7(2)(b)	Plans, standard design drawings and specifications **reviewed and approved** by a P.Eng. or ESA (Signatures, stamps)	Plans, standard designs and specifications are reviewed and approved by a P.Eng. Externally produced plans are reviewed by the LDC.		X		
7(3) 7(5)	Plans, standard design drawings and specifications **certified** by a P.Eng. or ESA (Plans, drawings, specifications, certificates)	Standard design drawings are certified by a P.Eng. Drawings by consulting engineers and design-build contractors follow LDC standards and design procedures.		X		
7(6)	Ensure that standard design drawings, specifications and certificates are: • Recorded and tracked • As-built drawings show changes made in construction • Retained and available to ESA • Retained for minimum of one year after audit • Electronic storage	As-built drawings and Equipment Change Out Forms are scanned and indexed electronically by project number and a list of search names. Reactive work is scanned and indexed by request numbers and a list of other search names. Paper design drawings are destroyed after one year. The GIS is updated. Green work folders containing marked up and as-built drawings, material lists, certificates of inspection are stored in a warehouse.		X		
8(1)	Construction verification program: • Approved by ESA • When approved • Qualified persons list up-to-date • Any changes approved	The CVP is approved by ESA and qualified persons list maintained up-to-date.		X		
8(1)	Except for like-for-like replacements, emergency and legacy work, installations based on: • Approved and certified plans before construction; or • Standard design drawings and specifications • Approved equipment • Safety standards met • Noncompliances noted in record of inspection	Planned work records are assembled in green construction folders. As-built plans are stamped and signed off by construction crew leaders, construction supervisors and engineering. Partial certificates of inspection are signed off on construction drawings and green construction folders. Deviations from standards are documented in an operating procedure. Final certificates of inspection and as-built drawings are signed off by the Crew Leader and Construction Supervisor		X		

Audit Plan		Audit Results	NA	C	NI	NC
		Observations – reviewed: • 56 Boywood Lane, Toronto – residential underground rebuild, underground civil construction by contractor, daily inspection reports by the LDC's contract inspector. Contractor and contract inspector sign off on green folder certificate of inspection. One technical deviation – duct moved to avoid obstacle. • 1792 Birchmount Rd., Scarborough – 27.6 kV, 150 kVA, 600/347 V transformer. Separate civil and electrical drawings. Civil construction by contractor – certificate of inspection on green folder signed off by contractor and the LDC's contract inspector. • 27.6 kV Bellamy MS Cable Replacement– civil construction, install poles and SCADA switch installed by contractors. Civil signed off by contractor and civil inspector. Electrical signed off by contractor and Supervisor. Red folder created for replacement of faulty cable; RCF sheet signed off. • Ellesmere Ave., Toronto – two customer specific transformers replaced and voltage converted, 4160 V to 27.6 kV and replaced by 150 kVA padmount transformer by contractor. Crew Leader signed off on electrical drawings and green folder. Supervisor signed off on green folder. Civil contract inspector signed off on civil construction. • Thorncrest Voltage Conversion, 4160 V to 27.6 kV – overhead by LDC and underground by contractor. New poles by contractor and framed by the LDC. Partial certificates of inspection on construction drawings signed by Crew Leader. Green construction folder signed by Construction Supervisor. • 120/208 V Overhead Secondary Line Relocation by LDC. Partial certificate of inspection signed by Crew Leader. Final Inspection certificate and as constructed drawing signed by Supervisor.				

Audit Plan		Audit Results	NA	C	NI	NC
		• Mercer St. 13.8 kV Temporary Service, 1500 kVA-600 /347 V Transformer. Green civil construction folder signed by Design Supervisor and Contract Administrator. Contract civil inspector sighed own folder. As constructed drawings signed by contractor foreman and Design Supervisor.				
8(1)	Ensure construction inspected and approved before use: • When implemented? • Monitored to cover all construction	Reactive work by LDC personnel and contractors is filed in red work folders, inspected and signed off in Corrective Maintenance Work Orders off by Crew Leaders. Records are maintained in red folders. Final certificates of inspection are signed off on the red folders by LDC and contractor Supervisors. Grid Response reports may be signed off by LDC personnel or contractors.		X		
8(1)	Like-for-like, emergency and legacy work inspected and confirmed safe by competent person • Metering • Cutoff and reconnection • Customer service • NC's rectified • No undue hazard statement (how?) • Inspection record and certificate	Metering activities are recorded and signed off in paper Field Orders and Service Orders. Trouble reports are recorded in electronic SRR report forms. Collection activity records are recorded by contractors in yellow Field Orders for service disconnections and white Field Orders for reconnections. A "no undue hazards" statement is signed. Street disconnection reported in work orders by Operations personnel.		X		
8(2)(a) 8(2)(b) 8(2)(c)	Inspection by: • P.Eng.; or • Qualified person identified in inspection verification program; or • ESA	Inspections are normally carried out by qualified staff identified in the CVP. Supply services are signed off by lines personnel, partial and final certificates, as-built stamp on plans and back of green project folder. Certificates of inspection for substation work are signed off on engineering drawings and on the green folders.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
8(3)	Records of inspection include: • Inspection before use of installation • Approved plan or standard design followed • Approved equipment used • Inspection date • Installation identified • Noncompliances rectified Stamped, signed or initialed	Records of inspection provide all required information on what was inspected, identify the inspector and include: • Marked up and as-built drawings • As constructed stamps • Final and partial certificates on plans and project folders • Field Orders • Work Orders and Service Orders • System Response Reports • Street Lighting Work Activity Logs (WAL)		X		
8(4)	Safety standards met before certification Certificates available and show: • Identify work inspected • Safety standards met • Date of certification • Stamp, signature or initials • Like-for-like and legacy construction no undue hazards	Certificates of inspection provide all necessary information on what was inspected and identify the inspector. Certificates include: • Certificates of inspection on drawings and project folders • As constructed stamps • Work Orders and Service Orders • Field Orders • System Response Reports • Street Lighting Work Activity Logs (WAL)		X		
8(7)	Certificates and records of inspection available to ESA and: • Who maintains records and certificates • Covers all applicable construction • Signed and dated	Certificates and records of inspection are available in engineering project files or other departments as applicable.		X		
	Competent and qualified persons trained on CV program and process for updating • All identified in CVP	Competent and qualified personnel receive initial CVP training and refresher training every 3 years. Sample of qualifications of competent and qualified staff reviewed and confirmed. Reviewed 2019 CVP training records.		X		
	Third party contractors trained and listed in the CVP	Contractors receive initial CVP training during orientation and refresher CVP training at 3-year intervals by IHSA.		X		

	Audit Plan	Audit Results	NA	C	NI	NC
	Sampling program developed	Sampling inspections not done except for re-inspections of contractors' work.		X		
	Process for resolving noncompliances and design changes	Noncompliances and field proposals for design changes are managed in accordance with the LDC's operating procedure.		X		
	Third party construction by contractors • Approved plan followed	Civil and electrical construction may be carried out by the LDC's design-build contractors. Contractors' work is inspected and signed off by the LDC's contract inspectors who also provide close out project reports. Contractors and contract inspectors sign off on as-built plans. Partial certificates of inspection by contractors. Project folders signed off by crew leader, construction supervisor and Contract Administrator. Contract inspector signs off in a separate inspection folder. Observations – design-build construction reviewed: • Scarborough Golf Club, 27.6 kV and 4160 V Overhead Project and Underground Rebuild. Contractor Superintendent and Contract Administrator sign off on certificate of inspection and as-built drawings. Contractor Foreman signs off on partial certificates of inspection on plans. Contract Foremen and Contract Supervisor signs off on civil and electrical green folders. • Isabella St. 13.8 kV Network transformer Underground Vault Rebuild. Design-build contractor did both civil and electrical construction. LDC's contract inspector signed off certificates of inspection for civil and electrical work. The inspector submitted daily and final inspection reports. The contract inspector signs off on the green inspection folder. Contractor Supervisor, contract inspector and Contract Administrator sign off on the green electrical and civil folders.		X		

	Audit Plan	Audit Results	NA	C	NI	NC
	Third party attachment – communications and community antenna systems: • Meets safety requirements • Noncompliances and variations resolved • Inspection by P.Eng. or person qualified	The LDC's inspectors inspect and sign off on third party attachments by means of stamped certificates of inspection on the construction drawings..		X		
	Public safety promotion Regular training includes safety Performance assessment includes safety Records on dealing with safety issues Training materials Safety communications Interest and input from the Board	The distributor promotes public safety in the following ways: • Emergency preparedness planning • Electrical safety information on distributor's web-site including electrical safety videos, information on Ontario One Call, power outages, kids safety, downed power lines, emergency preparedness • ISO45001 and ISO 14001 • Participation with safety professionals – AEUSP, BCRSP, CEA, and CRSP • Dig safe promotion • Radio electrical safety messages • Among Canada's Safest Employers • Billing inserts – electrical safety for home owners • Communications with City council • Electrical safety messages in community newspapers • Electrical safety presentations at community events • Use of social media to provide electrical safety tips and safety alerts including road safety in vicinity of Hydro crews, emergency preparedness, kids safety, weather alerts and safety videos, • Electrical safety messages in public transit and THES vehicles Records available		X		

Toronto Hydro-Electric System Limited
EB-2023-0195
2B-VECC-16
Appendix B
FILED: March 11, 2024
(28 Pages)

REPORT OF THE ANNUAL AUDIT
AND DECLARATION OF COMPLIANCE
UNDER ONTARIO REGULATION 22/04

SUBMITTED TO THE ELECTRICAL SAFETY AUTHORITY

SUBMITTED BY

Hani Taki, P.Eng.
Director, Standards & Energy Solutions
Toronto Hydro-Electric System
500 Commissioners Street
Toronto, ON M4M 3N7

July 26, 2021

Report Due Date: July 31, 2021

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2.0 2020/2021 AUDIT RESULTS AND ACTION PLANS 3
3.0 DECLARATION OF COMPLIANCE 4
4.0 APPENDIX A – REPORT OF THE AUDITOR 6

The information in these materials is based on information currently available to Toronto Hydro Corporation and its affiliates (together hereinafter referred to as "Toronto Hydro"), including information provided by an independent external auditor to verify Toronto Hydro's compliance with Ontario Regulation 22/04. Toronto Hydro (including its directors, officers, employees, agents and subcontractors) hereby waives any and all liability for damages of whatever kind and nature which may occur or be suffered as a result of the use of these materials or reliance on the information therein. Certain information included in These materials constitutes "forward-looking information" within the meaning of applicable securities laws in Canada ("Forward-Looking Information"). The purpose of the forward-looking information is to provide management's expectations regarding the Corporation's future results of operations, performance, business prospects and opportunities, and may not be appropriate for other purposes. All forward-looking information is given pursuant to the "safe harbour" provisions of applicable Canadian securities legislation. The words "can", "could", "will" and similar expressions are often intended to identify forward-looking information, although not all forward-looking information contains these identifying words. The forward-looking information reflects management's current beliefs and is based on information currently available to the Corporation's management.

The forward-looking information is subject to risks, uncertainties and other factors that could cause actual results to differ materially from historical results or results anticipated by the forward-looking information. The factors which could cause results or events to differ from current expectations include, but are not limited to: risks associated with the execution of the Corporation's capital and maintenance programs necessary to maintain the performance of our distribution assets and make required infrastructure improvements; risks associated with electricity industry regulatory developments and other governmental policy changes, including in respect of conditions created by COVID-19; risks associated with the timing and results of regulatory decisions regarding the Corporation's revenue requirements, cost recovery and rates; risk that the Corporation is not able to arrange sufficient and cost-effective debt financing to fund capital expenditures and other obligations; risk of downgrades to the Corporation's credit rating; the impact of COVID-19 on the Corporation's operating results and financial position in the future; and the ultimate duration and level of impact of COVID-19 on the economy and the Corporation's business.

1.0 SUMMARY - 2020/2021 AUDIT AND DECLARATION OF COMPLIANCE

This report is submitted to the Electrical Safety Authority by Toronto Hydro-Electric System Limited ('Toronto Hydro'), as required under Ontario Regulation 22/04, "Electrical Distribution Safety" issued under the Electricity Act, 1998 (the 'Regulation').

This report covers the period from May 1, 2020 through April 30, 2021.

This report contains the report of the Auditor, and if applicable, an Action Plan to further improve compliance with Ontario Regulation 22/04 and the Declaration of Compliance.

Toronto Hydro hired Acumen Engineered Solutions International Inc. (AESI) to perform the audits for this reporting period.

Les Stoch, an ESA-approved Auditor, performed the audit on behalf of AESI. The audit covered sections 4, 5, 6, 7, and 8 of Ontario Regulation 22/04. Les Stoch also performed an audit in support of the Declaration of Compliance.

2.0 2020/2021 AUDIT RESULTS AND ACTION PLANS

The 2020/2021 Audit was performed by Les Stoch on May 4, 5, 11, and 12, 2021, to verify the extent of Toronto Hydro's compliance with Ontario Regulation 22/04. There were no opportunities for improvement and no non-compliances found during this year's Ontario Regulation 22/04 audit. A copy of the audit report is included in Appendix A.

Even though no opportunities for improvement and non-compliances were found during this year's Ontario Regulation 22/04 audit, Toronto Hydro is still committed to continuous improvement.

3.0 DECLARATION OF COMPLIANCE

Toronto Hydro employed an external auditor (AESI) to assess the Company's compliance to Sections 3, 9, 10, 11, and 12 of the Regulation.

The Declaration is included here.

Toronto Hydro-Electric System Ltd.

Annual Declaration of Compliance

Year 2020/21

Period May 1, 2020 to April 30, 2021

This Declaration of Compliance is submitted by Toronto Hydro-Electric System Limited (THESL) in accordance with Ontario Regulation 22/04, Section 14.

I, Hani Taki, P. Eng., of THESL state that, to the best of my knowledge and belief and having made reasonable inquiries, THESL has complied with the following sections of Ontario Regulation 22/04:

1) Section 3 – Change of ownership;
2) Section 9 – Deviations from required standards;
3) Section 10 – Proximity to distribution lines;
4) Section 11 – Disconnection of unused lines;
5) Section 12 – Reporting of serious electrical incidents.

In Q4 of 2020, it came to Toronto Hydro's attention that 19 primary lines exist in the electrical distribution system in a disconnected but not grounded state as defined by ESA's Guideline for Disconnecting Unused Lines dated October 5, 2005. Toronto Hydro is in process of correcting these deficiencies by grounding or removing the unused lines as applicable. Work has been scheduled with an expected completion by August 2021. All locations are in areas inaccessible to the public (e.g. submersible vaults) and therefore the risk to the public remains low. Toronto Hydro remains committed to public safety and compliance with Ontario Regulation 22/04.

Performance records for 2020/21 show that over 90% requests for locates were completed within 5 days during the audit period.

THESL has used a methodology of review and validation of processes by an independent external auditor, appointed by THESL to assess and verify compliance. Documentation to support this review and validation process is available to the ESA, upon request.



Hani Taki, P. Eng.
Director, Standards & Energy Solutions

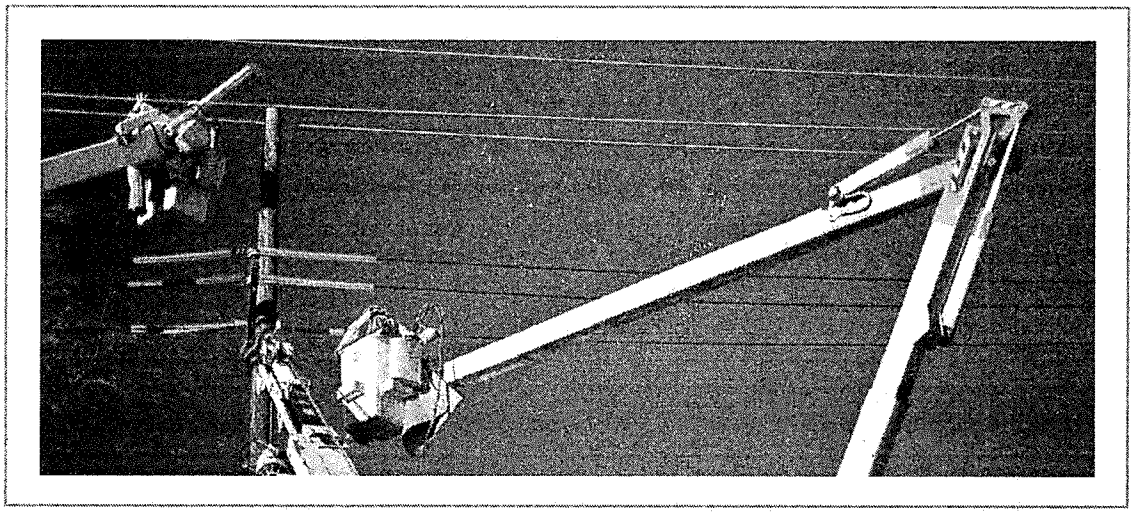
June 30, 2021

4.0 APPENDIX A – REPORT OF THE AUDITOR

The enclosed report was provided by the External Auditor (Sections 4 to 8 of Ontario Regulation 22/04)

REMOTE AUDIT REPORT

Ontario Regulation 22/04 Sections 4 to 8



Client
Toronto Hydro Electric System
date
May 18, 2021

Prepared by
L. Stoch and Associates

AESI

775 Main Street E
Suite 1B
Milton, Ontario
Canada L9T 3Z3
P · 905.875.2075
F · 905.875.2062

1990 Lakeside
Parkway
Suite 250
Tucker, Georgia
USA 30084
P · 770.870.1630
F · 770.870.1629

www.aesi-inc.com

PRIVATE AND

Remote Audit Report
May 1, 2020 to April 30, 2021
Ontario Regulation 22/04
Sections 4 to 8

Toronto Hydro Electric System,
500 Commissioners Street,
Toronto, ON M4M 3N7

Prepared by: Leslie Stoch **Date:** May 18/21

L. Stoch, P.Eng.

Reviewed by: _____ **Date:** June 1, 2021

Description and Scope of Remote Audit

An Ontario Regulation 22/04 remote audit of Toronto Hydro Electric System was carried out on May 4, 5, 11 and 12, 2021 by Les Stoch of L. Stoch and Associates. The audit closing meeting was held on May 18, 2021.The purpose of the audit was to assess the distributor's extent of compliance with respect to OR 22/04, Sections 4 to 8 to measure whether the distributor has appropriate processes in place to comply with the safety standards set out in the regulation and whether the organization correctly follows its processes. The time period audited was May 1, 2020 to April 30, 2021.

The Toronto Hydro Electric System distributes electricity in the City of Toronto, serving approximately 78,230 residential, commercial and industrial customers. Ownership is by the City of Toronto. The scope of this audit involved processes concerning 143 municipal substations, 27.6 kV volts to 4160 volts, overhead and underground primary and secondary systems. The distributor also contracts out work to qualified consulting engineers and contractors, and such work was included within the scope of the audit. The distributor maintains a staff of approximately 1270 persons. The LDC owns 36 transformer stations that are not within the scope of the audit.

The remote audit plan, shown in the attached audit checklist/report covers the distributor's policies and procedures concerning OR 22/04. Standard auditing methods and procedures were used including interviews with personnel, examining documents and records for a relevant sample of work activities.

Although the emphasis of this audit was directed toward noncompliances and aspects that should be considered for improvement, nothing in this report should be construed as criticism of neither the distributor's staff nor the services provided.

Auditor Qualifications and Experience

Les Stoch is a professional electrical engineer, qualified quality management system auditor and consultant. Since 1993, he provides electrical engineering services under a PEO Certificate of Authorization, and quality management consulting services for organizations working toward ISO 9001 registration. He is a member of Professional Engineers Ontario, the American Society for Quality, the International Association of Electrical Inspectors and the Ontario Electrical League.

His electrical industry experience includes 21 years with Electrical Inspection, Ontario Hydro in electrical engineering and management positions. He is a past member of the Ontario Provincial Advisory Committee, developing recommendations on Ontario's electrical code. Through Dalhousie University, he has provided professional development and training seminars on the electrical code and code-related subjects across Canada.

Auditor Independence

L. Stoch and Associates declares itself to be independent from the Toronto Hydro Electric System and the work to be audited, and free of any potential threats to the auditor's independence including self-interest, self-review, advocacy, familiarity and intimidation.

Executive Overview

A remote audit of the Toronto Hydro Electric System was performed on May 4, 5, 11 and 12, 2020 to verify the organization's extent of compliance with OR 22/04, to identify any gaps and to evaluate the effectiveness of procedures in place for compliance purposes.

The audit covered the organization's existing processes and new ones developed in response to the regulation. The distributor's processes are in good compliance with the regulation.

The Toronto Hydro Electric System is an effective organization, concerned about public safety, and protecting the public from any harm that might result from its operations. The professionalism and dedication of its employees was clearly evident throughout the audit.

Noncompliances

No noncompliances were found:

Opportunities for Improvement

No opportunities for improvement were noted:

General Observations

Several general observations are included:

1. The LDC has converted the collection and storage of many work records to digital format.

2. The LDC employs services of a consulting engineers and a quality management system registrar for inspection of work by contractors and design-build contractors.

3. The previous audit noted that work instructions for cellphone antennae attachments to overhead pole lines did not clearly identify the designers. This oversight was corrected by the third parties, either providing a construction drawing sealed by a P.Eng. or by identifying the designer of the work instruction.

4. The LDC is in process of converting construction drawing files to digital format..

Management Response to ESA

The Electrical Safety Authority will ask the distributor to submit a copy of this audit report. Management will be asked to prepare a response to the audit findings, which may include actions on any identified issues with a timetable to address each issue. An action plan may be requested by ESA along with the audit report.

ESA will respond directly on receiving the distributor's report. An audit review meeting with ESA may take place. The audit findings listed in the report may be reviewed, and any items that require action will be addressed along with the distributor's action plan and any timelines.

If any actions are required, the distributor will be asked to submit a progress report to ESA to provide information on progress in addressing any issues identified in the audit and action plan.

Opening Meeting

See attachment.

Remote Closing Meeting

See attachment

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
4(3)	A maintenance and inspection program for equipment **up to 750 volts not part of distribution** to ensure proper operation and safety (ancillary equipment) (Maintenance and inspection schedules, logs, checklists)	Inspection and PM low voltage ancillary equipment: • Municipal street lighting maintained by LDC's contractor, recorded by contractor in Work Activity Log and inspected by ESA under CSS permit. Red folder signed off by contractor and LDC's Contract Administrator. Planned work is signed by contactor and Supervisor, Maintenance and Construction on green folder. Random checks by the LDC's contract inspector signed off in a Daily Activity Report. ESA inspection application taken out for new installations. • Substation lighting, heating, ventilation and batteries checked during monthly inspections • Battery and charger maintenance twice annually Inspection and PM records available		X		
4(4)	A maintenance and inspection program for **overhead primary and secondary distribution** lines to ensure proper operation and safety • Maintenance schedule • Maintenance records • Asset management	Inspection and PM overhead systems: • System patrols by contractor, – 3-year cycle, deficiencies recorded in work orders – digital records • Annual IR inspection by contractor all, primary lines • Twice annual insulator washing by contractor • Pole testing by contractor – 10-year cycle (14,200 poles tested and approximately 200 replaced in 2020) • Fault indicators installed • Tree trimming by contractor – 1 to 5-years as necessary • Porcelain insulation replacements • PCB testing and elimination program • SCADA and manual switch maintenance by contractor – 4-year cycle Inspection and PM records available		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
4(5)	A maintenance, inspection and testing program for **underground primary and secondary distribution** lines to ensure proper operation and safety • Maintenance schedule • Asset management • Maintenance records	Inspection and PM underground systems: • Padmount and submersible transformers inspected by contractor including IR inspections - 3-year cycle • Digital inspection records ; deficiencies corrected in work orders • Switchgear - annual visual and ultrasound inspection by contractor and dry ice cleaning as required • Fault indicators installed • Voltage upgrades and underground rebuilds • Vaults checked annually; cleaning as necessary • Cable chamber inspections and IR scan by contractor – 10-year cycle • PCB testing and elimination program • Network systems checked by contractor and LDC – 1 to 5 years • Manholes and cable chambers checked every 10 years Inspection and PM records available		X		
4(6)	A maintenance, inspection and testing program for **distribution stations** to ensure proper operation and safety • Maintenance schedule • Asset management • Maintenance records	Inspection and PM substations: • Monthly substation inspections by contractor; deficiencies recorded in work orders • Digital inspection records • IR inspection twice annually • Stations shut down for maintenance by LDC 4-year cycle; relays, switches and circuit-breakers tested (34 stations maintained in 2020) • Vegetation control by contractor • PCB testing and elimination program • Annual oil sampling and gas analysis by contractor • Network inspections by LDC twice annually • Apartment building vaults, transformers up to 2 mVA checked – 3-year cycle Inspection and PM records available		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
6	Distribution equipment approved when approved by **certification or field inspection;** or approved under **Rule of Distributor** • Documented outline of equipment approval process including identification of competent persons, review of test reports • List of approved major equipment up-to-date and reference to standards • Major equipment specifications approved by a competent person or P.Eng. • Approval records • Non-major equipment – Good Utility Practice	The LDC's equipment approval procedures are documented and flow-charted, approved by the Director of Standards and Technical Studies. Flow-charts are approved by a P.Eng. New proposals are assessed by the Standards Department. Equipment Technical Specifications display P.Eng. signatures and seals, and reference equipment standards as applicable. An approved equipment list is maintained in digital format.		X		
6(1)(a)	**Specifying** equipment approved by **certification or field evaluation**	Certified or field approved low voltage equipment is approved.		X		
6(1(a)	**Checking** that supplied ancillary equipment ordered is approved by **certification or field evaluation**.	Warehouse personnel check for inventory codes to confirm approval.		X		
6(1)(b)	**Major distribution equipment** approval under **Rule of the Distributor**: • Documented approval process • Meets industry standards acceptable to ESA; or • Meets distributor specifications approved by a P.Eng., competent person and no undue hazard; or • Supporting record of approvals • Certified tests reviewed by a competent person	Quality and Standards Engineers assess new requests for major equipment prior to approval. Certified type test data is reviewed to ensure that a recognized standard is met. Technical Specifications reference equipment standards and specifications, signed and sealed by a P.Eng. Observations – Reviewed: • CES 2400 V - 120/240 V, 50 kVA Submersible Transformer. Certified type test report verified and Technical Specification approved by P.Eng.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
6(1)(b)	**Re-Use of Major Equipment** • Documented process identifies competent person • Used major equipment approved by competent person or a P.Eng. and no undue hazard • Competent person records no undue hazard • Testing or repair – competent person records no undue hazard • Must fail safely • Otherwise approve as new	The procedure for approving equipment for re-use is documented. Transformers, network protectors, load-break switches and switchgear may be re-used. Operations personnel complete an Equipment Change Record and tag returned equipment. Equipment is sent out for testing or repairs before approval, recorded in an Equipment Re-Use Consent form and approved by Quality and Standards Engineers. Equipment may also be tested in-house or returned to service without return to inventory after assessment by competent persons.		X		
6(1)(b)	**Non-major Equipment** approval under **Rule of the Distributor** (no undue hazards)**:** • Documented approval process • Meets industry standards; or • Distributor developed specifications; or • Good utility practice – 2 years or more, documented confirmation by a competent person, no undue hazards. • GUP may include successful use in comparable systems • Supporting documentation • Composite cross-arms	The non-major equipment approval procedure is documented and flow-charted. Equipment is approved by Quality and Standards Engineers when recognized standards are met or under Good Utility Practice after a 2-year observation period. Observation – reviewed: • Cicame Energy Aluminum Tinned Termination Lug. Record signed by professional engineer showed that standards ANSI C119-4-2003 and CSA C57-98 had been met. • No new types of equipment were under review a 2-year within the audit period.		X		
6(1)(b)	Equipment is **specified** to meet **Rule of Distributor** standards (Purchase orders, reference to standard by model numbers, engineering specifications, technical data)	Tender documents reference in the LDC's Technical Specifications, stock codes and manufacturer's part numbers. Purchase orders show Technical Specifications, stock codes, manufacturer's part numbers, equipment descriptions and ratings.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
6(1)(b)	Supplied equipment **meets Rule of Distributor** requirements • Inspection procedure • Dealing with vendor noncompliances	Equipment is checked against packing slips and purchase orders to ensure accuracy and satisfactory condition. Bar code scanning checks receipts against purchase orders and enters equipment into inventory. Packing slips are stamped and initialed.		X		
6(2)	**Inspection and testing** of equipment supplied based on **Rule of Distributor** requirements (Inspection and testing records)	The distributor has not developed any unique equipment standards and relies on existing industry standards.	X			
6(2)	**Determining inspection and testing methods** for equipment supplied to distributor (Records of analysis, conclusions, manufacturers declaration, witness testing, third party or distributor testing)	The distributor has not developed any unique inspection or testing methods.	X			
6(1)(a) 6(2)	Dealing with **vendor noncompliance** (Field evaluation, rejection, communications)	Nonconforming shipments are quarantined and tagged, vendors are contacted and equipment is returned by the Buyer if necessary.		X		
7	Work Instructions and Plans: • Prepared by a P.Eng.; and/or • Based on standard design drawings and specifications or Sect. 75 OESC • Reviewed and approved by a P.Eng. or ESA • Subdivision developers • External consultants • Temporary power plans • Deviation of approval	Standard design drawings are certified and sealed by Standards Engineers and the standards manual is certified by the Director of Standards and Technical Studies. Departures from standards are made as sealed sketches that may become standards, provided when specific standards are unavailable. Construction changes are classified as major or minor. Major changes are reviewed with Engineering. Observations – reviewed drawings by the LDC: • Project X18290 Danforth Ave. Ph. B, Overhead and Underground Conversion 4160 V to 13.8 kV, drawings identify the Designer and Design Supervisor. Sealed sketch and Certificate of Deviation provided for reduced clearances around padmount transformer. Job Instruction Sheet provides direction to contractor.		X		

Remote OR 22/04 Audit Checklist

Audit Plan		Audit Results	NA	C	NI	NC
		• Project E14140 Maisonette 27.6 kV Underground Subdivision Rebuild Ph. 1 – electrical and civil drawings identify the Designer and Design Supervisor. Transformers, primary and secondary cables and street lighting replaced. Deviations from standards shown in sealed sketches. • New 13.8 kV Underground Service to Customer Substation Office Tower 65 King St. Customer drawings reviewed by LDC. Design work may also be done by the LDC's design-build contractors using the LDC's design standards. Drawings are reviewed by the LDC's Design Supervisors and Contract Administrator and display P.Eng. seals. The LDC's contract inspector completes a close out checklist to ensure that all design details have been fulfilled All LDC's design processes are followed. Observations – design by design-build contractor reviewed: • E17114 Orton Park Merkley Square, 27.6 kV Overhead rebuild showed certificate of inspection and P.Eng. seal, reviewed by the LDC's Contract Administrator. One deviation from drawing - overhead transformer removed, approved by Contract Administrator. Partial certificates of inspection by contractor and final certificate by LDC's contract inspector. • E15485 Comrie Terrace Underground primary and secondary rebuild. Drawings showed certificate of approval and P.Eng. seal. Partial certificates of inspection by contractor and final certificate by LDC's contract inspector. Green contractor folder signed by contractor and inspection folder by contract inspector.				

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
		Substation design may be carried out either by the LDC or by an external engineer. No substation design or construction was carried out in 2020; design limited to equipment replacements. Observations – reviewed: • 27.6 kV Windsor MS - Battery Replacements by external P.Eng.– Work Instruction showed certificate off Approval and P.Eng. seal; installation by contractor. Commissioning by THES personnel. • 4160 V Pharmacy MS - Switchgear replacement by LDC. Work Instruction showed certificate of approval and P.Eng. seal. Relay Settings Specification showed certificate of approval and technician's signature. Drawing showed certificate of approval and P.Eng. seal. • 27.6 kV Pharmacy MS - 5 mVA Transformer Replacement and replacement ground grid design by LDC. Work Instruction showed certificate of approval and P.Eng. seal. Transformer purchased per previously approved specification installed by contractor.				
7	Approved plans or standard designs required except for: • Like-for-like construction • Emergency work • Legacy construction	Approved drawings are provided except for like-for-like, emergency and legacy construction		X		
7	Ensure third party attachments are: • Authorized; and • No adverse affect on distribution system safety • Engineering plans certified by LDC or third party P.Eng. (no gaps in certification) • Certified third party standards –	Third party attachers are Bell, Rogers, Cogeco, Beanfield and Zayo On submitting an application, the third party surveys the subject lines and submits construction drawings. The LDC reviews the third party's drawings and provides any required make ready work. The LDC tracks third party construction using an electronic spread sheet.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
	evidence of certification • Third party generation • Bell Canada plans	Observations – reviewed construction drawings: • Rogers, Avenue Road – drawings show certificate of approval and P.Eng. seal • Cogeco, Kenneth Drive – drawings show certificate of approval and P. Eng. seal. • Bell, 148 Falstaff Ave. cellphone antenna - Wireless Permit Application showed installation instructions supported by construction drawing sealed and certificate of approval by P.Eng. • Rogers, Bunton Road cellphone antenna – Wireless Permit Application identifies competent person who did the design. • The previous audit noted that work instructions for cellphone antennae attachments by third parties neglected to identify the designers of work instructions. This was corrected by identifying the designer or providing a sealed and certified construction drawing.				
7	Up-to-date copies of internal specifications and identified standards available to approving P.Eng. – examples: • Electrical Safety Code • CSA Std. O/H Systems • CSA Std. U/G Systems • National Electrical Safety Code • Equipment Standards	Engineering staff has access to all necessary codes and standards including equipment standards.		X		
7	Ensure P.Eng. memberships valid and current	P.Eng. memberships are subsidized maintained current.		X		
7	Identify competencies of identified competent persons and ensure they have the required competencies (training records, position descriptions, resumes)	Sample of qualifications of identified competent personnel reviewed and confirmed. Qualifications are listed electronically. The LDC requires that engineering personnel be qualified as engineering technologists or technicians.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
7(1)(a)	Installations based on plans by a P.Eng.: • Reviewed and approved by a P.Eng; or • Reviewed and Approved by ESA	Installations are based on construction drawings reviewed and approved by a P.Eng. Drawings by consultants and as-built contractors are reviewed by the LDC's P.Eng.		X		
7(1)(b)	Installations based on standard drawings and specifications assembled by a P. Eng., engineering technologist or competent person (Sample of drawings and specifications)	Installations are based on standard drawings and specifications assembled by engineering technicians and technologists. Drawings may be produced by an external P.Eng. or design-build contractor.		X		
7(2)(a) 7(2)(b)	Plans, standard design drawings and specifications **reviewed and approved** by a P.Eng. or ESA (Signatures, stamps)	Construction drawings, standard designs and specifications are reviewed and approved by a P.Eng. Externally produced plans are reviewed by the LDC.		X		
7(3) 7(5)	Plans, standard design drawings and specifications **certified** by a P.Eng. or ESA (Plans, drawings, specifications, certificates)	Standard design drawings are certified by a P.Eng. Drawings by consulting engineers and design-build contractors follow LDC standards and design procedures.		X		
7(6)	Ensure that standard design drawings, specifications and certificates are: • Recorded and tracked • As-built drawings show changes made in construction • Retained and available to ESA • Retained for minimum of one year after audit • Electronic storage	Planned work records are stored in green folders (presently being scanned), indexed by year, Project #, project scope, drawing number and address. Digital records are stored in SAP and the GIS, indexed by location, Date, drawing # and drawing type. Reactive work records are stored in red folders and digital format indexed by Work Request #.		X		
8(1)	Construction verification program: • Approved by ESA • When approved • Qualified persons list up-to-date • Any changes approved	The CVP is approved by ESA and qualified persons list maintained up-to-date. CVP training is provided and refresher training is done on-line every 3 years.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
8(1)	Except for like-for-like replacements, emergency and legacy work, installations based on: • Approved and certified plans before construction; or • Standard design drawings and specifications • Approved equipment • Safety standards met • Noncompliances noted in record of inspection	Operations personnel are fully aware of the LDC's CVP requirements. Construction is inspected; certificates of inspection and as-built drawings are signed off by Crew Leaders and Construction Supervisors. Partial certificates of inspection are signed off on construction drawings and construction folders. Changes are categorizes as minor or major. Major changes are reviewed by Engineering. Partial certificates of inspection are stamped and signed on construction drawings. Observations – reviewed construction by LDC: • 27.6 kV Overhead and Underground Scagway Ave. Rebuild Ph. 1 by LDC. Partial certificates of inspection signed and dated on drawings by Crew Leader and Construction Supervisor. Green construction folder signed off by Crew Leader, Construction Supervisor and Design Supervisor. • 27.6 kV Overhead and Underground Rebuild to bypass underground cable fault. Pole and anchor installations by contractor. Electrical work by the LDC. Contractor's work inspected and signed off by the LDC's contract inspector (records unavailable). Work still underway .		X		
8(1)	Ensure construction inspected and approved before use: • When implemented? • Monitored to cover all construction	Reactive work may be initiated by an electronic SRR or request for maintenance by LDC or contractors and filed in red work folders. Work is completed and signed off in Corrective Maintenance Work Orders crew members. Records are maintained in red folders. Final certificates of inspection are signed off on the red folders by LDC and contractor Supervisors.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
8(1)	Like-for-like, emergency and legacy work inspected and confirmed safe by competent person • Metering • Cutoff and reconnection • Customer service • NC's rectified • No undue hazard statement (how?) • Inspection record and certificate	Trouble reports are recorded in System Response Report (SRR) forms signed off electronically by Operations personnel or contractors. Trouble reports may result in reactive work records. Collections records are recorded by contractors in yellow paper Field Orders for service disconnections and white Field Orders for reconnections. All metering work is recorded in Field Orders.		X		
8(2)(a) 8(2)(b) 8(2)(c)	Inspection by: • P.Eng.; or • Qualified person identified in inspection verification program; or • ESA	Inspections are normally carried out by qualified personnel identified in the CVP. Supply services are signed off by lines personnel, partial and final certificates, as-built stamp on drawings and back of green project folder. Certificates of inspection for substation work are signed off on engineering drawings and on the green construction folders.		X		
8(3)	Records of inspection include: • Inspection before use of installation • Approved plan or standard design followed • Approved equipment used • Inspection date • Installation identified • Noncompliances rectified Stamped, signed or initialed	Records of inspection provide all required information on what was inspected, identify the inspector and include: • Marked up and as-built drawings • As constructed stamps • Final and partial certificates on plans and project folders • Field Orders • Work Orders and Service Orders • System Response Reports • Work Activity Logs (WAL)		X		
8(4)	Safety standards met before certification Certificates available and show: • Identify work inspected • Safety standards met • Date of certification • Stamp, signature or initials	Certificates of inspection provide all necessary information on what was inspected and identify the inspector. Certificates include: • Certificates of inspection on drawings and project folders • As constructed stamps		X		

NA – Not Applicable C – Complies NI - Needs Improvement NC - Noncompliance

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
	• Like-for-like and legacy construction no undue hazards	• Work Orders and Service Orders • Field Orders • System Response Reports • Work Activity Logs (WAL)				
8(7)	Certificates and records of inspection available to ESA and: • Who maintains records and certificates • Covers all applicable construction • Signed and dated	Certificates and records of inspection are available in engineering project files or other departments as applicable.		X		
	Competent and qualified persons trained on CV program and process for updating • All identified in CVP	Powerline Technicians are required to attain Red Seal status during their apprenticeship programs. Competent and qualified personnel receive initial CVP training and refresher training on-line every 3 years. Sample of qualifications of competent and qualified staff reviewed and confirmed.		X		
	Third party contractors trained and listed in the CVP	Contractors receive initial CVP training during orientation and refresher CVP training at 3-year intervals by IHSA.		X		
	Sampling program developed	Sampling inspections not done.		X		
	Process for resolving noncompliances and design changes	Noncompliances and field proposals for design changes are managed in accordance with the LDC's operating procedure.		X		
	Third party construction by contractors • Approved plan followed	Civil and electrical construction may be carried out by the LDC's design-build contractors. Contractors' work is inspected and signed off by the LDC's contract inspectors. Contractors and contract inspectors sign off on as-built plans. Partial certificates of inspection by contractors. Project folders signed off by crew leader, construction supervisor and Contract Administrator. Contract inspector signs off in a separate inspection folder.		X		

Remote OR 22/04 Audit Checklist

	Audit Plan	Audit Results	NA	C	NI	NC
		Observations – design-build construction reviewed: • 27.6 kV Windsor MS Battery Replacement design by contractor. Certificate of inspection on drawing signed off by contractor and LDC's Construction Supervisor. • 4160 V Pharmacy MS Switchgear Replacement design by contractor. Certificate of inspection on drawing showed certificate of inspection signed by Construction Supervisor and Technician. • 27.6 kV Pharmacy MS 5 mVA Transformer and ground grid replacement by contractor. Construction drawing signed by Contractor Supervisor.				
	Third party attachment – communications and community antenna systems: • Meets safety requirements • Noncompliances and variations resolved • Inspection by P.Eng. or person qualified	Third parties provide a stamped certificate of inspection on the Occupancy Permit. The LDC's inspectors do follow up inspection and sign off on third party attachments on certificates of inspection on the construction drawings.		X		
	Public safety promotion Regular training includes safety Performance assessment includes safety Records on dealing with safety issues Training materials Safety communications Interest and input from the Board	The distributor promotes public safety in the following ways: • Emergency preparedness planning with the City • Certification to Standards – ISO 14001 Environment OHSAS 18001 and ISO 45001 Health and Safety • Electrical safety information on distributor's web-site • Public safety messages by social media including public electrical safety, Dig Safe, Emergency preparedness, Powerline safety, Electrical fires, Electrical safety reporting, ESA safety tips and Children's safety • Development of electrical safety information for children accessible on line • Radio, television and newspaper safety messages • Monthly mail outs to customers including electrical safety messages Records available		X		

NA – Not Applicable C – Complies NI - Needs Improvement NC - Noncompliance

All sessions in Eastern Daylight Time (Toronto, GMT-04:00)
Session detail for 'Ontario Regulation 22/04 - Kick off meeting':

Caution: This is a preliminary report. It provides immediate access to session data before the final repoı

Participant	Name	Email	Date	Invited	Registered	Company	Title	Phone Nun	
1	Afshin Dary	adaryaei@	########	No	43	Magda Sulz	msulzycki@	########	Yes	N/A
2	Scott Wilgc	swilgosh@	########	Yes	44	Hasdeep Bl	hbhatia@t	########	Yes	N/A
3	Mahnoush	mhamzehl	########	No	45	Claudio Bel	cbellisario(	########	Yes	N/A
4	Leslie Stocl	lstochanda	########	Yes	46	Christina Ll	clima@tor	########	Yes	N/A
5	Rob McKec	rmckeown	########	Yes	47	T.J. Wahid	twahid@to	########	Yes	N/A
6	Ben Pantin	bpantin@t	########	Yes	48	Jeremy Pas	jpasma1@1	########	Yes	N/A
7	Luzmilla YC	lyousif@to	########	Yes	49	Michele D'I	mdmello@	########	Yes	N/A
8	Daniel Sma	dsmart@tc	########	Yes	50	Spyros Nik	snikolaidis(	########	Yes	N/A
9	Akiff Mare	amaredia@	########	Yes	51	Claudio Bel	cbellisario(	########	Yes	N/A
10	Luzmilla YC	lyousif@to	########	Yes	52	John Piroli	jpiroli@tor	########	Yes	N/A
11	Martijn Hu	mhuigens@	########	Yes	53	Sunny Pate	SPatel@To	########	No	N/A
12	Umar Rehn	urehman@	########	Yes	54	Darryl Seal	dseal@tor	########	Yes	N/A
13	Michael M	mmarchan	########	Yes	55	Keith Hunt	khunter@t	########	Yes	N/A
14	Liam Ross	lross@toro	########	No						N/A
15	Mike McDo	mmcdonal	########	Yes						N/A
16	Edmond W	ewong1@t	########	Yes						N/A
17	Pat Allen	pallen@tor	########	Yes						N/A
18	Ammar Abı	aabughazal	########	Yes						N/A
19	Bryan Desc	bdesouza@	########	Yes						N/A
20	Shaun Pina	spinard@t	########	Yes						N/A
21	Matthew F	mfisher1@	########	Yes						N/A
22	Russell BAI	rbaker@to	########	Yes						N/A
23	Leila Karim	lkarimi@to	########	Yes						N/A
24	Rajesh Yat	ryata@tor	########	Yes						N/A
25	Thomas Pa	tpalleschi@	########	No						N/A
26	Darar Abdi	DAbdissa@	########	No						N/A
27	Sakaran M	smanivann	########	Yes						N/A
28	Richard He	rheighway(	########	Yes						N/A
29	Darren Farı	dfarrugia@	########	Yes						N/A
30	Roger Ersil	rersil@tor	########	Yes						N/A
31	Duncan Kei	dkerr@tor	########	Yes						N/A
32	Andrew Ml	ametrick@	########	Yes						N/A
33	Joe Bembri	jbembridge	########	Yes						N/A
34	Daniel Tan	dtan@toro	########	Yes						N/A
35	Phil Genow	pgenoway(	########	Yes						N/A
36	Darren Farı	dfarrugia@	########	Yes						N/A
37	Hani Taki	htaki@tor	########	Yes						N/A
38	Victor Volo	vvolokitin@	########	Yes						N/A
39	James Wei	jwei@toro	########	Yes						N/A
40	Mike Sulit	msulit@to	########	Yes						N/A
41	Chris Hend	chenderso	########	Yes						N/A
42	Daniel Pizz	DPizzardi@	########	No						N/A

All sessions in Eastern Daylight Time (Toronto, GMT-04:00)
Session detail for 'Ontario Regulation 22/04 - Closing Meeting':

Participant	Name	Email	Date	Invited	Company
1	Afshin Daryaei	adaryaei@TorontoHydro.com	5/18/2021	No	
2	Matthew Fisher	mfisher1@torontohydro.com	5/18/2021	Yes	
3	Akiff Maredia	amaredia@torontohydro.com	5/18/2021	Yes	
4	James Wei	jwei@torontohydro.com	5/18/2021	Yes	
5	Martijn Huigens	mhuigens@torontohydro.com	5/18/2021	Yes	
6	Pat Allen	pallen@torontohydro.com	5/18/2021	Yes	
7	Safal Bhattarai	sbhattarai@torontohydro.com	5/18/2021	Yes	
8	Shaun Pinard	spinard@torontohydro.com	5/18/2021	Yes	
9	Hani Taki	htaki@torontohydro.com	5/18/2021	Yes	
10	Umar Rehman	urehman@torontohydro.com	5/18/2021	Yes	
11	Rob McKeown	rmckeown@torontohydro.com	5/18/2021	Yes	
12	Mike McDonald	mmcdonald@torontohydro.com	5/18/2021	Yes	
13	Rajesh Yata	ryata@torontohydro.com	5/18/2021	Yes	
14	Christina LIMA	clima@torontohydro.com	5/18/2021	Yes	
15	Leslie Stoch	lstochandassoc@bellnet.ca	5/18/2021	Yes	
16	Leila Karimi	lkarimi@torontohydro.com	5/18/2021	Yes	
17	Ben Pantin	bpantin@torontohydro.com	5/18/2021	Yes	
18	Russell BAKER	rbaker@torontohydro.com	5/18/2021	Yes	
19	Darren Farrugia	dfarrugia@torontohydro.com	5/18/2021	Yes	
20	Leila Karimi	lkarimi@torontohydro.com	5/18/2021	Yes	
21	Victor Volokitin	vvolokitin@torontohydro.com	5/18/2021	Yes	
22	Scott Wilgosh	swilgosh@torontohydro.com	5/18/2021	Yes	
23	Dave Martins	dmartins@torontohydro.com	5/18/2021	Yes	
24	Phil Genoway	pgenoway@torontohydro.com	5/18/2021	Yes	
25	Daniel Smart	dsmart@torontohydro.com	5/18/2021	Yes	
26	Michele D'Mello	mdmello@torontohydro.com	5/18/2021	Yes	
27	Andrew METRICK	ametrick@torontohydro.com	5/18/2021	Yes	
28	Hasdeep Bhatia	hbhatia@torontohydro.com	5/18/2021	Yes	
29	Spyros Nikolaidis	snikolaidis@torontohydro.com	5/18/2021	Yes	
30	Daniel Tan	dtan@torontohydro.com	5/18/2021	Yes	
31	Sammy Elias	selias@torontohydro.com	5/18/2021	Yes	
32	Steve Strugar	sstrugar@torontohydro.com	5/18/2021	Yes	
33	Magda Sulzycki	msulzycki@torontohydro.com	5/18/2021	Yes	
34	Luzmilla YOUSIF	lyousif@torontohydro.com	5/18/2021	Yes	
35	Luzmilla YOUSIF	lyousif@torontohydro.com	5/18/2021	Yes	
36	Steve Strugar	sstrugar@torontohydro.com	5/18/2021	Yes	
37	Emily Majdi	emajdi@torontohydro.com	5/18/2021	Yes	
38	Sushma Narisetty	snariset@torontohydro.com	5/18/2021	Yes	
39	Ammar Abughazaleh	aabughazaleh@torontohydro.com	5/18/2021	Yes	
40	Edmond Wong	ewong1@torontohydro.com	5/18/2021	Yes	
41	Richard Heighway	rheighway@torontohydro.com	5/18/2021	Yes	
42	Chris Henderson	chenderson@torontohydro.com	5/18/2021	Yes	

43	Jeremy Pasma	jpasma1@torontohydro.com	5/18/2021	Yes
44	Bryan Desouza	bdesouza@torontohydro.com	5/18/2021	Yes
45	Jeremy Pasma	jpasma1@torontohydro.com	5/18/2021	Yes
46	Gerry Zervos	gzervos@torontohydro.com	5/18/2021	Yes

Toronto Hydro-Electric System Limited
EB-2023-0195
2B-VECC-16
Appendix C
FILED: March 11, 2024
(32 Pages)

REPORT OF THE ANNUAL AUDIT
AND DECLARATION OF COMPLIANCE
UNDER ONTARIO REGULATION 22/04

SUBMITTED TO THE ELECTRICAL SAFETY AUTHORITY

SUBMITTED BY

Sushma Narisetty, P.Eng.
Director, Standards & Procurement
Toronto Hydro-Electric System
500 Commissioners Street
Toronto, ON M4M 3N7

July 28, 2022

Report Due Date: July 31, 2022

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2.0 2021/2022 AUDIT RESULTS AND ACTION PLANS 3
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4.0 APPENDIX A – REPORT OF THE AUDITOR 6

The information in these materials is based on information currently available to Toronto Hydro Corporation and its affiliates (together hereinafter referred to as "Toronto Hydro"), including information provided by an independent external auditor to verify Toronto Hydro's compliance with Ontario Regulation 22/04. Toronto Hydro (including its directors, officers, employees, agents and subcontractors) hereby waives any and all liability for damages of whatever kind and nature which may occur or be suffered as a result of the use of these materials or reliance on the information therein. Certain information included in these materials constitutes "forward-looking information" within the meaning of applicable securities laws in Canada ("ForwardLooking Information"). The purpose of the forward-looking information is to provide management's expectations regarding the Corporation's future results of operations, performance, business prospects and opportunities, and may not be appropriate for other purposes. All forward-looking information is given pursuant to the "safe harbour" provisions of applicable Canadian securities legislation. The words "can", "could", "will" and similar expressions are often intended to identify forward-looking information, although not all forward-looking information contains these identifying words. The forwardlooking information reflects management's current beliefs and is based on information currently available to the Corporation's management.

The forward-looking information is subject to risks, uncertainties and other factors that could cause actual results to differ materially from historical results or results anticipated by the forward-looking information. The factors which could cause results or events to differ from current expectations include, but are not limited to: risks associated with the execution of the Corporation's capital and maintenance programs necessary to maintain the performance of our distribution assets and make required infrastructure improvements; risks associated with electricity industry regulatory developments and other governmental policy changes, including in respect of conditions created by COVID-19; risks associated with the timing and results of regulatory decisions regarding the Corporation's revenue requirements, cost recovery and rates; risk that the Corporation is not able to arrange sufficient and cost-effective debt financing to fund capital expenditures and other obligations; risk of downgrades to the Corporation's credit rating; the impact of COVID-19 on the Corporation's operating results and financial position in the future; and the ultimate duration and level of impact of COVID-19 on the economy and the Corporation's business.

1.0 SUMMARY - 2021/2022 AUDIT AND DECLARATION OF COMPLIANCE

This report is submitted to the Electrical Safety Authority by Toronto Hydro-Electric System Limited ('Toronto Hydro'), as required under Ontario Regulation 22/04, "Electrical Distribution Safety" was issued under the Electricity Act, 1998 (the 'Regulation').

This report covers May 1, 2021, through April 30, 2022.

This report contains the auditors' report and, if applicable, an action plan to further improve compliance with Ontario Regulation 22/04 and the Declaration of Compliance.

Toronto Hydro hired Acumen Engineered Solutions International Inc. (AESI) to perform the audits for this reporting period.

Ted Olechna, P.Eng. and Daljit Cheema, P.Eng., as ESA-approved Auditors, performed the audit on behalf of AESI. The audit covered sections 4, 5, 6, 7, and 8 of Ontario Regulation 22/04. Daljit Cheema, P.Eng. also performed audit interviews in support of the Declaration of Compliance.

2.0 2021/2022 AUDIT RESULTS AND ACTION PLANS

The 2021/2022 Audit was performed by Ted Olechna, P.Eng. and Daljit Cheema, P.Eng., on May 11, 12, 17, 18, and 20, 2022, to verify the extent of Toronto Hydro's compliance with Ontario Regulation 22/04. No opportunities for improvement and no non-compliances were found during this year's Ontario Regulation 22/04 audit. A copy of the audit report is included in Appendix A.

Even though no opportunities for improvement and non-compliances were found during this year's Ontario Regulation 22/04 audit, Toronto Hydro is still committed to continuous improvement.

3.0 DECLARATION OF COMPLIANCE

Toronto Hydro employed an external auditor (AESI) to assess the Company's compliance with Sections 3, 9, 10, 11, and 12 of the Regulation.

The Declaration is included in this report.

Toronto Hydro-Electric System Limited

Annual Declaration of Compliance

Year 2021/22

Period May 1, 2021 to April 30, 2022

This Declaration of Compliance is submitted by Toronto Hydro-Electric System Limited ("THESL") in accordance with Ontario Regulation 22/04, section 14.

I, Sushma Narisetty of THESL, state that, to the best of my knowledge and belief and having made reasonable inquiries, THESL has complied with the following sections of Ontario Regulation 22/04:

1) Section 3 – Change of ownership;

2) Section 9 – Deviations from required standards;

3) Section 10 – Proximity to distribution lines;

4) Section 11 – Disconnection of unused lines;

5) Section 12 – Reporting of serious electrical incidents.

In last year's declaration, THESL identified 19 primary lines that exist in the distribution system in a disconnected but not grounded state as defined by the Electrical Safety Authority's ("ESA") Guideline for Disconnecting Unused Lines dated October 5, 2005. THESL confirms that it corrected these deficiencies by December 2021 by grounding or removing the unused lines. Where any other unused primary lines in a disconnected but not grounded state are newly identified, Toronto Hydro continues to correct these deficiencies in a timely manner. Such locations are typically in areas inaccessible to the public and therefore any risk to the public remains low. Toronto Hydro remains committed to public safety and compliance with Ontario Regulation 22/04.

Performance records for 2021/22 show that 88% of requests for locates were completed within 5 days during the audit period. The slight decrease from the previous reporting period can be attributed to the industry-wide shortage of locator resources. The recent passage of legislative amendments under Bill 93 (Getting Ontario Connected Act, 2022) is expected to further affect the availability of locators and locate performance. Furthermore, Toronto Hydro is working with the Locate Alliance Consortium to implement the provincial strategy and increase the quantity of locators.

THESL has used a methodology of review and validation of processes by an independent external auditor, appointed by THESL to assess and verify compliance. Documentation to support this review and validation process is available to the ESA, upon request.

Sushma Narisetty

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DN: cn=Sushma Narisetty, email=snariset@torontohydro.com
Date: 2022.07.27 22:20:24 -04'00'

Sushma Narisetty, P. Eng., M. Eng., MBA

Director, Standards & Procurement

4.0 APPENDIX A – REPORT OF THE AUDITOR

The enclosed report was provided by the External Auditor (Sections 4 to 8 of Ontario Regulation 22/04)

AESI AUDIT REPORT

Ontario Regulation 22/04 Sections 4 to 8



Client

Toronto Hydro-Electric System Ltd.

Date

June 28, 2022

5575 North Service Rd
Ste 401
Burlington, Ontario
Canada L7L6M1
P · 905.875.2075
F · 905.875.2062

www.aesi-inc.com

5055 Memorial Dr.
Ste A #204
Stone Mountain, GA
USA 30083
P · 770.870.1630
F · 770.870.1629

aesi@aesi-inc.com

PRIVATE AND CONFIDENTIAL

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1. AUDIT SCOPE & SUMMARY

This audit report was prepared for Toronto Hydro Electric-Hydro Ltd. (THESL), which distributes electricity in the City of Toronto, serving approximately 787,000 residential, commercial, and industrial customers.

The scope of this audit involved processes for one hundred and forty-three 143 municipal substations, 4,16kV to 27.6kV overhead and underground primary and secondary lines. THESL may contract out a portion of its work to qualified contractors; such work was included within the scope of the audit. THESL employs 1169 regular staff.

THESL also owns one hundred and thirty-six (36) transformer stations. The audit of these transformer stations is out of the scope of Ontario Regulation 22/04 (Regulation).

Ted Olechna has a Lead QMS Auditor Certificate (ISO 9001:2015). Ted is registered with the Professional Engineers of Ontario and has over 35 years of experience working in various capacities at Ontario Hydro/Hydro One in Ontario, as well as a Director at the Electrical Safety Authority (ESA). This audit report is prepared by Ted Olechna under the supervision of Daljit Cheema, P. Eng.

The auditor, Daljit Cheema, has a Lead QMS Auditor Certificate (ISO 9001:2008). Daljit is registered with the Professional Engineers of Ontario and has over 30 years of experience working in various capacities at local electrical distribution companies in the Greater Toronto Area. He is an approved auditor by ESA to conduct this audit to the requirements of the Regulation for THESL.

As the COVID-19 pandemic situation continues to evolve, ESA recommended that this year auditors and the distributors discuss the possibility of performing the audits remotely. ESA will accept and recommends remote audits under the circumstances. The recommendation may continue to be applied to each audit year or updated at a future time.

Sushma Narisetty, P. Eng., Director, Standards & Procurement has agreed to a remote audit. Therefore, site visits and walk-throughs of stores and outside equipment storage facilities were not conducted. Audit meetings were conducted via WEBEX. Records, plans, and standard design drawings were made available by screen sharing and emails.

The audit was conducted on May 11th, 12th, & 17th, 18th, and 20th, 2022, including the period required for documentation review. Additional time was required for audit preparation and to prepare this report.

The audit covered the period from May 1, 2021, to April 30, 2022.

The scope of the audit covered the following processes and departments:

- Management Infrastructure/Oversight
- Review of the responses to the issues from previous audits (if applicable)
- Maintenance
- Purchasing
- Engineering/Design
- Field Construction and Inspection
- Health and Safety

- THESL's Construction Verification Program (CVP)

The audit was conducted in accordance with the requirements of Sections 4 – 8 of the Regulation. The audit confirmed the control environment according to the ESA's Auditing Guidelines.

The auditor declares himself to be independent of THESL, the work to be audited and free of any potential threat to the auditors' independence, including self-interest, self-review, advocacy, familiarity, and intimidation.

The processes documented within the Construction Verification Program and associated procedures were followed, personnel interviewed, and records reviewed to confirm the implementation of the program.

Although the emphasis of this audit was directed towards non-compliances and aspects that should be considered for improvements, nothing in this report should be construed as criticism of either THESL's staff, or it services provided.

1.1. Opportunity for Improvements or Non-Compliances

No issues were identified in the audit covered from May 1, 2021, to April 30, 2022.

1.2. Observations

- Preventive Maintenance and inspection programs for equipment up to 750V not part of the distribution system, overhead/underground primary & secondary distribution lines, and substations equipment comply with Appendix 'C' of OEB's Distribution System Code. Excellent Asset Management Programs. P.O. reviewed for inspection programs (infrared inspections, tree trimming, vegetation control, and oil testing for gas analysis). W.O. issued for required corrective actions were signed off by competent persons with "no undue hazard" statement.

- All work programs and inspection data are scanned or electronically inputted into a central database for access. All work records reviewed acknowledged that no undue hazards were present.

- THESL Inspected 2232 locations where 3 phase, 3 wire solidly grounded WYE system (Delta) were suspected. 744 required corrective action, with 458 locations corrected. Leaving 286 to be corrected from this audit period. In total, there are 8080 Delta services identified, with 5530 inspections completed. Plans are continuing to verify/correct the remaining +/- 2500, by the end of 2024.

1.3. Management Response to ESA

ESA will request a copy of this audit report. Management will be asked to prepare a response to the audit findings, including actions or any opportunities for improvement, with a timetable to address each issue. An action plan should be submitted to ESA along with the audit report.

ESA will respond directly to THESL on receiving the report. An audit review meeting with ESA may take place. The audit findings may be reviewed, and any items that may require action addressed along with the THESL's action plan and timelines. If actions are required, THESL may be asked to submit a progress report to ESA

1.4. Auditor Opinion

It is the opinion of this auditor that THESL is in compliance with the requirements of Sections 4, 5, 6, 7, and 8 of the Regulation.

Sushma Narisetty

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DN: cn=Sushma Narisetty, email=snariset@torontohydro.com
Date: 2022.07.27 22:20:11 -04'00'

Ted Olechna

Client
Sushma Narisetty, P.Eng.
Director, Standards and Procurement
Toronto Hydro-Electric System Ltd.
500 Commissioners Street
Toronto, ON M4M-3N7

Prepared By
Ted Olechna, P.Eng.
AESI Acumen Engineered Solutions Int'l Inc.
5575 North Service Road, Ste 410
Burlington, ON L7L-6M1

Daljit S. Cheema

Approved by
Daljit Cheema, P.Eng.
AESI Acumen Engineered Solutions Int'l Inc.
5575 North Service Road, Ste 410
Burlington, ON L7L-6M1

Appendix 1

AUDIT RESULTS AND CHECKLIST

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
4(3)	A maintenance and inspection program for equipment ***up to 750 volts not part of distribution*** to ensure proper operation and safety (ancillary equipment). (Maintenance and inspection schedules, logs, checklists)	Inspection and PM low voltage ancillary equipment: • Municipal street lighting maintained by THESL contractor and THESL staff, recorded by the contractor in Work Activity Log, and inspected by ESA under CSS permit. • Red Construction Folder (RCF) signed off by contractor and THESL Contract Administrator. Planned work is signed by the contactor and Supervisor. • Maintenance and Construction in Green Construction Folder (GCF). Random checks by THESL contract administrator are signed off in a Daily Activity Report. ESA inspection application is taken out for new installations as needed. • Substation lighting, heating, ventilation, and batteries are checked during monthly inspections. • Battery and charger maintenance every six months. Inspection and PM records available for review		X		
4(4)	A maintenance and inspection program for ***overhead primary and secondary distribution*** lines to ensure proper operation and safety • Maintenance schedule • Maintenance records • Asset management program	Inspection and PM overhead systems: • System patrols by contractor – annually on 3-year cycle, deficiencies recorded in work orders – digital records • Primary lines Infra-Red inspections by a contractor - annually • Insulator washing by the contractor - every 6 months • Pole testing by contractor tested 14,287 poles during audit period – annually on a 10-year cycle • Fault indicators installation • Tree trimming by contractor – 1 to 5-years as required		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		• Porcelain insulation replacements – ongoing and as required • PCB testing and elimination program - ongoing • SCADA and manual load break switch maintenance– annually on a 4-year cycle Inspection and PM records available for review				
4(5)	A maintenance, inspection and testing program for ***underground primary and secondary distribution lines to ensure*** proper operation and safety • Maintenance schedule • Asset management program • Maintenance records	Inspection and PM underground systems: • Padmount and submersible transformers inspection and Infra-Red scanning by contractor – annually on a 3-year cycle • Digital inspection records; deficiencies corrected in work orders • Switchgear - annual visual and ultrasound inspection by contractor and dry ice cleaning as required • Fault indicators installation • Voltage upgrades and underground rebuilds • Submersible Vault Inspection – annually on a 3-year cycle • Cable chamber inspections and IR scan by contractor – annually on a 10-year cycle • PCB testing and elimination program • Network systems checked by contractor and THESL – 1 to 5 years (Once a year – electrical Inspection and Once a year Civil inspection) • Contact Voltage Mobile Surveying – annually where specified or as reported Inspection and PM records available for review Contact voltage mobile surveying procedure reviewed		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
4(6)	A maintenance, inspection, and testing program ***for distribution stations*** to ensure proper operation and safety • Maintenance schedule • Asset management program • Maintenance records	Inspection and PM substations: • Digital inspection records, deficiencies recorded in work orders • Substation inspections (meeting Regulation requirements) by contractor - monthly • Infra-Red inspection – every six months • Complete stations shutdown maintenance by THESL - annually on a 4-year cycle relays ○ 34 stations were maintained in the audit period • Vegetation control by the contractor – as required • PCB testing and elimination program • Annual oil sampling and gas analysis by the contractor • Network inspections by THESL – every six months • Apartment building vaults, transformers up to 2 MVA checked – annually on a 3-year cycle Inspection and PM records available for review.		X		
6	Distribution equipment approved when approved by ***certification or field inspection or approved under Rule of Distributor*** • Documented outline of equipment approval process including identification of competent persons, review of test reports • List of approved major equipment up-to-date and reference to standards	THESL's equipment approval procedures are documented, flow-charted, and approved by the Director of Standards and Technical Studies. New proposals are assessed by the Standards Department. Equipment Technical Specifications display P.Eng. signatures and seals and reference equipment standards as applicable.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	• Major equipment specifications approved by a competent person or P. Eng. • Approval records • Non-major equipment – Good Utility Practice • Receiving inspection • Pre-regulation equipment - GUP	An approved equipment list is maintained in digital format.				
6(1)(a)	***Specifying*** equipment approved by ***certification or field evaluation***	Low voltage equipment is approved by a Certification Body or Field Evaluation Agency		X		
6(1(a)	***Checking*** that supplied ancillary equipment ordered is approved by ***certification or field evaluation.***	Warehouse personnel check for inventory codes to confirm approval.		X		
6(1)(b)	Major distribution equipment approval under Rule of the Distributor: • Meets industry standards acceptable to ESA; or • Meets distributor specifications approved by a P. Eng., competent person, and no undue hazard; or • Documented approval process • Supporting documentation of approvals • Certified tests reviewed by a competent person • Composite poles & wood poles	Quality and Standards Engineers assess new requests for major equipment prior to approval. Certified type test data is reviewed to ensure that a recognized standard is met. Technical Specifications reference equipment standards and specifications, signed and sealed by a P.Eng. Observations – Reviewed: • CES – 50 KVA transformer type test report		X		
6(1)(b)	Re-Use of Major Equipment	The procedure for approving equipment for re-use is documented.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	• Documented process identifies competent person • Used major equipment approved by competent person or a P. Eng. and no undue hazard. • Competent person records no undue hazard • Testing or repair – competent person records no undue hazard • Must fail safely	Transformers, network protectors, load-break switches, and switchgear may be re-used. Operations personnel complete an Equipment Change Record and tag returned equipment. Equipment is sent out for testing or repairs before approval, recorded in an Equipment Re-Use Consent form and approved by Quality and Standards Engineers. Equipment may also be tested in-house or returned to service without return to inventory after assessment by competent persons. Observation – reviewed the following W.O: • WO – RK4036 CAM Tran Co. Ltd ○ 8kV 100KVA transformer quote and analysis ○ Test report ○ Equipment Reuse consent Form ○ Equipment Return Tag • WO – 97-48-056 Network protector ○ Internal ○ Equipment Re-Use Consent Form				
6(1)(b)	Non-major Equipment approval under Rule of the Distributor (no undue hazards**):** • Documented approval process • Meets industry standards; or • Distributor developed specifications; or • Good utility practice – 2 years or more, documented confirmation by a competent person, no undue hazards	The non-major equipment approval procedure is documented and flow-charted. Equipment is approved by Quality and Standards Engineers when recognized standards are met or under Good Utility Practice after a 2-year observation period. STAMP process Observation – reviewed the following: • Ilsco – part GPL3905BU ○ Grounding clamp		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	• GUP may include successful use by a different LDC	○ Approved by certification body • SDA-2551 – Wildlife guards kit 25kV SCADA Mate switch ○ Approved ○ P.Eng report				
6(1)(b)	Equipment is specified to meet Rule of Distributor standards • Tendering • Purchasing alliances • Purchasing approved equipment (Purchase orders, reference to standard by model numbers, engineering specifications, technical data)	Purchase orders show THESL's Technical Specifications, stock codes, manufacturer's part numbers, equipment descriptions and ratings.		X		
6(1)(b)	Supplied equipment meets Rule of Distributor requirements • Inspection procedure • Dealing with vendor non-compliances	Equipment is checked against packing slips and purchase orders to ensure accuracy and satisfactory condition. Bar code scanning checks receipts against purchase orders and enters equipment into inventory. Packing slips are stamped and initialed.		X		
6(2)	Inspection and testing of equipment supplied based on Rule of Distributor requirements (Inspection and testing records)	Equipment is checked against packing slips and purchase orders to ensure accuracy and satisfactory condition. Bar code scanning checks receipts against purchase orders and enters equipment into inventory. Packing slips are stamped and initialed.		X		
6(2)	Determining inspection and testing methods for equipment supplied to distributor	The distributor has not developed any unique inspection or testing methods	X			

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	(Records of analysis, conclusions, manufacturers declaration, witness testing, third party or distributor testing)					
6(1)(a) 6(2)	Dealing with vendor noncompliance (Field evaluation, rejection, communications)	Nonconforming shipments are quarantined and tagged, vendors are contacted, and equipment is returned by the Buyer if necessary.		X		
7	Plans and work : • Prepared by a P. Eng. • Based on standard design drawings and specifications or Sect. 75 OESC • Reviewed and approved by a • P. Eng. or ESA • Plans by subdivision developers • Plans by external consultants • Temporary power design standard • Deviation from approved standards	THESL's standard design drawings and Standards manual are certified and sealed by Standards Engineers, P.Eng. approved by the Director of Standards and Technical Studies THESL is also a member of USF. USF standard design drawings are certified by a group of professional engineers. Deviations from standards are prepared as a sketch and approved by a P. Eng. This sketch may become a standard, until a specified standard is available. Construction changes are classified as major or minor. Major changes are reviewed with Engineering, and minor changes are discussed in the field. Assembly of work instructions, standard design drawings, and specifications are prepared by a competent person. Plans are prepared by a P. Eng. Approved standard design drawing displays a certificate of approval and seal of P.Eng. Reviewed reactive work, record keeping, and signing off process Reviewed the GCF process Reviewed Construction standards - Ebook Observation - Reviewed the following projects:		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		• Project P-200209 – McCowan Rd. - changeout of THESL's transformer on customer property. • Project P-210351 – Windsor Station to Copeland TS. tie – Replace and install new cables. Certificate of deviation prepared by P.Eng.- 3 neutral cables in one duct. • Project P-190056 – Holmes Ave. New 3 phase underground service with overhead rebuild. • Project – C-220031 – Cadmus Rd. Residential service upgrade to 400A. overhead to underground conversion • Project P-0211384 - Brimley Seminole MS power transformer replacement All the plans were prepared by P. Eng., display P. Eng. seal and certificate of approval				
7	Approved plans or standard designs required except for: • Like-for-like construction • Emergency work • Legacy construction	Approved drawings are provided except for like-for-like, emergency and legacy construction		X		
7	Ensure third party attachments are: • Authorized; and • No adverse effect on distribution system safety • Engineering plans certified by THESL or third-party P. Eng. (no gaps in certification)	Third-party will apply for the permit. Third party will survey the subject lines. Based on line survey third party's P. Eng. will prepare plans and a list of make ready work. THESL makes standards relating to project available to third party for purpose of designing. THESL will review the plans (including pole loading engineering analysis) and required make ready work to ensure there are no conflicts. If approved, THESL will allow the third party to install their asset. THESL tracks third party construction using an electronic spread sheet.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	• Certified third party standards – evidence of certification • Third party generation • Bell Canada standards	Third party attachers are Bell, Rogers, Cogeco, Metro Connect, Beanfield and Zayo. Observations: • P-2022-00138 – Beanfield, fiber on Poles, Lawrence Ave East • D2022-00125 Zayo, Underground conduit, Bay Street • P2020-00832 – Zayo, Fiber on poles, Islington Ave, All plans for above projects were prepared by P. Eng. and display certificate of approval and P.Eng. seal All projects designed by third party attachers have been constructed and will be reviewed in section 8. • W2021-00103 – Rogers, small cell installed on pole, Layton Blvd The work instruction was prepared by a competent person				
7	Up-to-date copies of internal specifications and identified standards available to approving P. Eng. – examples: • Ontario Electrical Safety Code, 28 edition, 2021 • CSA Std. O/H Systems, No. 1 - 20 • CSA Std. U/G Systems, No. 7 - 20 • CSA/CSA – 22.3 No. 61931:08 • National Electrical Safety Code C2 -2017	Engineering and design staff have access to all necessary codes and standards including equipment standards.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	• Equipment Standards					
7	Ensure P. Eng. memberships valid and current	Engineers are registered with PEO. Memberships are maintained in electronic database. Cost of membership subsidized.		X		
7	Identify competencies of identified competent persons and ensure they have the required competencies (training records, position descriptions, resumes)	Reviewed electronic record database of personnel, and status of training completion. Reviewed employee credential policy. THESL runs the Powerline Technician Program. It is a 5 ½ year program. E-learning is the preferred format, and staff are tracked when complete. Staff notified of upcoming training requirements. Regulation refresher training every 3 years for staff. Electronic records kept on contractors, mandatory safety training and refresher every 3 years, (CVP) Training material reviewed Records of apprentice evaluation reviewed Reviewed THESL's policies and procedures on training.		X		
7(1)(a)	Installations based on plans: • Reviewed and approved by a P. Eng.; or • Reviewed and approved by ESA (Sample of plans)	Installations are reviewed and approved by THESL's Engineers		X		
7(1)(b)	Installations based on standard drawings and specifications assembled by a P. Eng., engineering technologist or competent person (Sample of drawings and specifications)	Installations are based on standard drawings and specifications assembled by engineering technicians and technologists. Drawings are also produced by an external engineers or design-build contractor, based on THESL's standard specifications.		X		
7(2)(a) 7(2)(b)	Plans, standard design drawings and specifications reviewed and approved by a P. Eng. or ESA	Plans, standard designs and specifications are reviewed and approved by a P.Eng.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	(Signatures, stamps)					
7(3) 7(5)	Plans, standard design drawings and specifications certified by a P. Eng. or ESA (Plans, drawings, specifications, certificates)	Standard design drawings are certified by a P.Eng.		X		
7(6)	Ensure that standard design drawings, specifications and certificates are: • Recorded and tracked • As-built drawings show changes made in construction • Retained and available to ESA • Retained for minimum of one year after audit • Electronic storage	Planned work records are stored in GCF (presently being scanned from paper) • GCF are indexed by year, Project #, project scope, drawing number and address for ease of locating. • Records are stored in SAP and the GIS, indexed by location, Date, drawing # and drawing type. Reactive work records are stored in RCF • Accessed in digital format and signed electronically. • All changes are recorded electronically and reviewed. • Indexed by location, Date, drawing # and drawing type.		X		
8(1)	Construction verification program: • Approved by ESA • When approved • Qualified persons list up to date • Any changes approved	CVP revision 6 submitted to ESA Qualified persons list maintained up-to-date in database. CVP training is provided and refresher training for internal staff and contractors every 3 years. CVP for external contractors provided by IHSA Reviewed the training matrix for THESL staff and contractors		X		
8(1)	Except for like-for-like replacements, emergency and legacy work, installations based on:	Operations personnel are fully aware of THESL's CVP requirements. Construction is inspected before use. Partial, final inspections and certificates are signed off on construction drawings and construction folders by competent person, or contractor. Certificates of inspection		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	• Approved and certified plans before construction; or • Standard design drawings and specifications • Approved equipment • Safety standards met • Non-compliances noted in record of inspection • Collections Department	and as-built drawings are signed off by Crew Leaders and Construction Supervisors. Changes are categorizing as minor or major. Major changes are reviewed by Engineering. Observations: • Milner ave – new service 27.6/16 kV - U/G duct • Northdale Road - New residential service – 400A • William Kitchen Road - New commercial, underground, 600/347 V, 400A service Partial, final record of inspections, and certificates signed by competent person, available for review				
8(1)	Ensure construction inspected and approved before use: • When implemented? • Monitored to cover all construction	Construction is inspected and approved before use.		X		
8(1)	Like-for-like, emergency and legacy work inspected and confirmed safe by competent person • Metering • Cutoff and reconnection • Customer Service • NC's rectified • No undue hazard statements • Inspection record and certificate	Trouble reports are recorded in System Response Report (SRR) forms signed off electronically by Operations personnel or contractors. Trouble reports may result in reactive work records. Collections records are recorded by contractors in yellow paper Field Orders for service disconnections and white Field Orders for reconnections. All metering work is recorded in Field Orders. Observation: • # 3414090274 – No meter pulses, Russel St.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		Site left with no undue hazard				
8(2)(a) 8(2)(b) 8(2)(c)	Inspection by: • P. Eng.; or • Qualified person identified in inspection verification program; or • ESA	Inspections are normally carried out by qualified personnel identified in the CVP.		X		
8(3)	Records of inspection include: • Inspection before use of installation • Approved plan or standard design followed • Approved equipment used • Inspection date • Installation identified • Non-compliances rectified • Stamped, signed, or initialed • Inspection verification program followed	Records of inspection include: • Marked up and as-built plans • Record of inspection • Approved equipment used • Inspection date • Installation identified • Non-compliances were not noted • Stamped, signed, or initialed by the inspector competent person • Inspection verification program followed.		X		
8(4)	Safety standards met before certification Certificates available and show: • Identify work inspected • Safety standards met • Date of certification • Stamp, signature, or initials • Like-for-like and legacy construction no undue hazards	Certificate of inspection provide all necessary information on what was inspected, identify the inspector, date of inspection, stamp and initial of the inspector		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
8(7)	Certificates and records of inspection available to ESA and: • Records and certificates of inspection • Covers all applicable construction • Signed and dated • Progressive inspections and sampling process certificates • Records of inspection for underground work	Certificates and records of inspection are available in engineering project files or other departments as applicable and are available to ESA		X		
	Competent and qualified persons trained on CVP and process for updating	Competent and qualified personnel receive CVP refresher training on-line every 3 years.		X		
	Third party contractors trained and listed in the CVP	Contractors receive initial CVP training during orientation and refresher CVP training at 3-year intervals by IHSA.		X		
	Sampling program developed	Sampling inspections not done.	X			
	Process for resolving non-compliances and design changes	Non-compliances and field proposals for design changes are managed in accordance with THESL's operating procedure.		X		
	Third party construction by contractors • Construction and maintenance on electrical distribution system • Records of inspection and certificates • Approved plan followed	Civil and electrical construction may be carried out by THESL's design-build contractors. Contractors' work is inspected and signed off by THESL's contract inspectors. Contractors and contract inspectors sign off on as-built plans. Partial certificates by contractors. Project folders signed off by crew leader, construction supervisor and Contract Administrator. Observations: • Project P-210036 – Inverness MS, battery and charger replacement • Project P-218000 – Runnymede – Load Relief phase 3		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		• Project P-210101 – Lakeshore & Fleet, underground cable renewal • Project P-200007 – Warden Ave & Lupin Dr. - Replace numerous PCB Transformers and associated equipment. Certificates of approval signed by THESL's P.Eng and certificates signed by THESL's approved contractor				
	Third party attachment – communications and community antenna systems: • Meets safety requirements • Non-compliances and variations resolved • Inspection by P. Eng. or person qualified in CVP • Certificate and record of inspection • Other joint users	Third parties provide a stamped certificate of inspection on the Occupancy Permit. Reviewed the following projects. • P2022-00138 – Beanfield, fiber on Poles, Lawrence Ave East • D2022-00125 Zayo, Underground conduit, Bay Street • P2020-00832 – Zayo, Fiber on poles, Islington Ave, Plans for the above third party attachers installations were prepared by P.Eng. Plans displayed certificate and P.Eng. seal. THESL's inspectors follow up on completed installations to inspect and sign off on certificates on the construction drawings.		X		
	Public safety promotion Regular training includes safety Performance assessment includes safety Records on dealing with safety issues Training materials	THESL Promotes Public Safety in the following way: • Electrical Safety Tips on THESL's website (Emergency Preparedness Guide in eight different languages). • Emergency Preparedness Plan with the City, IESO, Hospitals, Enbridge, and communication companies.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	Safety communications Interest and input from the Board	• Emergency Preparedness week from May 2 to May 8. • Emergency Resources. • Business Continuity Plan. • Emergency Preparedness for business (Prepare your business). • Electrical Safety Tips (Safety at home, outdoor safety, and Powerline safety). • Contact voltage Safety tips (avoid touching any outdoor electrical structures, including bus shelters and walk around handwells). • Crew safety. • Plan outages related to construction works map. • Life Support Notification and Special Needs Program • Road Safety (tips for drivers & pedestrians and cyclist information). • Dig safety - contact Ontario One Call. • Track THESL vehicles incidents via GPS on vehicles (speeding, braking, seatbelt issues). Vehicles speeding and incidents are reviewed every month. These incidents are reduced substantially. • Inter active map to locate a streetlight and report an issue online. • Use of social media to promote safety (Facebook, twitter, and Instagram). • Crisis management with oil, gas, OPG, transmission and distribution.				

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		• Reports on THESL's Health and Safety presented to the Board of Directors quarterly. • Four (4) Lost Time Injuries during the audit period. • Canadian Occupational Safety 5-Star Energy and Resource Company Award. • Certifications to Standards – ISO 14001 Environment Management System & ISO 45001 Occupational Health and Safety. • CEA's Centre of Excellence awards for two (2) separate projects: ➢ On-street charging network pilot project, ➢ Bulwer Station Battery Energy Storage System, • Global pandemic communication – keep employees safe. • Contractors' safety and training records uploaded in training matrix. • THESL's employees safety and training records uploaded in training matrix. • Work with the City on Café' TO, to ensure safety of the public and avoid any encroachment of THESL asset. Records available				

Appendix 2

Opening and Closing Meetings Attendees List

Opening Meeting

Opening Meeting held on May 11, 2022, with the following team members present:

Afshin Daryaei	Andrew Otal	Sunny Patel
Isabelle Caron	Anupam Dave	Vinesh Bharat
Rajesh Yata	Bonnie Lam	Ashley Collier
Shaun Pinard	Dan Smart	Jeremy Pasma
Edmond Wong	Daniel Tan	Steve Strugar
Darren Farrugia	Elyas Syed	Gabriel Grauer Michael
Duncan Kerr	Emma Halilovic	Andrew Kha
Maria Kuruvilla	Gaurav Uppal	Phill Genoway
Pat Allen	Paul Lopes	Roger Ersil
Patrick McDonnell	Riad Khan	Russell Baker
Hasdeep Bhatia	Dave Martins	Thomas Marshall
Leila Karimi	Joe Bembridge	Sushma Narisetty
Matrijn Huigens	Long Zhuang	T. J. Wahid
Michael Marchant	Michele D'Mello	Zane Hussain
Mike McDonald	Spyros Nikolaidis	Jay Gorecki
Ted Olechna (AESI)	Daljit Cheema (AESI)	

Closing Meeting

Closing Meeting held on May 20, 2022, with the following team members present:

Afshin Daryaei	Andrew Otal	Sunny Patel
Darer Abdissa	Anupam Dave	Sammy Elias
Rajesh Yata	Bonnie Lam	Ashley Collier
Shaun Pinard	Dan Smart	Seeuma Tepuksorn
Edmond Wong	Daniel Tan	Steve Strugar
Darren Farrugia	Elyas Syed	Gabriel Grauer Michael
Duncan Kerr	Emma Halilovic	Andrew Kha
Maria Kuruvilla	Gaurav Uppal	Phill Genoway
Pat Allen	Paul Lopes	Roger Ersil
Patrick McDonnell	Riad Khan	Bryan De Souza
Fatima Al emara	Dave Martins	Thomas Marshall
James Murchison	Joe Bembridge	Sushma Narisetty
Matrijn Huigens	Long Zhuang	Binendra Shakya
Michael Marchant	Michele D'Mello	Zane Hussain
Mike McDonald	Spyros Nikolaidis	Jay Gorecki
Ted Olechna (AESI)	Daljit Cheema (AESI)	Ryan Doung

Appendix 3

THESL List of Designate Personnel Knowledgeable in Regulation Procedures & Audit Evidence

Section 4 (Maintenance/Inspections of electrical equipment <750V, Overhead & Underground Distribution Lines and Distribution Substations:

Afshin Daryaei, Darren Farrugia, Ricky Khullar, Sakaran Manivannan, Isabella Caron, Binendra Shakya, Michele D'Mello, Imtiaz Ahmed, Ted Olechna, Daljit Cheema

Section 6 (Approval of Electrical Equipment):

Afshin Daryaei, Andrew Kha, Rajesh Yata, Gaurav Uppal, Joe Bembridge, Mike McDonald, Emma Halilovic, Zane Hussain, Ted Olechna, Daljit Cheema

Sections 7 (Approval of Plans, Standard Designs Drawings, and Specifications, Third-Party Attachment for Installation Work):

Afshin Daryaei, Sunny Patel, T. J. Wahid, Akif Maredia, Bryce Dmello, Patrick McDonnell, Emma Halilovic, Zane Hussain, Leila Karimi, Mike Sulit, Gerry Zervos, Ted Olechna, Daljit Cheema,

Section 8 (Inspections, Approval of Constructions, Employee Qualification/Certification, Training & Public Safety Promotions):

Afshin Daryaei, Rich Heigh, Keith Hunter, Maria Kuruvilla, Anupam Dave, Bryce Dmello, Dikshya Gautam, Roger Ersil, Riad Khan, Bonnie Lam, Patrick McDonnell, Jeremey Pasma, Mark Atkinson/James Murchison, Awais Kadam, Ammar Abughazaleh, Luke Susnik, Vinesh Bharat, Ted Olechna, Daljit Cheema

Toronto Hydro-Electric System Limited
EB-2023-0195
2B-VECC-16
Appendix D
FILED: March 11, 2024
(39 Pages)

REPORT OF THE ANNUAL AUDIT
AND DECLARATION OF COMPLIANCE
UNDER ONTARIO REGULATION 22/04

SUBMITTED TO THE ELECTRICAL SAFETY AUTHORITY

SUBMITTED BY

Sushma Narisetty, P.Eng.
Director, Standards
Toronto Hydro-Electric System
500 Commissioners Street
Toronto, ON M4M 3N7

July 12, 2023

Report Due Date: July 31, 2023

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2.0 2022/2023 AUDIT RESULTS AND ACTION PLANS....3
3.0 DECLARATION OF COMPLIANCE....4
4.0 APPENDIX A – REPORT OF THE AUDITOR....6

The information in these materials is based on information currently available to Toronto Hydro Corporation and its affiliates (together hereinafter referred to as "Toronto Hydro"), including information provided by an independent external auditor to verify Toronto Hydro's compliance with Ontario Regulation 22/04. Toronto Hydro (including its directors, officers, employees, agents and subcontractors) hereby waives any and all liability for damages of whatever kind and nature which may occur or be suffered as a result of the use of these materials or reliance on the information therein. Certain information included in these materials constitutes "forward-looking information" within the meaning of applicable securities laws in Canada ("Forward-Looking Information"). The purpose of the forward-looking information is to provide management's expectations regarding the Corporation's future results of operations, performance, business prospects and opportunities, and may not be appropriate for other purposes. All forward-looking information is given pursuant to the "safe harbour" provisions of applicable Canadian securities legislation. The words "can", "could", "will" and similar expressions are often intended to identify forward-looking information, although not all forward-looking information contains these identifying words. The forward-looking information reflects management's current beliefs and is based on information currently available to the Corporation's management.

The forward-looking information is subject to risks, uncertainties and other factors that could cause actual results to differ materially from historical results or results anticipated by the forward-looking information. The factors which could cause results or events to differ from current expectations include, but are not limited to: risks associated with the execution of the Corporation's capital and maintenance programs necessary to maintain the performance of our distribution assets and make required infrastructure improvements; risks associated with electricity industry regulatory developments and other governmental policy changes, including with respect to conditions created by COVID-19; risks associated with the timing and results of regulatory decisions regarding the Corporation's revenue requirements, cost recovery and rates; risk that the Corporation is not able to arrange sufficient and cost-effective debt financing to fund capital expenditures and other obligations; risk of downgrades to the Corporation's credit rating; the impact of COVID-19 on the Corporation's operating results and financial position in the future; and the ultimate duration and level of impact of COVID-19 on the economy and the Corporation's business.

1.0 SUMMARY – 2022/2023 AUDIT AND DECLARATION OF COMPLIANCE

This report is submitted to the Electrical Safety Authority by Toronto Hydro-Electric System Limited ('Toronto Hydro'), as required under Ontario Regulation 22/04, "Electrical Distribution Safety" under the *Electricity Act, 1998* (the 'Regulation').

This report covers May 1, 2022 through April 30, 2023.

This report contains the auditors' report and, if applicable, an action plan to further improve compliance with Ontario Regulation 22/04 and the Declaration of Compliance.

Toronto Hydro hired Acumen Engineered Solutions International Inc. (AESI) to perform the audits for this reporting period.

Ted Olechna, P.Eng., as an ESA-approved Auditor, performed the audit on behalf of AESI. The audit covered sections 4, 5, 6, 7 and 8 of Ontario Regulation 22/04. Ted Olechna, P.Eng., also performed an audit in support of the Declaration of Compliance.

2.0 2022/2023 AUDIT RESULTS AND ACTION PLANS

The 2022/2023 Audit was performed by Ted Olechna, P.Eng., on May 15, 16, 17, 18, 29 and 31, 2023, to verify the extent of Toronto Hydro's compliance with Ontario Regulation 22/04. No opportunities for improvement and no non-compliances were found during this year's Ontario Regulation 22/04 audit. A copy of the audit report is included in Appendix A.

Even though no opportunities for improvement and non-compliances were found during this year's Ontario Regulation 22/04 audit, Toronto Hydro is still committed to continuous improvement.

3.0 DECLARATION OF COMPLIANCE

Toronto Hydro employed an external auditor (AESI) to assess the Company's compliance with Sections 3, 9, 10, 11 and 12 of the Regulation.

The Declaration is included in this report.

Toronto Hydro-Electric System Limited

Annual Declaration of Compliance

Year 2022/2023

Period May 1, 2022 to April 30, 2023.

This Declaration of Compliance is submitted by Toronto Hydro-Electric System Limited ("THESL") in accordance with Ontario Regulation 22/04, section 14.

I, Sushma Narisetty of THESL, state that, to the best of my knowledge and belief and having made reasonable inquiries, THESL has complied with the following sections of Ontario Regulation 22/04:

1) Section 3 – Change of ownership;
2) Section 9 – Deviations from required standards;
3) Section 10 – Proximity to distribution lines;
4) Section 11 – Disconnection of unused lines;
5) Section 12 – Reporting of serious electrical incidents.

THESL identified and corrected 152 primary lines that exist in the distribution system in a disconnected but not grounded state as defined by the Electrical Safety Authority's ("ESA") Guideline for Disconnecting Unused Lines dated October 5, 2005. THESL confirms that it corrected these deficiencies by December 2022 by grounding or removing the unused lines. Where any other unused primary lines in a disconnected but not grounded state are newly identified, Toronto Hydro continues to correct these deficiencies in a timely manner. Such locations are typically in areas inaccessible to the public and therefore any risk to the public remains low. Toronto Hydro remains committed to public safety and compliance with Ontario Regulation 22/04.

Performance records for 2022/2023 show that 84 per cent of requests for locates were completed within five days during the audit period of May 2022 to April 2023. The recent passage of legislative amendments under Bill 93 (*Getting Ontario Connected Act, 2022*) has affected the availability of locators and locate performance. Toronto Hydro has worked with the Locate Alliance Consortium to implement the provincial strategy and increased its quantity of locators. Monthly locates performance has since improved to above 90 per cent in April 2023.

THESL has used a methodology of review and validation of processes by an independent external auditor, appointed by THESL to assess and verify compliance. Documentation to support this review and validation process is available to the ESA, upon request.

Sushma Narisetty

Digitally signed by Sushma Narisetty
DN: cn=Sushma Narisetty, email=snariset@torontohydro.com
Date: 2023.07.11 16:18:42 -04'00'

Sushma Narisetty, P. Eng., M. Eng., MBA
Director, Standards
July 12, 2023

4.0 APPENDIX A – REPORT OF THE AUDITOR

The enclosed report was provided by the External Auditor (Sections 4 to 8 of Ontario Regulation 22/04).

ACUMEN

Acumen Audit Report

Ontario Regulation 22/04 Sections 4 to 8

Prepared For:

Toronto Hydro-Electric System Ltd.

AESI Acumen Engineered Solutions International Inc.

5575 North Service Road, Suite 401
Burlington, Ontario, L7L 6M1
P - 905.875.2075
F - 905.875.2062
www.aesi-inc.com

Audit Report

Ontario Regulation 22/04 Sections 4 to 8

Toronto Hydro-Electric System Ltd.

Prepared By: Ted Olechna, P. Eng. Date: 2023-06-23

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1. Audit Scope & Summary

This audit report was prepared for Toronto Hydro-Electric System Ltd. (THESL), which distributes electricity in the City of Toronto, serving approximately 790,000 residential, commercial, and industrial customers.

The scope of this audit involved processes concerning one hundred and thirty-one (131) municipal substations, 4.16kV to 27.6kV overhead and underground primary and secondary lines. THESL contracts out a portion of its work to qualified contractors; such work was included within the scope of the audit. THESL employs 1245 regular staff.

There are 36 active transformer stations in Toronto, and THESL owns five (5) transformer stations, the other thirty-one (31) are owned and operated by Hydro One. The audit of these 36 transformer stations is not in the scope of O.Reg 22/04 (Regulation).

The auditor, Ted Olechna, has a Lead QMS Auditor Certificate (ISO 9001:2015). Ted is registered with the Professional Engineers of Ontario and has over 35 years of experience working in various capacities at Ontario Hydro/Hydro One in Ontario, as well as a Director at ESA. He is an approved auditor by the Electrical Safety Authority (ESA) to conduct this audit to Ontario Regulation 22/04 (Regulation) requirements for THESL.

ESA has identified that this year audits could be performed in-person or remotely. Sushma Narisetty, P. Eng., (Director, Standards) has agreed to a hybrid model. Therefore, walk-through of stores and equipment storage facilities was conducted. Audit meetings were conducted in person and via WebEx. Records, plans, and standard design drawings were made available at the meetings, by screen sharing and emails.

The audit was conducted on May 15th, 16th, 17th, 18th, 29th, and 31st, 2023, including the period required for documentation review. Additional time was required for audit preparation and to prepare this report.

The audit covered the period from May 1st, 2022, to April 30th, 2023.

The scope of the audit covered the following processes and departments:

- Management Infrastructure/Oversight
- Review of the responses to the issues from previous audits (if applicable)
- Maintenance
- Purchasing
- Engineering/Design
- Field Construction and Inspection

- Health and Safety
- THESL's Construction Verification Program (CVP)

The audit was conducted in accordance with the requirements of Sections 4–8 of the Regulation. The audit conformed the control environment according to the ESA's Auditing Guidelines.

The auditor declares himself to be independent of THESL, the work to be audited and free of any potential threat to the auditors' independence including self-interest, self-review, advocacy, familiarity, and intimidation.

The processes documented within the Construction Verification Program and associated procedures were followed, personnel interviewed, and records reviewed to confirm the implementation of the program.

Although the emphasis of this audit was directed towards non-compliances and aspects that should be considered for improvements, nothing in this report should be construed as criticism of either THESL's staff or it services provided.

1.1 Opening Meeting

The opening meeting was held on May 15, 2023.

1.2 Closing Meeting

The closing meeting was held on May 31, 2023.

1.3 Participants

Individuals who have participated in the opening and closing meetings and other audit sections:

Rowena Chan	Elizabeth Chelmecki	Sean Fletcher
Sushma Narisetty	Ferdinand Strang	Maria Kuruvilla
Awais Kadam	Fiona Noshirwani	Mike Sulit
Andrew Sandrasagra	Gabriel Michael	Pat Allen

Anupam Dave
Aaron Wilhelm
Andrew Kha
Andrew Otal
Bass Khadori
Binendra Shakya
Brandon Dale
Bryan De Souza
Claudio Bellisario
Dan Smart
Daniel McNeil
Daniel Tan
Darren Farrugia
Dave Martins
Diana Tonus
Duncan Kerr
Edmond Wong
Hardik Gadani
Hasdeep Bhatia
James Murchison
James Wei
Ian Fernandez
Jen Grado
Jeremy Pasma
Joe Bembridge
Keith Hunter
Kitty Leung
Leila Karimi
Martijn Huigens
Michele D'Mello
Michael Merchant
Mike McDonald
Numaya Iqbal
Sakaran Manivannan
Patrick McDonnell
Phil Genoway
Pranav Kalra
Rajesh Yata
Rich Heighway
Richard Lowns
Rob Beaverstock
Roger Ersil
Roshan Reginold
Ryan Duong
Sean Fletcher
Seeuma Tepuksorn
Sergio Higuera
Stephen Sheehy
Steve Strugar
Sunny Patel
T.J Wahid
Zane Hussain

1.4 Observations

- Preventive Maintenance and inspection programs for equipment up to 750V not part of the distribution system, overhead/underground primary & secondary distribution lines, and municipal substations conducted as per Appendix 'C' of Ontario Energy Board's Distribution System Code. Excellent Asset Management Programs. P.O. are issued to execute some inspection programs by contractors (e.g. tree trimming, vegetation control, oil testing for gas analysis and IR scans)

- PCB testing is ongoing to identify and remove PCB liquid equipment
    - Despite global supply chain challenges and their impact on the supply of transformers, THESL continues to make headway in removing PCB filled equipment

- THESL has a documented equipment re-use program.

- Refresher CVP training for engineering, managers, and line staff is done every 3 years, and starting in 2024 it will be every 2 years.

- All work programs and inspection data are scanned or electronically inputted into a central database for access.
    - GCF – planned work
    - RCF – Reactive work
    - All work records reviewed acknowledged that no undue hazards were present.

• 3 phase, 3 wire solidly grounded WYE system (Delta)
    - THESL inspected 1715 locations where 3 phase, 3 wire solidly grounded WYE system (Delta) were suspected.
    - 616 locations were corrected which included locations identified from prior year.
    - In total, there are 8080 Delta services identified, with 7245 inspections completed. Plans are continuing to verify the remaining +/- 835, by the end of 2025.
    - The original plan was to complete the inspection and necessary corrective work by 2024. A request was sent to and accepted by the ESA in July 2022 to revise the proposed completion date to 2025.

- One-Call is back on track to respond to Locates requests within the prescribed timelines.

- Third-party attachers (communication) are being managed and responded to in a timely manner.

- Planned work is delayed due to equipment availability. However, THESL's robust enterprise program management and procurement mitigated any risks to the system.

- THESL's public safety information to the public has a wide reach and covers seasonal as well as specific safety topics

- Review of CSA C22.3 No. 11 (Maintenance of electric and communication utility equipment and systems) is in the process of determining what if anything needs to be changed in relation to THESL's maintenance program.

1.5 Opportunities for Improvement & Non-compliances

No opportunities for improvement & non-compliances were recorded

1.6 Management Response to ESA

ESA will request a copy of this audit report. Management will be asked to prepare a response to the audit findings, including actions or any opportunities for improvement with a timetable to address each issue. Action plan should be submitted to ESA along with the audit report.

ESA will respond directly to THESL on receiving the report. An audit review meeting with ESA may take place. The audit findings may be reviewed, and any item that may require action, addressed along with THESL's action plan and timelines. If actions are required, THESL may be asked to submit a progress report to ESA.

1.7 Auditor Opinion

It is the opinion of this auditor that THESL is in compliance with the requirements of ONTARIO REGULATION 22/04 Section 4, 5, 6, 7, and 8.

Sushma Narisetty

Digitally signed by Sushma Narisetty
DN: cn=Sushma Narisetty, email=snariset@torontohydro.com
Date: 2023.07.11 16:18:54 -04'00'

Ted Olechna

Client

Sushma Narisetty, P. Eng.
Director, Standards
Toronto Hydro-Electric System Ltd.
500 Commissioners Street

Auditor

Ted Olechna, P. Eng.
AESI Acumen Engineered Solutions Int'l Inc
5575 North Service Road, Suite 401
Burlington, Ontario, L7L 6M1

Toronto, ON M4M 3N7

2. Appendix 1

Audit Results and Checklist

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
4(3)	A maintenance and inspection program for equipment ***up to 750 volts not part of distribution*** to ensure proper operation and safety (ancillary equipment). (Maintenance and inspection schedules, logs, checklists)	Inspection and PM low voltage ancillary equipment: • Municipal street lighting maintained by THESL's contractor and THESL's staff, recorded by the contractor in Work Activity Log, and inspected by ESA under CSS permit as needed. • Red Construction Folder (RCF) signed off by contractor and THESL's Contract Administrator. Planned work is signed by the contractor and Supervisor. • Maintenance and Construction in Green Construction Folder (GCF). Random checks by THESL's contract administrator are signed off in a Daily Activity Report. ESA inspection application is taken out for new installations as needed. • Substation lighting, heating, ventilation, and batteries are checked during monthly inspections. • Battery and charger maintenance every six months. Inspection and PM records available for review		X		
4(4)	A maintenance and inspection program for ***overhead primary and secondary distribution*** lines to ensure proper operation and safety • Maintenance schedule • Maintenance records • Asset management program	Inspection and PM overhead systems: • System patrols by a contractor – annually on a 3-year cycle, deficiencies recorded in work orders – digital records • Primary lines Infra-Red inspections by a contractor - annually • Insulator washing by the contractor - every 6 months • Pole testing by contractor tested 12,157 poles during the audit period – annually on a 10-year cycle • Fault indicators installation ongoing • Tree trimming by a contractor – 1 to 5 years as required		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC

		• Porcelain insulation replacements – ongoing and as required
		• PCB testing and elimination program – by 2025
		  ○ Lack of replacement TX
		• SCADA and manual load break switch maintenance– annually on a 4-year cycle
		• 3-phase, 3-wire connected solidly to WYE at customers' service entrances (Delta).
		  ○ 1715 were Inspected during the audit period.
		  ○ Remaining 835 to be completed by 2025
		
		Inspection, PM records, and maintenance summary spreadsheet available for review				

4(5)	A maintenance, inspection, and testing program for ***underground primary and secondary distribution lines to ensure*** proper operation and safety
	
	• Maintenance Schedule
	• Asset management program
	• Maintenance records
		Inspection and PM underground systems:
		
		• Padmount and submersible transformers inspection and Infra-Red scanning by a contractor – annually on a 3-year cycle
		• Digital inspection records; deficiencies corrected in work orders
		• Switchgear - annual visual and ultrasound inspection by a contractor and dry ice cleaning as required
		• Fault indicators installation
		• Voltage upgrades and underground rebuilds
		• Submersible Vault Inspection – annually on a 3-year cycle
		• Cable chamber inspections and IR scan by a contractor – annually on a 10-year cycle
		• PCB testing and elimination program
		  ○ ~2500 Tx to be completed by 2025
		  ○ Shortage of replacement transformers
				X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		• Network systems checked by contractor and THESL – 1 to 5 years (Once a year – electrical Inspection and Once a year Civil inspection) • Contact voltage mobile surveying procedure reviewed Inspection, PM records, and maintenance summary spreadsheet available for review				
4(6)	A maintenance, inspection, and testing program ***for distribution stations*** to ensure proper operation and safety • Maintenance schedule • Asset management program • Maintenance records	Inspection and PM substations: • Digital inspection records, deficiencies recorded in work orders • Substation inspections (meeting Regulation requirements) by a contractor - monthly • Infra-Red inspection – every six months • Complete stations shutdown maintenance by THESL - annually on a 4-year cycle relays • Cable chambers infra-red every 10 years • Vegetation control by the contractor – as required • PCB testing and elimination program to be completed by 2025 • Annual oil sampling and gas analysis by the contractor • Network inspections by THESL – every six months • Apartment building vaults, transformers up to 2 MVA checked – annually on a 3-year cycle Inspection, PM records, and maintenance summary spreadsheet available for review		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
6	Distribution equipment approved when approved by ***certification or field inspection or approved under Rule of Distributor*** • Documented outline of equipment approval process including identification of competent persons, review of test reports • List of approved major equipment up-to-date and reference to standards • Major equipment specifications approved by a competent person or P. Eng. • Approval records • Non-major equipment – Good Utility Practice • Receiving inspection • Pre-regulation equipment - GUP	THESL's equipment approval procedures are documented, flow-charted, reviewed by Product Change Committee (PCC), and approved by the Director of Standards. Observation: • product change process map • PCC (Product Change Committee) New proposals are assessed by the Standards Department. Equipment Technical Specifications display P.Eng. signatures and seals and reference equipment standards as applicable. Approximate 11,000 parts in stock An approved equipment list is maintained in digital format. Observation: Stock numbers match the equipment in the stock room		X		
6(1)(a)	***Specifying*** equipment approved by ***certification or field evaluation***	Low-voltage equipment is approved by a Certification Body or Field Evaluation Agency		X		
6(1(a)	***Checking*** that supplied ancillary equipment ordered is approved by ***certification or field evaluation.***	Warehouse personnel check for inventory codes to confirm approval.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
6(1)(b)	Major distribution equipment approval under Rule of the Distributor: • Meets industry standards acceptable to ESA; or • Meets distributor specifications approved by a P. Eng., competent person, and no undue hazard; or • Documented approval process • Supporting documentation of approvals • Certified tests reviewed by a competent person • Composite poles & wood poles	Quality and Standards Engineers assess new requests for major equipment prior to approval. Certified type test data is reviewed to ensure that a recognized standard is met. Technical Specifications reference equipment standards and specifications, signed and sealed by a P.Eng. Observations – Reviewed: Poles with new Preservative Hitachi transformers • Test report from manufacturers • Part number assigned and stocked		X		
6(1)(b)	Re-Use of Major Equipment • Documented process identifies the competent person • Used major equipment approved by a competent person or a P. Eng. and no undue hazard. • Competent person records no undue hazard • Testing or repair – competent person records no undue hazard • Must fail safely	The procedure for approving equipment for re-use is documented. Transformers, network protectors, load-break switches, and switchgear may be re-used. No Poles or Minor equipment re-used Operations personnel complete an Equipment Change Record and tag returned equipment. Equipment is sent out for testing or repairs before approval, recorded in an Equipment Re-Use Consent form, and approved by Quality and Standards Engineers. TX may be reused in the field, by a competent person. If returned to stock, shall go through re-use program 120 Pole mounted TX were reused		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		Observation – reviewed the following W.O: • WO – WR1095 CAM Tran Co. Ltd o 27kV 50KVA transformer quote and analysis o Test report o Equipment Reuse Consent Form o Equipment Return Tag • PO – 4500058506 2015 switch refurbished o External Company				
6(1)(b)	Non-major Equipment approval under the Rule of the Distributor (no undue hazards**):** • Documented approval process • Meets industry standards; or • Distributor developed specifications; or • Good utility practice – 2 years or more, documented confirmation by a competent person, no undue hazards • GUP may include successful use by a different LDC	The non-major equipment approval procedure is documented and flow-charted. Equipment is approved by Quality and Standards Engineers when recognized standards are met or under Good Utility Practice after a 2-year observation period. STAMP process		X		
6(1)(b)	Equipment is specified to meet the Rule of Distributor standards • Tendering • Purchasing alliances • Purchasing approved equipment	Purchase orders show THESL's Technical Specifications, stock codes, manufacturer's part numbers, equipment descriptions and ratings.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	(Purchase orders, reference to standard by model numbers, engineering specifications, technical data)					
6(1)(b)	Supplied equipment meets the Rule of Distributor requirements • Inspection procedure • Dealing with vendor non-compliances	Equipment is checked against packing slips and purchase orders to ensure accuracy and satisfactory condition. Bar code scanning checks receipts against purchase orders and enters equipment into inventory. Packing slips are stamped and initialed. Non-compliant equipment is returned to the vendor		X		
6(2)	Inspection and testing of equipment supplied based on the Rule of Distributor requirements (Inspection and testing records)	Equipment is checked against packing slips and purchase orders to ensure accuracy and satisfactory condition. Bar code scanning checks receipts against purchase orders and enters equipment into inventory. Packing slips are stamped and initialed.		X		
6(2)	Determining inspection and testing methods for equipment supplied to the distributor (Records of analysis, conclusions, manufacturers declaration, witness testing, third party or distributor testing)	The distributor has not developed any unique inspection or testing methods	X			
6(1)(a) 6(2)	Dealing with vendor non-compliance (Field evaluation, rejection, communications)	Nonconforming shipments are quarantined and tagged, vendors are contacted, and equipment is returned by the Buyer if necessary.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
7	Approval of Plans, Drawings and Specifications for Installation Work Plans and work : • Prepared by a P. Eng. • Based on standard design drawings and specifications or Sect. 75 OESC • Reviewed and approved by a • P. Eng. or ESA • Plans by subdivision developers • Plans by external consultants • Temporary power design standard • Deviation from approved standards	THESL's standard design drawings and Standards manual are certified and sealed by Standards Engineers, P.Eng. approved by the Director of Standards THESL is a member of USF. USF standard design drawings are certified by a group of professional engineers. Deviations from standards are prepared as a sketch and approved by a P. Eng. This sketch may become a standard until a specified standard is available. Construction changes are classified as major or minor. Major changes are reviewed with Engineering, and minor changes are discussed in the field. Observation - • Std # 31-1600 deviation approval for cable entry window in existing cable chamber Assembly of work instructions, standard design drawings, and specifications are prepared by a competent person. Plans are prepared by a P. Eng. Approved standard design drawing displays a certificate of approval and seal of P.Eng.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		Reviewed the GCF process Reviewed Construction standards - Ebook Observation - Reviewed the following projects: • Watercliffe MS – Battery replacement • P-190049 – Dundas street west, 8kV to 27.6 kV, Entera , SNC Lavalin Auditor • P-190193 – Gerrard Street – Station-to-station cable replacement, Ainsworth • P-220040 – The Westway, 4kV O/H replacement, Valard. All the plans were prepared by P. Eng., display P. Eng. seal and certificate of approval Reviewed in Section 8,				
7	Approved plans or standard designs required except for: • Like-for-like construction • Emergency work • Legacy Construction	Approved drawings are provided except for like-for-like, emergency and legacy construction Observations: new standards developed • New Pole and preservative • Std # 03-2500 Overwater span		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		• Std # 03-2110 Minimum clearance for in-pole spans				
7	Ensure third-party attachments are Authorized • No adverse effect on distribution system safety • Engineering plans certified by THESL or third-party P. Eng. (no gaps in certification) • Certified third-party standards – evidence of certification • Third-party generation •	Third-party will apply for the permit. The third-party will survey the subject lines. Based on the line survey third parties' P. Eng. will prepare plans and a list of make-ready work. THESL makes standards relating to projects available to third parties for the purpose of designing. THESL will review the plans (including pole loading engineering analysis) and required make-ready work to ensure there are no conflicts. If approved, THESL will allow the third party to install their asset. THESL tracks third-party construction using an electronic spreadsheet. After completion, THESL goes out and inspects, Third-party attachers are Bell, Rogers, Cogeco, Metro Connect, Beanfield, Telus, and Zayo. Observations: • P-2022-00725 – Rogers - Bainhart Cres, Conditional granted and followed by Final granted • TP23-0401 Rogers, Decline, no equipment on switch pole • P2022-00027 – Bell, • D2023-00078 – Zayo, U/G Ducts • W2023-00080 – Rogers, Cell Modem on Pole All plans for the above projects were prepared by P. Eng. and display certificate of approval and P.Eng. seal		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		Reviewed in section 8. The work instruction was prepared by a competent person				
7	Up-to-date copies of internal specifications and identified standards available to approving P. Eng. – examples: • Ontario Electrical Safety Code, 28 edition, 2021 • CSA Std. O/H Systems, No. 1 - 20 • CSA Std. U/G Systems, No. 7 - 20 • CSA/CSA – 22.3 No. 61931:08 • National Electrical Safety Code C2 -2017 • Equipment Standards	Engineering and design staff have access to all necessary codes and standards including equipment standards. CSA C22.3 No. 11 • Review started on internal processes to determine what if any changes are needed.		X		
7	Ensure P. Eng. memberships are valid and current	Engineers are registered with PEO.		X		
7	Identify competencies of identified competent persons and ensure they have the required competencies (training records, position descriptions, resumes)	Reviewed electronic record database of personnel, and status of training completion. Reviewed employee credential policy. THESL runs the Powerline Technician Program. It is a 5 ½ year program. E-learning is the preferred format, and staff are tracked when complete. Staff notified of upcoming training requirements. Regulation refresher training every 3 years for staff. Electronic records kept on contractors, mandatory safety training and refresher every 3 years, (CVP) Records of apprentice evaluation reviewed		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		Reviewed THESL's policies and procedures on training.				
7(1)(a)	Installations based on plans: • Reviewed and approved by a P. Eng.; or • Reviewed and approved by ESA (Sample of plans)	Installations are reviewed and approved by THESL's Engineers		X		
7(1)(b)	Installations based on standard drawings and specifications assembled by a P. Eng., engineering technologist or competent person (Sample of drawings and specifications)	Installations are based on standard drawings and specifications assembled by engineering technicians and technologists. Drawings are also produced by an external engineer or design-build contractor, based on THESL's standard specifications.		X		
7(2)(a) 7(2)(b)	Plans, standard design drawings and specifications reviewed and approved by a P. Eng. or ESA (Signatures, stamps)	Plans, standard designs, and specifications are reviewed and approved by a P.Eng.		X		
7(3) 7(5)	Plans, standard design drawings, and specifications certified by a P. Eng. or ESA (Plans, drawings, specifications, certificates)	Standard design drawings are certified by a P.Eng.		X		
7(6)	Ensure that standard design drawings, specifications, and certificates are: • Recorded and tracked	Planned work records are stored in GCF (presently being scanned from paper) • GCFs are indexed by year, Project #, project scope, drawing number, and address for ease of locating.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	• As-built drawings show changes made in construction • Retained and available to ESA • Retained for a minimum of one year after the audit • Electronic storage	• Records are stored in SAP and the GIS, indexed by location, Date, drawing #, and drawing type. Reactive work records are stored in RCF • Accessed in digital format and signed electronically. • All changes are recorded electronically and reviewed. • Indexed by location, Date, drawing # and drawing type.				
8(1)	Construction verification program: • Approved by ESA • When approved • Qualified persons list up to date • Any changes approved	CVP revision 7 submitted to ESA (January 2023) Currently, CVP refresher training for internal staff and contractors every 3 years, starting in 2024 it will be every 2 years. The qualified persons' list is maintained up-to-date in the database. CVP for external contractors provided by IHSA Reviewed the training matrix for THESL's staff and contractors		X		
8(1)	Except for like-for-like replacements, emergency and legacy work, installations based on: • Approved and certified plans before construction; or • Standard design drawings and specifications • Approved equipment • Safety standards met • Non-compliances noted in the record of inspection • Collections Department	Operations personnel are fully aware of THESL's CVP requirements. Construction is inspected before use. Partial, final inspections and certificates are signed off on construction drawings and construction folders by a competent person, or contractor. Certificates of inspection and as-built drawings are signed off by Crew Leaders and Construction Supervisors. Changes are categorized as minor or major. Major changes are reviewed by Engineering.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		Observations: • Watercliffe MS – Battery replacement • P-190049 – Dundas street west, 8kV to 27.6 kV, Entera, SNC Lavalin Auditor • P-190193 – Gerrard street – Station to station cable replacement, Ainsworth • P-220040 – The Westway, 4kV O/H replacement, Valard. Partial, final record of inspections, and certificates signed by a competent person, available for review				
8(1)	Ensure construction is inspected and approved before use: • When implemented? • Monitored to cover all construction	Construction is inspected and approved before use.		X		

8(1)	Like-for-like, emergency and legacy work inspected and confirmed safe by a competent person
	• Metering
	• Cutoff and reconnection
	• Customer Service
	• NC's rectified
	• No undue hazard statements
	• Inspection record and certificate
		Trouble reports are recorded in System Response Report (SRR) forms signed off electronically by Operations personnel or contractors. Trouble reports may result in reactive work records. Collections records are recorded by contractors in yellow paper Field Orders for service disconnections and white Field Orders for reconnections. All metering work is recorded in Field Orders.
		• 3 levels of priority
		  ○ P1 -15 days
		  ○ P2 – 15-60 days
				X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		○ P3 – 60-180 days Reactive folder - RCF Observation: • 2199 Queen St East 120/240 meter • Canon-Jackson Dr. Bulk meter • 2787 Eglinton Ave E – Itron Meter • 630 Vesta Dr – TX rusted • M-220227 – Steeles and Pharmacy – cable fault Site left with no undue hazard statement				
8(2)(a) 8(2)(b) 8(2)(c)	Inspection by: • P. Eng.; or • Qualified person identified in inspection verification program; or • ESA	Inspections are carried out by qualified personnel identified in the CVP.		X		
8(3)	Records of inspection include: • Inspection before use of installation • Approved plan or standard design followed • Approved equipment used • Inspection date • Installation identified • Non-compliances rectified	Records of inspection include: • Marked-up and as-built plans • Record of inspection • Approved equipment used • Inspection date • Installation identified • Non-compliances were not noted		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	• Stamped, signed, or initialed • Inspection verification program followed	• Stamped, signed, or initialed by the inspector (competent person) • Inspection verification program followed.				
8(4)	Safety standards met before certification Certificates available and show: • Identify work inspected • Safety standards met • Date of certification • Stamp, signature, or initials • Like-for-like and legacy construction no undue hazards	The certificate of inspection provides all necessary information on what was inspected, and identifies the inspector, date of inspection, stamp, and initial of the inspector. Shows partial certificate and final certificate		X		
8(7)	Certificates and records of inspection available to ESA and: • Records and certificates of inspection • Covers all applicable construction • Signed and dated • Progressive inspections and sampling process certificates • Records of inspection for underground work	Certificates and records of inspection are available in engineering project files or other departments as applicable and are available to ESA		X		
	Competent and qualified persons trained on CVP and process for updating	Competent and qualified personnel receive CVP refresher training online every 3 years.		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
	Third party contractors trained and listed in the CVP	Contractors receive initial CVP training during orientation and refresher CVP training at 3-year intervals by IHSA.		X		
	Sampling program developed	Sampling inspections not done.	X			
	Process for resolving non-compliances and design changes	Non-compliances and field proposals for design changes are managed in accordance with THESL's operating procedure.		X		
8(7)	Third-party construction by contractors • Construction and maintenance of electrical distribution system • Records of inspection and certificates • Approved plan followed	• Civil and electrical construction may be carried out by THESL's design-build contractors. • Contractors' work is inspected and signed off by THESL's contract inspectors. • Contractors and contract inspectors sign off on as-built plans. Partial certificates by contractors. • Project folders signed off by crew leader, construction supervisor and Contract Administrator. Observations: • Humber Bay MS, 27.6kV / 4.16kV replacement. • 541 Commissioners , 13.8kV/600V service upgrade Certificates of approval signed by THESL's P.Eng and certificates signed by THESL's approved contractor .No Undue hazard		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
8(7)	Third party attachment – communications and community antenna systems: • Meets safety requirements • Non-compliances and variations resolved • Inspection by P. Eng. or person qualified in CVP • Certificate and record of inspection • Other joint users	Third parties provide a stamped certificate of inspection on the Occupancy Permit. Observations: • P-2022-00725 – Rogers - Bainhart Cres, Conditional granted and followed by Final granted • P2022-00027 – Bell, • D2023-00078 – Zayo, U/G Ducts • W2023-00080 – Rogers, Cell Modem on Pole Plans for the above third-party attachers installations were prepared by P.Eng. Plans displayed certificate and P.Eng. seal. THESL's inspectors follow up on completed installations to inspect and sign off on certificates on the construction drawings.		X		
	Public safety promotion & Training Safety communications	THESL Promotes Public Safety in the following way: • Electrical Safety Tips on THESL's website (Emergency Preparedness Guide in ten different languages). • Emergency Preparedness Plan with the City, IESO, Hospitals, Enbridge, and communication companies. • Emergency Preparedness week from May 1 to May 7. • Emergency Resources. • Business Continuity Plan. • Emergency Preparedness for business (Prepare your business).		X		

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		• Electrical Safety Tips (Safety at home, outdoor safety, and Powerline safety). • Powerline safety campaign May 16 to May 22 • Contact voltage Safety tips (avoid touching any outdoor electrical structures, including bus shelters and walk around handwells, including Pet safety) • Crew safety. • Plan outages related to the construction work map. • Life Support Notification and Special Needs Program • Road Safety (tips for drivers & pedestrians and cyclist information). • Dig safety - contact Ontario One Call. ○ Issued a joint news release with Alectra, Elexicon Energy, Hydro One, and Hydro Ottawa • Interactive map to locate a streetlight and report an issue online. • Use of social media to promote safety (Facebook, Twitter, and Instagram). • Crisis management with oil, gas, OPG, transmission, and distribution. • CafeTO – worked with City –safety around electrical infrastructure • Electrical Vehicle – Charging safety. • Bright ideas publication • eCONNECT (email) Records available				

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
1	Public safety promotion & Training Regular training includes safety Performance assessment includes safety Records on dealing with safety issues Training materials Interest and input from the Board	• Reports on THESL's Health and Safety presented to the Board of Directors quarterly. • Two (2) Lost Time Injuries during the audit period. • Seven (7) recordable injuries • Certifications to Standards – ISO 14001 Environment Management System & ISO 45001 Occupational Health and Safety. • THESL tracks vehicle incidents via GPS on vehicles (speeding, braking, seatbelt issues). Vehicle speeding and incidents are reviewed every month. These incidents are reduced substantially. • Training • Contractors' safety and training records uploaded in the training matrix. • THESL's employees safety and training records are uploaded in the training matrix. • Each employee has a different training track depending on the job performed • Training records are assessed every 2 months and managers are notified if staff is not in compliance • ESA Reg training will be every 2 years starting 2024, as per 2023 CVP • Line staff in classroom training				

Legend: NA – Not Applicable C – Complies NI – Needs Improvement NC – Non-Compliance

Reg. Sect.	Audit Plan / Requirement	Audit Results	NA	C	NI	NC
		• Admin staff e-learning Awards Best 50 Corporate Citizens in Canada (2022)- Corporate Knights • 9th overall • 1st among Electricity Transmission and Distribution in Canada 5-Star Energy and Resource Company (2022) • Canadian Occupational Safety				

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 2B-VECC-17

References: Exhibit 1B, Tab 3, Schedule 1, Page 8

Exhibit 2B, Section C, Pages 5-6

Preamble:

"Toronto Hydro proposes to remove the Scheduled Outages cause code from its 2025-2029 custom SAIDI performance measure for two reasons: (1) major forecasting uncertainty caused by the ongoing implementation of Oracle's Utility Analytics ("OUA")"

"Toronto Hydro upgraded its existing Outage Management System with Oracle's Network Management System ("NMS"). This new system provides Toronto Hydro with more robust data and enhanced visibility into near real-time system events. As part of the multi-year NMS upgrade initiative, Toronto Hydro is implementing a new commercial solution, Oracle's Utility Analytics ("OUA"), which will serve as the future successor to IT IS"

Furthermore, the following changes are expected over the course of the multi-year upgrade, leading to more interruptions being captured in 2023 to 2029

1. Increased number of outages affecting a small number of customers.
2. Improved resolution of outage duration, down to the second.
3. Increased number of scheduled outages reported; and
4. Changes in outage structuring: currently, outages are structured manually, typically broken down by feeder. OUA will streamline this process by automatically generating outage reports based on restoration actions recorded in NMS.

QUESTION (A):

a) Please clarify which aspect of the OUA replacement project interfere with the use of scheduled outage duration or frequency as a metric for the proposed PIM?

RESPONSE (A):

As described in the evidence referenced, implementation of OUA results in more accurate reporting of scheduled outages in the future, which introduces significant uncertainty with future forecasts. The other factors discussed in the preamble above are expected to have relatively minor impacts on SAIDI/SAIFI.

QUESTION (B):

b) If the conversion to a new outage management system is ongoing in the 2024 through 2026 period will this interfere with an effective evaluation of those programs later? That is if THESL is unable to appropriately monitor outages until it has fully implemented OUA then why is it not best to defer some capital spending until such time as that system is fully operational?

RESPONSE (B):

The implementation of Oracle Utility Analytics solution will not interfere with an effective evaluation of programs. The additional unplanned outages reported through the platform impact a very small number of customers, which in turn has a marginal impact on overall system reliability metrics.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 2B-VECC -18

Reference: Exhibit 2B, Section C, Page. 15

QUESTION (A):

a) Presumably customers are concerned with the duration of outages irrespective of their reason and especially if the outage is a matter within THESL's ability to address. The PIM measure for Outage Duration excludes Scheduled Outages. Why?

RESPONSE (A):

Please refer to Exhibit 1B, Tab 3, Schedule 1, pages 8-9 for an explanation of the rationale behind the PIM measures. Independent of the PIM measure, Toronto Hydro measures and monitors "all-in" reliability metrics (including scheduled outages) on an ongoing basis, and has an established process for managing the impacts of scheduled outages on customers.

Toronto Hydro agrees that customers are concerned about outages irrespective of their reason. However, Toronto Hydro disagrees with the implication that scheduled outages are equivalent to unplanned outages when it comes to the customer experience. Toronto Hydro offers the following high-level comparison of scheduled and unplanned outages for further consideration.

Aspect	Scheduled Outages	Unplanned Outages
Predictability	Planned in advance, scheduled time known	Occur without warning, unpredictable
Duration and Impact	Typically short, a few hours, and contained	Variable, can last from minutes to days, and can impact thousands of customers

Aspect	Scheduled Outages	Unplanned Outages
Communication	Toronto Hydro communicates schedule in advance	No advance notice
Impact on Customers	Predictable, can plan around outage	Disruptive, can cause inconvenience and losses
Mitigation Options	Customers can prepare, use backup power	Limited options, may not be able to mitigate
Frequency	Regular, scheduled based on capital and maintenance plan	Occasional, based on system reliability
Preventive Purpose	Preventive maintenance, system improvements	Reactionary response to failures

QUESTION (B):

b) Are there any other measures used by THESL to gauge the response capability/efficiency of outage recovery?

RESPONSE (B):

Toronto Hydro routinely measures and monitors "all-in" SAIFI and SAIDI, "defective equipment" SAIFI and SAIDI, volume/impact of outages by specific cause codes and availability/accuracy of outage Estimated Time of Restoration. Large outages are reviewed on a weekly basis for lessons learned and improvement opportunities.

QUESTION (C):

c) With respect to scheduled outages are planned projects provided guidelines or expectations for maximum outage time? If so, please provide or explain the process that is used to ensure that a given project meets the expected outage time.

RESPONSE (C):

Crews undertaking scheduled outages are expected to plan outages in a manner that minimizes customer impact (duration and scope) to the extent possible. Outage requests are submitted to the Control Centre with start and finish times. Controllers will review the request and create a switching order to enable work to be completed safely while minimizing the number of customers impacts.

Field Managers oversee the work and monitor progress to ensure that work is completed within the allotted time.

Additionally, in the planning phase, proactive engagement with customers is facilitated through community relations teams (as detailed in Exhibit 4, Tab 2, Schedule 18). Notices regarding power interruptions, along with advance information about the expected outage duration, are provided.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 2B-VECC-19

Reference: Exhibit 2B, Section E7

QUESTION (A):

a) THES is proposing to a significantly more expense system enhancement program that in the past (26.3M vs $151.2M). What metrics, statics or measurable outcomes is the Utility employing to judge the success of this initiative?

RESPONSE (A):

Outcomes and measures impacted by the System Enhancements program are documented in Exhibit 2B, Section E7.1, Table 2. This table describes measures these investments will contribute to, such as reliability objectives (e.g. SAIFI, SAIDI), the reduction of impact due to Major Event Days ("MEDs"), maintaining Toronto Hydro's Total Recorded Injury Frequency ("TRIF") and safety objectives, and contributing to Toronto Hydro's financial objectives by reducing operational costs associated with patrolling feeders for fault finding purposes.

In addition to these outcomes and measures, the System Enhancements program contributes to metrics under Toronto Hydro's Performance Incentive Mechanism ("PIM"). The program contributes to the Grid Automation Readiness PIM by increasing the number of Horseshoe feeders with a minimum of 2.5 switches from 78 percent in 2022 to 90 percent by 2029. This prepares the system for achieving its distribution automation goals. To support the Outage Duration and Outage Frequency PIMs, investments in this program allow for the installation of SCADA switches, tie-points and reclosers on targeted feeders to improve outage response capabilities, reduce fault isolation times and reduce the number of customers impacted by an outage event on a feeder. Overall, this program will form the system configuration required for Toronto Hydro's self-healing grid in 2030 and beyond, contributing to long-term reliability benefits. Please refer to Exhibit 1B,

Tab 3, Schedule 1 for more details on the Outage Duration, Outage Frequency, and Grid Automation Readiness PIMs.

QUESTION (B):

b) How would THESL prioritize projects if faced with a 20% reduction in the annual amount expended on this capital program segment.

RESPONSE (B):

The System Enhancements program is a critical part of Toronto Hydro's Grid Modernization Strategy. Investments in this program are generally prioritized on the basis of need, including, for example, which parts of the system are experiencing poor reliability and would benefit most from additional flexibility. As discussed in Section E2, page 19, there are evolving systemic challenges such as climate change and electrification which Toronto Hydro expects will have the dual effect of (i) increasing reliability risk on the system due to greater system utilization and more frequent impacts from adverse weather, and (ii) increasing the average customer's sensitivity to outages due to an increased reliance on electricity as their primary source of energy. With these broader trends in mind, the utility concluded that the 2025-2029 investment period would demand a greater emphasis on modernizing the grid, leveraging technologies such as SCADA-operated switches and reclosers, distribution sensors, and advanced distribution management tools to not only continue to improve the customer's overall reliability experience within the rate period, but establish the foundation for full-scale grid automation in 2030 and beyond, ensuring the utility is prepared to deliver stable reliability performance as climate change and electrification pressures accelerate. Furthermore, as noted in Section D4.2, these and other Grid Modernization investments will provide crucial reinforcement to the utility's "least regrets" investment approach as it deals with uncertainty with respect to future rates of growth and electrification. System Enhancements will provide Toronto Hydro with the capability to observe system performance at an asset-level and make real-time (and increasingly automated) operating decisions. Building these capabilities is necessary to optimize the capacity and performance of a more heavily utilized grid.

A 20 percent reduction in the System Enhancements program would not only undermine this long-term strategy, but would also delay the realization of customer benefits within the 2025-2029 rate period from the deployment of cost-effective solutions on the worst performing and most vulnerable parts of the grid (e.g. reclosers). If faced with a reduction of this magnitude, Toronto Hydro would be forced to reassess the viability of the various segments that constitute this program and defer a large portion of the plan.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 2B-VECC -20

Reference: Exhibit 2B, Section E8

QUESTION (A) :

a) We are unable to locate any budget costing for the closure and relocation of EDC1. Please provide the current budget which shows separately, the budgeted cost of land, building, furnishings, incremental IT equipment (as separate from equipment to be moved) and other major project components. Please also clarify the time frame over which the project is expected to be completed (i.e., land acquisition, building, move-occupation).

RESPONSE (A):

As noted in Table 1 of Exhibit 2B, Section E8.1, the cost for the relocation project is $72.0 million.

There will be no land acquisition costs as the proposed EDC will be constructed in an existing Toronto Hydro facility.

The project will be completed over the 2025-2029 period. Design will begin in 2025, with tendering and procurement beginning in 2026. Construction will take place until the end of 2028, with site finishing, commissioning, and testing taking place in 2029. The proposed EDC would be fully functional in 2029.

A breakdown of the project budget is shown below:

Cost Category	Budget ($ millions)
Building Shell	0.4
Building Interiors	1.4
Mechanical	5.1

Electrical	15.0
Site Work	0.5
Ancillary (Demolition + Temporary Work)	0.4
IT	26.2
General Requirements, CM Fees	7.1
Soft Costs (Permitting, Consulting, Project Management etc.)	7.8
Inflation Escalation	8.1
Total	72.0

QUESTION (B):

b) Is there expected to be proceeds from the sale of the current EDC 1 location?

RESPONSE (B):

There will be no proceeds of sale for EDC 1 since it is located in an existing building that continues to operate for other business purposes. Decommissioning EDC 1 is not possible until the proposed EDC is constructed and comprehensively tested and commissioned. Since the estimated timing for this phase is the second half of 2029, Toronto Hydro estimates that the decommissioning of EDC 1 will potentially take place in the 2030-2034 rate period. Toronto Hydro estimates that decommissioning costs will be immaterial, but is unable to estimate any future proceeds at this time.

QUESTION (C):

c) Are there any plans to relocate or refurbish EDC 2 during the rate plan period?

RESPONSE (C):

No. Please also refer to Toronto Hydro's response to 2B-Staff-259, subpart (b).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-274

References: Exhibit 3, Tab 1, Schedule 1, Section 6.1
Load Forecast Guideline for Ontario, Guidance for the Development of Regional Planning Demand Forecasts, Oct 13, 2022

Preamble:

Toronto Hydro has included CDM as a multivariate regression variable as part of its proposed load forecast in an attempt to represent conservation that occurs through formal programming as well as naturally.

QUESTION (A):

a) Please discuss how Toronto Hydro considered guidance from the OEB's Regional Planning Process Advisory Group's Load Forecast Guideline for Ontario, including how it considered how to adjust the gross demand forecast to reflect the forecast impact of non-wires alternative activities (including DERs, CDM and distributed generation).

RESPONSE (A):

Toronto Hydro reviewed but did not incorporate OEB's Regional Planning Process Advisory Group's Load Forecast Guideline for Ontario for its Revenue load forecast. It is Toronto Hydro's understanding that the purpose of the OEB's Regional Planning Process Advisory Group's Load Forecast Guideline for Ontario, is to provide guidance to Ontario LDC's in the preparation of Peak Demand Forecasts used for Regional Planning. Where the proposed revenue load forecast in the Exhibit 3 focuses on projecting distribution electricity consumption and billing demand at the customer level. Thus, Toronto Hydro's view is that the guidance and underlying assumptions are not applicable for the use of the revenue load forecast.

QUESTION (B):

b) Toronto Hydro has based its annual forecasted CDM savings for the 2025 to 2029 period on the assumption that there will be a continuation of the current IESO CDM Framework. Please confirm that should there be any changes to IESO CDM program delivery, including expanded delivery to residential and business customers, that there will be no subsequent changes to Toronto Hydro's proposed 2025-2029 CDM savings after the OEB has approved Toronto Hydro's application.

RESPONSE (B):

Toronto Hydro confirms that should there be any changes to IESO CDM program delivery there will be no subsequent changes to Toronto Hydro's proposed 2025-2029 CDM savings embedded in the load forecast after the OEB has approved Toronto Hydro's application.

QUESTION (C):

c) Please discuss the basis for Toronto Hydro's forecasted 2025-2029 Gross Energy Efficiency and Demand Response savings. In particular, please discuss the basis for the increase in demand savings for the residential class.

RESPONSE (C):

The 2025-2029 CDM savings mirror the final year of the IESO's 2021-2024 CDM Framework for the province, with an extrapolation for Toronto Hydro's portion. Residential demand savings are not used in the CDM variable, and are only shown for display purposes.

QUESTION (D):

d) Please discuss how Toronto Hydro has included any naturally occurring conservation during the 2025 to 2029 period?

RESPONSE (D):

Toronto Hydro has moved towards including CDM as a multivariate regression variable to represent conservation that occurs through CDM program delivery. Naturally occurring conservation may be captured through the CDM variable, as well as the time trend variables used.

QUESTION (E):

e) Please discuss how Toronto Hydro has incorporated information from the IESO's Annual Planning Outlook to inform its CDM forecasts.

RESPONSE (E):

Toronto Hydro reviewed but did not incorporate IESO's Annual Planning Outlook to inform its CDM forecasts.

QUESTION (F-H):

f) On what basis has Toronto Hydro concluded that the impact of heat pumps on overall load and demand is not yet material. Please discuss how, if at all, Toronto Hydro has considered recommendations from the Electrification and Energy Transition Panel and/or OEB findings in Enbridge Gas Inc.'s recent rate proceeding (EB-2022-0200) related to the revenue horizon for new customer connections.

g) Please list and discuss the ways in which the Future Energy Scenarios modelling tool was used to inform and develop the proposed load forecast.

h) Please discuss if Toronto Hydro reviewed either the IESO's Pathways to Decarbonization report (December 15, 2022) and/or the Enbridge Gas Inc. Pathways to Net-Zero Emissions report (revised April 2023) and how these reports were considered in the development of its Future Energy Scenarios model and load forecast, including assumptions related to electrification of buildings, vehicles and commercial and industrial activities.

RESPONSE (F-H):

Toronto Hydro actively monitors regulatory adjudication proceedings and policy consultations in the sector. Through its Future Energy Scenarios work, Toronto Hydro factored in the significant uncertainties with respect to the energy transition, which will play out in many ways, including in adjudication and policy development. To the extent that the future varies from forecast insofar as distribution revenue is concerned, those revenue variance would track to the Demand Related Variance Account (revenue variance subaccount).

With respect to heat pumps in particular, please see the response to 2B-BOMA-02.

With specific reference to the Enbridge Gas Inc's rate proceeding, the decision in EB-2022-0200 came out after the Application was finalized and filed. Similarly, the Electrification and Energy Transition Panel's report was issued following the finalization and filing of the Application.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-275

References: Exhibit 3, Tab 1, Schedule 1, Page 1

Ref 2: Exhibit 3 / Tab 1 / Schedule 1 / Appendix A, Appendix B, Appendix H, Appendix I

Preamble:

Toronto Hydro's customer and load forecast filed November 17, 2023, includes 2023 as a bridge year.

QUESTION:

Please provide an updated load forecast where 2023 is provided as a historic actual year and used in the regression equations to forecast 2024 to 2029.

RESPONSE:

The request entails complex modelling to update the load forecast to include 2023 as a historical actual year and the regression equations to forecast 2024 to 2029. Toronto Hydro does not have sufficient time to complete this work within the timelines for responding to interrogatories, but will undertake to provide this information at the Technical Conference.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-276

References: Ref 1: Exhibit 3, Tab 1, Schedule 1, pp. 3-4

Ref 2: EB-2018-0165 Decision and Order, December 19, 2019, p 126.

Preamble:

In its Decision on Toronto Hydro's 2020-2024 rate application, the OEB expected Toronto Hydro to enhance its approach to forecasting customers / connections through the consideration of economic and demographic conditions.

Toronto Hydro states that to forecast customer connections in the GS 1,000-4,999 kW, Large Use, CSMUR, and Street Lighting rate classes it relied on market knowledge of construction as well as expert judgement.

In the CSMUR rate class, customer connections increased from 75,028 in 2018 to 94,391 in 2023, a compound average growth rate of 4.7% and are forecast to grow to 104,994 in 2029, a compound average growth rate of 1.8%.

In the GS 1,000-4,999 kW rate class, customer connections increased from 427 in 2018 to 455 in 2023, a compound average growth rate of 1.3% and are forecast to grow to 461 in 2029, a compound average growth rate of 0.2%.

In the Large Use rate class, customer connections increased from 42 in 2018 to 47 in 2023, a compound average growth rate of 2.3% and are forecast to decrease to 46 in 2029.

QUESTION (A):

a) Please explain how the methodology used for these rate classes was an enhancement of the approach Toronto Hydro used in its 2020-2024 Custom IR application.

RESPONSE (A):

Table 1 below outlines Toronto Hydro's customer count forecast in the previous application and the current application, thereby showing the forecasting enhancements.

Table 1: Enhancements to Customer Count Forecast

Rate Class	Methodology used in 2020-2024 Custom IR application	Enhancements made in 2025-2029 Custom IR application
CSMUR	The forecast was based on forecast of housing starts for multi-unit developments in Toronto, and professional judgement was used to estimate market share that will be serviced by Toronto Hydro.	The forecast was based on historic multi-unit trends reported by developers in Toronto, alongside Toronto Hydro's historical market share trends of Toronto multi-units.
GS 1,000-4,999 & Large Use	The forecast was kept constant at the latest historical value as the trend was fairly flat over the years at the time of filing	The forecast includes customers that have a confirmed feeder request

QUESTION (B):

b) Please explain drivers of the decreasing trend in customer connection additions.

RESPONSE (B):

Customer reclassification contributes to the decreasing trends in the GS 1,000-4,999 kW and Large Use rate classes.

QUESTION (C):

c) Please provide details on Toronto Hydro's market knowledge of construction customer connection additions, aggregated by customer class and year. Please indicate how this

translates to the overall forecast for customer connections, and how the later years in the forecast period are derived.

RESPONSE (C):

Please refer to Interrogatory 3-VECC -25 b) and c).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-277

Reference: Exhibit 3, Tab 1, Schedule 1, p. 1

Preamble:

Toronto Hydro has forecasted one customer for Street Lighting.

OEB staff anticipate that, at a minimum, street lighting would be required on City of Toronto maintained roadways and Ministry of Transportation maintained roadways.

QUESTION (A):

a) Please provide the historical and forecast number of street lighting connections for each year from 2018-2029.

RESPONSE (A):

Please refer to OEB Appendix 2-IB in Exhibit 3, Tab 1, Schedule 2.

QUESTION (B):

b) Please explain the structure that leads to a single street lighting customer for all historic and forecast years.

RESPONSE (B):

The City of Toronto is the sole customer in the Street Lighting rate class for both historic and forecast years. Toronto Hydro does not own street lighting on Ministry of Transportation expressways (e.g. Hwy 401).

QUESTION (C):

c) Please provide the number of end-use customers for street lighting.

RESPONSE (C):

Please refer to part (b) above of Toronto Hydro's response to interrogatory 3-Staff-277.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-278

Reference: Regression Model Statistics - Customers

Preamble:

Toronto Hydro used dummy variables RECLASS1, RECLASS2, and RECLASS3. OEB staff understands that these variables would be intended to capture the impact of reclassification in the GS < 50 kW and GS 50 - 999 kW rate classes.

The RECLASS variables start in June 2020, and are used one at a time, in sequence, until the end of the forecast period.

The residential customer connection forecast relied on population as the only external variable with a trend that varies over time. The same variable was used in the GS < 50 kW rate class. The GS 50-999 kW rate class used a measure of employment instead.

QUESTION (A):

a) Please confirm OEB staff's understanding of the purpose of these variables or explain.

RESPONSE (A):

Toronto Hydro confirms OEB's staff's understanding of the variables.

QUESTION (B):

b) Is Toronto Hydro able to count the number of customers reclassified?

i. If so, please provide the number of customers reclassified in/out each month.

ii. If so, why weren't known values used as a manual adjustment?

RESPONSE (B):

Toronto Hydro is able to count the number of customers reclassified on an annual basis, as per Customer Care processes.

Please refer to Table 1 below for the annual number of customers reclassified between 2020 and 2022 for the GS<50kW and GS 50-999 kW rate classes.

Table 1: Annual number of customers reclassified for GS<50kW and GS 50-999 kW rate classes

Year	GS<50 kW	GS 50-999 kW
2020	106	-206
2021	270	-294
2022	197	-198

i) Toronto Hydro anticipates further reclassification in the future, and believes that RECLASS indicator variable is the appropriate methodology to be used for GS<50 kW and GS 50-999 kW rate classes for the following reasons: it creates a balance of good model fit, appropriate causation and yield coefficient values that make practical and statistical sense as well as provide good predictive value.

QUESTION (C):

c) What steps has Toronto Hydro taken to prevent trends or other causes of connection change from being captured in the RECLASS variables?

RESPONSE (C):

Toronto Hydro established RECLASS variables based on the historical timing of customer reclassification, ensuring the suitability of explanatory variables in the model and minimizing the influence of other factors being captured, as confirmed by the good fit.

QUESTION (D):

d) Please explain the rationale for use of the population variable in the residential and GS < 50 kW rate class, and employment in the GS 50 - 999 kW rate class. Were different variables attempted?

RESPONSE (D):

Toronto Hydro tested several external variables to capture demographic and economic conditions, create a balance of good model fit, and result in coefficient values that make practical and statistical sense. The population and employment variables confirmed the best modeling results for their respective rate classes.

QUESTION (E):

e) To what extent were customer connections impacted by the COVID-19 pandemic?

i. How is this reflected in the customer connection forecast?

RESPONSE (E):

As set out in Exhibit 2B, Section E5.1 Customer Connections, during the COVID-19 pandemic Toronto Hydro's historical trajectory of capital spend was maintained. This was also observed in other data indicators such as the number of new connections, and feeder requests.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-279

Reference: Exhibit 3, Tab 1, Schedule 1, p. 7

Preamble:

Each rate class is forecasted using kWh per day as the dependant variable.

OEB staff understands this to be determined calculating kWh per month divided by the number of days in the month. Other variables that include totals for the month such as heating degree days and cooling degree days are also divided by the number of days in the month.

QUESTION (A):

a) Please confirm OEB staff's understanding or explain.

RESPONSE (A):

Toronto Hydro confirms OEB staff's understanding within the Preamble above.

QUESTION (B):

b) Has Toronto Hydro considered using daily data to forecast daily energy use?

RESPONSE (B):

Toronto Hydro has not considered the use of daily data for forecasting energy use, as there isn't enough available data from all rate classes to support this method.

QUESTION (C):

c) Does Toronto Hydro have enough data available to it to perform a daily regression? If so, how many years are available?

RESPONSE (C):

Please refer to response part (b) above.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-280

References: Exhibit 3, Tab 1, Schedule 1, pp. 9, 17

Regression Model Input Data

Preamble:

A positive dewpoint variable was used in several rate classes, but not residential and large use rate classes.

A Lockdown binary variable was used in the GS < 50 kW, GS 50 - 999 kW and Large Use rate classes. This variable reflects the months April and May 2020, and January, February, April, and May 2021.

QUESTION (A):

a) Did Toronto Hydro consider the positive dewpoint variable for the residential and large use rate classes? If so, why was it rejected? If not, why not?

RESPONSE (A):

The positive dew point temperature variable in the Residential model resulted in a coefficient value with the incorrect sign (i.e., a negative coefficient – suggesting an increase in a positive dew point leads to a decrease in loads).

Toronto Hydro confirms that positive dew point temperature was used as an explanatory variable for the Large Use class. Please refer to Appendix B in Exhibit 3, Tab 1, Schedule 1.

QUESTION (B):

b) Does Toronto Hydro believe that the COVID-19 pandemic impacted load in the Residential, CSMUR, or GS 1,000 - 4,999 kW rate classes? If so, how is this reflected in the explanatory variables?

RESPONSE (B):

Toronto Hydro understands that the Residential, CSMUR, or GS 1,000 - 4,999 kW rate classes were impacted by the COVID-19 pandemic. The lockdown variable was found to be statistically insignificant in these rate classes. Additional load impacts from the pandemic are captured through the economic variables used in the model, such as GDP and unemployment rate.

QUESTION (C):

c) Does Toronto Hydro believe that the COVID-19 pandemic impacted load in months not subject to a complete lockdown? If so, how was this reflected in the remaining explanatory variables?

RESPONSE (C):

Yes, additional load impacts from the pandemic are captured through the economic variables used in the model, such as GDP and unemployment rate as explained on page 15 of 28, Exhibit 3, Tab 1, Schedule 1.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-281

Reference: Exhibit 3, Tab 1, Schedule 1, pp. 15-16

Preamble:

Toronto Hydro used linear spline time trends in several rate classes when forecasting energy consumption.

QUESTION (A):

a) Please explain how the time periods were selected for the time trend variables.

RESPONSE (A):

Please refer to Toronto Hydro's response to Interrogatory 3-VECC-30.

QUESTION (B):

b) Please indicate how the trend variables are continued into the forecast period.

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 3-VECC-30 parts b), d) and f).

QUESTION (C):

c) Please explain whether the historic period of over 20 years necessitated the use of spline time trend variables, and how the use of 20-year-old data in combination with spline time trends aids in forecasting the test years.

RESPONSE (C):

Please refer to Toronto Hydro's response to interrogatory 3-VECC-30.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-282

Reference: Exhibit 3, Tab 1, Schedule 1, p. 7

Preamble:

Toronto Hydro states that for rate classes whose billing units are monthly peak demand, the forecasted monthly non-coincident peak by class is forecasted based on historical relationships between energy and demand.

QUESTION:

a) Please provide the derivation of the monthly peak demand forecasts, indicating which historic years were used to establish the relationship between energy and demand as well as any equations used such as averages or time trends, etc.

RESPONSE:

Please refer to Toronto Hydro's response and appendix to 3-VECC-39.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-283

References: **Ref 1: Exhibit 3, Tab 1, Schedule 1**

Ref 2: Exhibit 9, Tab 1, Schedule 1, section 9.2

Ref 3: EB-2010-0060: Review of Distribution Revenue Decoupling Mechanisms, Pacific Economics Group Research, LLC, March 2010

Ref 4: EB-2018-0165: Decision and Order, December 2019, Findings under Issue 4.0, Load and Other Revenue Forecast

Preamble:

Table 1 of Reference 1 is reproduced below:

		Total Normalized GWh	Total Normalized MVA	Total Distribution Revenue ($Million)	Total Customers
2018	Actual	24,701.0	39,823.2	736.6	770,333
2019	Actual	24,429.6	39,126.0	766.2	777,369
2020	Actual	23,674.7	36,813.7	727.8	781,374
2021	Actual	23,575.0	36,638.0	761.8	786,258
2022	Actual	23,990.1	37,648.0	786.5	790,699
2023	Bridge	23,678.6	37,199.3	834.3	794,025
2024	Bridge	23,676.2	36,993.9	874.3	797,318
2025	Forecast	23,458.7	36,384.5	972.4	800,374
2026	Forecast	23,416.5	36,063.4	1,019.7	803,344
2027	Forecast	23,389.6	35,698.8	1,059.1	806,017
2028	Forecast	23,498.8	35,507.1	1,151.0	808,731
2029	Forecast	23,458.5	35,093.4	1,185.1	811,245

Note 1 that accompanies the table states:

Total Normalized GWh are purchased GWh (before losses) and are weather normalized to the Test Year heating and cooling degree day assumptions.

Note 2 that accompanies the table states:

Total Normalized MVA are weather normalized MVA.

QUESTION (A):

a) Please provide a forecast of base distribution revenue for each year of 2025 to 2029 assuming values at the 5th, 25th, 75th and 95th percentiles of the probability distribution of forecast consumption given expected variability in weather.

RESPONSE (A):

The methodology of using percentiles of the probability distribution that is proposed in this question does not represent likely scenarios due to unrealistic weather patterns (e.g., an extremely mild winter and extremely mild summer may not occur within the same year). By contrast, Toronto Hydro's Application proposes a methodology that presents realistic variabilities in weather based on historic weather-related revenue variances. Toronto Hydro's methodology uses the historic weather impacts on revenue for the past seven years (2016-2022) and selects the year with the largest variance impacted by weather (2018) to create the most extreme positive and negative variances from weather. The weather impacts are calculated as the variance between the non-weather normalized and weather-normalized actual billing determinants. Toronto Hydro's weather normalization methodology is described in Exhibit 3, Tab 1, Schedule 1, Section 5.1.

The revenue variances are then extrapolated to the 2025-2029 equivalents to represent the 0th and 100th percentiles. Assuming the 50th percentile is zero (i.e., no variability in weather), the 5th, 25th, 75th, and 95th percentiles were developed by calculating the range in which they would fit between the 50th percentile, versus the 0th and 100th percentiles. Please refer to Table 1 for the resulting distribution revenue forecasts by percentile.

Table 1: Distribution Revenue by Percentile (Weather-driven)

Year	5th Percentile	25th Percentile	Proposed Revenue	75th Percentile	95th Percentile
2025	961	967	972	978	984
2026	1,008	1,014	1,020	1,025	1,032
2027	1,047	1,053	1,059	1,065	1,071

2028	1,138	1,145	1,151	1,157	1,164
2029	1,171	1,179	1,185	1,191	1,199

QUESTION (B):

b) For each revenue forecast using these weather-driven consumption inputs, identify the amount to be recorded in the revenue variance subaccount of the proposed revenue variance subaccount of the proposed demand related variance account given the proposed revenue forecast in Reference 1.

RESPONSE (B):

Given DRVA Revenue Variance Sub-Account will be based on weather normal values, there will be no weather driven entries into the DRVA.

QUESTION (C):

c) On page 4 of Reference 1, Toronto Hydro states its forecast of customer count is the product of "model statistics and expert judgment" (Ex 3-1-1 p4).

i. Please provide an estimate of the customer count at the 5th, 25th, 75th and 95th percentiles of a probability distribution, or reasonable equivalent, reflecting the potential range of change in customer count over the period.

ii. Please estimate the base distribution revenues associated with each of these different customer forecast inputs, holding all other inputs equal, by rate class.

iii. Please identify the amount to be recorded in the DRVA for each revenue forecast under different forecast customer count levels, by rate class.

RESPONSE (C):

i) Please refer to Table 2 below for a total customer estimate assuming values at the 5th, 25th, 75th, and 95th percentiles. The percentiles were calculated based on 10-years of customer counts where applicable, and the customer forecasts used in proposed distribution revenue forecast were adjusted for each percentile. While Toronto Hydro has provided the requested data, the relevance of the data is unclear.

Table 2: Total Customer Number Estimates

Year	5th Percentile	25th Percentile	Proposed Forecast	75th Percentile	95th Percentile
2025	785,974	793,943	800,374	808,151	814,598
2026	788,943	796,913	803,344	811,120	817,567
2027	791,617	799,586	806,017	813,794	820,240
2028	794,331	802,300	808,731	816,507	822,954
2029	796,845	804,814	811,245	819,022	825,469

ii) Please refer to Table 3 below for a distribution revenue forecasts assuming values at the 5th, 25th, 75th, and 95th percentiles, as well as the proposed distribution revenue. All other components of the revenue load forecast were held constant. While Toronto Hydro has provided the requested data, the relevance of the data is unclear.

Table 3: Distribution Revenue Estimate (Customer-driven),

	Total Revenue ($M)				
Year	5th Percentile	25th Percentile	Proposed Revenue	75th Percentile	95th Percentile
2025	954.4	963.4	972.4	980.7	986.1
2026	1,000.9	1,010.3	1,019.7	1,028.3	1,033.9
2027	1,039.6	1,049.4	1,059.1	1,068.1	1,073.9
2028	1,129.9	1,140.5	1,151.0	1,160.7	1,167.0
2029	1,163.4	1,174.3	1,185.1	1,195.1	1,201.6

iii) Please refer to Table 4 below for the amount that would be recorded in the revenue variance subaccount with the circumstances given in part c), ii). While Toronto Hydro has provided the requested data, the relevance of the data is unclear.

Table 4: Distribution Revenue Variance (Customer-driven)

	DRVA ($M)			
Year	5th Percentile	25th Percentile	75th Percentile	95th Percentile
2025	(18.0)	(9.0)	8.3	13.7
2026	(18.8)	(9.3)	8.6	14.3
2027	(19.5)	(9.7)	9.0	14.8
2028	(21.1)	(10.5)	9.7	16.1
2029	(21.6)	(10.8)	10.0	16.6

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-284

References: **Exhibit 1C, Tab 3, Schedule 3, Appendix B, Page 28**
Exhibit 1C, Tab 3, Schedule 3, Appendix C, Page 29
Exhibit 3, Tab 2. Appendix 2-H
EB-2018-0165, THESL_APPL_U_T3_S02_App A_OEB Appendix 2-H Other Operating Revenue_20190430

Preamble:

Since the completion of the transactions in EB-2009-0180/1/2/3 Toronto Hydro has owned streetlighting assets in the City of Toronto and Toronto Hydro Energy has owned expressway lighting assets as well as all the light fixtures.

Toronto Hydro's 2021 Financial Statements and Notes state revenues from street lighting services was $7.8M in 2021 and $6.9M in 2020. Toronto Hydro's 2022 Financial Statements and Notes state revenues from street lighting services was $8.3M in 2022. These values match the entries for line 4220 Other Electric Revenues in reference 3.

OEB staff have compiled the following table from Appendix 2-H found in both reference 3 and reference 4.

Table 3-1: USoA 4220

	Actual				Bridge	Actual / Forecast	actual		bridge		Forecast				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Ref 3						6.9	7.8	8.2	6.1	6.4	6.8	6.9	7.0	7.2	7.3
Ref 4	7.0	8.2	9.2	8.0	8.5	8.1									

Question (A):

a) Please review and either verify or correct the information in the preamble.

RESPONSE (A):

Since the completion of the transactions in EB-2009-0180/1/2/3, Toronto Hydro has owned certain street lighting assets in the city of Toronto that were deemed by the OEB to serve a distribution purpose and Toronto Hydro Energy has owned other street lighting and expressway lighting assets that were deemed not to serve a distribution purpose.

Please see the corrected Table 3-1 below, 2020 Forecast was updated to reflect Toronto Hydro's DRO Reply Submission and DRO Update[1].

Table 3-1-1 – Account 4220 Balance (Ref 4) (In $ millions)

	Actual				Bridge	Forecast
	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Ref 4	7.1	8.2	9.2	8.0	8.5	7.7

Table 3-1-2 – Account 4220 Balance (Ref 3) (In $ millions)

	Actual			Bridge		Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Ref 3	6.9	7.8	8.3	6.1	6.4	6.8	6.9	7.0	7.2	7.3

QUESTION (B):

b) Is it correct to state that in reference 3, the entries in account 4220 Other Electric Revenues are exclusively for streetlighting?

[1] EB-2018-0165, Toronto Hydro-Electric System Limited ("Toronto Hydro"), 2020-2024 Custom Incentive Rate-setting ("Custom IR") Application – DRO Reply Submission & DRO Update, February 12, 2020, Schedule 11

RESPONSE (B):

Confirmed.

QUESTION (C):

c) Please explain the reasons for the revenue decreases in 2018, 2020 and 2023.

RESPONSE (C):

2017-2018 Variance Explanation

The historical variance between 2017 and 2018 actuals from $9.2 million to $8.0 million is primarily due to lower streetlighting maintenance costs ($1.9 million) and higher revenue offsets e.g., accident claims, relocations related to Streetlighting assets ($0.2 million), which was partially offset by higher depreciation expenses ($0.7 million) and higher PILs ($0.2 million).

2019-2020 Variance Explanation

The historical variance between 2019 and 2020 actuals from $6.5 million to $6.9 million is primarily due to higher streetlighting maintenance costs ($0.7 million), which was partially offset by lower PILs ($0.2 million) and lower depreciation expenses ($0.1 million).

2022-2023 Variance Explanation

Forecasted variance between 2022 actuals and 2023 bridge from $8.3 million to $6.1 million is primarily due to lower depreciation expense ($0.9 million) due to a change in useful life, lower streetlighting maintenance costs ($0.8 million), lower PILs ($0.4 million) and higher revenue offsets e.g., accident claims and relocations related to Streetlighting assets ($0.1 million).

QUESTION (D):

d) What is the actual revenue for 2019?

RESPONSE (D):

Actual revenue for 2019 was $6.5 million.

QUESTION (E):

e) Please explain the reason for the variance between the forecast and actual revenue in 2020.

RESPONSE (E):

The historical variance between 2020 board approved and 2020 actuals from $7.7 million to $6.9 million is primarily due to higher revenue offsets e.g., accident claims and relocations related to Streetlighting assets ($0.8 million.)

QUESTION (F):

f) Please provide the revenue requirement calculations for those assets that were previously referred to as streetlighting assets, for each year from 2020 to 2025.

RESPONSE (F):

In $ millions	**Actuals**			**Bridge**		**Forecast**
	2020	2021	2022	2023	2024	2025
ROE	1.5	1.5	1.5	1.6	1.7	1.9
Interest	0.9	1.0	1.0	1.0	1.1	1.2
Depreciation	3.0	2.9	3.2	2.3	2.4	2.5
PILs	0.6	0.6	0.5	0.1	0.3	0.4
Capital-related revenue requirement	**6.0**	**6.0**	**6.2**	**5.0**	**5.5**	**6.0**
OM&A	3.1	3.0	3.8	3.0	2.8	2.8
Revenue Offsets	(2.2)	(1.2)	(1.7)	(1.9)	(1.9)	(2.0)
Non-capital-related revenue requirement	**0.9**	**1.8**	**2.1**	**1.1**	**0.9**	**0.8**
Base Revenue Requirement	**6.9**	**7.8**	**8.3**	**6.1**	**6.4**	**6.8**

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-285

References: **Exhibit 3, Tab 2. pages 1, 4**
Exhibit 3, Tab 2, Appendix 2-H
Exhibit 4, Tab 5, Appendix 2-N

Preamble:

OEB staff have compiled the following table showing costs allocated from Toronto Hydro-Electric System Limited to Toronto Hydro Energy Services Inc. from the information in Appendix 2-N.

Table 3-2: Streetlighting Costs Allocated from THESL to THESI

Row Labels	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Streetlighting Design	-	-	-	300	270	250	260	260	270	280
Streetlighting Support	650	540	280	740	740	760	800	840	880	1,130
Grand Total	**650**	**540**	**280**	**1,040**	**1,010**	**1,010**	**1,060**	**1,100**	**1,150**	**1,410**

QUESTION (A):

a) Please review and either verify or correct the information in the preamble.

RESPONSE (A):

Table 3-2 prepared by the OEB staff does not include the total shared services costs allocated from THESL to THESI. Toronto Hydro has corrected the Table 3-2 below to include total costs of shared services provided by THESL to THESI as presented in Appendix 2-N and summarized in Exhibit 4, Tab 5, Schedule 1, Table 3 at page 6.

In responding to this question, it is Toronto Hydro's understanding that by Streetlighting Design the OEB staff meant Engineering Design costs allocated to THESI as presented in the OEB Appendix 2-N, Shared Services and Corporate Cost Allocation.

Table 3-2: Shared Services Provided by THESL to THESI as presented in Appendix 2-N (In $ '000)

	Actual			Bridge		Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Engineering Design	80	850	910	300	270	250	260	260	270	280
Streetlighting Support	650	540	280	740	740	760	800	840	880	1,130
Corporate Costs Allocation	900	1,210	910	1,270	1,340	1,430	1,510	1,580	1,670	1,750
Total	**1,630**	**2,600**	**2,100**	**2,310**	**2,350**	**2,440**	**2,570**	**2,680**	**2,820**	**3,160**

QUESTION (B) AND (C):

b) Do the amounts in the table reflect the total cost for providing streetlighting services to THESI?

   i. If not, what are the other costs per year and where are they captured?

   ii. Please describe what activities are included in streetlighting support.

c) Please confirm that their HR, IT, and facilities services are not provided by THESL to THESI.

RESPONSE (B) AND (C):

Yes, the amounts provided in response to part (a) above reflect the total cost for providing streetlighting to THESI. Streetlighting support includes followings costs related to Toronto Hydro's employees dedicated to streetlighting: (a) administrative and support costs, (b) costs related to IT usage, (c) costs related to Human Resources, Environment and Safety, (d) facilities services and costs associated with other functions such as: payroll processing, account payable, legal costs incurred to support streetlighting activities in THESI.

QUESTION (D):

d) Please outline THESL's involvement THESI's material procurement, accounts payable, warehousing and site delivery are handled, and accounted for.

RESPONSE (D):

Toronto Hydro provides supply chain services to THESI including but not limited to contract negotiation and administration, procurement of contracted services. These costs are allocated to THESI based on number of purchase orders issued in a year. Similarly, Toronto Hydro provides accounts payable services to THESI which is recovered based on the number of invoices processed during the year (see Exhibit 4, Tab 5, Schedule 1) .

Toronto Hydro does not provide warehousing and site delivery services to THESI, these costs are outsourced and are paid for directly by THESI.

QUESTION (E):

e) How does THESI pay for energy consumed by streetlights; is there an allocation as in Appendix 2-N, other revenue as in Appendix 2-H or through a formal billing account as with other third-party unmetered loads?

RESPONSE (E):

City of Toronto pays for energy consumed by streetlights through a formal billing account.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-286

Reference: Exhibit 3, Tab 2, Appendix 2-H

QUESTION (A):

a) In Appendix 2-H, the table for Account 4330 - Costs and Expenses of Merchandising, the first row containing values is labelled "Reporting Basis". What is the correct description for this line item?

RESPONSE (A):

Please see Toronto Hydro's response to interrogatory 1B-SEC-01, subpart f.

QUESTION (B):

b) The historic average over 2020-2024 for the net of 4325 Revenues from Merchandise and 4330 Costs and Expenses of Merchandising is $7.8M. Why is the net of the cost and revenues in 2025 of $10M forecast to be higher than the historic average?

RESPONSE (B):

It is Toronto Hydro's understanding that in the question, OEB Staff made a calculation error in calculating the historic average over 2020-2024 for the net of 4325 Revenues from Merchandise and 4330 Cost and Expenses of Merchandising. In responding to this interrogatory Toronto Hydro believes the correct average should be $8.1 million.

As noted in Exhibit 3, Tab 2, Schedule 1, Section 5.1 in net revenues from Merchandise and Jobbing vary significantly from year to year, depending on the number and type of activities requested by customers. For reclaimed materials, any revenue depends on the strength of the market commodity prices at the time of disposition and the volume of reclaimed material that is available for processing.

Between the 2025 forecast of $10.1 million and the 2020-2024 historical average of $8.1 million, Toronto Hydro is forecasting higher revenues primarily from customer and temp services driven by higher demand related to transit projects, higher revenues from reclaimed materials driven by expected strength of commodity prices and volume of reclaimed materials, and higher demand for Hydro Make-Ready and Permit review work for Pole and Duct rentals.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 3-STAFF-287

References: Exhibit 3, Tab 2, Appendix 2-H

Exhibit 9, Tab 1, Schedule 1, Page 17

Preamble:

Table 9 in reference 2 shows that the revenue built into rates for pole attachments for 2020 to 2024 is $5.1M.

QUESTION (A):

a) Please provided an updated forecast for the number of pole attachments for 2025.

RESPONSE (A):

Toronto Hydro assumes that this question meant to refer to Table 10, Exhibit 9, Tab 1, Schedule 1 which deals with Wireline Pole Attachment Rate Variances. Toronto Hydro made a data entry error when populating that table, the corrected version is reproduced below as a response to this interrogatory. Toronto Hydro also confirms that this error did not have any impact on Exhibit 3, Tab 2, Schedule 2, Appendix 2-H. The corrected table shows that the revenue built into rates for pole attachments row reference (c).

The forecasted number of pole attachments for 2025 is 121,400.

Table 10: **Account 1508 - subaccount - Wireline Pole Attachment Revenue Variance Account**

Wireline Pole Attachment	Actual				Forecast	Total
	2020	2021	2022	2023	2024	
Number of Attachment Embedded in Rates (a)	113,630	113,630	113,630	113,630	113,630	
Pole Attachment Charge Embedded in Rates (b)	$44.50	$45.12	$46.43	$47.87	$49.88	

/C

Wireline Pole Attachment	**Actual**				**Forecast**	**Total**	
	2020	**2021**	**2022**	**2023**	**2024**		
Wireline Pole Attachment revenue embedded in Rates ($ Millions) (c = a x b)	$5.1	$5.1	$5.3	$5.4	$5.7	$26.6	/C
Actual/Forecast Pole Attachment Charge (d)	$44.50	$45.12	$34.76	$36.05	$37.78		/C
Actual/Forecast Wireline Pole Attachment revenue embedded in Rates ($ Millions) (e = a x d)	$5.1	$5.1	$4.0	$4.1	$4.3	$22.6	/C
Variance ($ Millions) (c – e)	**-**	**-**	**$1.3**	**$1.3**	**$1.4**	**$4.0**	/C
Carrying Charges ($ Millions)	**-**	**-**	**-**	**$0.1**	**$0.2**	**$0.3**	/C
Total Forecast for Clearance ($ Millions)						**$4.3**	/C

QUESTION (B):

b) What items generate the revenues in the remainder of account 4210 as shown in appendix 2-H? Please break out by year for 2020 through 2025.

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 3-VECC-55.

RESPONSES TO BUILIDING AND OPERATORS MAINTENANCE ASSOCIATION INTERROGATORIES

INTERROGATORY 3-BOMA-3

References: Exhibit 3, Tab 1, Schedule 1, Pages 1 to 2, Table 1

Preamble:

In the referenced evidence, Toronto Hydro's 2018 to 2029 total Normalized GWh and MVAs are provided.

QUESTION(A):

A. Please provide Toronto Hydro's actual total distribution system load shapes (24 hourly MVAs) on both the winter peak day and the summer peak day in 2019.

RESPONSE (A):

Please refer to 3-BOMA-3, Appendix A for Toronto Hydro's hourly MW loads for its winter and summer peaks in 2019.

QUESTIONS (B-D)

B. Please provide Toronto Hydro's forecast total distribution system load shapes (24 hourly MVAs) on both the winter peak day and the summer peak day in 2025 and in 2029.

C. Please further break down your responses to part A and part B into 5 categories:

i. CSMUR rate class
ii. Residential rate class
iii. Commercial sector
iv. Industrial sector
v. Other sector

D. Please further break down your response to part C iii (i.e. commercial sector) into commercial building types (e.g. office buildings, retail, hospitals, schools kindergarten to grade 12 schools, college and university, etc.).

RESPONSE B-D:

Toronto Hydro does not have the detailed load information and categorizations that would be required to perform this analysis. This type of analysis, which requires granular and real-time monitoring of electricity consumption, is going to be enabled by the deployment of smart meters and advanced metering infrastructure (AMI) as proposed in Exhibit 2B. AMI data can be used to identify patterns, forecast peak demand, and implement targeted strategies for demand management. Toronto Hydro is investing in this technology in the next rate period. Please see Exhibit 2B, Sections D5.2.2 and D5.3.1 for more information regarding these proposed investments.

RESPONSES TO BUILIDING AND OPERATORS MAINTENANCE ASSOCIATION INTERROGATORIES

INTERROGATORY 3-BOMA-4

Reference: Exhibit 3, Tab 1, Schedule 2 (OEB Appendix 2-IB)

Preamble:

Toronto Hydro's load forecast, including number of customers, annual kWh consumption and demand by rate class are provided in Exhibit 3-1-2.

QUESTIONS (A-D):

Further break down of commercial sector information in Exhibit 3-1-2:

A. For the rate classes "GS 50-999 kW", "GS 1000-4999 kW" and "Large User", please further break down 2017 to 2029 annual number of customers, weather normalized annual consumption kWh and weather normalized annual demand kW by residential (if applicable), commercial and industrial sectors.

B. Please further break down your response to part A by commercial building types (e.g. office buildings, retail, hospitals, kindergarten to grade 12 schools, college and university, etc.). Please note that this question is on the commercial sector only and therefore there is no need to further break down the residential and industrial figures provided in part A.

C. Please further break down the weather normalized annual consumption kWh and weather normalized annual demand kW given in your response in part B by month.

D. Please further break down the weather normalized annual consumption kWh and weather normalized annual demand kW given in your response in part B by the following two categories:

i. Buildings built after January 2017
ii. Buildings built prior to January 2017

RESPONSE (A-D):

Toronto Hydro does not have the detailed load information and categorizations that would be required to perform this analysis.

QUESTION (E):

E. Please further break down the weather normalized annual consumption kWh and weather normalized annual demand kW given in your response in part B by the following two categories:
   i. Class A customers
   ii. Class B customers

RESPONSE (E):

Please refer to Table 1 with the historical Class A and B breakdown of weather-normalized annual consumption and billing demand for GS 50-999 kW, GS 1000-4999 kW and Large Use for 2017-2022. Toronto Hydro does not have Class A and Class B projections for the forecasted period, nor does it have detailed load information based on the Part B split to complete the requested analysis.

Table 1: Annual Class A and Class B consumption and demand for GS > 50 kW classes.

YEAR		Class A		Class B	
		GWh	MVA	GWh	MVA
2017	Actual	3,705.6	7,769.1	20,173.9	31,855.0
2018	Actual	5,175.1	10,909.9	18,842.3	28,309.4
2019	Actual	5,479.9	11,537.6	18,272.5	26,999.7
2020	Actual	5,199.8	10,794.2	17,817.9	25,444.8
2021	Actual	5,290.6	11,205.3	17,628.8	24,888.8
2022	Actual	5,625.9	11,986.1	17,697.0	25,110.8

GWh is electricity consumption after losses.

QUESTION (F):

F. Please provide the floor space or square footage associated with the responses given for each category in part D.

RESPONSE (F):

Please refer to response 3-BOMA-4, B-D.

QUESTION (G):

G. For the rate class “CSMUR”, please provide 2017 to 2029 weather normalized monthly consumption kWh and weather normalized monthly demand kW (based on smart meter data).

RESPONSE (G):

Please refer to Appendix A for the rate class "CSMUR," which contains weather-normalized monthly consumption kWh data from 2017 to 2029. Kindly note that Toronto Hydro is unable to provide the requested weather-normalized monthly demand kW for the "CSMUR" class, as Toronto Hydro does not have that detailed load information.

QUESTION (H-I):

H. Please further break down the “CSMUR” 2017 to 2029 weather normalized annual consumption kWh by the following two categories:
   i. Buildings built after January 2017
   ii. Buildings built prior to January 2017

I. Please provide the floor space or square footage associated with the responses given for each category in part H.

RESPONSE (H–I):

Toronto Hydro does not have the detailed load information necessary to perform this analysis.

QUESTION (J):

J. Please provide individually, the annual impact of CDM, the annual impact of electrification (e.g. switching from natural gas heating to electric heating such as air source heat pump), the annual impact of EV charging and the annual impact of customer owned DER on the weather normalized annual consumption kWh and weather normalized annual demand kW given in your response in part B. To be specific, does the impact of CDM include the adoption of building ventilation heat recovery, heat recovery chillers and the service provided by district energy companies (e.g. Enwave Energy Corporation)? If yes, please quantify the impact of these adoptions.

RESPONSE (J):

Please refer to Appendix B for 2023-2029 total annual impacts of EV and customer owner DER by billed kWh and billed kVA for rate classes GS 50-999 kW, GS 1000-4999 kW and Large User that were used in Toronto Hydro's revenue load forecast. Toronto Hydro does not have incremental CDM impacts as it is embedded as the independent variable within its load forecast. Further, the utility does not have the requested load details on heat pumps and adoption of building ventilation heat recovery necessary to perform this analysis.

QUESTION (K):

K. For the rate class "CSMUR", please provide individually, the annual impact of CDM, the annual impact of electrification (e.g. switching from natural gas heating to electric heating such as air source heat pump), the annual impact of EV charging and the annual impact of customer owned DER on the weather normalized annual consumption kWh from 2017 to 2029. To be specific, does the impact of CDM include the adoption of building ventilation heat recovery, heat recovery chillers and the service provided by district energy companies (e.g. Enwave Energy Corporation)? If yes, can you quantify the impact of these adoptions?

RESPONSE (K):

Please refer to Appendix C for 2023-2029 CSMUR annual impacts of EV by billed kWh that were used in Toronto Hydro's revenue load forecast. Toronto Hydro does not have incremental CDM impacts as it is embedded as the independent variable within its load forecast. Further, the utility does not have the requested load details on heat pumps and adoption of building ventilation heat recovery necessary to perform this analysis.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 3-CCC-54

Reference : Exhibit 3, Tab 1, Page. 24

QUESTION:

Please provide the annual impact on the load forecast and the forecast of revenue related to EV adoption for each year 2024-2029.

RESPONSE:

Please refer to Exhibit 3, Tab 1, Schedule 1, Tables 7 and 8 for the annual impact on the load forecast and Table 1 below for related revenue forecast tied to EV adoption for each year 2024-2029.

Table 1: Revenue forecast related to EV adoption

	Revenue Impact ($ M)
2024	2.14
2025	4.36
2026	7.04
2027	10.46
2028	14.86
2029	19.08

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 3-CCC-55

Reference: Exhibit 3, Tab 2, Schedule 1, Page 2, Table 1 - Other Revenue Summary

For the years 2020-2024 please provide the forecast for all categories of Other Revenue.

RESPONSE:

Toronto Hydro's OEB approved Other Revenues for 2020 was $42.3 million after adjusting for shared services costs (USoA 4380)[1]. Toronto Hydro has used OEB approved Custom Incentive Rate-Setting approach[2] to forecast Other Revenues for 2021-2024 in Table 1 below.

Table 1: 2020-2024 Other Revenue Forecast

Segment	Board Approved			Forecast			
	2020	USoA Reclass[3]	2020 Adjusted	2021	2022	2023	2024
Specific Service Charges	3.7	-	3.7	3.8	3.8	3.9	3.9
Late Payment Charges	3.8	-	3.8	3.8	3.9	3.9	4.0
Other Operating Revenues	11.9	16.4	28.3	28.8	29.3	29.7	30.2
Other Income or Deductions	22.9	(16.4)	6.5	6.6	6.7	6.8	6.9
Total	**42.3**	**-**	**42.3**	**43.0**	**43.7**	**44.3**	**45.0**

[1] Please refer to Toronto Hydro's response to 1B-SEC-08 for detailed reconciliation
[2] EB-2018-0165, Decision and Order (December 19, 2019) at page 19
[3] Toronto Hydro corrected the presentation of pole and duct rental from USoA 4325 to USoA 4210.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 3-CCMBC-9

Reference: Exhibit 3, Tab 1, Schedule 1, Appendix J, 2.4 Estimate Monthly Billing Demand Impact, Page 7

Preamble:

"Three of Toronto Hydro's rate classes are billed on peak demand which is calculated as the highest kVA demand for that customer in each month (Footnote 6). Billing demand times and amounts will vary from customer to customer and from month to month. The presence of EV charging will put upward pressure on billing demand and that pressure is a function of the number of EVs being charged at the premise, the load profiles of those EVs, and the base load profile for that customer. A load profile that estimates the hourly charging requirements (or production expectations) of an EV/DER at the general service customer premise is necessary for the analysis.

Footnote 6: These rate classes are GS 50-999, GS 1-5MW, and Large Users. The remaining rate classes do not have a billing demand rate component.

Footnote 7: Since only the three general service rate classes have a billing demand component, it is only a general service load profile that needs to be calculated. Residential home charging can be ignored when estimating billing demand impacts."

QUESTION (A):

Please explain why residential home charging can be ignored. Would that not result in customers in GS 50-999, GS 1-5MW, and Large Users rate classes subsidizing residential customers who have Level 2 chargers? Please discuss.

RESPONSE (A) – PREPARED BY CLEARSPRING:

Residential home charging is only ignored in the Integration Model for forecasting billing demand since the residential customer class does not have a demand component to bills. Residential home charging is not ignored for forecasting energy. Furthermore, demand from forecasted EVs is included when adjusting the cost allocation model load profiles found in Section 9 of the Clearspring Report. This approach does not cause a subsidization between the customer classes.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 3-CCMBC-10

Reference: Exhibit 3, Tab 1, Schedule 1, Appendix J, 3.2 LDEV Billing Demand Forecast, Page 14

Preamble:

"A load profile that estimates the hourly charging requirements of an LDEV at the general service customer premise is necessary to forecast the impact of LDEVs on billing demand. Most of this charging will be from commuters who are working at the place of business."

QUESTION (A):

a) What percentage of Toronto Hydro general service customers have EV chargers at the place of business?

RESPONSE (A):

Given the limited visibility into customers' behind-the-meter technologies, Toronto Hydro cannot ascertain the percentage of general service customers who have EV chargers at the place of business.

QUESTION (B):

b) Do businesses with EV chargers have a different load profile than businesses that do not have them?

RESPONSE (B) – PREPARED BY CLEARSPRING:

A business that experiences EV charging at its place of business will have a modified load profile compared to if the business did not have EV charging being conducted.

QUESTION (C):

c) What could be done to prevent cross-subsidies between businesses with EV chargers and businesses without EV chargers?

RESPONSE (C):

Toronto Hydro does not typically have visibility into the equipment that customers have behind the meter, be that EV chargers or otherwise. Accordingly, establishing rates based on behind-the-meter technologies, including EV chargers, continues to be impractical.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 3-CCMBC-11

Reference: Exhibit 3, Tab 1, Schedule 1, Appendix J, 4.2 MDEV & HDEV Billing Demand Forecast, Page 21

Preamble:

"MDEVs and HDEVs will put upward pressure on Toronto Hydro's three rate classes with billing demand, and that pressure is a function of the number of EVs being charged at the premise, the load profiles of those EVs, and the base load profile for that customer."

QUESTIONS (A)

a) Please confirm that customers with chargers for MDEVs and HDEVs, not the vehicles, will put upward pressure on Toronto Hydro's three rate classes.

RESPONSE (A)– PREPARED BY CLEASPRING:

Confirmed. It will be the customers with chargers and that have active charging of MDEVs and HDEVs that will put upward pressure on billing demand.

QUESTIONS (B)

b) What could be done to prevent cross-subsidies between customers with chargers for these electric vehicles and customers without such chargers?

RESPONSE (B):

Please refer to Toronto Hydro's response for 3-CCMBC-10, c).

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 3-DRC-14

Reference(s): Exhibit 3, Tab 1, Schedule 1

Exhibit 3, Tab 1, Schedule 1, Appendix J

Preamble:

THESL engaged Clearspring Energy Advisors, LLC ("Clearspring") to help develop an approach and integration model for including the expected impacts of EVs and DERs into the 2025 to 2029 period. THESL indicated that the EV forecast was developed to be consistent with the City of Toronto's 2019 EV Strategy targets. Clearspring noted that is research did not focus on EV and DER forecasts but on building a model that estimates the impacts of the forecasts onto the billing determinants of energy and demand.

QUESTION (A):

a) Please provide any and all related analysis, working papers, and/or reports produced as part of Clearspring's integration model and the integration of EVs and DERs.

SUPPLEMENTARY RESPONSE (A) PREPARED BY TORONTO HYDRO:

Clearspring's working papers have been filed confidentially as an appendix to this response.

RESPONSE (A) PREPARED BY CLEARSPRING:

Clearspring's working papers are being provided on a confidential basis, pursuant to the OEB Practice Direction on Confidential Filings.

QUESTION (B):

b) What are the estimated total and annual capital expenditures and operating expenditures regarding EV charging infrastructure that THESL has included in the Application during the 2025-2029 period?

RESPONSE (B) PREPARED BY TORONTO HYDRO:

Proactive and responsive investments to support the connection of EV-charing infrastructure are enabled by various programs including Customer Connections (Exhibit 2B, Section E5.1), Load Demand (E5.3), Stations Expansion (E7.4) and Customer Operations (Exhibit 4, Tab 2, Schedule 8). However, Toronto Hydro is unable to disaggregate EV charging infrastructure-specific costs from other cost drivers in these capital and operation demand-related programs.

QUESTION (C):

c) What capital expenditure and operating expenditure funding (federal, provincial, or otherwise) is available to THESL specific to EVs and DERs?

RESPONSE (C) PREPARED BY TORONTO HYDRO:

Toronto Hydro continues to identify and apply for government funding as opportunities become available in relation to EVs and DERs; now and into the future. In the 2020-2024 rate period, Toronto Hydro leveraged $2 million from the IESO's Grid Innovation Fund and the Ontario Energy Board's (OEB's) Innovation Sandbox to support the Benefit Stacking Transmission and Distribution Pilot ("Benefit Stacking Pilot"). For more information about this work please see Exhibit 2B, Section E7.2.

In the 2020-2024 rate period, Toronto Hydro received a Natural Resources Canada ("NRCAN") contribution of $255,000 related to the installation of EV charging infrastructure for Fleet and employee vehicles. Toronto Hydro has also participated in the "Incentives for Zero-Emission Vehicle (iZEV) program" and the "Medium-and Heavy-duty Zero-Emission Vehicles (iMHZEV) program". Capital expenditures presented are net of these respective incentives.

QUESTION (D):

d) Please place the City of Toronto's EV Strategy on the record in this proceeding and discuss whether the targets, assumptions, and estimates relied upon by THESL and Clearsping

related to the strategy targets continue to be consistent with evolving federal and provincial policies developed since 2019 such as the federal EV mandate.

RESPONSE (D) PREPARED BY TORONTO HYDRO:

The City of Toronto's EV Strategy can be found here: https://www.toronto.ca/wp-content/uploads/2020/02/8c46-City-of-Toronto-Electric-Vehicle-Strategy.pdf , as well as through other public sources. Toronto Hydro continues to be of the opinion that these forecasts are reasonable, given future uncertainties in load materializing. Toronto Hydro has proposed a Revenue cap and Demand-Related DVA to address this concern.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 3-EP-30

Reference: Exhibit 3, Tab 1, Schedule 1, Page 27, 11. Heat Pumps

Preamble:

"In preparing the revenue load forecast for the 2025-2029 7 period, Toronto Hydro determined that the impact of heat pumps on overall load and demand is not yet material."

QUESTIONS (A):

a) How many Toronto Hydro customers have a heat pump and how many have a hybrid system that uses a heat pump and a gas furnace?

RESPONSE (A):

Given the limited visibility into customer's behind-the-meter technologies, Toronto Hydro cannot ascertain the number or type of heat pump systems used by its customers.

QUESTIONS (B):

b) What is the average load and peak load for a heat pump?

RESPONSE (B):

Please refer to Toronto Hydro's response in 3-EP-30 a).

QUESTIONS (C):

c) Please file the numerical analysis that supports the quoted statement.

RESPONSE (C):

Toronto Hydro through its Future Energy Scenarios work did have regard for advancements in electrified heating (e.g. heat pump) policies, technologies, and deployment. Toronto Hydro

conducted qualitative analysis to assess the impacts from heat pumps during the 2025-2029 period. The market for heat pumps has barriers to short-term market transformation due to the installation requirements and costs, particularly in existing building and homes.[1] Government policies have shown direction towards reducing overall GHG emissions from buildings and homes through heat pump installations. However, there are no specific targets or incentives for heat pump installations. The policies reviewed include TransformTO[2], City of Toronto's Net Zero Existing Buildings Strategy[3], Toronto Green Standard[4], and the Federal Government's Green Building Strategy[5]. To the extent that those technological developments and related policies lead to a variance in distribution revenue due to greater building electrification or greater energy efficiency, those revenue variance would track to the Demand Related Variance Account (revenue variance subaccount).

QUESTIONS (D):

d) How many multi-unit residential buildings in Toronto are heated and cooled with heat pumps?

RESPONSE (D):

Please refer to Toronto Hydro's response in 3-EP-30 a).

[1] https://www.electricity.ca/knowledge-centre/journal/we-are-so-close-to-affording-zero-carbon-electric-home-heating/
[2] https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/
[3] https://www.toronto.ca/wp-content/uploads/2021/10/907c-Net-Zero-Existing-Buildings-Strategy-2021.pdf
[4] https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/
[5] https://natural-resources.canada.ca/sites/nrcan/files/engagements/green-building-strategy/CGBS%20Discussion%20Paper%20-%20EN.pdf

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 3-EP-31

Reference: Exhibit 3, Tab 1, Schedule 1, Appendix J, 2.4 Estimate Monthly Billing Demand Impact, Page 7

Preamble: "Three of Toronto Hydro's rate classes are billed on peak demand which is calculated as the highest kVA demand for that customer in each month (Footnote 6). Billing demand times and amounts will vary from customer to customer and from month to month. The presence of EV charging will put upward pressure on billing demand and that pressure is a function of the number of EVs being charged at the premise, the load profiles of those EVs, and the base load profile for that customer. A load profile that estimates the hourly charging requirements (or production expectations) of an EV/DER at the general service customer premise is necessary for the analysis. Residential home charging can be ignored when estimating billing demand impacts."

Footnote 6: These rate classes are GS 50-999, GS 1-5MW, and Large Users. The remaining rate classes do not have a billing demand rate component.

Footnote 7: Since only the three general service rate classes have a billing demand component, it is only a general service load profile that needs to be calculated.

Residential home charging can be ignored when estimating billing demand impacts."

QUESTION (A):

a) Does a residential customer with a Level 2 charger have higher peak demand when charging than residential customers without chargers? If the answer is yes, please provide an estimate of how much higher, such as 100 times higher. If the answer is no, please explain why not.

RESPONSE (A) – PREPARED BY CLEASPRING:

All else being equal, yes. Level 2 charging can vary considerably regarding the kW power output from around 7 kW to 19 kW according to this U.S. Department of Transportation source: Charger Types and Speeds | US Department of Transportation. Residential peak demands are also variable and Clearspring has not investigated this issue. Coincidence of the load profile and the EV charging profile also impacts this. However, as a rough estimate, if we assume a non-charging household has a peak of 5 kW, then a household with Level 2 charging is likely to be 2 to 5 times higher.

QUESTION (B):

b) Please explain why residential home charging can be ignored. Would that not result in residential customers who do not have Level 2 chargers subsidizing residential customers who have Level 2 chargers? Please discuss.

RESPONSE (B) – PREPARED BY CLEASPRING:

Please see the response to 3-CCMBC-9 where this same quote in Footnote 7 was addressed.

QUESTION (C):

c) What can be done to prevent cross-subsidies between customers who have EV chargers and customers who do not?

RESPONSE (C):

Please refer to Toronto Hydro's response in 3-CCMBC-10, c).

QUESTION (D):

d) Do some North American jurisdictions have a rate for customers with EV chargers?

RESPONSE (D):

Yes, some North America jurisdictions have rates for customers with EV chargers. Power Advisor's report to the OEB on electric delivery rates[1] provided a North American jurisdictional overview. The reviewed jurisdictions with EV-specific rates included British Columbia, Quebec, California, and Colorado. The OEB is considering that jurisdictional information, and other considerations, on a sector-wide basis in EB-2023-0071.

[1] Electric Delivery Rates for Electric Vehicle Charging, Power Advisory, prepared for the OEB as part of its Electric Vehicle Integration (EVI) initiative, April 13 2023

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 3-EP-32

Reference: Exhibit 3, Tab 1, Schedule 1, Page 10, Appendix J, Footnote 11

Preamble: Footnote 11: "The more EVs or DER capacity at a given customer site, the more likely it will be that the presence of the technology will shift the billing peak time to a different time that day or to a separate day. The Integration Model accounts for this by adding more EVs and more DER capacity for the larger rate class customers (GS 15 MW and Large Use) who are likely to have a higher number of EVs or DERs on site than those customers GS 50-999 kW."

QUESTION (A):

a) The quoted text refers to a potential shift in billing time. Please explain from what time of the day to what other time of the day would this shift take place.

RESPONSE (A) – PREPARED BY CLEASPRING:

This would be different for each different customer being examined. The Integration Model examines all customers and estimates this potential shift for the GS 1 – 5 MW and LU classes and for a sample of 197 customers in the GS 50-999 kW customer class. The response to 3-VECC-45 (b) further describes how the model examines specific customer data for all 8,760 hourly observations in the year for the specific customers within each customer class.

QUESTION (B):

b) Considering that some large institutional and industrial customers use gas powered generators to avoid GA charges during peak periods under the Industrial Conservation Initiative program, is it possible that these customers would be burning more natural gas in order to charge EVs?

RESPONSE (B) – PREPARED BY CLEASPRING:

If that is occurring, then yes it is possible.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 3-PP-40

Please explain THESL's expectations related to OM&A costs over time as it makes progress on migrating to modern grid assets.

RESPONSE:

As detailed in Exhibit 2B, Section D5, Toronto Hydro has proposed a number of least-regret investments to modernize the grid where benefits are focused on improving OM&A costs; for example, reducing crew visits to perform inspections (Network Condition Monitoring and Control, Exhibit 2B, Section E7.3), providing greater and more accurate level of insights on assets that are difficult or costly to inspect (Online Cable Monitoring, Exhibit 2B, Section E7.1) and utilizing asset analytics and decision-making capabilities to leverage distribution system data and intelligence. Over the rate period, Toronto Hydro will evaluate and assess modernization initiatives for operational efficiencies. In order to execute the proposed modernization initiatives, Exhibit 4A, Tab 4, Schedule 3, outlines Toronto Hydro's resource needs. Central to the modernization strategy is acquiring and developing talent with skills in advanced data analytics, data science, and artificial intelligence that can efficiently and cost-effectively carry out modernization initiatives while responding to cybersecurity risks, managing a bi-directional grid, providing proactive information to improve customer experience, and responding to fast-changing regulatory policy developments.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 3-PP-41

Reference: Exhibit 3 Tab 1 Schedule 1, Page 6 - Since 2006, Toronto Hydro has experienced a significant decrease in total energy consumption

QUESTION (A):

a) Please explain the correlation and/or discrepancy between declining energy consumption and forecasted increasing peak demand.

RESPONSE (A):

As described in Exhibit 3, Tab 1, Schedule 1, Toronto Hydro's Distribution Revenue Forecast provides a view of electricity consumption over the coming rate period, throughout the service area, in respect of each customer class. The forecast utilizes multivariate regression modelling, an advanced statistical technique that uses historical information to identify variables that explain and drive historical variances in consumption and quantify the strength of their correlation. The main drivers of changes in consumption over time continue to be weather and conservation activities (both program-specific and naturally occurring), as well as calendar, economic, and demographic conditions. Since 2006, Toronto Hydro has experienced a significant decrease in total consumption, including due to conservation activities – both program-driven and naturally occurring. In the early stages of the energy transition, electricity consumption is forecasted to continue to decline, then plateau, and then rise.

The System Peak Demand forecast is described in detail in Exhibit 2B, Section D4.1 starting on page 2 of the evidence. The historical demand values utilized in the System Peak Demand forecast account for behavioral energy usage (e.g., conservation and demand management), enabling Toronto Hydro to capture and account for the persistence of CDM and energy efficiency measures and Distributed Energy Resources undertaken by existing customers. However, unlike the Distribution Revenue Forecast, the System Peak Demand growth rates are reflected on a gross basis and thus do not

include assumptions about future provincially-led conservation and energy efficiency efforts. This is because the impacts of provincially-led conservation and energy efficiency are expected to have less influence at a localized station and bus level in the next rate period relative to the demand outlooks/scenarios in the next decade as the energy transition unfolds. In the near-term, these impacts are also subject to varying degrees of uncertainty, as the results of future programs are contingent on customer behaviour, policy considerations and technology solutions. Toronto Hydro does consider the impacts of its own demand-side management programs (i.e., LDR) in its peak demand forecast, as these programs target specific stations and busses within its service territory. Furthermore, Toronto Hydro will continue to evolve its System Peak Demand forecast to include the impact of peak demand management programs where and when it is appropriate to do so.

QUESTION (B):

b) Please explain if THESL has assessed opportunities to leverage the tools/factors enabling lower total consumption (e.g. CDM, technology, rates, behavior, etc.) to be leveraged in parallel for mitigating peak demand. If not, why not. If yes, please provide a copy of the analysis and findings.

RESPONSE (B):

Please see Toronto Hydro's response to interrogatory 1B-Staff-40.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 3-PP-42

QUESTION (A):

a) Please provide the following data points and underlying references from Toronto Hydro for the Clearspring integration model used to forecast the impacts onto the billing components of energy and demand:

- Customer-owned renewable DERs ("Renewables"),
- Customer-owned non-renewable DERs ("Non-Renewables"), and
- Customer-owned energy storage resources

RESPONSE (A):

Please refer to Exhibit 3, Tab 1, Schedule 1 and Exhibit 2B, Section E5.1 for the data points and underlying references.

QUESTION (B):

b) Please provide the breakdown for energy storage resources if EVs are not included as an energy storage resource, or simply confirm if they were excluded.

RESPONSE PROVIDED BY CLEARSPRING (B):

Clearspring confirms that EV's are excluded from the energy storage resources detailed in the Clearspring Integration Model.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 3-PP-43

Reference: Table 11: DER Billed Demand (kVA) by Technology Type

The % of Total Billed Demand Forecast related to DERs out to 2029 is -1.6%. This value seems really low, particularly in relation to expected DER penetration and the Toronto Net Zero 2040 objective. Please provide any relevant benchmark information THESL has related to this and explain why THESL believes -1.6% is an adequate goal for aggressive DER development.

RESPONSE:

Toronto Hydro considered various external sources in developing its DER forecast as set out in [insert relevant exhibit references]. DER forecasts were developed by Toronto Hydro and provided to Clearspring as an input to the integration model[1]. Toronto Hydro's DER forecast is separated into renewable, energy storage and non-renewable segments. For each segment, forecast DER capacity was approximated using a mathematical model that best represented recent and anticipated growth patterns, considering a combination of historical trends, project pipeline, economic environment and the current energy policies at the time of forecast.

ADDITIONAL RESPONSE – PREPARED BY CLEASPRING:

The Integration Model examines the reduction in billing demand resulting from DERs. Billing demand is calculated based on the non-coincident peaks of individual customers. Billing demand will tend to be less sensitive to DER penetration levels, especially from solar generation, because of the intermittency of the resource and the fact that new peak times for each customer are likely to be created which will lessen the calculated billing demand reductions substantially. Most likely, new peak times will be created during hours with less sunlight. This will dampen the estimated

[1] Exhibit 3, Tab 1, Schedule 1, page 24

billing demand reductions relative to what the solar impact may be from either a capacity perspective or on system peak demands.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 3-PP-44

QUESTION:

Please provide what penetration THESL has forecasted for the IESO funded ASHP program in its forecast.

RESPONSE:

This appears to be a reference to the IESO program that it was launched in December 2023. If that is the program being referred to, it was launched after the Application was finalized and filed.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 3-PP-45

Reference: Exhibit 3, Tab 1, Schedule 1, Appendix J - Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts - There is a balancing of impacts between the technologies as EVs will increase energy and billing demand, whereas DERs will lower energy and billing demand.

QUESTION (A):

a) Please explain how the Ultra Low Overnight Rate implemented in Ontario was included in the Clearspring modeling and results.

RESPONSE (A) – PREPARED BY CLEASPRING:

Please see page 37 of the Clearspring Integration Report, which includes a description of how the Ultra Low Overnight Rate is implemented in the load profiles produced for the cost allocation model.

QUESTION (B):

b) Please explain what the impact would be if the Ultra Low Overnight Rate was excluded.

RESPONSE (B) – PREPARED BY CLEASPRING:

If the EV load profiles assumed normal charging rather than smart charging because of the Ultra Low Overnight Rate then the Residential customer class NCPs and CPs in the cost allocation model would be higher.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 3-PP-46

Reference: Exhibit 3 Tab 1 Schedule 1 Appendix J - Clearspring Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts.

QUESTION (A):

a) Was the Clearspring Report peer reviewed. If yes, please provide a list of participants and their feedback.

RESPONSE (A) – PREPARED BY CLEASPRING:

No, the Clearspring Report and model was developed solely by Clearspring and reviewed internally within Clearspring.

QUESTION (B):

b) Please provide a list of the stakeholders consulted or stakeholders otherwise part of the information input, modeling inputs and/or report development process.

RESPONSE (B) – PREPARED BY CLEASPRING:

Please see the response to part (a). Toronto Hydro provided the EV and DER forecasts and other information inputs as cited in the Clearspring Report.

QUESTION (C):

c) Please indicate if/how the modeling was validated against the City of Toronto energy and emissions plan information, modeling and data.

RESPONSE (C) – PREPARED BY CLEASPRING:

Clearspring did not compare the model inputs or results against the City of Toronto plan. This was not necessary for purposes of Clearspring's Integration Model.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 3-SEC-79

Reference: [Appendix 2-IB]

QUESTION (A):

With respect to Appendix 2-IB:

a. Please provide a spreadsheet that breakdown the 2025-2029 forecasts by class for Weather Normalized consumption and demand into the base revenue load forecast, the adjustment for CDM, the adjustments for EVs and the adjustments for DERs, such that the totals for each of the three adjustments reconcile to those shown in Exhibit 3-1-1, Appendix C, and Exhibit 3-1-1, Appendix J Tables 41 and 42 and Exhibit 3-1-1 Tables 10 & 11.

RESPONSE (A):

Please refer to Appendix A for a working spreadsheet with the 2025-2029 forecasts by class. Note that Toronto Hydro does not manually adjust its load forecast for CDM. Please refer to Exhibit 3, Tab 1, Schedule 1, p. 10 for a description of Toronto Hydro's forecasting enhancement to include CDM impacts.

QUESTION (B):

b. For the GS 1000-4999 kW and Large Use classes, did Toronto Hydro test using stepwise regression techniques to forecast customer #s for 2025-2029? If not, why not? If so, please provide results and why this methodology was rejected.

RESPONSE (B):

Toronto Hydro did not use step-wise regression techniques to forecast the customer count in GS 1000-4999 kW and Large Use classes because it was not suitable for these rate classes. The GS

1000-4999 kW and Large Use class customer count forecasts were developed with a combination of 1) customer counts from new connections during this period, and 2) forecasted changes in customer counts due to reclassification. Please refer to interrogatory 3-VECC-25, part b) for planning/construction lead times for these rate classes.

QUESTION (C):

c. Toronto Hydro used market knowledge of construction and expert judgement to forecast customer #s for the GS 1000-4999 kW and Large Use classes. For each class, please provide the changes which were made to each class, each year and the reason for each of them.

RESPONSE (C):

Please refer to part b).

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 3-SEC-80

Reference: Exhibit 3, Page.19

Please provide the historical information on the relationship between energy and demand for each of the rate classes listed and the five-year average which was used for forecasting purposes.

RESPONSE:

Please refer to Toronto Hydro's response and appendix to interrogatory 3-VECC-39.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 3-SEC-81

Reference: Ex.3-1-1, p.14, Appendix C

Appendix C shows no Demand Response savings for Business for 2025-2029. Ex. 1B-2-1, p. 37 refers to "technology market advancements providing customers and/or the utility access to new or more cost-effective demand-management tools." Please identify any adjustments to the load forecast for 2025-2029, by class, for demand-management not captured in other adjustments, including Toronto Hydro's Local Demand Response program.

RESPONSE:

There are no additional adjustments for demand-management not already captured. Toronto Hydro relied on the IESO's 2021-2024 CDM Framework to develop its CDM forecast. The framework included programs for both energy efficiency and demand response. Please refer to Exhibit 3, Tab 1, Schedule 1 for a description of Toronto Hydro's forecasting to include CDM impacts.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 3-SEC-82

Reference : Ex.3-1-1, Appendix J Tables 6-11, Appendix J, p.2

The Clearspring Integration of Revenue Forecast With Electric Vehicle and Distributed Energy Resource Forecast Report lists six forecast inputs that were used to forecast the impacts of EVs and DERs on the billing components of energy and demand.

QUESTION (A) AND (B) :

a. Does Toronto Hydro currently track the actual number of customer-owned electric vehicles, 'renewables' and 'non-renewables' generation?

b. If not, does Toronto Hydro plan to track this data? If not, how does it propose to reconcile impacts of these technologies in order to record entries in the variance account?

RESPONSE (A) AND (B):

Toronto Hydro tracks renewable and non-renewable generation connections submitted through the DER connections process and periodically monitors the Ministry of Transportation electric vehicle registration data to assess the uptake of electric vehicles in the City of Toronto. However, the utility is unable to isolate the impacts of these demand drivers separate from other drivers that can drive cost and revenue variance (with the exception of weather normalization which is an established practice). For more information please see the response to 9-SEC-129.

To protect both ratepayers and the utility from structural unknowns in forecasted costs and revenues related to demand growth in a time of unprecedented change in the economy and energy system, Toronto Hydro proposes to reconcile all the demand-related program and revenue variances as part of the DRVA.

QUESTION (C):

For each of these six inputs, please provide further details on what assumptions were made to arrive at the data in Tables 6-11 and how the data was tested.

RESPONSE (C)– PREPARED BY CLEASPRING:

The assumptions underpinning the analysis for Tables 6-11 are provided in Sections 2, 3, and 4 of the report.

QUESTION (D) :

What is the relationship between the data provided in Tables 6-11 and the Future Energy Scenarios report in Exhibit 2B-D4, Appendix B? Please reconcile the two.

RESPONSE (D):

Please refer to Toronto Hydro's response 3-Staff-274(g).

QUESTION (E) :

Were alternative scenarios considered for the data in Tables 6-11, such as more aggressive, more conservative? If not, why not? If so, please provide the results.

RESPONSE (E) – PREPARED BY CLEASPRING:

The Integration Model considers one scenario, one that reflects a 50/50 scenario. The purposes of the Integration Model is to add incremental EV/DER loads to the base revenue load forecast, which is also a 50/50 forecast, and to modify the 2025 test year cost allocators to account for EV/DER incremental loads.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 3-SEC-83

Reference: Exhibit 3, Appendix J, Tables 42, 44, & 45

Table 42 shows the annual incremental net billing demand by rate class. Tables 44 & 45 show the NCPs and CPs for the GS 50-999 kW, GS 1-5 MW and LU classes being lower after consideration of the 2025 technology impacts.

QUESTION (A):

a) Please confirm that Table 42 is kW or KVA, not kWh as shown.

RESPONSE (A) – PREPARED BY CLEASPRING:

Confirmed, the table displays kVA billing demand.

QUESTION (B):

b) Please provide an explanation of why in Table 42 the incremental billing demand for the GS 50-999 kW class is increasing by 67,656, however the 1NCP for the class is decreasing by 6,141 kVA.

RESPONSE (B) – PREPARED BY CLEASPRING:

The primary driver of this is what each result is measuring. In Table 42, this is the expected change in the billing demand which is calculated from individual customers load profiles. Whereas, for the 1NCP found on Table 44 this is the change in the rate class load shape. Given this difference, the intermittency of solar plays a significant role in modifying these load shapes. Given the higher disaggregation of load shapes at the customer level for Table 42 and when calculating billing demand, there is more flexibility for the customer profile to shift the peak time to new hours where solar is not producing. However, when you look at the analysis for the purposes of rate allocation and what solar's impact will be on the rate class load profile as a whole there is less

ability to shift to new hours because the levels of EV/DER impacts are proportionally smaller relative to the aggregated load profile. Clearspring investigated the GS 50-999 kW class. The original rate class load profile's annual peak occurred on July 19th around noon. After layering on the 2025 expected impacts of EVs and DERs in every hour of that load profile, the peak remained at that same hour on July 19th. Since solar is producing at one of its highest levels then, this reduces the 1NCP. This contrasts with the analysis in Table 42, where individual customers in the GS 50-999 kW rate class have varied peak times that will not always coincide with solar production. This fact combined with the smaller load levels of individual customers are more likely to shift peak times away from high solar production times and more towards high EV consumption times.

QUESTION (C):

c) Using the same methodology as was done for Table 44 & 45, please calculate the impacts by rate class before and after for 2026, 2027, 2028 and 2029 technologies.

RESPONSE (C):

Toronto Hydro declines to answer this question, as 2026 to 2029 load profiles have not been incorporated into Toronto Hydro's proposed cost allocation in this application, and thus have no relevance to its requested relief.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 3-SEC-84

References: Exhibit 3. Tab 2, Schedule 1, Page 2

Preamble:

With respect to Other Revenue, please explain:

QUESTION (A):

a) Why Toronto Hydro's revenue from specific service charges is not increasing in 2025, and from 2025-2029 is only increasing at a Compounded Annual Growth Rate (CAGR) of 1.4%, "in accordance with the growth of Toronto Hydro's customer base and concomitant growth in the volume of services" when costs (OM&A) to provide these services are increasing by a CAGR of 4.2% for the same period?

RESPONSE (A):

It is Toronto Hydro's understanding that in the question, SEC made a computational error in calculating the CAGR from 2025-2029 for specific service charges and OM&A. In responding to this interrogatory Toronto Hydro believes the correct CAGR from 2025-2029 for specific service charges should be 2% and for total OM&A over the same period should be 3.9%.

For this rate application Toronto Hydro has proposed to leave its specific service charges unchanged (Exhibit 8, Tab 2, Schedule 1). Despite that, revenues from specific service charges are increasing from 2025-2029 at the CAGR of 2% to reflect the growth of Toronto Hydro's customer base and concomitant growth in the volume of services.

QUESTION (B):

b) Why Toronto Hydro's Other Revenue is decreasing in 2025-2029 from 2024 when it is also affected by the growth of customer base and volume of services and the cost to produce the services.

RESPONSE (B):

Toronto Hydro's Other Revenues are not decreasing in 2025-2029 when compared with 2024, please refer to Exhibit 3, Tab 2, Schedule 1, Table 1.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 3-SEC-85

References: Exhibit 3, Tab 2, Schedule 2, Appendix 2-H

Exhibit 9, Tab 1, Schedule 1, Table 8

With respect to Other Revenue:

QUESTION (A):

a) Please update Appendix 2-H to include 2023 actuals.

RESPONSE (A):

Please refer to Toronto Hydro's response to 1B-SEC-1, subpart (f).

QUESTION (B):

b) For Account 4355, Toronto Hydro's evidence shows the following:

	2020A	2021A	2022A	2023F	2024F
Forecast from Decision $M	$1.0	$1.0	$1.0	$1.0	$1.0
2-H $M	$0.49	$2.71	$0.38	$1.80	$1.80
Ex. 9 Table 8 $M	$0.0	$1.6	$0	$0	$0

Please explain how the entries for each year in 2-H and Table 8 were determined.

RESPONSE (B):

Toronto Hydro identified a correction to Table 8 on Exhibit 9, Tab 1, Schedule 1 at page 12, the corrected version is reproduced below as a response to this interrogatory. Toronto Hydro will update the evidence as noted in 1A-Staff-01.

Table 8: **Account 1508 - subaccount Gain on Sale of Property Variance ($ Millions)**

	Actual				Forecast	Total	
	2020	**2021**	**2022**	**2023**	**2024**		
Gain on Sale embedded in rates	1.0	1.0	1.0	1.0	1.0	5.0	
Actual/Forecast Gain on Sale[1]	0.5	2.6	0.4	1.6	1.8	6.9	/C
Variance	**0.5**	**(1.6)**	**0.6**	**(0.6)**	**(0.8)**	**(1.9)**	/C
Carrying Charges	**-**	**-**	**-**	**-**	**(0.1)**	**(0.1)**	/C
Total Proposed for Clearance						**(2.0)**	/C

[1] Actual/Forecast Gain on Sale presented net of taxes.

Toronto Hydro confirms that the original error did not have any impact on Exhibit 3, Tab 2, Schedule 2, Appendix 2-H, where the entries derived from the sale of properties match the values in the corrected Table 8.

QUESTION (C):

c) Please provide the pole attachment revenues that Toronto Hydro has included in its revenue offset forecast for 2025-2029 and compare it to the 2020-2024 period. Please advise where that revenue is included in Appendix 2-H.

RESPONSE (C):

Please refer to Toronto Hydro's response to 3-VECC-55.

QUESTION (D):

d) Please explain how the pole attachment revenue forecast.

RESPONSE (D):

Please refer to Toronto Hydro's response to 3-VECC-55 and 3-Staff-287.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 3-SEC-86

Reference: Ex.3-1-1;
Ex.1C-3-9, p. 4

Toronto Hydro's 2022 Annual Report indicates the goals of the climate advisory services for 2023-2040 include: 60,000+ Air source heat pumps + electric hot water heaters and 50,000 EV Chargers.

QUESTIONS (A):

a. Please provide details for each of these goals for each year 2023-2029.

RESPONSE (A):

Climate Advisory Services are non-rate regulated business activities, which do not form part of this application.

For further information on Climate Advisory Services, please refer to the latest update for the Climate Action Status Report[1].

QUESTIONS (B):

b. Please explain how these goals are incorporated into the load forecast provided.

RESPONSE (B):

These goals were not incorporated into the load forecast. However, these technologies are reflected in the Future Energy Scenarios, in that they are in keeping with the efforts to help the City

[1] https://www.torontohydro.com/documents/20143/74105431/climate-action-plan-2023-status-report.pdf/d724e49b-e4ee-d8f2-f51b-915fb3622231?t=1688486791957

of Toronto achieve its Net Zero 2040 Strategy. To the extent that Toronto Hydro's efforts result in greater electrification during the 2025-2029 period, that will factor into the balance of the Demand-Related Variance Account.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 3-SEC-87

Reference: Exhibit 3, Tab 1, Schedule 1, Appendix J, Table 24

Exhibit 1B, Section 2.3.1

QUESTION:

Toronto Hydro states that "By the end of the decade, Toronto Hydro expects to have over 4,400 DER connection projects representing a total installed capacity of approximately 517 MW." Please reconcile that statement with the information provided in Table 24.

RESPONSE:

The information provided in table 24 excludes existing biogas and wind turbine generation from the integration model as growth from renewables is not expected to be driven by these generation types. The amounts for biogas and wind turbine generation were subtracted from the renewables forecast in Exhibit 2B, Section E5.1 to create the information in Table 24. Please see Table 1 below for the excluded amounts:.

Table 1: Biogas and Wind Turbine Installed Capacity, removed from the Renewables forecast for the Integration Model

Generation Type	Installed Capacity (MW)
Biogas	15.1
Wind Turbine	0.8

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3.0-VECC -21

Reference: Exhibit 3, Tab 1, Schedule 1, pages 1-2

Preamble:

The footnotes to Table 1 state:

"Total Customers are an annual average and exclude street lighting devices and unmetered load connections."

QUESTION (A):

a) Please confirm that by "annual average" THESL means the average of the 12 monthly values for each year.

RESPONSE (A):

Toronto Hydro confirms the statement above.

QUESTION (B):

b) Please confirm that the annual totals reported in Table 1 include the Street Lighting and USL classes based on the number of customers (not connections) for each of these classes.

RESPONSE (B):

Toronto Hydro confirms the statement above.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC -22

Reference: Exhibit 3, Tab 1, Schedule 1, page 4
Exhibit 3, Tab 1, Schedule 1, Appendices H and I

QUESTION (A):

a) Please explain why the regression model used to forecast the Residential customer count was developed using historic data starting in April 2013 and did not use any data for the months prior to that.

RESPONSE (A):

Toronto Hydro used historical data starting in April 2013 to ensure no CSMUR customers that were Residential customers prior to the introduction of the CSMUR class were included.

QUESTION (B):

b) With respect to the Residential customer count model, please explain the basis for the Seasonality variable and the rationale for its inclusion.

RESPONSE (B):

Toronto Hydro used the Seasonality variable to account for monthly trends throughout a year. The Residential class averages a month-to-month decrease in customers between May and August. The variable was used to capture these trends.

QUESTION (C):

c) With respect to the Residential customer count model, please provide a schedule that compares the actual average annual customer count for each of the years 2013-2022 with the predicted values based on THESL's regression model.

(Note: For 2013 please use the actual vs. predicted average monthly values for April through December).

RESPONSE (C):

Please refer to Table 1 below for a comparison between the actual average annual Residential customer count and the predicted values based on Toronto Hydro's regression model for the years 2013-2022.

Table 1: Average Annual Residential Customer Count - Actual vs Predicted

Year	Actual	Predicted
2013	608,340	608,436
2014	610,125	610,093
2015	610,971	610,879
2016	611,150	611,205
2017	611,575	611,606
2018	612,262	612,302
2019	614,206	614,068
2020	614,229	614,262
2021	614,181	614,182
2022	614,926	614,956

QUESTION (D):

d) What is the source of the historic monthly population data used to develop the Residential and GS<50 customer count models?

RESPONSE (D):

Toronto Hydro sources its population data from the Conference Board of Canada, and extends the forecast using simple linear trend when the forecast does not cover the full rate application period.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC -23

References: Exhibit 3, Tab 1, Schedule 1, Page 4

Exhibit 3, Tab 1, Schedule 1, Appendices A, H and I

QUESTION (A):

a) Please explain why the regression models used to forecast the GS<50 and GS 50-999 customer counts were developed using historic data starting in February 2015 and did not use any data for the months prior to that.

RESPONSE (A):

As part of the forecast development process, Toronto Hydro assessed historical customer count patterns and identified a notable shift in customers in 2015 within GS<50 kW and GS 50-999 kW rate classes. After testing several regression models to forecast the GS <50kW and GS 50-999 kW customer counts, Toronto Hydro determined that historical starting point of 2015 yielded the best modeling result.

QUESTION (B):

b) With respect to the GS<50 customer count model, please provide a schedule that compares the actual average annual customer count for each of the years 2015-2022 with the predicted values based on THESL' regression model. (Note: For 2015 please use the actual vs. predicted average monthly values for February through December).

RESPONSE (B):

Please refer to Table 1 below for a comparison between the actual average annual GS<50 customer count and the predicted values based on Toronto Hydro's regression model for the years 2015-2022.

Table 1: Average Annual GS<50 kW Customer Count - Actual vs Predicted

Year	Actual	Predicted
2015	70,564	70,558
2016	70,534	70,586
2017	71,035	70,981
2018	71,266	71,266
2019	71,515	71,520
2020	71,899	71,894
2021	72,408	72,405
2022	72,614	72,625

QUESTION (C):

c) With respect to the GS 50-999 customer count model, please provide a schedule that compares the actual average annual customer count for each of the years 2015-2022 with the predicted values based on THESL's regression model. (Note: For 2015 please use the actual vs. predicted average monthly values for February through December).

RESPONSE (C):

Please refer to Table 2 below for a comparison between the actual average annual GS 50-999 customer count and the predicted values based on Toronto Hydro's regression model for the years 2015-2022.

Table 2: Average Annual GS 50-999 Customer Count – Actual vs Predicted

Year	Actual	Predicted
2015	10,421	10,415
2016	10,418	10,422
2017	10,411	10,414
2018	10,470	10,457
2019	10,444	10,456
2020	10,213	10,218
2021	9,846	9,853
2022	9,731	9,718

QUESTION (D):

d) What is the source of the historic monthly employment data used to develop the GS 50-999 customer count model?

RESPONSE (D):

Toronto Hydro sources its employment data from the Conference Board of Canada, and extends the forecast using simple linear trend when the forecast does not cover the full rate application period.

QUESTION (E):

e) Please provide the Conference Board of Canada (CboC) document with the forecast monthly employment and population values used by THESL and demonstrate that the historic employment and population data used in the development of the models are consistent with the CboC's forecasts for these variables.

RESPONSE (E):

Toronto Hydro uses information from the Conference Board of Canada, which includes forecast and historical values. The information is provided as quarterly reports, and Toronto Hydro calendarizes as monthly. Please refer to Appendix A for the Conference Board of Canada document for the quarterly reports, as well as a monthly formatted report with linear trend extension which Toronto Hydro has derived from these reports.

QUESTION (F):

f) Does the City of Toronto develop/produce population forecasts for use in its planning processes? If yes, please provide the City of Toronto's most recent population forecast and the associated reference document.

RESPONSE (F):

Toronto Hydro has reviewed City of Toronto data sets, but has not found a population forecast data set that is suitable for Toronto Hydro's revenue load forecasting purposes.

QUESTION (G):

g) In Appendix A (Columns S and U), are the GDP and Employment values meant to be those for the City of Toronto?

RESPONSE (G):

Yes, Toronto Hydro sources its GDP and employment data from the Conference Board of Canada, which represent the Toronto Census Metropolitan area.

QUESTION (H):

h) For the GS 50-999 customer count model, were population and GDP also tested as explanatory variables? If yes, why were they rejected? If not, please provide the resulting regression model and statistics where population or GDP are used as an explanatory variable as opposed to employment.

RESPONSE (H):

Toronto Hydro tested population and GDP as explanatory variables for GS 50-999 kW customer count model. These variables did not result in satisfactory model fit or predictive value and were therefore rejected.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-24

REFERENCES: Exhibit 3, Tab 1, Schedule 1, Page 4
Exhibit 3, Tab 1, Schedule 1, Appendices A, H And I

QUESTION (A):

a) For each of the Residential, GS<50 and GS 50-999 customer classes please provide a schedule (i.e., a working excel file) that sets out the calculation of the 2023 to 2029 monthly (and resulting annual) customer count forecast using the forecast values for each class model's explanatory variables and the coefficients from the regression models in Appendix I.

RESPONSE (A):

Please refer to the included Appendix A, Tab "2023-2029 Customer Forecast".

QUESTION (B):

b) For each of the Residential, GS<50 and GS 50-999 customer classes please provide a schedule that sets out the predicted monthly customer count values for 2023 versus the actual monthly customer counts for all months where actual data is available.

RESPONSE (B):

Please refer to 3-VECC -24, Appendix A, Tab "2013-2022 Predicted Values".

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC -25

Reference: Exhibit 3, Tab 1, Schedule 1, page 4

EB-2018-0165, Exhibit 3, Tab 1, Schedule 1, page 16

Preamble:

The current Application states:

"The customer forecast for GS 1000-4999 kW, Large Use, CSMUR, and Street Lighting rate classes are based on market knowledge of construction in Toronto Hydro's service area, as well as an application of expert judgement. Toronto Hydro regularly communicates with developers, municipal representatives and commercial and residential associations to identify new larger connection projects and their expected connection years.

The EB-2018-0165 Application stated:

"The utility's forecast of new customers is primarily based on extrapolation models for each rate class with the exception of the CSMUR rate class (implemented on June 1, 2013), whose forecast customer additions are based on market knowledge of suite metering and multi-unit dwelling construction in Toronto Hydro's service area, as well as an application of expert judgement."

QUESTION (A):

a) Please provide a schedule that sets out: i) THESL's forecast average customer count for the CSMUR class for each of the years 2018-2022 per EB-2018-0165 and ii) the actual average annual customer count for the CSMUR class for the same years.

RESPONSE (A):

Please refer to Table 1 below for a table that sets out THESL's forecast average customer count for the CSMUR class for each of the year's 2018-2022 per EB-2018-0165 and the actual average annual customer count for the CSMUR class for the same years.

Table 1: Average Annual CSMUR Customer Count – Actual vs Forecast as per EB-2018-0165

Year	Actual*	Forecast*
2018	75,028	75,028
2019	79,882	80,370
2020	83,686	85,981
2021	88,478	91,294
2022	92,126	97,687

* Customer counts presented in EB-2018-0165 are mid-year numbers, while those in EB-2023-0195 reflect the annual average.

QUESTION (B):

b) Please describe the typical planning/construction lead times for customers in each of the GS 1000-4999 kW, Large Use, CSMUR, and Street Lighting rate classes.

RESPONSE (B):

Please refer to Table 2 below for typically planning /construction lead times for these customers

Table 2: Planning/Construction lead times for the listed rate classes

Rate Class	Lead Times
GS 1,000-4,999 kW	Within 1 to 5 years after receiving and confirming a feeder request.
Large Use	
CSMUR	
Street Lighting	For planned capital projects the time from planning to construction is typically 1 year.

QUESTION (C):

c) For each of these customer classes, please comment on whether planning/construction lead times are sufficiently long that THESL can rely on current "market intelligence/knowledge" to predict new customer additions out to 2029 (i.e., how far into the future can current market knowledge be expected to provide a reasonable estimate of future customer additions for each of these classes)? If not, how has THESL addressed this issue in developing the customer count forecasts for these classes?

RESPONSE (C):

Toronto Hydro acknowledges the potential for uncertainty within these customer count forecasts. However, as the lead times are between 1 to 5 years, Toronto Hydro believes that the information included in its forecast is the reasonable as it is based on the best information available to predict out to 2029.

QUESTION (D):

d) Please explain the reason for the decline in the GS 1,000-4,999 customer count in 2022 (e.g., is it the result of customer reclassification?).

RESPONSE (D):

The decline in the GS 1,000-4,999 customer count in 2022 is the result of customer reclassification.

QUESTION (E):

e) Please explain why THESL expects the GS 1,000-4,999 customer count to continue to decline annually in 2023, 2024 and 2025.

RESPONSE (E):

The GS 1,000-4,999 customer count forecast declines between 2023 and 2025 due to forecasted impacts from reclassification. The forecasted reclassification was based on a 10-year average reclass (prior to the COVID-19 pandemic).

QUESTION (F):

f) Please explain the annual change in the Large Use customer count (relative to the preceding year) for each of the years 2023 to 2029 as the values fluctuate up and down during this period.

RESPONSE (F):

The forecast for the customer count of Large Use comprises two factors: the projected rise in Large Use customer numbers resulting from anticipated new connections, offset by the change in customer counts due to reclassification. For instance, while six new customers are forecasted to be added in 2023, offset by one reclassification, resulting in a net total of 47.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-26

Reference: Exhibit 3, Tab 1, Schedule 1, page 9

Preamble:

The Application states:

> "All of Toronto Hydro's regression models use monthly kWh per day as the dependent variable and monthly values of independent variables from July 2002 through to the latest actual values (December 2022) to determine the monthly regression coefficients."

QUESTION (A):

a) Please explain why July 2022 was used as the starting point for the data used to estimate THESL's regression models.

RESPONSE (A):

Toronto Hydro presumes interrogatory a) above should state 'July 2002', rather than as stated ' 'July 2022'.

Toronto Hydro used July 2002 as the starting point for the data used because it is consistent with previous methodology.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3.0-VECC -27

Reference: Exhibit 3, Tab 1, Schedule 1, pages 9-10, 17 (Table 4) and Appendix B

Preamble:

The Application states:

> "Positive dew point temperature is another type of weather factor included as an explanatory variable for the CSMUR, GS <50 kW, GS 50-999 kW, and GS 1000-4999 kW customer classes." (pg.9)
>
> "The forecast for heating and cooling degree-days, and positive dew point temperature inputs is based on a ten-year historical average of HDD, CDD, and positive dew point."

QUESTION (A):

a) Please explain why "positive dew point temperature" was not used as an explanatory variable for the Residential model.

RESPONSE (A):

The positive dew point temperature variable in the Residential model resulted in a coefficient value with the incorrect sign (i.e., a negative coefficient – suggesting an increase in a positive dew point leads to a decrease in loads).

QUESTION (B):

b) At page 9 the Application states that positive dew point temperature was used as an explanatory variable for the GS<50 class. However, positive dew point temperature is not identified as an explanatory variable for the GS<50 class in either Table 4 or Appendix B. Please reconcile.

RESPONSE (B):

Toronto Hydro confirms that positive dew point temperature was not used as an explanatory variable for the GS<50 class. The inclusion of "GS <50 kW" within the sentence quoted above was inadvertent.

QUESTION (C):

c) At page 9 the Application does not identify positive dew point temperature as an explanatory variable for the Large Use class. However, positive dew point temperature is identified as an explanatory variable for the Large Use class in either Table 4 or Appendix B. Please reconcile.

RESPONSE (C):

Toronto Hydro confirms that positive dew point temperature was used as an explanatory variable for the Large Use class. The omission of "Large Use" within the sentence quoted above was inadvertent.

QUESTION (D):

d) What 10 year period was used to determine the weather normal values for HDD, CDD, and positive dew point?

RESPONSE (D):

Toronto Hydro used 2013 to 2022 to determine the weather normal values for HDD, CDD and positive dew point for the 10-year period.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-28

Reference: Exhibit 3, Tab 1, Schedule 1, Table 4, Page. 17 / Appendix B

Table 4 and Appendix A indicate that the Residential and GS 50-999 class models are the only ones that employ a "blackout binary" variable. Please explain why this variable was not used for the other customer classes.

RESPONSE:

Toronto Hydro tested the blackout binary variable in GS<50, GS 1-5MW, and Large Use. The blackout binary variable did not fit the GS <50 and Large Use class models, and was therefore rejected. The variable fit the GS1-5MW model, but did not provide statistical significance to the model. The blackout event took place before the CSMUR class existed, and was therefore not used in the model.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-29

Reference: Exhibit 3, Tab 1, Schedule 1, Table 4, Pages 15, 17, and Appendices A & B

Preamble:

The Application states:

"Load impacts from the COVID-19 pandemic are captured through a lockdown binary variable. This variable is based on the provincial lockdown periods announced during the pandemic in 2020-2021. Additional load impacts from the pandemic are captured through the economic variables used in the model, such as GDP. The lockdown binary variable was found to be statistically significant in the Residential, GS <50 kW, GS 50-999 kW, and Large Use class models."

QUESTION (A):

a) Please confirm that, per Appendix A, the lockdown periods used were April & May 2020; January & February 2021 and April & May 2021.

RESPONSE (A):

Toronto Hydro confirms the lockdown periods used were April & May 2020; January & February 2021 and April & May 2021.

QUESTION (B):

b) Please explain the basis on which these "lockdown" months were identified.

RESPONSE (B):

The provincial lockdown period was identified by months where the provincial government declared full lockdowns as part of the state of emergency order.

QUESTION (C):

c) At page 15 the Application identifies the Residential class model as using a lockdown binary variable. However, neither Table 4 nor Appendix B do so.

Please reconcile.

RESPONSE (C):

Toronto Hydro confirms that the Residential Class does not use the lockdown binary variable.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-30

Reference: Exhibit 3, Tab 1, Schedule 1, Table 4, Pages 15-16, 17, and Appendices A & B

Preamble:

The Application states (pages 15-16):

> "The time trend variables used in the model are designed to capture trends which are not otherwise explained by the other driver variables, as well as to improve the overall model fit over the period. The Residential, GS<50 kW, and Large Use classes use a linear spline time trend in the 2012 to 2022 period, the General Service 1,000-4,999 kW class uses a linear spline time trend in the 2018 to 2022 period, and the GS 50-999 kW uses a simple time trend over historical period 2018 to 2022."

QUESTION (A):

a) To what factors does THESL attribute the statistical significance in the models for the Residential, GS<50 and Large Use classes of a time trend variable that increases monthly over the period 2002 to 2011 but is then constant for the period 2012 - 2022?

RESPONSE (A):

Toronto Hydro used time series trends in this instance to increase the strength of fit and predictive accuracy in all models. These time trends were developed after noting unexplained annual increases in 2012 and 2018, and may possibly capture unexplained changes in trends. This approach is consistent with its prior rate application EB-2018-0165.

QUESTION (B):

b) Why is it reasonable to use constant value for the 2023-2029 monthly value for the time trend variable in the Residential, GS<50 and Large Use class models?

RESPONSE (B):

Please refer to response 3-VECC-30, a).

QUESTION (C):

c) To what factors does THESL attribute the statistical significance in the GS 1,000-4,999 class model of a time trend variable that is constant over the period 2002 to 2017 but then increases monthly over the period 2018 - 2022?

RESPONSE (C):

Toronto Hydro used time series trends in this instance to increase the fit and predictive accuracy in all models. These time trends were developed after noting unexplained annual increases in 2012 and 2018, and may possibly capture unexplained trends. These time trends may possibly capture, amongst other things, natural conservation behaviour unrelated to CDM initiatives, due to environmental consciousness, as well as escalating electricity prices over time, i.e. price elasticity. Toronto Hydro tested several time trend variables, and choose a linear spline time trend in the 2012 to 2022 period because it resulted the best modeling result. Toronto Hydro tested several time trend variables, and choose a linear spline time trend in the 2018 to 2022 period because it yielded the best modeling result. This approach is consistent with its prior rate application EB-2018-0165.

QUESTION (D):

d) Why is it reasonable to assume the time trend variable for the GS 1,000-4,999 class will continue to increase over the 2023-2029 period?

RESPONSE (D):

Please refer to response 3-VECC-30, c).

QUESTION (E):

e) To what factors does THESL attribute the statistical significance in the GS 50-999 class model of a time trend variable that increases monthly over the period 2002 to 2017 but is then constant for the period 2018 - 2022?

RESPONSE (E):

Toronto Hydro used time series trends in this instance to increase the goodness of fit and predictive accuracy in all models. These time trends were developed after noting unexplained annual increases in 2012 and 2018, and may possibly capture unexplained trends. These time trends may possibly capture, amongst other things, natural conservation behaviour unrelated to CDM initiatives, due to environmental consciousness, as well as escalating electricity prices over time, i.e. price elasticity. Toronto Hydro tested several time trend variables, and choose a linear spline time trend in the 2012 to 2022 period because it resulted the best modeling result. Toronto Hydro tested several time trend variables, and choose a simple time trend over historical period 2018 to 2022 because it yielded the best modeling result. This approach is consistent with its prior rate application EB-2018-0165.

QUESTION (F):

f) Why is it reasonable to use a constant value for the 2023-2029 monthly values for the time trend variable in the GS 50-999 class model?

RESPONSE (F):

Please refer to response 3-VECC-30, e).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-31

Reference: Exhibit 3, Tab 1, Schedule 1, Page 12, and Appendices A & C
EB-2018-0165, 3-VECC-25 b) & d)

Preamble:

The Application states:

> "Toronto Hydro incorporated CDM variables into the multivariate regression: a residential CDM variable for the Residential class, and a business CDM variable for the General Service classes.
> Both variables are based on the cumulative historical and forecast level of savings from 2006 to 2029, and separated by residential and business program savings for each variable respectively."

QUESTION (A):

a) Please confirm that, for purposes of the load forecast models, THESL assumed that there was no reduction in the persistence of CDM savings after the first year (i.e. the first years saving continue on in perpetuate). If confirmed, please explain why this is reasonable assumption for DR programs.

RESPONSE (A):

Toronto Hydro confirms that it has assumed no reduction in the persistence of CDM savings after the first year, with the exception of savings related to the DR programs. Please refer to Exhibit 3, Tab 1, Schedule 1, Appendix C for the full calculations.

QUESTION (B):

b) Please confirm that the savings reported/verified by the IESO are full year savings for each project aggregated to a total and, as such, do not account for the implementation of projects throughout their first year (per VECC 25 d)).

RESPONSE (B):

Toronto Hydro confirms the above statement.

QUESTION (C):

c) Please confirm that, unlike in EB-2018-0165, THESL has not made any adjustments to account for the fact that in the first year the CDM savings realized will be less than the annualized value.

RESPONSE (C):

Toronto Hydro used a 5-year average monthly distribution of consumption to account for the fact that in the first year the CDM savings realized will be less than the annualized value. Please refer to Exhibit 3, Tab 1, Schedule 1, Appendix C for the full calculations.

QUESTION (D):

d) If part c) is confirmed, please revise the values for the CDM variables used to reflect this fact, re-estimate the regression models and provide a revised forecast by customer class for 2023-2029.

RESPONSE (D):

Please refer to the response 3-VECC-31, c).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-32

Reference: Exhibit 3, Tab 1, Schedule 1, Page 12, and Appendix C

QUESTION (A):

a) In Appendix C - Monthly Savings Tab, for 2008 the sum of the Residential monthly values up to December 2008 (Sum of D3 through D80 and F3 though F80) is 249,714.87. However, the cumulative December 2008 value for Residential in Column H is 249,521.8 (Cell H80). Please reconcile.

RESPONSE (A):

Toronto Hydro confirms that the amounts in cumulative monthly savings (Column H) do not reconcile with monthly energy efficiency savings (Column D) and demand response savings (Column F) because demand response savings are event-based, and should not be included in the cumulative savings.

QUESTION (B):

b) There appear to be similar issues in terms of discrepancies in 2009 and subsequent years through to 2022 for both Residential and Business CDM savings as between the sum of the individual monthly values (columns D and F for Residential and columns E and G for Business) and the reported cumulative values in columns H and I respectively. Please reconcile.

RESPONSE (B):

Please refer to response 3-VECC-32, a).

QUESTION (C):

c) Based on the above please revise the CDM inputs to the regression models as necessary, re-estimate the regression models and provide a revised forecast by customer class for 2023-2029.

RESPONSE (C):

Please refer to response 3-VECC-32, a).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-33

Reference: Exhibit 3, Tab 1, Schedule 1, Page 13 and Appendices C & D

Preamble:

Appendix C reports the following THESL annual savings for 2015-2017:

		Gross Energy Savings - EE		Gross Energy Savings - DR		
Year	Source(s)	Residential	Business	Residential	Business	TOTAL
2015	2015-2017 Final Verified CDM	31,680,379	374,016,196	-	-	405,696,576
2016	Results and Post-CFF Actual	82,342,286	315,948,154	-	-	398,290,440
2017	Savings	149,075,375	300,270,827	-	-	449,346,201

QUESTION (A):

a) Are the results reported in Appendix D meant to reflect the savings described in the third bullet on page 13 as set out below:

i. "for savings to December 31, 2022 that are related to CFF programs, project-level savings for projects that were completed within the 2015-2022 period which a distributor is contractually obligated to finish. For the Retrofit Projects, energy savings and demand reductions are based on the list of projects for which Toronto Hydro paid incentives to customers and which had their status updated to "Project Closed" in CDM-IS system post March 1, 2019. For non-Retrofit CFF Projects, savings are based on the list of projects for which Toronto Hydro has paid incentives and submitted project-level details to the IESO"?

RESPONSE (A):

Toronto Hydro confirms that the results reported in Appendix D are meant to reflect the savings described in the third bullet on page 13.

QUESTION (B):

b) If not, please indicate how the savings reported in Appendix D relate to the various savings sources outlined in the four bullets on page 13.

RESPONSE (B):

Please refer to 3-VECC-33, a).

QUESTION (C):

c) Are the savings reported in Appendix D for the province overall or for THESL? If for the province overall, please provide a schedule that sets out the amounts attributable to THESL and how they were determined for 2015-2017.

RESPONSE (C):

The savings reported in Appendix D are for Toronto Hydro.

QUESTION (D):

d) For each of the years 2015-2017 please provide a schedule that shows the savings reported from each of the sources referenced on pages 12 and 13 such that they total the annual values set out in Appendix C - Annual Savings Tab as provided in the Preamble. If the relevant reference document has already been filed please indicate where in the document the values provided in the requested schedule can be found. If the relevant reference document has not been provided already, please provide and indicate where in the document the values provided in the requested schedule can be found.

RESPONSE (D):

Please refer to Appendix A for a schedule that shows the 2015-2017 savings reported from each of the sources referenced on pages 12 and 13. Please refer to Appendix B for the 2015-2017 Final Verified Results for Toronto Hydro.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-34

Reference: Exhibit 3, Tab 1, Schedule 1, Page 13 and Appendices E & F

Preamble:

Appendix F reports the 2019-2020 Interim Framework provincial results. Appendix E extrapolates those results to THESL.

QUESTION (A):

a) Are the 2019-2020 Interim Framework results based entirely on savings achieved by customers of Ontario's electricity distributors or do they also include savings by commercial/industrial customers directly connected to the transmission system?

RESPONSE (A):

Toronto Hydro cannot confirm that the savings in the IESO's 2019-2020 Interim Framework results include or exclude savings by commercial/industrial customers directly connected to the transmission system as the data is unavailable.

QUESTION (B):

b) With respect to Appendix E, please provide the source of the 2015-2017 THESL savings and total provincial savings by program area (Cells E3 to H8) used in the 2019-2020 IF Est. Tab.

RESPONSE (B):

Please refer to Appendix A for THESL's 2015-2017 Final Verified Results.

QUESTION (C):

c) Please provide schedule that sets out THESL's and total provincial Residential sales for each of the years 2015-2018 along with THESL's Residential sales as percent of total provincial Residential sales for each of these years.

RESPONSE (C):

Toronto Hydro does not agree with using Residential sales to calculate its portion of CDM savings as a percentage of total province CDM savings. Toronto Hydro's methodology involves calculating savings by CDM program. Toronto Hydro's methodology better represents the CDM program activity within its service area, as opposed to Residential sales that include fixed and variable revenues.

QUESTION (D):

d) What would be THESL's share of the 2019-2020 Residential Interim Framework savings if the average percentage per part (c) was used to determine THESL's share?

RESPONSE (D):

Please refer to the response to 3-VECC-34, c).

QUESTION (E):

e) Please provide schedule that sets out THESL' and total provincial Commercial and Industrial sales for each of the years 2015-2018 along with THESL's Commercial and Industrial sales as percent of total provincial Commercial and Industrial sales for each of these years.

RESPONSE (E):

Toronto Hydro does not agree with using Commercial and Industrial sales to calculate its portion of CDM savings as a percentage of total province CDM savings. Toronto Hydro's methodology involves calculating savings by CDM program. Toronto Hydro's methodology better represents the CDM

program activity within its service area, as opposed to Commercial and Industrial sales that include fixed and variable revenues.

QUESTION (F):

f) What would be THESL' share of the 2019-2020 Business (i.e. Commercial and Industrial) Interim Framework savings if the average percentage per part (e) was used to determine THESL's share?

RESPONSE (F):

Please refer to the response to 3-VECC-34, e).

QUESTION (G):

g) With respect to Appendix E, 2019-2020 IF Est. Tab, please provide the source of the Net to Gross Ratio values by program area (Cells G14-H19).

RESPONSE (G):

Please refer to the response to 3-VECC-34, b).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-35

Reference: Exhibit 3, Tab 1, Schedule 1, Page 13 and Appendices G & F

Preamble:

Appendix G reports the planned 2021-2024 CDM Framework results. Appendix E extrapolates those results to THESL.

QUESTION (A):

a) The 2021-2024 CDM Framework includes savings of 61 GWh in 2022 from Local Initiatives. Did THESL undertake any Local Initiatives in 2022 that would contribute to the 61 GWh result? If yes, what specifically were they and what are the estimated annual savings.

RESPONSE (A):

Toronto Hydro did not undertake any Local Initiatives in 2022. However, the IESO's local initiatives program was developed to deliver CDM savings in targeted areas of the province[1]. Part of Toronto was identified as one of the first four targeted areas.

QUESTION (B):

b) The 2021-2024 CDM Framework includes savings of 161 GWh in 2023 from Local Initiatives. Did THESL undertake any Local Initiatives in 2023 that would contribute to the 161 GWh result? If yes, what specifically were they and what are the estimated annual savings.

[1] Local Initiatives to Deliver CDM Savings in Targeted Areas https://www.ieso.ca/en/Sector-Participants/IESO-News/2021/04/Local-Initiatives-to-Deliver-CDM-Savings-in-Targeted-Areas

RESPONSE (B):

Toronto Hydro did not undertake any Local Initiatives in 2023. Please refer to the explanation in 3-VECC-35, a) referring to the IESO's program delivery.

QUESTION (C):

c) The 2021-2024 CDM Framework includes savings of 181 GWh in 2024 from Local Initiatives. Is THESL currently planning to undertake any Local Initiatives in 2024 that would contribute to the 181 GWh result? If yes, what specifically are they and what are the estimated annual savings.

RESPONSE (C):

Toronto Hydro is not currently planning to undertake any Local Initiatives in 2024. Please refer to the explanation in 3-VECC-35, a) referring to the IESO's program delivery.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-36

Reference: Exhibit 3, Tab 1, Schedule 1, Page 14 and Appendices G & F
IESO, 2022 Planning Outlook (December 2022)

Preamble:

The Application states:

> "Toronto Hydro's annual forecasted savings for 2025 to 2029 were developed based on the assumption that there will be a continuation of CDM program delivery by the IESO. In the absence of a new framework, the projected impact is based on the anticipated "status quo" CDM delivery objectives and expectations assigned for the post-2024 conservation planning period. Toronto Hydro has determined this to be the best estimate at this time given the absence of conservation planning detail for this period."

The IESO's 2022 Planning Outlook includes the following cumulative savings from Future Frameworks for 2025 and after (https://www.ieso.ca/en/Sector-Participants/Planning-and-Forecasting/Annual-Planning-Outlook):

Figure 19: Conservation - Future Program Framework Assumption - Annual Energy Demand Savings

Data Annual Energy Demand Savings (TWh)

Data	Annual Energy Demand Savings (TWh)						
	Year						
	1	2	3	4	5	6	7
	2024	2025	2026	2027	2028	2029	2030
Future Frameworks	-	0.18	0.73	1.53	2.34	3.15	3.97

QUESTION (A):

a) Please confirm that in the Application THESL assumes that the post-2024 Framework will include annual provincial savings of 1,575 GWh, equivalent to the results targeted for 2024. If not confirmed, what annual provincial savings post-2024 does the THESL application assume?

RESPONSE (A):

Toronto Hydro confirms the above statement.

QUESTION (B):

b) What would be the annual savings attributable to THESL for 2025 through 2029 based on the Future Framework savings set out in the IESO's 2022 Planning Outlook? (Note: Please assume split between Residential and Business is the same as that in the 2021-2024 Framework)

RESPONSE (B):

The IESO's 2022 APO Conservation - Annual Energy Demand Savings (TWh)[1] does not disclose underlying data to accurately incorporate the figures into the load forecast. Most notably, Toronto Hydro would require insight into assumptions regarding the wind-down of the 2021-2024 framework, the ramp-up of future framework savings and the degree to which they incorporate continuation of existing programs, and the methodologies pertaining to CDM persistence.

QUESTION (C):

c) Please provide a revised Load Forecast for 2025-2029 using the results from part (b) to derive the Residential and Business CDM variables for 2025-2029.

[1] Figures 19 and 20, 2022 Annual Planning Outlook https://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/Dec2022/Demand-Forecast-Module-Data.xlsb

RESPONSE (C):

Please refer to the response 3-VECC-36, b).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-37

Reference: Exhibit 3, Tab 1, Schedule 1, Table 4, Pages 7 and 17 and Appendices A & B

QUESTION (A):

a) For each of the six customer classes that uses a regression model to forecast energy usage, please provide a schedule (i.e., a working excel file) that sets out the calculation of the 2023 to 2029 monthly (and resulting annual) energy usage forecast using the forecast values for each class model's explanatory variables and the coefficients from the regression models in Appendix B.

RESPONSE (A):

Please refer to 3-VECC-37 Appendix A, Tab "2023-2029 Load Forecast".

QUESTION (B):

b) For each of these customer classes please provide a schedule that sets out the predicted monthly energy usage for 2023 versus the actual monthly energy usage for all months where actual data is available.

RESPONSE (B):

Please refer to 3-VECC-37 Appendix A, Tab "2013-2022 Predicted Values".

QUESTION (C):

c) For the Street Lighting class, please provide a schedule that set outs: i) the calculation of the average use per device used to forecast energy usage and ii) the calculation of the resulting energy usage forecast for 2023-2029.

RESPONSE (C):

Please refer to 3-VECC-37 Appendix B for the calculations related to Street Lighting.

QUESTION (D):

d) Please confirm that for the USL class the forecast usage for 2023-2029 was based on actual 2022 usage, adjusted in leap years for the number of days in the year.

RESPONSE (D):

Toronto Hydro confirms the above response.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-38

Reference: Exhibit 3, Tab 1, Schedule 1, Table 4, Pages 7 and 17 and Appendix B

QUESTION (A):

a) For each of the five customer classes that uses a regression model with CDM/day as an explanatory variable to forecast energy usage, please confirm that the coefficient for this variable ranges from -14 to -41, such that a 1 kWh/day increase in CDM leads a decrease in forecast daily usage that is an order or orders of magnitude larger.

RESPONSE (A):

The CDM/day variable is forecasted in MWh. The coefficient for the variable is such that for 1 kWh/day increase in CDM leads to a decrease in forecast daily usage ranges from -0.014 to -0.041 kWh.

QUESTION (B):

b) If confirmed, please explain why, intuitively, this is a reasonable result.

RESPONSE (B):

Please refer to 3-VECC-38, a).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-39

Reference: Exhibit 3, Tab 1, Schedule 1, Page 19

Preamble:

The Application states:

> "Toronto Hydro's forecast of monthly peak demand by customer class, which is used to determine revenue for those customers billed on a demand basis (GS 50-999 kW, GS 1000-4999 kW, Large User, and Street Lighting), is established using historical relationships between energy and demand. The utility uses the latest five-year average growth of this relationship for forecasting purposes. The resulting kW demand forecast is explicitly converted based on average power factors to determine the peak kVA demand forecast."

QUESTION:

For each of the four customer classes billed on a demand basis, please provide a schedule (working excel file) that sets out: i) the calculation of the energy to demand relationship used to forecast kW demand; ii) the calculation of the forecast 2023-2029 kW demand for each class and iii) the conversion of the forecast kW demand to a peak kVA demand forecast.

RESPONSE:

Please refer to 3-VECC-39 Appendix A for a working excel file that sets out the requested calculations for the GS 50-999 kW, GS 1000-4999 kW, Large Use and Street Lighting customer classes.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-40

Reference: **Exhibit 3, Tab 1, Schedule 1, Page 21**
City of Toronto, Electric Vehicle Strategy, Page 13

Preamble:

The Application states:

> "Toronto Hydro developed the EV forecast as an input to Clearspring's integration model. The forecast was developed in reference to the three vehicle types: LDEV (battery and plug-in electric), MDEV, and HDEV. The EV forecast was developed to be consistent with the City of Toronto's EV Strategy targets:
> • 2025 - 15% of new vehicle sales and 5% of total light duty vehicles be classified as EVs; and
> • 2030 - 40% of new vehicles sales and 20% of total light duty vehicles be classified as EVs, totalling 220,000 LDEVs."

The City of Toronto's Electric Vehicle Strategy states that the interim goals for EV adoption are:

- By 2025, 5% of registered personal vehicles are EVs;
- By 2030, 20% of registered personal vehicles are EVs;
- By 2040, 80% of registered personal vehicles are EVs; and By 2050, 100% of registered personal vehicles are EVs.

QUESTION (A):

a) Are Light-Duty (LD) vehicles as referred to in the Application equivalent to the "personal vehicles" referred to the City of Toronto's strategy?

RESPONSE (A):

Toronto Hydro confirms Light-Duty (LD) vehicles as referred to in the Application is equivalent to the "personal vehicles" referred to the City of Toronto's strategy.

QUESTION (B):

b) The Application indicates that the City of Toronto strategy goal/target is for 220,000 LDEVs by 2030. Please indicate where in the Strategy document the 220,000 goal/target is referenced.

RESPONSE (B):

The strategy target is referenced in the City of Toronto's Report for Action on its Electric Vehicle Strategy on page 1 of 9, paragraph four[1]. The report references the 2030 target as 220,000 LDEVs, approximately 20% of personal vehicles. This is aligned with referenced report in Exhibit 3, Tab 1, Schedule 1.

[1] City of Toronto's Report for Action on its Electric Vehicle Strategy, https://www.toronto.ca/legdocs/mmis/2020/ie/bgrd/backgroundfile-141238.pdf

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-41

Reference: Exhibit 3, Tab 1, Schedule 1, Page 22

City of Toronto, Electric Vehicle Strategy, Page 13 (FN #17)

Preamble:

The Application states:

> "The LDEV forecast was developed by using historical Light-Duty Vehicles ("LDV") population in Ontario, as well average annual growth rates, for which an extrapolation for Toronto and LDEV forecasts were created. The number of new LDV and LDEV registrations in Ontario were obtained from StatsCan. The reported values were used to estimate the number of new LDVs and LDEVs registered each year in Toronto. It is estimated that approximately 12.7 percent of new vehicles registered in Ontario each year are registered in Toronto."

QUESTION (A):

a) Please fully explain what data was received from StatsCan and how it was used to estimate the number of new LDVs and LDEVs registered in Toronto each year. Please provide a working excel file setting out the supporting calculations for the forecast LDEVs in Toronto for 2023-2029.

RESPONSE (A):

Toronto Hydro estimated the size and growth of total LDV population in Toronto based on available data on new LDV registrations in Ontario obtained from StatsCan[1], and assumed that the long-term average of new vehicles registrations would be consistent with the levels seen in 2017-2019 (pre-COVID).

Toronto Hydro utilized data from the Ontario Ministry of Transportation to obtain the number of LDEVs in Toronto for 2018 to 2021. Toronto's share of Ontario's new vehicles is assumed to be constant over time at 12.7%. The forecast of new vehicle registration and total vehicles registered each year was built up to achieve 20% of the total LDV fleet in 2030, a target provided by City of Toronto's Electric Vehicles Strategy.

Toronto Hydro estimated that there will be 1.1M LDVs registered in Toronto in 2030 based on the assumption that annual growth in new LDV registrations will average 1% during the forecast period. These assumptions led to an estimation of 220,000 LDEVs in Toronto by 2030, and the 20% LDEV target provided by the City of Toronto. Please refer to 3-VECC-41, Appendix A for the supporting calculations.

QUESTION (B):

b) It is noted the City of Toronto EV Strategy relied on data obtained from the Ontario Ministry of Transportation regarding registered LDVs and LDEV's in Toronto. Did THESL also use data from the source?

RESPONSE (B):

Please refer to Toronto Hydro's response to 3-VECC-41, a).

[1] New motor vehicle registrations: Quarterly data visualization tool, https://www150.statcan.gc.ca/n1/pub/71-607-x/71-607-x2021019-eng.htm

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-42

Reference: Exhibit 3, Tab 1, Schedule 1, Pages 22 - 23
City of Toronto, Electric Vehicle Strategy

Preamble:

The Application states:

> "The MDEV and HDEV forecasts were also developed using the historical vehicle population in Ontario, as well average annual growth rates, for which an extrapolation for Toronto and EV forecasts were created. With the annual growth rate of both vehicle classes, a provincial wide population forecast was derived. Toronto accounts for approximately 20% of the provincial medium and heavy-duty vehicle population. The HDEV forecast also includes vehicle growth from the Toronto Transit Commission ("TTC")."
>
> "An adoption rate was then developed to establish how rapidly MDEVs and HDEVs would need to be adopted to meet the City's EV Strategy Target. A materialization factor was also added to the MDEV and HDEV forecasts as an adjustment to account for delayed adoption. Internal analysis shows that commercial customers typically have delayed completion dates compared to their original estimated completion dates. Internal analysis was based on energization project materialization between estimated and actual completion dates."

QUESTION (A):

a) Does the City of Toronto's EV Strategy include goals/targets for MDEV and HDEV? If yes, what are they and where are they set out in the Strategy document?

RESPONSE (A):

The City of Toronto's EV Strategy did not include specific targets for MDEVs and HDEVs. Toronto Hydro developed adoption rates as a linear trend to meet the City's EV Strategy Target of 100% zero emission transportation by 2050.

QUESTION (B):

b) With respect to the MDEV and HDEV forecasts, please outline: i) what historical data was employed (including sources) and ii) how it was used (in conjunction with the targets) to develop the forecasts for MDEVs and HDEVs in Toronto. Please provide working excel files setting out the supporting calculations of the forecast MDEVs and HDEVs in Toronto for 2023-2029.

RESPONSE (B):

Historical Medium and Heavy-Duty vehicle population counts for 2015-2019 for the province of Ontario were obtained through Stats Canada.[1] With the annual growth rates of both vehicle classes, a provincial wide population forecast was derived. Subsequently, the ratio of the City of Toronto's population of 20% was utilized to assume the provincial medium and heavy-duty vehicle population. The resulting MD and HD vehicles in Toronto were used, in conjunction with the EV adoption rates described in 3-VECC-42, a) to develop the MDEV and HDEV vehicle forecasts. Please refer to Appendix A for supporting calculations.

[1] https://www150.statcan.gc.ca/n1/pub/71-607-x/71-607-x2021019-eng.htm

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-43

References: Exhibit 3, Tab 1, Schedule 1, Page 22 (Table 6)
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), Pages 12-13 and 18-19

Preamble:

Appendix J states:

> "To integrate the LDEV forecasted energy into the revenue forecast, the incremental load of LDEVs for each rate class from their 2022 adoption levels are added to the revenue forecast." (page 13)
>
> "To integrate the MDEV/HDEV forecasted energy into the revenue forecast, the incremental load of MDEV and HDEVs for each rate class from their 2022 adoption levels are added to the revenue forecast." (page 19)

QUESTION (A):

a) Appendix J provides the number of LDEVs in Toronto dating back to 2019 and the number of MDEVs and HDEVs in Toronto as of 2022. Please provide an estimate as to the number of LDEVs, MDEVs and HDEVs that were registered in Toronto in 2002.

RESPONSE (A):

Toronto Hydro does not have the requested information and cannot obtain this information within the interrogatory response timelines for 2002.

QUESTION (B):

b) Please confirm that: i) the number of registered LDEVs, MDEVs and HDEVs in Toronto have each increased between 2002 and 2022, ii) this increase in registrations will have increased the energy usage in the Residential, CSMUR, GS<50, GS50-999, GS1,000-4,999 and Large Use classes as between 2002 and 2022 and iii) the forecast 2023-2029 energy usage for each of these customer classes will (implicitly) reflect a continuing increase in energy usage by EVs.

RESPONSE (B):

Toronto Hydro confirms the above statements.

QUESTION (C):

c) If part (b) is not confirmed, please explain why.

RESPONSE (C):

Please refer to Toronto Hydro's response in 3-VECC-43, b).

QUESTION (D):

d) If part (b) is confirmed, will the approach used by Clearspring in Appendix J lead to a double counting of some portion of the incremental load attributable to EVs for these classes? If not, why not?

RESPONSE (D) – PREPARED BY CLEARSPRING:

The Integration Model developed by Clearspring addressed the issue of double counting by calculating the incremental number of EVs from the last year of the base load forecast dataset, which is 2022. Only the added EVs from 2022 will add to energy usage in the Integration Model.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-44

Reference(s): Exhibit 3, Tab 1, Schedule 1, page 24 (Table 7)
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts)

Preamble:

Appendix J states:

"The electric vehicles will mostly be charged at the owner's residence. However, some of the LDEVs will be charged at alternate locations, typically at the place of work. The energy required for home charging will add to residential energy use and the alternate locational charging will add to the general service rate classes. Integration of the LDEVs into the revenue forecast requires an assumption on the rate class split of where charging will occur. The Integration Model assumes 91% of LDEV charging in Toronto will occur at home. The five rate classes based on Toronto Hydro data on the percentage of Level 2 EV chargers in those five rate classes." (page 11)

"Toronto Hydro estimated that an average Toronto LDEV driver will average 40.3 km/day. The EV efficiency factor is estimated by Toronto Hydro at .233 kWh/km. Multiplying these two components together produces the estimate of each LDEV requiring 9.4 kWh per day, which appears reasonable to Clearspring based on our experience and other external sources." (page 12)

"The forecasts are translated into monthly forecasts using the monthly LDEV counts found in Table 4 and multiplying the average daily kWh charging by the number of days in each month. An additional monthly adjustment is made to account for the reality that EV batteries perform worse in cold temperatures. To adjust for this, the Integration Model adds 10 percent to the energy totals in winter months and subtracted 10 percent to the energy totals in summer months." (page 13)

QUESTION (A):

a) With respect to page 12, what is the basis for THESL's estimates that: i) an average Toronto LDEV driver will average 40.3 km/day and ii) the EV efficiency factor is estimated by Toronto Hydro at .233 kWh/km?

RESPONSE (A):

Toronto Hydro relied from USDRIVE's report on EVs at Scale and the U.S. electric power system[1], which assumes an average annual distance of 12,000 miles and 300 Wh/mi. Toronto Hydro made an adjustment to this assumption to reflect the distance travelled by a Toronto driver. A Toronto driver's average annual vehicle kms driven is 14,186kms or 38.9 kms/day, while the Ontario's equivalent is 14,175kms or 40.3 kms/day respectively[2]. Toronto Hydro assumed that EV adopters will convert to electric vehicles because they may be higher mileage drivers, hence relying on the Ontario average driven per day. The combination of these two assumptions led to the estimated EV efficiency factor or 0.233 kWh/km.

QUESTION (B):

b) With respect to page 11, does the assignment of charging requirements to customer classes take into consideration that some charging of LDEVs registered in Toronto will take place outside THESL's service area (e.g., charging during vacation travel). If not, does THESL have any estimate to how this would impact the forecasts set out in Table 5?

RESPONSE (B) - PREPARED BY CLEARSPRING:

No, that consideration does not enter the model. The inverse of the statement will have a balancing effect, that is, there will be some LDEVs that are not registered in Toronto but will be charged in Toronto Hydro's service territory. Clearspring is not aware of any estimates in this regard and is therefore unable, from a data perspective, to adjust for this consideration.

[1] US Drive: Summary Report on Evs at Scale and the U.S. Electric Power System https://www.energy.gov/eere/vehicles/articles/summary-report-evs-scale-and-us-electric-power-system-2019

[2] https://www.insurancehotline.com/resources/did-ontario-motorists-drive-fewer-kilometres-2020

QUESTION (C):

c) With respect to page 13, given there are only 5 summer months (per Footnote #17), does this adjustment increase the total forecasted kWhs attributed to LDEVs?

RESPONSE (C) - PREPARED BY CLEARSPRING:

Yes, compared to having six summer months, this would slightly increase the forecasted kWhs attributable to LDEVs.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-45

Reference: Exhibit 3, Tab 1, Schedule 1, Table 8, Page 24
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), Pages 14-15

Preamble:

Appendix J states:

> "A load profile that estimates the hourly charging requirements of an LDEV at the general service customer premise is necessary to forecast the impact of LDEVs on billing demand. Most of this
> charging will be from commuters who are working at the place of business. The Integration Model uses a load profile that estimates "at work" charging behavior per LDEV from the U.S. Department of Energy (DOE) Alternative Fuels Data Center. The DOE profile is scaled to match the LDEV energy charging assumptions that were provided to Clearspring by Toronto Hydro. The model scales the profile to match the energy use estimate of 9.4 kWh and adjusts for summer and winter differences in battery efficiency. The winter and summer LDEV load profiles for "at work" charging used in the analysis are provided in the following table." (page 14)

QUESTION (A):

a) Please explain how the differences in winter vs. summer battery efficiency will impact the kW (as opposed to kWh) requirements for a charging.

RESPONSE (A) – PREPARED BY CLEARSPRING:

The EV battery will be further depleted, assuming the same driving distances, during cold weather versus mild or hot weather. This will require more kWhs at charging. The average kWs in each hour will, therefore, increase by a corresponding amount to deliver the energy to the EV battery.

QUESTION (B):

b) For each of the customer classes in Table 8, please indicate which of hourly values in Table 7 (Appendix J) were used to determine the billing demand associated with LDEVs and basis on which that hour was chosen.

RESPONSE (B) – PREPARED BY CLEARSPRING:

All of the hours found on Table 7 are used in determining the billing demand associated with LDEVs. For the customer classes found in Table 8, Clearspring received 8,760 hourly data for a suitable sample size of customers in each of those customer classes. From that data, we calculated the monthly peak hour for each specific customer. We then added to each customer's 8,760 hourly loads the load profile found in Table 7. After adding the LDEV load profile, we can re-examine what the new monthly peak demands will be. This may be in the same hour as the pre-LDEV load profile for the customer or may be in a new hour due to the LDEV load profile changing the peak time. The model remains flexible and uses all hours of the year for this calculation. All three customer classes peak demand are calculated in this way.

QUESTION (C):

c) For each of the customer classes in Table 8, please provide a schedule (i.e., working excel file) that sets out how total billing demands associated with LDEVs were determined for the years 2025-2029.

SUPPLEMENTARY RESPONSE (C) PREPARED BY TORONTO HYDRO:

Clearspring's working papers have been filed confidentially as an appendix to Toronto Hydro's response to 3-DRC-14(a).

RESPONSE (C) – PREPARED BY CLEARSPRING:

Clearspring's working papers are being provided on a confidential basis, pursuant to the OEB Practice Direction on Confidential Filings.

There are four Excel files that comprise the Integration Model. The primary file is titled "Integration Model". This is where the calculations for the billing demand of each rate are aggregated and displayed for both energy and billing demand. The tables found in the report are produced in here.

Three additional files produce the average billing demand impacts per each of the studied technologies that are then inputted into the Integration Model. These average billing demand inputs are pasted into the Integration Model in the worksheet titled "Demand Impacts per unit" in columns C through H in the appropriate month and technology which are all labeled in the worksheet.

The first input file is titled, "Average Demand Calculator GS 1 to 5 MW". This file calculates the average impact of the technology for each customer in the GS 1 to 5 MW customer class. The file includes all the 2019 AMI hourly data for every customer in that class. For each technology on the "Load Shapes" worksheet, the load shape of the technology needs to be put into column B (shaded in green). These load shapes are found in columns D through N in the Load Shapes worksheet. The multiplier cell C2 in the Load Shapes worksheet needs to be put in as the appropriate multiplier for the technology and customer class being examined. These are found in the Integration Model's worksheet titled "inputs" in columns M, N, and P. In the Average Demand GS 1 to 5 MW file once technology load shape is entered and the multiplier, the average demand impact by customer will automatically calculate and be displayed in the worksheet "Results" in column C, rows 28 to 39 for each month. The calculations may take awhile as the file is adding the hourly technology profile to 8,760 observations for every customer in that customer class, calculating what the new billing peak is in each month for that customer, and then subtracting that from the pre-technology billing peak for every customer. All those customer billing demand changes are then averaged to determine the average billing demand impact by customer for the technology being studied. These results in column C of the Results worksheet are the ones that are inputted into the Integration Model in the

worksheet titled “Demand Impacts per unit” in columns C through H and then the customer class billing demands are aggregated in the Integration Model based on how much of the incremental technology is forecasted to be present and a power factor adjustment to translate into KVa.

The two other input files work in the exact same manner but for the other two customer classes that have a billing demand component to rates. These files are titled “Average Demand Calculator GS 50 to 999 kW” and “Average Demand Calculator LU”. The LU calculator includes all the Large Use customer data in 2019. The GS 50 to 999kW calculator is a sample of 197 customers to enable the file size to be manageable because of the larger number of customers in that customer class.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-46

References: **Exhibit 3, Tab 1, Schedule 1, Page 24 (Table 7)**
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), Pages 17-19

Preamble:

Appendix J states:

> "The MDEVs and HDEVs count forecasts for Toronto Hydro are allocated to the rate classes. The Integration Model uses the Manufacturing and Warehouse kWh usage percentages by rate class provided by Toronto Hydro to allocate the MDEVs by rate class. For the HDEV rate class allocations, the model uses the same Manufacturing and Warehouse kWh usage percentages plus the Toronto Transit Commission ("TTC") garage kWh usage. The TTC garage usage, which was provided by Toronto Hydro, and was added to the HDEV allocations because of TTC's Green Bus Program, is forecasted to purchase and add several electric buses to its fleet, which would be classified as HDEVs." (page 17)
>
> "The Integration Model assumes that MDEVs require 103.56 kWh per day and HDEVs require 319.87 kWh of electricity per day. Both of these assumptions were provided from Toronto Hydro." (page 18)

QUESTION (A):

a) Please clarify whether in allocating the MDEVs and HDEVs to rate classes Clearspring uses: i) the total kWh for each rate class as provided by THESL or ii) the HDEV and MDEV charging kWh in Manufacturing and Warehouses as provided by THESL.

RESPONSE (A) PREPARED BY CLEASPRING:

The first one described in i).

QUESTION (B):

b) With respect to page 18, please indicate the basis for: i) the assumed MDEVs requirement of 103.56 kWh per day and ii) the assumed HDEVs requirement of 319.87 kWh of electricity per day.

RESPONSE (B) PREPARED BY TORONTO HYDRO:

Toronto Hydro obtained forecasts of fleet charging profiles from Lawrence Berkeley National Laboratory in California[1]. These fleet forecasts are projections of charging demand profiles for fleets in California in 2030. Toronto Hydro revised the forecast to better fit Toronto's environment by removing off-road vehicles and other non-relevant vehicles.

QUESTION (C):

c) Please explain why the kWh associated with the TTC's Green Bus Program weren't directly estimated and added to the customer class in which TTC load is billed.

RESPONSE (C) PREPARED BY TORONTO HYDRO:

Toronto Hydro was not able to estimate the number of MDEVs and HDEVs associated with the TTC's Green Bus Program after developing the EV adoption rates as defined in interrogatory 3-VECC -42, a), and could not directly estimate the associated kWh.

QUESTION (D):

d) With respect to page 19, does the assignment of charging requirements to customer classes take into consideration that some charging of MDEVs and HDEVs registered in Toronto will take place outside THESL's service area (e.g., charging during deliveries outside

[1] Individual Charging Profile in 2030, California: Lawrence Berkely National Laboratory, 2022

Toronto). If not, does THESL have any estimate to how this would impact the forecasts set out in Tables 13 and 14 (Appendix J)?

RESPONSE (D) PREPARED BY CLEASPRING:

Please see response to 3-VECC-44 (b) as this applies to the MDEVs and HDEVs in the same manner.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-47

Reference: Exhibit 3, Tab 1, Schedule 1, Table 8, Page 24
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), pages 14-15

Preamble:

Appendix J states:

> "MDEVs and HDEVs will put upward pressure on Toronto Hydro's three rate classes with billing demand, and that pressure is a function of the number of EVs being charged at the premise, the
> load profiles of those EVs, and the base load profile for that customer. The model accounts for these factors by using hourly load profiles of the MDEV and HDEVs, analyzing smart meter
> interval data for customers from Toronto Hydro, and then examining how the estimated number of MDEV and HDEVs would impact billing demand for each general service customer." (pages 21-22)

QUESTION (A):

a) For each of the customer classes in Table 20, please indicate which of hourly values in Table 19 (Appendix J) were used to determine the billing demand associated with MDEVs and HDEVs and basis on which that hour was chosen for each class.

RESPONSE (A) – PREPARED BY CLEASPRING:

Please see the response to 3-VECC-45 (b) as the response is the same except applied to MDEVs and HDEVs.

QUESTION (B):

b) For each of the customer classes in Table 19, please provide a schedule (i.e., working excel file) that sets out how total billing demands associated with MDEVs and HDEVs were determined for the years 2025-2029.

RESPONSE (B) – PREPARED BY CLEASPRING:

Please see the response to 3-VECC-45 (c).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC -48

Reference: **Exhibit 3, Tab 1, Schedule 1, pages 24-25 (Tables 9 & 10)**
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), pages 24-27

Preamble:

Appendix J states:

> "Toronto Hydro provided the Renewable nameplate capacity forecast, and historical, data to Clearspring. It is Clearspring's understanding that the Renewable forecast is entirely driven by solar. The forecasts appear to be reasonable expectations of near-term technology adoption based on our experience with other clients in forecasting solar resources." (page 24)
>
> "The Renewable capacity forecasted for Toronto Hydro is allocated to the different rate classes. The Integration Model uses the 2022 participation percentages in Toronto Hydro's net metering program by rate class to estimate the rate class allocations." (page 24)
>
> "To integrate the Renewable forecasted energy into the revenue forecast, the incremental production of Renewables for each rate class from their 2022 adoption levels are added to the revenue forecast. The incremental production forecasted in each month in 2025 to 2029 is the difference between that month's forecasted production and the same month in 2022. The incremental production is used since the base revenue forecast uses a dataset through 2022 and, therefore, already has the 2022 Renewable production embedded into the forecast."

QUESTION (A):

a) Please provide an estimate at to the renewable (solar) capacity installed in the THESL service area in 2002 and the associated annual energy production.

RESPONSE (A):

In 2002, Toronto Hydro had 2 solar projects connected with a capacity of 2.5 kW.

QUESTION (B):

b) When did THESL' net metering program start? Please provide an estimate of the renewable capacity in place at that time and a breakdown by customer class based on the net metering program's participation.

RESPONSE (B):

The net metering program started in 2005. In 2005 there was 5.4 MW of renewable capacity. There were three net metering projects at that time, all residential customers (micro projects).

QUESTION (C):

c) Please confirm that: i) the renewable capacity in Toronto has increased between 2002 and 2022, ii) this increase in capacity will have increased the behind the meter energy production in the Residential, CSMUR, GS<50, GS50-999 and GS1,000-4,999 classes as between 2002 and 2022 and iii) the forecast 2023-2029 energy usage for each of these customer classes will (implicitly) reflect a continuing increase in renewable energy production for these classes.

RESPONSE (C):

Toronto Hydro confirms statements c) i, ii, iii above.

RESPONSE – PREPARED BY CLEASPRING:

Please see response to 3-VECC-43 (b).

QUESTION (D):

d) If part (c) is not confirmed, please explain why.

RESPONSE (D):

Please refer to Toronto Hydro's response in 3-VECC-48, c).

QUESTION (E):

e) If part (c) is confirmed, will the approach used by Clearspring in Appendix J determine the incremental renewable energy production after 2022 result in a double counting of some portion of the incremental energy production attributed to renewable capacity for these classes? If not, why not?

RESPONSE – PREPARED BY CLEASPRING:

Please see the response to 3-VECC-43 (d) as the same modeling mechanics apply to renewable energy.

QUESTION (F):

f) For 2022 what was energy delivered to THESL by rate class under the net metering program and what does this represent as a portion of the total renewable energy produced in 2022 (per Table 27) for each customer class?

RESPONSE (F):

Please refer to response 3-VECC-45, c).

QUESTION (G):

g) Has the estimation of the load reduction due to renewable capacity in 2022 and also in 2025-2029 been adjusted to account for the fact that not all renewable production leads to a decrease in energy deliveries to THESL' customers (i.e., a portion of the energy is delivered to THESL)? If not, please revise Tables 27 and 28

accordingly.

RESPONSE – PREPARED BY CLEASPRING:

The Integration Model does not adjust for this. Clearspring is not aware of the data being available to make this adjustment.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-49

Reference: Exhibit 3, Tab 1, Schedule 1, Table 11, Page 26
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), Pages 25 & 27

Preamble:

Appendix J states:

> "Renewables will put downward pressure on Toronto Hydro's three rate classes regarding billing demand, and that pressure is a function of the nameplate capacity producing at the premise,
> the production profiles of those Renewables (provided in the table in the prior subsection), and the base load profile for that customer. The Integration Model accounts for these factors by using the hourly Renewable capacity factors, analyzing smart meter interval data for customers from Toronto Hydro, and then examining how the estimated production of the Renewables would impact billing demand for each general service customer." (page 27)

QUESTION:

Using the GS 50-999 class, please demonstrate how the impact of renewable
on billing demand was determined and provide a working excel file setting out the calculations.

RESPONSE – PREPARED BY CLEASPRING:

Please see the response to 3-VECC-45 (c).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-50

References: **Exhibit 3, Tab 1, Schedule 1, Page 25 (Tables 9 &10)**
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), Pages 28-30

Preamble:

Appendix J states:

> "Toronto Hydro provided the behind-the-meter Non-Renewable nameplate capacity forecast and historical data to Clearspring. It is Clearspring's understanding that these Non-Renewable DERs will be actively dispatched by the IESO. The forecasts increase substantially until 2024 and then grow by less than two percent thereafter." (page 28)
>
> "The Non-Renewable capacity forecasted for Toronto Hydro is then allocated to the different rate classes. The Integration Model uses the current nameplate capacity of non-renewable generation by rate class to estimate the rate class allocations." (page 28)
>
> "Unlike Renewables, Non-Renewables can continuously and consistently produce the same amount of electricity in any hour of the day and are not significantly impacted by winter/summer conditions. Toronto Hydro provided the capacity factors by hour for the existing Non-Renewable generation on its system that are dispatched by the IESO. These capacity factors are for an average day and are the same for both winter and summer months." (pages 28-29)

QUESTION (A)

a) Can THESL confirm that all of the current (i.e., as of 2022) non-renewable capacity is dispatched by the IESO? If not confirmed, what percentage of the kW capacity is currently dispatched by the IESO and what is the estimated hourly capacity factor for the non-renewable capacity that is not dispatched?

RESPONSE (A):

Toronto Hydro has over 2,500 customer-owned DERs connected to its distribution system. Toronto Hydro does not collect detailed information about the number of DERs that are currently Market Participants (i.e., dispatched by the IESO).

QUESTION (B):

b) Can THESL confirm that all of the incremental non-renewable capacity to be installed post-2022 will be dispatched by the IESO? If not, for each year 2023-2029 what portion of the incremental non-renewable capacity does THESL expect will be dispatched by the IESO?

RESPONSE (B):

Please see the response to 3-VECC-50 part (a).

QUESTION (C):

c) Does all of the current (i.e., 2022) production by non-renewable capacity go towards reducing customer purchases from electricity or is a portion of it delivered to the THESL system? If a portion was delivered to the THESL system in 2022, what percentage of the total production attributed to each rate class (per Table 35) was delivered to the THESL system?

RESPONSE (C):

Correct, all production by non-renewable capacity goes towards reducing customer purchases from the grid. Toronto Hydro does not purchase electricity from customer DERs. Any electricity sold to the grid would be paid for by the IESO.

QUESTION (D):

d) If a portion of non-renewable production is currently (2022) delivered to the THESL system, has the estimation of the load reduction due to non-renewable capacity in 2022 and also in 2025-2029 been adjusted to account for the fact that not all non- renewable production leads to a decrease in energy deliveries to THESL' customers? If not, revise Tables 35 and 36 accordingly.

RESPONSE (D) PREPARED BY CLEASPRING:

The Integration Model does not adjust for this. Clearspring is not aware of the data being available to make this adjustment.

QUESTION (E):

e) Please provide an estimate as to the non-renewable capacity installed in the THESL service area in 2002 and the associated annual energy production.

RESPONSE (E) PREPARED BY TORONTO HYDRO:

As of 2002, Toronto Hydro had 11 non-renewable projects connected with a capacity of 18.9 MW.

QUESTION (F):

f) Please confirm that:

   i. the non-renewable capacity in Toronto has increased between 2002 and 2022,

   ii. this increase in capacity will have increased the behind the meter energy production in the GS<50, GS50-999, GS1,000-4,999 and Large Use classes as between 2002 and 2022 and

iii. the forecast 2023-2029 energy usage for each of these customer classes will (implicitly) reflect a continuing increase in renewable energy production for these classes.

RESPONSE (F):

i) Yes, there has been an increase in non-renewable capacity between 2002 and 2022. In 2002 the non-renewable capacity connected was 18.9 MW and it increased to 169.5 MW in 2022.

ii) Yes, the increase in capacity will have increased behind the meter production in each rate class.

iii) Yes, our forecast projects there will be an increase of renewable energy production for each rate class.

QUESTION (G)

g) If part (f) is not confirmed, please explain why.

RESPONSE (G):

Part (f) is confirmed.

QUESTION (H)

h) If part (f) is confirmed, will the approach used by Clearspring in Appendix J to determine the incremental non-renewable energy production after 2022 result in a double counting of some portion of the incremental energy production attributed to non-renewable capacity for these classes? If not, why not?

RESPONSE (H) PREPARED BY CLEASPRING:

Please see the response to 3-VECC-43 (d) as the same modeling mechanics apply to non-renewable energy production.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-51

Reference: Exhibit 3, Tab 1, Schedule 1, Table 11, Page 26
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), Pages 29 & 31

Preamble:

Appendix J states:

> "Non-Renewables will put downward pressure on billing demand and is a function of the nameplate capacity producing at the premise, the production profiles of those Non-Renewables
> (provided in the table in the prior subsection), and the base load profile for every customer. The Integration Model accounts for these factors by using the hourly Non-Renewable capacity factors provided by Toronto Hydro, receiving smart meter interval data for customers from Toronto Hydro, and then analyzing how the estimated production of the Non-Renewables would impact billing demand for each general service customer.." (page 31)

QUESTION:

Using the GS 50-999 class, please demonstrate how the impact of non-renewable on billing demand was determined and provide a working excel file setting out the calculations.

RESPONSE – PREPARED BY CLEASPRING:

Please see the response to 3-VECC-45 (c).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-52

Reference: Exhibit 3, Tab 1, Schedule 1, Pages 25 - 26
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), Pages 29 & 31

Preamble:

Appendix J states: "Energy storage can be used for multiple purposes. One viable option may be for back-up power when outages are encountered. Another possible purpose is to reduce billing peaks or shift energy use from on peak to off-peak. If energy storage is actively used to reduce billing demands, this could have the impact of reducing demands but increasing energy use at the premise through energy losses that result from the inefficiency in the discharge/charging cycle. Under the back-up option, there would be minimal impacts on demand and energy. It is unclear how energy storage will be used in the future on Toronto Hydro's system. There is no evidence yet that reveals how energy storage may be used on the system and if its presence will result in meaningful energy or billing demand changes. Given this current lack of evidence, it is assumed that energy storage will only be used for back-up power through the forecast period meaning that energy storage is assumed to have zero kWh and zero kW impacts." (page 32)

QUESTION (A):

a) Please provide any insights THESL has as to the use of energy storage by current customers (i.e., is it just used for back-up power in the event of an outage or is also used to reduce billing peaks or shift energy use from on-peak to off-peak)?

RESPONSE (A):

As noted in Exhibit 2B Section E5.1 Table 4, there are only 28 customer-owned energy storage systems connected to Toronto Hydro's service area, representing about 1% of the total number of

DERs connected as of 2022. Toronto Hydro is unable to comment on how these assets are being used as that information is not readily available at this time.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-53

Reference: Exhibit 3, Tab 1, Schedule 1, Page 17 and 19
Exhibit 3, Tab 1, Schedule 1, Appendix J (Integration of Revenue Forecast with Electric Vehicle and Distributed Energy Resource Forecasts), Pages 13, 15, 20, 22, 26, 27, 30, 31 and 34, and Appendix 2-IB

QUESTION (A):

a) For each rate class please provide a schedule that set out for the years 2025-2029 the contribution to the forecast kWh and kVA (where applicable) as set out in Appendix 2-IB from each of the following: i) the results of the energy models, ii) LDEVs, iii) MDEVs, iv) HDEVs, v) renewable resources, and vi) non-renewable resources.

RESPONSE (A):

Please refer to Appendix A for the requested schedule.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC -54

References: Exhibit 3, Tab 2, Schedule 1, Pages 1-3
Appendix 2-H

QUESTION :

With respect to Appendix 2-H and the details regarding Account #4235, please explain: i) the negative microFIT revenues in 2020 and 2021 and ii) why microFIT revenues are lower in the 2024-2029 period than in the previous years.

RESPONSE:

i. The MicroFIT line of Account 4235 in Appendix 2-H captures both microFIT service charges and fees for connecting customer-owned generation facilities, with the latter costs typically being the larger driver in this line item. In 2020 and 2021, Toronto Hydro experienced immaterial variances between its generation connection revenues and costs of less than $30,000 and $40,000, respectively, which resulted in negative revenues for those years. These immaterial variances resulted due to unrecovered costs of investigative engineering design and field work associated with customer generation connection requests that never materialized.

ii. The immaterial variance of $20,000 to $50,000 forecasted for generation connection revenues in 2024-2025 compared to 2023 forecast is a result of the variable demand which differs from year to year depending on the number of customer connection requests. Toronto Hydro has forecasted 2025 revenues using trending from 2021-2023 and escalated it by inflation for the 2026-2029 period. These variances would not have a material impact on the revenue requirement for Toronto Hydro.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC -55

References: **Exhibit 3, Tab 2, Schedule 1, Pages 4-5**

Appendix 2-H

QUESTION:

Please provide a detailed breakdown as to the sources of the historic and forecast revenue for Account #4210.

RESPONSE:

Please see below the detailed breakdown of the sources of the historic and forecast revenues for Account #4210. For 2025, Toronto Hydro forecasted a revenue of $1.0 million for wireless attachments (Account 1508 – subaccount – Wireless Attachments) and escalated this forecast by inflation for the 2026-2029 period as part of Other Revenue. This approach passes an immediate benefit to ratepayers via a reduction to base Revenue Requirement.

Table 1: Account #4210 Breakdown (in $ million)

Account Details	Actual			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Duct Rental	10.5	10.4	10.8	11.0	11.2	11.8	12.0	12.3	12.5	12.7
Pole Rental Wireline	5.2	5.2	5.4	5.5	5.8	4.7	4.8	4.9	5.0	5.1
Pole Rental Wireless	-	-	-	-	-	1.0	1.0	1.0	1.1	1.1
Property Rental	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total	**16.1**	**16.0**	**16.7**	**17.0**	**17.5**	**18.0**	**18.3**	**18.7**	**19.1**	**19.4**

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 3-VECC-56

References: Exhibit 3, Tab 2, Schedule 1, Page 1

Appendix 2-H

QUESTION (A):

a) Please provide a schedule setting out the actual 2023 Other Revenues at the same level of detail as provided in Appendix 2-H. (Note: If actuals are not available for all of 2023, please provide year-to-date numbers and the year-to-date numbers for the equivalent period in 2022).

RESPONSE (A):

Please refer to Toronto Hydro's response to 1B-SEC-1, subpart (f).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-288

References: Exhibit 4, Tab 1, Schedule 1, Pages 14-19

Exhibit 1B, Tab 3, Schedule 3, Pages 32-38

Preamble:

In Exhibit 4, Tab 1, Schedule 1 Toronto Hydro compares its unit costs of OM&A and its employee staffing levels to those of a peer group consisting of Hydro One, Hydro Ottawa, Alectra, Elexicon, London Hydro, EnWin, and Enova Power for the 2016-2022 period. The metrics used in these calculations include OM&A per MWh of load, OM&A per customer, the number of full-time employees per $1 million of capex, the number of full-time employees per GWh of load, the number of full-time employees per 1,000 customers, and the number of full-time employees per circuit kilometer of line. Toronto Hydro also presents its MWh of load per customer, commonly referred to as average use.

On page 14 of Exhibit 4, Tab 1, Schedule 1, Toronto Hydro provided its appraisal of this research:

"Using publicly available data, the historical benchmarking analysis presented in this section demonstrates that Toronto Hydro (i) has a lean workforce compared to its Ontario peers and (ii) is a strong OM&A cost performer compared to other large and mid-sized distributors in the province. Toronto Hydro's efficient OM&A and staffing cost management to date positions the utility well to address a growing need for investments in operations and resourcing without creating undue cost burdens and rate increases for customers in the next rate term."

Unit cost metrics from the APB work are presented in Exhibit 1B, Tab 3, Schedule 3. Toronto Hydro presented the historical trend in these metrics and did not present results for the 2025 test year. The Company also did not present any unit cost comparisons to peers for these APB metrics.

On pages 32-33 of Exhibit 1B, Tab 3, Schedule 3, Toronto Hydro stated:
"Furthermore, Toronto Hydro notes that the APB econometric model does not account for recognized differences that set Toronto Hydro apart from other Ontario utilities due to its unique urban environment and customer base that includes many high-rise buildings… As such Toronto Hydro, is not in a position to comment on the results of the econometric model."

QUESTIONS (A), (B) AND (C):

a) Did Toronto Hydro additionally commission Clearspring to undertake econometric OM&A, capital, capex or unit cost benchmarking or to comment on the APB econometric research?

b) If not, why not?

c) If yes, what were the results?

RESPONSE (A), (B) AND (C):

No. Toronto Hydro did not commission Clearspring to undertake unit cost benchmarking or comments on the APB econometric research because: (i) it did not see value in duplicating the UMS unit cost benchmarking; (ii) the APB data set needs more refinement and vetting to produce results that can be commented upon (let alone relied on). Toronto Hydro did not commission Clearspring to undertake the econometric OM&A & CAPEX analysis because a similar (albeit less sophisticated) analysis was completed internally by using OEB yearbook data. Thanks to the OEB's Open Data initiative enhancing the accessibility and transparency of electricity distributors' yearbook information, Toronto Hydro was able to carry out this analysis without having to procure specialized third-party benchmarking services from Clearspring.[1]

[1] https://www.oeb.ca/sites/default/files/OEB-Letter-Open-Data-2.0-20231006.pdf

QUESTION (D):

d) In Clearspring's view, is econometric or unit cost benchmarking likely to yield more accurate benchmarking results for OM&A expenses?

RESPONSE (D) – PREPARED BY CLEASPRING:

Clearspring is of the view that the econometric approach has more potential to provide useful results than the APB unit cost approach, assuming the models are specified correctly and accurately account for the relevant cost challenges present for the category of costs being investigated.

QUESTION (E):

e) Why is Toronto Hydro comparing itself to other Ontario distributors in appraising its OM&A costs but to US distributors in appraising its total costs?

RESPONSE (E):

As noted above, thanks to the OEB's Open Data initiative enhancing the accessibility and transparency of yearbook information and providing industry stakeholders "*with a clear line of sight to better understand and visualize trends in a way that can be customized"* Toronto Hydro was able to use open-source yearbook data for Ontario distributors to conduct the OM&A benchmarking analysis.

QUESTION (F):

f) Does the quoted statement on the APB econometric model also apply to the APB unit cost research?

RESPONSE (F):

Yes, the quoted statement regarding the APB econometric model also applies to the APB unit cost research in so far as it may be used to compare Toronto Hydro's performance on these metrics to that of other Ontario utilities, or an industry average as requested in interrogatories 1B-SEC-26 and 1B-VECC-10.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-289

References: Exhibit 4, Tab 2, Schedule 1, Pages 7, 28, 30

Exhibit 4, Tab 2, Schedule 4, Page 7

QUESTION (A):

a) Toronto Hydro describes annual planning of vegetation management program which considers criterial such as feeder reliability and time since last prune. The exhibit also references planned trimming activities which are expected reduce costs through reduction of spot trimming. Please clarify if Toronto Hydro has a multi-year vegetation management plan that with scheduled trimming activities that may have small adjustments, or if it schedules vegetation management focus on an annual basis.

RESPONSE (A):

Toronto Hydro's vegetation management strategy schedules vegetation management on an annual basis. The current model involves prioritizing feeders for vegetation management activities on a yearly basis taking into consideration the multi-year view to understand the risk posed for different feeders. This prioritization process takes into account various factors such as feeder reliability history, the number of customers served by each feeder, and the time elapsed since the last pruning.

QUESTION (B):

b) Based on Toronto Hydro stating there are 4,800 circuit kilometers of overhead lines to trim, and that it has trimmed an average of 1,399 circuit kilometers annually between 2020 and 2022, would it be correct to say the majority of the overhead lines are trimmed on a three-year cycle? Please explain.

RESPONSE (B):

Confirmed. Through the Vegetation Management segment, Toronto Hydro trims a majority of its overhead lines on a three-year cycle.

QUESTION (C):

c) The ever expanding tree canopy has been included as a cost driver for the increased costs with time.

   i. Please describe how Toronto Hydro has worked with the City of Toronto and developers regarding tree planting species and location, for example, as outlined in the Electrical Safety Authority's publication Planting Under or Around Powerlines & Electrical Equipment.

   ii. How have items such as underground conversion and storm damage mitigated the impact of additional tree planting in the city?

RESPONSE (C):

i. Toronto Hydro is actively collaborating with the City of Toronto and developers to align tree planting practices with safety guidelines, including the Electrical Safety Authority's ("ESA's") recommendations. Recent discussions focused on the City of Toronto's forestry management strategy which aims for a 40 percent tree canopy cover by 2050. As part of the initiative, Toronto Hydro is closely involved in updating Municipal Consent Requirements ("MCRs") and assembling relevant documentation, including the ESA's guidelines, to enhance coordination with the city and peer utilities. The updated MCR, anticipated by the fourth quarter of 2024, will include vertical and horizontal clearance guidelines, tree protection policies, cut permits, and utility cut and restoration guidelines. Toronto Hydro is also providing feedback on revisions to the City of Toronto Development Infrastructure Policy and Standards ("DIPS") for Public Local Residential Streets and Private Streets. These efforts underscore Toronto Hydro's commitment to safe, sustainable, and coordinated urban development in alignment with the city's green infrastructure objectives.

ii. Certain investments, such as underground conversion could have potentially helped to offset the impact of additional tree planting on the Vegetation Management segment. However, Toronto Hydro cannot meaningfully analyze the impact of such investments along with items such as 'storm damage' as it is impractical to extrapolate the full impact of tree planting on Vegetation Management needs without these factors. Toronto Hydro does note that underground conversions are limited to specific parts of the distribution system, such as in Rear Lot Conversion (Exhibit 2B, Section E6.1), and the overall impact is unlikely to be significant. Toronto Hydro can say that, whatever the impact of these factors, it has seen a notable increase in the number of trees requiring trimming, as shown in Figure 16 of Exhibit 4, Tab 2, Schedule 1. Furthermore, Toronto Hydro clarifies that it based its 2025-2029 Vegetation Management forecasts on recent experience, which implicitly includes this historical impact, but has not included any additional costs in the forecasts related to future expectations regarding the ever-growing tree canopy.

QUESTION (D):

d) How does bundling the trimming of feeders out of the same substation produce cost savings?

RESPONSE (D):

Bundling the trimming of feeders out of the same substation allows optimization of resource allocation and can also result in cost savings as the crews can avoid repeat visits if adjacent feeders traverse in close proximity over a certain distance.

QUESTION (E):

e) Please explain why there is a need for higher yearly increases in the bridge year and test year.

RESPONSE (E):

Toronto Hydro's Vegetation Management segment is designed to address feeder reliability issues driven by vegetation growth. An elevated risk of tree-related outages to customers, as evidenced by an increasing number of sustained outages due to tree contacts, has led Toronto Hydro to adjust the level of investment in Vegetation Management.

QUESTION (F):

f) Please provide the annual actual and forecast costs of "vegetation management in response to off-cycle requests" that are included in Preventative and Predictive Overhead Line Maintenance, as stated in reference 2, from 2020 through 2029.

RESPONSE (F):

Historically, as part of the Vegetation Management segment within the Preventative and Predictive Overhead Line Maintenance program, Toronto Hydro does not include any costs for off-cycle requests. However, in response to reliability performance in 2023, Toronto Hydro allocated an additional $0.7 million to the Vegetation Management segment for preventative off-cycle requests.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-290

Reference: Exhibit 4, Tab 2, Schedule 1, Page 40

Exhibit 2B, Section E5.4, Pages 16-17

QUESTION (A):

a) Please explain the need for increased maintenance spending during the 2024-2029 period when Toronto Hydro is replacing meters in the capital AMI 2.0 initiative. a. If the meters are being replaced, why does reference 1 state there will be "increased testing and resealing operational costs"?

RESPONSE (A):

The 2022-2025 variance explanation statements in lines 20-22 on page 40 of Exhibit 4, Tab 2, Schedule 1 refer to two distinct cost drivers:

1) increasing suite meter testing and resealing costs due to higher volumes of suite metering maintenance activities; and
2) operational costs driven by the AMI 2.0 initiative.

Toronto Hydro's suite metering asset base is not included in the AMI 2.0 initiative and therefore, the initiative will have no impact on maintenance, testing, and resealing costs relating to the suite meter group of metering assets. As discussed in lines 3-5 of page 7 of Exhibit 4, Tab 2, Schedule 1 there is a growing number of suite metering units being driven by the growing population of condominium residents and changes in the volume of meters due to be tested and resealed each year. This is driving an increase in costs for suite meters, which are outside the scope of the AMI 2.0 initiative.

Moreover, as discussed on page 41 of Exhibit 4, Tab 2, Schedule 1, costs for the Metering Services segment of the Preventative and Predictive Overhead Line Maintenance program are expected to

decrease by $0.4 million when comparing 2025 annual costs to 2029, primarily due to the completion of the AMI project as explained in part b.

QUESTION (B):

b) Please explain why there is a need for higher yearly increases in the bridge year and test years.

RESPONSE (B):

Regarding the OM&A costs of the Metering Services segment of the Preventative and Predictive Overhead Line Maintenance program, during the bridge (2023-2024) and forecast (2025-2029) years, Toronto Hydro will be carrying out its AMI 2.0 initiative. During implementation, the utility anticipates an increased volume of billing data exceptions from meter exchanges. In order to manage and maintain Toronto Hydro's bill accuracy performance, ensure bills are issued in a timely manner, and maintain customer engagement and trust during this period, additional operational resources will be required to perform bill quality and assurance related tasks. In addition to this, Toronto Hydro plans to increase the number of Meter Mechanics between 2023 to 2029 in order to fill vacancies created through the retirement of Toronto Hydro's metering work force in 2020. This specialist skillset is required by the utility to ensure the ongoing accurate and safe installation of its metering infrastructure and to maintain its assets in accordance with legislative and regulatory requirements.

As for capital expenditures under the Metering program, as shown in Tables 5 and 6 of Exhibit 2B, Section 5.4, at pages 16-17, the increases in the bridge and test years are primarily in the Residential and Small C&I Meter Replacement category, which reflects the pacing of the AMI 2.0 meter replacement initiative.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-291

References: **Exhibit 4, Tab 2, Schedule 3, Page 13**
Exhibit 4, Tab 2, Schedule 4, Page 15
Exhibit 2B, Section E5.1, Page 24

Preamble:

In reference 1 Toronto Hydro states it is "piloting inspections of renewable and non-renewable Distributed Energy Resource ("DER") sites, which are electrical generation and storage sites connected to Toronto Hydro's distribution system".

In reference 2 Toronto Hydro states spot tree trimming and corrective work for DER sites is a cost driver for increased costs.

In reference 3 Toronto Hydro indicates that DERs cover their own connection costs.

QUESTION (A):

a) What is the estimated cost that has been included for both inspections, and spot tree trimming and corrective work, for third party owned DER sites for 2023-2029?

RESPONSE (A):

Please see Table 1 below, which details the maintenance and corrective costs for DER sites. There is no requirement for spot tree trimming at DER sites.

Table 1: Maintenance and Corrective Expenditures for DER Sites ($ Millions)

	2023	2024	2025	2026	2027	2028	2029	Total
Maintenance Cost	0	0.2	0.2	0.2	0.3	0.3	0.3	**1.5**
Corrective Cost	0	0.1	0.1	0.1	0.1	0.1	0.1	**0.5**
Total Cost	**0**	**0.2**	**0.3**	**0.3**	**0.4**	**0.4**	**0.4**	**2.0**

QUESTION (B):

b) Why is Toronto Hydro incurring O&M costs for DER sites?

RESPONSE (B):

Toronto Hydro owns monitoring and control equipment up to the power quality meter for renewable sites and up to the radio modem or LTE router for non-renewable sites. The costs are for inspecting this equipment. In addition, the uninterruptible power supply unit requires a battery replacement every 2 years to ensure operability.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-292

References: Exhibit 4, Tab 2, Schedule 4, Pages 1, 9, 19

QUESTION (A):

a) Please reproduce Table 1 in reference 1 by:

i. Removing the costs for "vegetation management in response to off-cycle requests",

ii. Creating a separate line item for items located within substations,

iii. Creating a separate line for items located within the underground distribution system, and

iv. Creating a separate line for items located within the overhead distribution system.

RESPONSE (A):

Please see Table 1 below.

Table 1: Corrective Maintenance Program Costs Breakout ($ Millions)

	2020A	2021A	2022A	2023A	2024B	2025F	2026F	2027F	2028F	2029F
i. Off-cycle Veg. Mgmt. Removed	22.8	26.3	23.2	25.4	25.3	29.2	30.3	30.6	31.6	33.2
ii. Substations	3.1	3.9	3.6	4.2	4.2	4.8	5.0	5.1	5.2	5.5
iii. Underground	8.2	11.1	9.9	10.7	10.7	12.3	12.8	12.9	13.3	14.0
iv. Overhead	6.0	3.4	3.5	3.4	3.4	3.9	4.1	4.1	4.2	4.4

QUESTION (B):

b) For 2020 through 2023 please fill in the table below with:

i. The number of requests per year in each of the P1, P2, P3 and P4 categories.

ii. The number of requests that were completed within 15 days for P1s, 60 days for P3s and 180 days for P3s.

Work Requests								
	2020		**2021**		**2022**		**2023**	
	Number Opened	Closed within Metric	Number Opened	Closed within Metric	Number Opened	Closed within Metric	Number Opened	Closed within Metric
P1								
P2								
P3								
P4		NA		NA		NA		NA

RESPONSE (B):

Please see Table 2 below for the number of Corrective Maintenance requests created/opened and closed within metric. Note that not all P1s and P2s are closed within metric due to requirements for scheduling outages, obtaining locates etc. The P3 closures within metric are low in comparison due to budget constraints i.e. there was more work to be performed than what the budget allowed.

Table 2: Number of Work Requests Created and Closed Within Metric

	2020		**2021**		**2022**		**2023**	
	Number Opened	**Closed within Metric**	**Number Opened**	**Closed within Metric**	**Number Opened**	**Closed within Metric**	**Number Opened**	**Closed within Metric**
P1	668	165	625	350	737	436	507	329
P2	2,442	1,072	2,512	1,666	2,269	1,624	2,548	2,014
P3	3,390	1,608	7,190	2,161	8,701	2,441	10,019	1,019
P4	5,763	NA	7,849	NA	13,367	NA	8,044	NA

QUESTION (C):

c) Toronto Hydro states that installation of animal guards is at risk if this program funding is not fully funding in the forecast period. What are the costs per year for installing animal guards in the historic period?

RESPONSE (C):

Please see Table 3 below.

Table 3: Annual Cost to Install Animal Guards

Animal Guards	2019	2020	2021	2022	2023
Cost	$39,232	$168,014	$360,868	$291,265	$176,830

QUESTION (D):

d) What are the costs per year for replacing faulted circuit indicators in the historic period?

RESPONSE (D):

Please see Table 4 below.

Table 4: Annual Cost to Replace Faulted Circuit Indicators ("FCIs")

FCI	2019	2020	2021	2022	2023
Cost	$11,945	$41,208	$194,031	$231,808	$143,401

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-293

References: Exhibit 2A, Tab 2, Schedule 4, Page 13

QUESTION (A):

a) Please provide all capital and maintenance costs per year for Delta-Wye corrective work.

RESPONSE (A):

Please see Table 1 below for annual maintenance expenditures for Delta-Wye corrective work.

There have been no capital expenditures related to Delta-Wye corrective work.

Table 1: Delta-Wye Corrective Work Expenditures ($ Millions)

	2019	2020	2021	2022	2023
Corrective Maintenance – Delta Wye	0.0	0.0	0.7	1.1	2.1

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-294

References **Exhibit 4, Tab 2, Schedule 5, Page 21**

Exhibit 4, Tab 2, Schedule 7, Pages 12-13

Preamble:

Toronto Hydro currently splits work between two independent service providers for the grid response function.

As outlined in reference 2, Toronto Hydro's urban setting has several unique legacy distribution configurations that are not found at the same scale elsewhere in the province, which requires knowledge and experience to effectively respond to unplanned outages.

QUESTION (A):

a) Please provide Toronto Hydro's process for acceptance of assets constructed or repaired under this program, including how Toronto Hydro addresses correction of non-conformances.

RESPONSE (A):

For each completed job, the assigned contractor communicates the details of what steps they undertook to resolve the issue, including any materials and equipment used, and the crew signs off to confirm that the site was left in a condition that presents no undue hazard to the public (as required by Ontario Regulation 22/04). Dispatchers review event completion details and formally mark the event complete. Work under this program is monitored in the field on a real-time, 24/7/365 basis by Toronto Hydro's grid response shift managers. Additionally, third-party auditors perform unannounced spot audits of work for quality and safety purposes. In each case, any non-conformances are reported to the responsible contractor for resolution. The non-conformance process for contractor work is described in Toronto Hydro's response to 4-Staff-297 part (b). /C

QUESTION (B):

b) What is the rate or volume of non-conformances addressed by the contract crews and by Toronto Hydro crews?

RESPONSE (B):

For the period of 2020-2023, Toronto Hydro raised a total of 50 non-conformances for contractor work under the Emergency Response program, covering a range of categories including safety, work administration, and work quality. Over this period, crews responded to a total of approximately 75,000 events. Toronto Hydro internal crews do not perform work under this program.

QUESTION (C):

c) What has Toronto Hydro recently experienced in terms of employee turn-over rates with the two contractors? How has contracted employee turnover impacted service delivery and outage restoration times?

RESPONSE (C):

Toronto Hydro is not directly involved in management of the contractor's workforce. It is the contractor's responsibility to ensure they maintain a sufficient headcount of qualified personnel to fulfill their obligations effectively. Toronto Hydro has observed no impacts on service delivery or outage restoration times due to contractor employee turn-over.

QUESTION (D):

d) Please outline where in the application evidence, benchmarking for costs, etc. the full-time equivalent employees due to these contractors have been included.

RESPONSE (D):

Costs for the full-time equivalent employees working for the contractors to provide field emergency response services are accounted for in Exhibit 4, Tab 2, Schedule 5, page 17, Table 2.

QUESTION (E):

e) Where does the responsibility lay for supplying vehicles, tools, and personal protective equipment to the grid response contractors?

RESPONSE (E):

The contractors are responsible for supplying vehicles, tools, and personal protective equipment to their employees.

QUESTION (F):

f) Does Toronto Hydro include the emissions of contractor vehicles as part of its emissions in its Net Zero 2040 Strategy?

RESPONSE (F):

Please refer to Toronto Hydro's response to interrogatory 1B-Staff-9 part (b).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-295

Reference: Exhibit 4, Tab 2, Schedule 8, Pages 22 - 27

Preamble:

Since 2020, Toronto Hydro has moved the Key Accounts function into its own segment and increased the scope of work and expenses.

QUESTION (A):

a) How many employees are forecast for this department in 2025?

RESPONSE (A):

The department is forecast to have seven employees in 2025.

QUESTION (B):

b) At the end of 2029 expenses for the team will be four times what they were when the unit was in customer care. How has this segment provided savings to offset its cost?

RESPONSE (B):

Interpreting the value proposition of the Key Accounts function solely from the narrow perspective of costs and savings would miss the value that this segment's enhanced customer services provide to individual customers and ratepayers, as outlined in section 6.1 of Exhibit 4, Tab 2, Schedule 8. As the needs of large customers have continued to evolve and grow, the Key Accounts segment has also evolved to emphasize more proactive engagement with these customers. The segment provides a communication channel much better suited to the often more complex and engagement-intensive needs and preferences of this customer group, thereby freeing up regular customer communication resources for more routine and voluminous tasks emanating from the general customer base.

The benefits offered to Key Account customers are responsiveness, facilitating and assisting with capital planning activities, and support aligned with their unique needs and operations. Internally, the Key Accounts team provides Toronto Hydro teams with insight into these customers' energy needs, connection and expansion plans, and forthcoming business changes to enable them to be met in a timely and cost-effective manner.

Key Account consultants provide support to customers by being the single point of contact for all enquiries, for example new expansion projects, billing concerns, metering questions, outages, power quality issues, distributed energy resource connections, and so on. Key Account customers' consistent feedback to Toronto Hydro has been that they highly value this service and its quality, timeliness, and how responsive it is to their unique needs.

QUESTION (C):

c) How many 1) entities and 2) customers (i.e. individual meter points) are currently addressed by Toronto Hydro's Key Accounts definition.

RESPONSE (C):

As of January 2024, Toronto Hydro has 513 Key Account customers. This includes 423 entities (unique customers, some with multiple connected loads) and 4,052 individual metered points addressed by Toronto Hydro's Key Account definition.

QUESTION (D):

d) Please describe how costs for this are handled in the cost allocation model.

RESPONSE (D):

The cost is embedded in OM&A under USofA # 5315 and 5675. It is part of allocated cost.

QUESTION (E):

e) What proportion of the costs are incurred on behalf of each rate class?

RESPONSE (E):

Please see the table below with proportion of the costs by rate class.

	Total	Residential	GS <50	GS 50-999 kW	GS 1,000-4,999 kW	Large Use >5MW	Street Light	Unmetered Scattered Load	CSMUR
Cost related to the Key Accounts for 2025	1,551,433	1,173,357	330,880	- 91,790	- 60,943	- 26,785	- 20,532	- 1,084	248,330
Base Revenue Requirement	972,362,213	372,078,020	156,662,222	256,976,954	82,965,142	39,215,748	16,546,293	3,611,942	44,305,893
Proportion to Base Revenue Requirement.	0.2%	0.3%	0.2%	0.0%	-0.1%	-0.1%	-0.1%	0.0%	0.6%

QUESTION (F):

f) As a scenario, prepare a cost allocation model where these costs are directly allocated to the causative rate classes.

RESPONSE (F):

See the attached copy of Cost Allocation Model in 4-Staff-295 Appendix A.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-296

Reference: Exhibit 4, Tab 2, Schedule 8, Page 9
Exhibit 9, Tab 1, Schedule , Page 27
EB-2023-0143 - Generic Variance Account for Locates - Evidence Filing, July 7, 2023[1]
EB-2023-0143, Decision and Order, October 31, 2023

Preamble**:**

Reference 3 shows that the annual cost per locate was approximately $31 in 2020 and forecast to increase to $60 in 2023.

Reference 1 states that the segment "includes labour costs and other types of costs known at the time of filing".

QUESTION (A):

a) What cost per locate was used in the preparation of the application? What was the actual average cost per locate in 2023?

RESPONSE (A):

The actual average cost per locate in 2023 was $51. This is less than the $60 forecast cost per locate in Toronto Hydro's evidence for the generic variance account application[2] because some incremental costs the utility forecasted for 2023 did not materialize as originally estimated. The Government of Ontario consulted with stakeholders and indicated its active consideration of policy

[1] https://www.rds.oeb.ca/CMWebDrawer/Record/801395/File/document
[2] EB-2023-0143, Toronto Hydro Evidence Filing (July 7, 2023) at https://www.rds.oeb.ca/CMWebDrawer/Record/801395/File/document.

changes that would result in cost reductions, relative to the policies in place at the time of the locates variance account application and Decision. Mindful of potential Government policy action, and in the interest of cost management, Toronto Hydro chose to not incur all the costs associated with the estimate. On November 27, 2023, the Government introduced Bill 153, *Building Infrastructure Safely Act, 2024*.

QUESTION (B):

b) Does the amount forecast for 2023 and 2024 include all locate costs, or was it prepared with costs in the generic variance account?

RESPONSE (B):

Since the OEB's decision on the generic variance account was issued on October 31, 2023—very shortly before Toronto Hydro filed its rate application on November 17, 2023—the forecast costs of the Public Safety and Damage Prevention segment for 2023 and 2024 in Table 6 of the Customer Operations program evidence[3] include all locate costs and do not incorporate the effects of the variance account for those years. For information on the 2023-2024 amounts that Toronto Hydro is recording in the generic variance account, please refer to the response to subpart (e).

QUESTION (C):

c) What are the total forecast volumes and costs, as if there were no variance account for 2023-2025?

RESPONSE (C):

Table 1 below includes total forecast volumes and costs for locates, as if there were no variance account for 2023-2025. These total costs also include locates related to Toronto Hydro owned streetlighting assets, which are offset by revenues recovered from streetlighting services and recorded in USoA 4220, and therefore are not included in Toronto Hydro's non-capital related

[3] Exhibit 4, Tab 2, Schedule 8 at p. 29.

revenue requirement. For more information, please refer to the updated OEB Appendix 2-H Toronto Hydro is filing in 1B-SEC-1(f), as well as the response to 3-Staff-284(f).

Table 1: 2023-2025 Actual and Forecast Locate Costs and Volumes

	Forecast	Actual	Forecast	
	2023	**2023**	**2024**	**2025**
Volumes	122,400	133,520	110,400	105,000
Cost ($ millions)	$7.3	$6.9	$6.8	$10.4
Cost Data Source (Exhibit 4, Tab 2, Schedule 8)	Table 6	4-SEC-89 (c) and (d)	Table 6	Table 7

Toronto Hydro notes that the forecasts for 2024 and 2025 remain subject to significant uncertainty given that further legislation, namely Bill 153, additional ministerial regulations, and rules by Ontario One Call will foreseeably further alter the cost drivers. Furthermore, the 2025 forecast provided here reflects Toronto Hydro's provision for a higher recovery of locates costs to achieve 100% compliance in the event that the OEB were to reject Toronto Hydro's request for a continuation of the variance account in the 2025-2029 rate period.[4]

QUESTION (D):

d) Does Toronto Hydro plan to update the forecast costs for 2024, or the test period, based on actual costs per locate in 2023 during this proceeding?

RESPONSE (D):

Toronto Hydro is not planning to provide new evidence for 2024 or the test period because pending legislative amendments, namely Bill 153, could further significantly impact cost projections.

[4] Exhibit 4, Tab 2, Schedule 8, Table 7 at p. 30.

QUESTION (E):

e) When will Toronto Hydro file the supplemental evidence to forecast the balances in this account over the current rate period, as stated in Ref 2?

RESPONSE (E):

Table 2 below provides the balances that Toronto Hydro would record in the GOCA Variance Account, in accordance with the OEB's accounting order.[5] In preparing this forecast, the utility has excluded locates costs related to streetlighting assets that are not part of the non-capital related revenue requirement, as discussed in subpart (c) of this response.

Table 2: Account 1508 – Subaccount GOCA Variance Account ($ Millions)

	Actual				Forecast
	2020	**2021**	**2022**	**2023**	**2024**
Public Safety and Damage Prevention Approved OM&A *(Note 1)*	2.8	2.8	2.9	3.0	3.1
Public Safety and Damage Prevention (a)	2.7	2.5	3.0	4.7	5.2
On-going locate costs recorded in OM&A (b)	2.7	2.5	3.0	3.8	3.7
Costs subject to GOCA Variance Account (c = a-b) (*Note 2)*	-	-	-	0.9	1.5

Note 1: As noted in Toronto Hydro's response to interrogatory 4-SEC-89(a), the total OM&A cost approved by the OEB for 2020 was $266.7 million, which was lower than the 2020 test year OM&A funding requested by Toronto Hydro.[6] The OEB approved OM&A on an envelope basis and therefore Toronto Hydro cannot provide a breakdown by the specific programs or segments such as Public Safety and Damage Prevention. However, in order to provide a directional view of the approved locates funding in base rates per the OEB's decision in EB-2018-0165, Toronto Hydro has used its

[5] EB-2023-0143, Ontario Energy Board, Decision and Order (October 31, 2023).
[6] See also 1B-SEC-8 for a discussion of adjustments for Account 4380 with respect to the OEB-approved 2020 OM&A budget.

2020 Test[7] costs for Public Safety and Damage Prevention segment and have escalated it by the OEB approved Custom Price Cap Index ("CPCI") formula[8] for 2021-2024 using OEB's prescribed rates.

Note 2: The OEB set the effective date for the GOCA account as of April 1, 2023[9] and therefore, the costs recorded for 2023 only cover actual costs incurred between April 1, 2023 and December 31, 2023. The 2024 forecast is for the full calendar year.

[7] EB-2018-0165, Exhibit 4A, Tab 2, Schedule 8.
[8] EB-2018-0165, Ontario Energy Board, Decision and Order (December 19, 2019).
[9] EB-2023-0143, Ontario Energy Board, Decision and Order (October 31, 2023).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-297

Reference: Exhibit 4, Tab 2, Schedule 10, Page 9

QUESTION (A):

a) What is the total cost of executed capital managed by this segment, by internal staff and external contractors, per year for 2020-2029?

RESPONSE (A):

Please see Table 1 below for the total cost of executed capital managed by this segment.

Table 1: Capital Costs managed by the External Work Execution Segment (in $ millions)

	Actual			Bridge		Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Capital Expenditures	218.3	218.4	256.2	293.4	280.8	340.9	322.1	321.5	337.6	356.0

QUESTION (B):

b) Please provide Toronto Hydro's process for acceptance of assets constructed by external contractors, including how Toronto Hydro addresses correction of non-conformances.

RESPONSE (B):

Toronto Hydro's project closure process encompasses all aspects of asset acceptance before putting the asset into service. This process includes a checklist of all required forms, such as third-party audits, field verifications, signed as-built drawings, and documentation of any safety, quality, and administrative non-conformances.

Toronto Hydro documents and logs all safety, quality, and administrative non-conformances in an internally managed database. The issuer logs the non-conformance into the database and uploads the required forms and pictures. Following this, an investigation is conducted to determine the root cause analysis and any necessary corrective/preventative action(s). The contractor responds to the non-conformance by completing the corrective/preventative action(s) and root cause analysis fields, subject to the issuer's satisfaction.

Upon review of the contractor's response, the contractor proceeds to rectify the non-conformance. Once rectification is complete, a third-party auditor and/or field administrator confirms whether the proper actions were taken to rectify the NCR and closes the non-conformance in the database.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-298

Reference: Exhibit 4, Tab 2, Schedule 14, Pages 6, 30, 45

QUESTION (A):

a) What impact is AMI 2.0 forecast to have on the expenses for Billing, Remittance and Meter Data Management segment?

RESPONSE (A):

Toronto Hydro does not expect the AMI 2.0 initiative to impact costs forecasted for the Billing, Remittance and Meter Data Management segment during the 2025-2029 rate period. Following implementation, a stabilization period is expected before certain benefits can be realized, and therefore, potential savings such as improved meter data capture are not expected during this rate filing period.

However, during the project's implementation phase the utility expects an increase in meter data exceptions and an increased risk of billing inaccuracies. To manage this additional exception workload and mitigate the risk, Toronto Hydro incorporated additional resource costs in the Metering Services segment of the Preventative and Predictive Overhead Line Maintenance program.[1]

QUESTION (B):

b) Please reproduce Table 5: Collections Segment Expenditures ($Millions) with a separate row for bad debt expense.

[1] Exhibit 4, Tab 2, Schedule 1 at p. 35-41.

RESPONSE (B):

Please see Table 1 below.

Table 1: Reproduction of Table 5 with Bad Debt Expense

Segment	Cost ($ millions)									
	Actual			Bridge		Forecast				
Collections	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Operations Total	3.3	3.2	3.6	4.8	5.3	5.2	5.7	5.8	6.0	6.2
Bad Debt Total	21.7	5.8	4.2	4.8	4.9	5.0	5.1	5.2	5.3	5.4
Grand Total	24.9	9.0	7.8	9.6	10.2	10.2	10.9	11.0	11.3	11.6

Note: Variances due to rounding may exist.

QUESTION (C):

c) Expenses for the collections segment increase by more than $2.6M over 2022 to 2025 due to payroll costs for vacant positions, compensation increases, and staff returning from the CIS project. With staff returning form the CIS upgrade project to support operations, why was there still a need for additional headcount?

RESPONSE (C):

Of the $2.4 million increase in the Collections segment over 2022 to 2025 discussed in lines 12-25 on page 33 of Exhibit 4, Tab 2, Schedule 14, $0.6 million is attributable to staffing increases and inflation related compensation increases. This includes only one new position, a new senior leader role which has been introduced and was filled in early 2024. Three existing and vacant frontline positions were filled in 2023. The balance of the payroll cost increases in this period for the Collections segment reflect the return of staff previously assigned to the CIS upgrade project to the OM&A budget and do not constitute a headcount increase. These payroll cost increases are partially offset by the savings of releasing temporary contract staff backfilling for vacancies and those on project work.

QUESTION (D):

d) Please explain why there is a need for additional staff, and therefore expense increases, in the bridge years and test years?

RESPONSE (D):

Please refer to the response to subpart (c). There is no change in the number of headcount since temporary contracted backfills are utilized to replace vacant staff and those assigned to projects, with the exception of one new senior leader position. This position was created to better balance the scope of duties amongst senior managers in the Customer Care Program. The cost differential for permanent staff versus contracted staff is reflected beginning 2023 and carries forward throughout the bridge and tests years.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-299

References: Exhibit 4, Tab 2, Schedule 15, Page 12
Powering Ahead, 2020 Annual Report, Toronto Hydro Corporation
Court Bulletin, Ontario Ministry of Labour, Immigration, Skills Development
September 27, 2022[1]

In Reference 1 Toronto Hydro states:
"Our recordable injury performance has improved by 43 percent since 2018 and we have not had any critical or fatal incidents since that time".

QUESTION (A):

a) Please clarify the inconsistencies between the referenced documents.

RESPONSE (A):

Due to an administrative error made by a member of the regulatory applications team during the intensive process of finalizing and publishing the pre-filed evidence in the fall of 2023, a draft version of this program narrative was mistakenly filed instead of the final version which included a correction to this statement as follows: "*Our recordable injury performance has improved by 19 percent since 2020 and we have not had any critical or fatal incidents since that time*." Toronto Hydro's regulatory applications team sincerely apologizes for this oversight, and confirms that it has reviewed the rate application document management system and confirmed that all the pre-filed narratives filed were the correct final versions.

[1] Worker Fatality During Electrical Maintenance Results in $200,000 Fine for Toronto Hydro | Ontario Newsroom

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-300

Reference: Exhibit 4, Tab 2, Schedule 15, Pages 20, 22, 26

QUESTION (A):

a) Please confirm that health and safety related training development and delivery costs are in the Talent Management, Change Leadership and Sustainability segment budget.

RESPONSE (A):

Toronto Hydro confirms that the health and safety related training development and delivery costs are included in the Talent Management, Change Leadership and Sustainability segment budget.

QUESTION (B):

b) The budget increase from $5.9M in 2021 to $10M in 2025 was attributed to a reorganization in the division.

i. Please provide details on how the division was reorganized in a manner that resulted in a sustained additional $4.1M of expenses per year.

ii. Why would preparing a rate application, a routine activity at Toronto Hydro, be an initiating factor for a reorganization?

RESPONSE (B):

i. The reorganization of the division did not result in sustained additional $4.1 million of expenses per year from 2021 to 2025. The reorganization involved resources moving from one segment to another. From an overall divisional perspective, program expenditures are expected to increase by $7.1 million from 2020 to 2025 in total. Please refer to Exhibit 4, Tab 2, Schedule 15, Table 3. When normalized for shared services recoveries outlined in Exhibit 4, Tab 5, Schedule 1, the expected total increase in this program is $6.1 million from 2020 to 2025.

ii. The reorganization within the division, including the resources moving into the Human Resources Services & Systems, Organizational Effectiveness, and Employee Labour Relations segment, was undertaken to ensure sufficient resources in that segment to support delivery of current and upcoming organizational strategies and strategic projects, including supporting the division in the rate application, as well as others as described in Exhibit 4, Tab 2, Schedule 15.

QUESTION (C):

c) Please explain why there is a need for increases in the bridge years and test year.

RESPONSE (C):

The cost increases are primarily a result of increasing capacity to support Toronto Hydro's investment plan. Please refer to Exhibit 4, Tab 2, Schedule 15, Pages 6-7, 14, 20, and 28.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-301

Reference: Exhibit 4, Tab 2, Schedule 16, Pages 5, 10-12

Preamble:

Toronto Hydro explains increases in the Controllership segment from $6.5M in 2020 to $9.4M in 2025.

QUESTION (A) - (B):

a) How many additional headcount were required to support each of increased capital spending in the 2020-2024 program and preparation of the 2025-2029 rate application.
b) Why was the staffing level required to complete the 2020-2024 rate application not sufficient to prepare the 2025-2029 application?

RESPONSE (A) - (B):

Please see Toronto Hydro's response to interrogatory 4-SEC-108 part (a).

QUESTION (C):

c) Please explain why there is a need for higher yearly increases in the bridge years and test year for both the Controllership and External Reporting segments.

RESPONSE (C):

Please see Toronto Hydro's response to interrogatory 4-SEC-108 part (a) and Exhibit, Tab 2, Schedule 16 at pages 11 and 19 for an explanation of the reasons for the forecasted increases for the bridge years and test years for Controllership and External Reporting segments.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-302

Reference: Exhibit 4, Tab 2, Schedule 16, Pages 15-16

Preamble:

Toronto Hydro explains increases in the Financial Services segment from $6.7M in 2020 to $10.5M in 2025 is largely due to higher insurance premiums. OEB staff have created the table below which shows the Gross Financial Services budget, and what is referred to as the Net Financial Services budget, which excludes the impact of the stated insurance premium increases. The $1.2M increase from 2022 to 2025 has been spread equally over the three years for illustrative purposes. The increase of the Net Financial services expenses from 2020 to 2025 is $1.3M (average annual compound rate of 3.6%).

	Expenses ($M)					
Segment	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Gross Financial Services	6.7	7.7	8.4	9.3	9.7	10.5
Subtract Insurance Increases	-	0.8	0.5	0.4	0.4	0.4
Net Financial Services	6.7	6.9	7.1	7.6	7.6	8.0

QUESTION (A):

a) Please review and either verify or correct the information in the preamble.

RESPONSE (A):

Toronto Hydro has corrected the information prepared by the OEB Staff in the preamble and have reproduced in Table 1 below with the correct information.

Table 1: Breakdown of Financial Services Segment ($ Millions)

	Actual			Bridge		Forecast
	2020	**2021**	**2022**	**2023**	**2024**	**2025**
Gross Financial Services	6.7	7.7	8.4	9.3	9.7	10.5
Less: Insurance Increases	-	(0.8)	(0.5)	(0.3)	(0.3)	(0.6)
Net Financial Services	**6.7**	**6.9**	**7.1**	**7.7**	**7.8**	**8.0**

QUESTION (B) :

b) What steps is Toronto Hydro taking to limit and manage increasing insurance premiums?

RESPONSE (B):

There are three primary drivers for insurance premiums: (i) self-insured deductible, (ii) policy limit, and (iii) the value of the insured assets. Insurance premiums are also a function of specific loss ratios on policies experienced by the underwriters. While Toronto Hydro has enjoyed a claims free record across many of its policies, its liability insurance premium has been affected by losses experienced by the underwriters. For more information, please see Exhibit 4, Tab 2, Schedule 16, Section 6.2.

To manage and mitigate some of the above factors Toronto Hydro has engaged with Marsh Research Consultants to provide site reports on some of the transformer stations, and a table top exercise on network vaults. These reports are shared with the insurance underwriters prior to the policy renewal to proactively demonstrate mitigation activities and processes being undertaken by Toronto Hydro to reduce risks and improve safety and reliability of physical assets. Additionally, to limit the impact to the OM&A, Toronto Hydro has forecasted self-insured deductible and policy limits to be at the 2023 levels.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-303

Reference: Exhibit 4, Tab 2, Schedule 18, Pages 18-19

Please provide a more detailed explanation for the 61% cost increase in Legal Services from $6.1M in 2020 to $9.8M in 2025.

RESPONSE:

Consistent with Toronto Hydro's principles of developing in-house talent for reasons of both business continuity and cost-efficiency (see 4-Staff-308), the increase in the Legal Services segment budget between 2020 and 2025 is primarily driven by Toronto Hydro investing in building internal capacity and capability to navigate complex and consequential legal matters in the areas of customer connections, relocations, commercial law, construction, real property, litigation, claims, privacy, corporate governance, securities and disclosure.

The specific increase in the Legal Services segment budget between 2020 and 2025 is predominately driven by the addition of 10 FTEs, as shown in the response to interrogatory 4-VECC-74, and by market-based annual compensation increases (as set out in Exhibit 4, Tab 4) associated with attracting and retaining the necessary resource complement in this area of Toronto Hydro's operations.

During 2022-2023, Toronto Hydro increased the staffing compliment by 3 FTEs to address historical resourcing shortages in this portfolio. From 2023 to 2025, the staffing compliment will grow from 28 FTEs to 36 FTEs in order to strengthen internal capacity as noted above. This will allow Legal Services to handle higher volumes of work and complexity observed over the 2020-2024 period and expected into the 2025-2029 period emanating from:

(1) Increasing volumes of customer connections and capital work – as an example, for 2020-2024, the load connection segment is forecast to be 1.75 the gross expenditures initially planned.[1] Please also see the response to 4-SEC-110 (a).

(2) Increasing volumes of relocations due to increased infrastructure development in the City of Toronto (for example, Transit Projects[2] and housing initiatives[3])

(3) Increase in procurement and property-related matters to support higher volumes of work associated with the delivery of an expanded capital program.[4]

[1] Exhibit 2B, Section E5.1
[2] Exhibit 2B, Section E5.2
[3] https://www.toronto.ca/community-people/community-partners/housing-partners/housing-initiatives/
[4] Exhibit 4, Tab 2, Schedule 13

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-304

Reference: Exhibit 4, Tab 2, Schedule 18, Pages 24

Excel file: THESL_4_T02_S18_AppA - OEB Appendix 2-M_20231117

Please re-file OEB Exhibit 4, Tab 2, Section 18, Appendix 2-M, including the missing data for 2021.

RESPONSE:

Please see Toronto Hydro's response to 4-SEC-110 at Appendix A.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-305

Reference: Exhibit 4, Tab 2, Schedule 18, Pages 25-26

QUESTION (A):

a) Please provide a more detailed explanation for the 84% sustained cost increase in Regulatory Affairs from $3.8M in 2020 to $7.0M in 2025.

   i. Please outline any one-time costs that may have been included in Regulatory Affairs versus those contained in Regulatory Applications.

RESPONSE (A):

Consistent with Toronto Hydro's principles of developing in-house talent for reasons of both business continuity and cost-efficiency (see 4-Staff-308), the increase in the Regulatory Affairs segment budget between 2020 and 2025 is primarily driven by Toronto Hydro investing in building internal capacity and capability in its regulatory activities, including ensuring the resources necessary to help increase regulatory acumen throughout the utility's workforce and processes. This is consistent with Toronto Hydro's maturation as a regulated entity, and the utility's ability to keep pace and ensure quality standards are met with the increased volume of regulatory policy, compliance, and applications requirements.

The specific increase in predominately due to the addition of 10 FTEs over this period, as shown in the response to interrogatory 4-VECC-74, and by market-based annual compensation increases (as set out in Exhibit 4, Tab 4) associated with attracting and retaining the necessary resource complement in this area of Toronto Hydro's operations.

From 2020 to 2022, Toronto Hydro increased the staffing compliment in this area by 6 FTE to address historical resourcing shortages in this portfolio,[1] and develop internal capacity for regulatory applications, regulatory compliance, regulatory analytics and reporting, and business support files. The decision to increase in-house regulatory and legal capacity to prepare the 2025 rate application, was supported by a decision to also reduce the external legal expenses budget compared to the last filing, as shown in the response 4-SEC-110.

From 2022 to 2025, increases in payroll are driven by the addition of 4 FTEs (representing an 18% increase) which are necessary to handle higher volumes of work and complexity emanating from OEB-related business activities (e.g. regulatory and energy policy development, implementation and compliance activities). This increase is (i) aligned with the OEB's expanded priorities articulated in recent Business Plans and the Letters of Direction,[2] and (ii) commensurate with the OEB's 18% increase in FTE (from 193 to 228 FTEs) from the 2021-22 budget to the 2023-24 budget.[3]

Application-related costs that are included in the regulatory affairs budget (rather than Appendix 2-M) do not constitute one-time costs because they reflect the reprioritization of work in 2023 and 2024 in order to prepare and adjudicate the rate application. After the application is completed, ongoing application-related work activities and priorities will resume including: (1) preparing, filing, defending and implementation of annual rate updates; (2) interpreting and implementing the OEB's decision, directives and related continuous improvement initiatives; (3) supporting the execution and implementation of the 2025-2029 Investment Plan through monthly oversight processes as noted in 2B-AMPCO-29(d) and annual investment planning activities as described in Exhibit 2B, Section D1; (4) measuring and tracking progress against performance outcomes and other key commitments outlined in the rate application; (5) undertaking regulatory research, analysis and other preparatory activities for the 2030 rebasing application; and (6) supporting regulatory and

[1] This was noted in EB-2018-0165, Volume 5 - Oral Hearing Transcript (July 5, 2019) at pages 27-28
[2] E.g. *Letter of Direction from the Minister of Energy* (November 29, 2023)
[3] Ontario Energy Board, Business Plan 2023-2026 at page 59

energy policy development, implementation and compliance-related work, including active participation and thought-leadership in OEB policy consultations and generic proceedings.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-306

Reference: Exhibit 4, Tab 2, Schedule 18, Pages 38-39

Please provide a more detailed explanation for the 83% cost increase in Communications and Public Affairs from $3.6M in 2020 to $6.6M in 2023.

RESPONSE:

Based on the quoted numbers, Toronto Hydro assumes that the question is asking about the increase in this segment from 2020 to 2025, rather than 2020-2023.

The increase in the Communications and Public Affairs segment budget between 2020 and 2025 is driven by: (i) $1.9 million increase in external services costs related to a return to pre-pandemic levels of customer communications, and (ii) $1.1 million increase due to market-based annual wage increase of existing headcount (in accordance with the compensation philosophy in Exhibit 4, Tab 4) and the addition of 5 FTEs over this period, as shown in the response to interrogatory 4-VECC-74.

Customer communications focus on crucially important topics such as rates, financial assistance, public safety, crew safety, fraud prevention, outages, emergency preparedness, online tools and services, and customer education generally, including about the energy transition and related topics. Increased costs in this area reflect a return to normal levels of communication following the COVID-19 pandemic, along with an increase that is prudent and necessary to meet growing customer expectations. This includes engaging with customer through an increasing number of communications channels (e.g. additional social media channels and online tools) and being responsive to customers' expectations for more timely and frequent communications with Toronto Hydro as an essential service provider.

External costs support the planning, development and execution of frequent communications with customers through a variety of channels, as outlined in Exhibit 4, Tab 2, Schedule 18 at Page 28. For example, Toronto Hydro recently planned and executed a multi-channel public safety campaign, including an email deployment to customers sharing important public safety information. The email had an open rate of 60% -- well above the average email open rate of around 40% -- reflecting a high level of customer engagement and interest in the subject matter.

The increase is also attributable to the addition of 4 FTEs to support the day-to-day management of digital communications channels and increasing customer expectations with respect to engagement through these channels. Since 2020, there have been more than 45,000 online mentions of Toronto Hydro, and the utility has resolved 5,226 customer issues via social media. As of July 2023, Toronto Hydro has over 121,400 followers on X (formerly known as Twitter), approximately 40%-60% more followers than the other three large distributors in Ontario. Additionally, the resources are necessary to respond to an overall increase operational volume of work, associated with customer communications and engagement needs. For example, the volume of customers contacting Toronto Hydro regarding equipment placement has increased approximately 258 % since 2019.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-307

References: Exhibit 4, Tab 4, Schedule 2, OEB Appendix 2-K

QUESTION (A):

a) With respect to individual contributor positions, that is, those employees who have no direct reports, but whose employment is not covered by a collective agreement:
   i. What line item in Appendix 2-K has Toronto Hydro included them in?
   ii. What positions fall under this classification?
   iii. What were the actual FTEs for each year from 2020-2023?
   iv. What are the forecast FTEs for each year from 2024-2029?

RESPONSE (A):

Individual contributors are included in Appendix 2-K as non-Management (union and non-union). Positions that fall under the individual contributor category include: Administrator, Analyst, Associate, Clerk, Consultant, Coordinator, Counsel, and Specialist. Please refer to the appendix filed in 4-AMPCO-87 for the requested breakdown in sub-parts (iii) and (iv); individual contributors are categorized as Non-Union in that table.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-308

References: **Exhibit 4, Tab 4, Schedule 3, Page 6**

Exhibit 4, Tab 4, Schedule 2, OEB Appendix 2-K

EB-2018-0165 / THESL_Sch08 - Workforce Staffing and Compensation OEB Appendix 2-K_xlsx_20200121

Preamble:

In reference 1 Toronto Hydro states it "needs to expand its workforce by approximately 214 resources starting in 2024 through 2029 to meet the imperatives and objectives of its 2025-2029 investment plan".

Reference 3 is the Appendix 2-K submitted as part of the draft rate order in Toronto Hydro's last CIR application. It contains the forecast information for 2020. OEB staff have compiled the information both versions of Appendix 2-K in the table below.

	Forecast (EB-2018-0165)	Actual			Bridge		Forecast				
	2020	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
FTE – Management	66	71	67	73	86	96	96	96	97	98	98
FTE – Non-Management	1393	1,250	1,136	1,154	1,221	1,367	1,435	1,477	1,499	1,519	1,532
FTE – Total	1459	1,321	1,203	1,227	1,307	1,463	1,531	1,572	1,596	1,617	1,631
FTE Management Change	-	5	-4	6	13	10	0	0	1	1	0
FTE Non-Management Change	-	-143	-114	18	67	146	68	42	22	20	13
% change FTE Management	-	7.9	-5.6	9.0	17.8	11.6	0.0	0.0	1.0	1.0	0.0
% change FTE non -Management	-	-10.3	-9.1	1.6	5.8	12.0	5.0	2.9	1.5	1.3	0.9
% change FTE Total	-	-9.4	-8.9	2.0	6.5	11.9	4.6	2.7	1.5	1.3	0.9
Non-Man / Man	21.2	17.6	17.0	15.8	14.2	14.2	14.9	15.4	15.5	15.5	15.6

QUESTION (A):

a) Please review and either verify or correct the information in the preamble.

RESPONSE (A):

Confirmed.

QUESTION (B):

b) Please confirm that and explain why, as shown in the preamble, almost half of the 214 hires required for the 2024-2029 period would occur in 2024.

RESPONSE (B):

As stated in Exhibit 4, Tab 1, Schedule 1 at pages 22-23:

> *As Toronto Hydro prepares to enter its next rate period, staffing levels are forecasted to grow by 25 percent over the 2024 through 2029 period. Due to the necessity of long lead time investments in human capital (see below), this growth is higher in the beginning years [i.e 2024 and 2025] and more gradual over the rest of the period, focused on scaling teams that require additional resources and expanded skills to plan, design and execute capital and operations work programs.*
>
> *Just as it takes years to build new transformer station or convert an area of the city served by legacy infrastructure to modern standards, human capital investments require long lead times, with the average employee undergoing two years training and development before becoming a fully competent contributor due to the specialized nature of the skills and experience required to work in this sector. For certain trades, it takes anywhere from four and a half to six and a half years to train a new certified and skilled tradesperson, plus a minimum additional one to two years to develop a new frontline leader post apprenticeship.*
>
> *Toronto Hydro often hires capable, but relatively inexperienced employees, with the intention to develop them in-house through on-the-job training and mentoring by tenured*

staff who can ensure effective knowledge and skill transfer to the next generation of employees.

In summary, hiring must be initiated in 2024 in order to have sufficient lead-time to recruit, onboard, train and develop employees into fully competent contributors capable of meeting customers' demands and delivering the 2025-2029 Investment Plan and its performance objectives. Without this hiring in 2024, Toronto Hydro may not have the staffing capacity and capabilities it needs in the outer years of the period. Please see Exhibit 4, Tab 4, Schedule 3, Table 1 at Pages 12 – 13 which speak to the workforce skill sets and capabilities required to support asset investment plans.

QUESTION (C):

c) Toronto states the non-management staff numbers decreased from the 2020 plan to 2021 actual largely due to impacts of the COVID-19 pandemic. Please confirm that non-management numbers at the end of 2024 are forecast to be below the plan numbers for 2020.

RESPONSE (C):

Confirmed, however it is important to contextualize and understand why non-management numbers at the end of 2024 are below the plan numbers for 2020. In the last rate application when the plan line for 2020 was established, Toronto Hydro forecasted certain retirement projections and associated hiring plans to replenish the aging workforce. Specifically, Toronto Hydro projected the retirement of 278 employees by the end of 2021.[1] Due to changing employee preferences arising out of the global COVID-19 pandemic, the actual retirements from 2018-2021 exceeded the projection by approximately 100 employees (see IR 4-AMPCO-83 for details). To put this in context, the utility experienced an increase of one-third more employees departing the organization earlier than planned, at a time during which it was also very challenging to hire and onboard new entrants due to (i) social distancing restrictions imposed by the pandemic and remote work considerations,

[1] Please see EB-2018-0165, Exhibit 4A, Tab 4A, Schedule 3 at page 20, Table 4.

and (ii) loss of experienced workers who are necessary to safely and efficiently train, develop and absorb new resources into the organization (e.g. maintaining the appropriate apprentice to qualified journeyperson ratios). During this challenging time of change and instability in the labour economy, Toronto Hydro also experienced higher than usual turnover rates for other (non-retirement) exits in certain groups, which places further pressure on non-management staffing levels. The staffing plan outlined in Exhibit 4, Tab 4, Schedule 4, reflects the practical consideration that the utility continues to recover from the workforce impacts of this unusual period of time.

QUESTION (D):

d) Please explain the requirement for a 48% increase in management employees from 2020 plan to 2024 forecast.

RESPONSE (D):

Please see response to 4-AMPCO-84 part (b) and (c).

QUESTION (E):

e) Please explain the reason for the non-management staff to management staff ratio has decreased from the 2020 plan to the 2024 bridge year and through the 2025-2029 forecast period.

RESPONSE (E):

Toronto Hydro does not derive span of control for Management FTEs by simply dividing the total Management FTEs into the total Non-management FTEs. Organization design considers a variety of factors and is not a “one size fits all” solution for each area of the company. Considerations include factors such as specialized knowledge, skills and competencies, key accountabilities for the position, process and management system ownership, level of influence, and the nature and complexity of the work executed by the team. For those areas of the organization with high volume, repeatable work tasks the ratio of management to non-management FTE’s is higher than in those areas executing more complex individualized knowledge work product. Thus, in our respectful view,

looking at top level ratios of management to non-management across an organization with the breadth and diversity of work and skills sets like Toronto Hydro, does not yield an appropriate assessment. A case-by-case consideration of these ratios is much more appropriate.

QUESTION (F):

f) How does Toronto Hydro intend to execute its significantly larger capital plan for the forecast period, compared to the historic period, with the proposed increase of non-management staff during the forecast period over 2020 levels?

RESPONSE (F):

Toronto Hydro's Staffing strategy is detailed in Exhibit 4, Tab 4, Schedule 3 at pages 22-31. Toronto Hydro utilizes a multi-pronged approach to build a flexible talent pool to enable efficient execution of its asset investment plans. Approaches include internal talent development, external hiring of both experienced resources and new graduates and outsourcing to third-party service providers. The resourcing approach for each program and segment is determined by factors such as the availability of resources (or service providers) in the external market, and the degree of specialized knowledge or skills required. Where external market resources are readily available, outsourcing will complement the hiring of internal capabilities to support the delivery of the work in programs such as Work Program Execution, Information Technology and Customer Care. In those areas where specialized knowledge of the utility's distribution system, assets and operations is required to drive and support investments the hiring and development of internal talent is a preferred strategy. Examples where this approach is leveraged include programs as Control Centre, Finance, Legal and Regulatory or Human Resources, Environment and Safety. In these areas, the utility requires a highly-skilled and capable pool of resources that must be developed internally.

QUESTION (G):

g) Please outline any projects THESL has, that Toronto Hydro is aware of, that will result in increased services from Toronto Hydro, such as LED conversion of streetlights.

RESPONSE (G):

Toronto Hydro is not aware of any projects that THESI has which would result in increased services from Toronto Hydro.

QUESTION (H):

h) What would be the impact be to the 2 management positions and approximately 100 non-management positions to be hired during the forecast period if there were reductions to capital budget for 2025-2029 of 10, 20 or 30%?

RESPONSE (H):

Toronto Hydro is unable to answer this question within the timelines for responding to interrogatories. The utility would need to undertake a planning exercise to assess and evaluate the workforce implications of a revised capital expenditures plan, along with appropriate considerations of other key parameters of an OEB decision.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-309

References: Exhibit 4, Tab 1, Schedule 1, Pages 32-33, 38
Exhibit 4, Tab 2, Schedule 9, Table 1, Table 3
Exhibit 4, Tab 2, Schedule 9, Section 5.1.2

Preamble:

Toronto Hydro has proposed an increase to its workforce plan, particularly in the area of System Planning, in part to support work related to the energy transition and electrification of its system, including its grid modernization plan, flexibility services, including integration of DERs and Non-Wires solutions.

QUESTION (A):

a) Please provide a table that shows the staffing levels in the system planning group during the current rate period and the proposed 2025-2029 rate period.

RESPONSE (A):

Table 1 below describes FTE staffing levels in the system planning group during the current rate period and the proposed 2025-2029 rate period.

Table 1: FTE Staffing Levels in System Planning – 2020 to 2029

Segment Name	Actuals			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
System Planning	62	70	81	82	98	105	115	119	120	120

QUESTION (B):

b) Please indicate the number of staff proposed to be dedicated to work related to the energy transition, the roles of the staff, a general description of their responsibilities, and salary levels for the roles.

RESPONSE (B):

Toronto Hydro cannot provide the requested breakdown as the System Planning program does not have a dedicated pool of resources allocated to energy transition. Over the next rate period, Toronto Hydro's system investment needs are growing and the challenges of system planning are becoming more complex due to energy transition and other interrelated drivers described in the evidence at Exhibit 2B. To deal effectively with these System Planning needs and challenges, Toronto Hydro must increase resourcing in this area by 38 FTEs over the next rate term, for the reasons that follow.

Increasing Capital Work Volume: By far the most significant driver of this increase is the general increase in capital work across the Growth, Sustainment, and Modernization programs (detailed throughout Exhibit 2B, Section E), driven in part, but not exclusively by, the energy transition. With an 47% increase in capital investment across the various system investment programs, there is a correlating need to scale-up the available pool of engineering and analyst resources who are responsible for studying the system, identifying projects, developing those projects into detailed scopes of work, and advising on changes to the projects as they move through design and execution. Toronto Hydro will also need greater support in the Records Management area to keep pace with the higher volume of changes in asset information related to the completion of incremental capital work. While none of these incremental positions will be "dedicated" to the energy transition, they will all be contributing to ensuring that Toronto Hydro is able to facilitate customers' increased and evolving use of electricity. They will be part of an expanded pool of resources dealing with a volume of work that is greater in part because of the demands of electrification, decarbonization, and Distributed Energy Resource ("DER") proliferation. Figure 1 in Exhibit 4, Tab 2, Schedule 9 shows the expected increase in the value of scopes of work and demand program expenditures (primarily customer connections and generation connections) in 2025-2029.

Grid Modernization and Continuous Improvement in Asset Management: The other driver of this increase is the need to adequately support the modernization efforts detailed throughout Toronto Hydro's DSP. Toronto Hydro has outlined various plans to accelerate its efforts to apply technology, innovation, and best practices to enhance the value derived from its assets ("asset performance")

and its Asset Management System ("asset management capabilities"). These efforts are broadly outlined in Exhibit 2B, Section D1.2.1.1, and further detailed within the utility's comprehensive Grid Modernization Strategy in Section D5. As discussed in the introduction to the strategy (D5.1), the decision to accelerate the modernization dimension of the utility's investment plan is driven in part by the realities of the energy transition.

As discussed in response to 2B-DRC-12, successful delivery of modernization and innovation efforts will depend in part on having the appropriate resources and skillsets. This will include creating sufficiently robust modernization, innovation, data governance and analytics functions, with a particular focus on building strategy implementation and change management competence that enables a sustained organizational focus on transformative activities efforts that go beyond day-to-day engineering and operations.

The System Planning function is one of the most critical areas in the organization where these incremental capabilities and skillsets are being developed, especially within the Integrated Planning & Grid Modernization functional area (discussed in Exhibit 4, Tab 2, Schedule 9, section 5.1.3.). This area will increasingly be responsible for supporting long-term change and transformation when it comes to grid planning and related asset management capabilities, and will be responsible for leading, facilitating and supporting necessary utility initiatives, including:

- Implementation and governance of the 2025-2029 Grid Modernization Strategy (Exhibit 2B, Section D5);
- Implementation and governance of the distribution system-related aspects of the Innovation Fund detailed in Exhibit 1B, Tab 4, Schedule 2;
- Development and implementation of the *Asset Analytics & Decision-making* element of the Grid Modernization Strategy (Section D5.2.3), including development of an Asset Management Capabilities roadmap, an Asset Information Strategy, implementation and enhancement of asset planning tools and frameworks, and development and implementation of advanced analytics to improve decision-making capacity and effectiveness;

- Direct support for the *Grid Readiness* element of Toronto Hydro's Grid Modernization Strategy (Section D5.2.2), including initiatives which involve innovation, analytics, and scenarios forecasting, such as the Hosting and Load Capacity Map initiative, GIS DER Asset Tracking, DER Management System ("Energy Centre") road-mapping and enhancements, AMI 2.0 analytics use case and benefits realization, Flexible Connections pilots, and the next iteration of strategic scenario-based load forecasting enhancements, including low-voltage level monitoring and forecasting of demand; and
- The ISO 55001 Alignment and Certification Project.

For more information on the functions performed by the System Planning segment, please refer to Exhibit 4, Tab 2, Schedule 9, section 5.

With respect to salary ranges, Toronto Hydro does not believe that the requested information is probative because this information does not provide an evaluative basis to assess whether the ranges are commensurate with position and the experience. That information is provided in the Mercer Non-Executive Compensation Study Exhibit 4A, Tab 4, Schedule 5, Non-executive Compensation and Benefits Review (Mercer Canada) which shows that Toronto Hydro's compensation strategy consistently yields costs (i.e. salary and wages) that are market-competitive at the 50th percentile within both the energy sector and general industry.

QUESTION (C):

c) Please discuss the need and identify the specific projects/tasks that the proposed new staff related to the energy transition and electrification (including grid modernization, DER integration and non-wires solutions) will be assigned over the 2025-2029 period.

RESPONSE (C):

Please see response to part (b). For details regarding the key investments and objectives related to the Toronto Hydro's modernization and growth efforts in preparation for the energy transition and increasing electrification, please refer to Exhibit 2B, Sections D1, D4, D5, E2, E3, E5, and E7.

QUESTION (D):

d) Has Toronto Hydro retained staffing with the required knowledge to deliver local and/or Province-Wide CDM programs (currently offered through the IESO) should policy change and local distribution companies be provided a path for greater program activity? If yes, please discuss how these staff have been incorporated into other business functions, and the ease with which they could manage additional responsibilities should they be required.

RESPONSE (D):

Toronto Hydro has retained the majority of the employees with required knowledge, skillsets and capabilities to support *non-rate regulated business activities* in accordance with the utility's Climate Action Plan.[1] These resources could be engaged to provide expertise should the need arise. However, incremental mandates for distributors to deliver local and/or Province-wide CDM programs (currently offered through the IESO) would have to come along with incremental funding to do this work, as these needs have not been factored into the 2025-2029 Investment Plan.

[1] Toronto Hydro, Climate Action Plan at pages 44-53: https://www.torontohydro.com/documents/20143/74105431/climate-action-plan.pdf/8fe4406c-7675-76a7-00c9-c0c4e58ae6df?t=1638298942820

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-310

References: Exhibit 4, Tab 5, Pages 2, 6-7

Exhibit 4, Tab 5, Appendix 2-N

Preamble:

OEB staff have compiled the following tables showing costs allocated from Toronto Hydro Corporation (THC) to Toronto Hydro-Electric Systems Limited (THESL), from the information in Appendix 2-N.

Table 4-1: Percent of Corporate Costs Allocated from THC to THESL

Year	Corporate Stewardship – Board of Directors	Corporate Stewardship – CEO	Finance Stewardship – CFO
2020	52%	52%	83%
2021	96%	96%	93%
2022	89%	90%	89%
2023	89%	89%	89%
2024	89%	89%	89%
2025	89%	89%	89%
2026	89%	89%	89%
2027	89%	89%	89%
2028	89%	89%	89%
2029	89%	89%	89%

Table 4-2: Amount Allocated from THC to THESL ($ 000)

Year	Corporate Stewardship Board of Directors	Corporate Stewardship CEO	Finance Stewardship CFO	Total
2020	170	2,580	1,100	3,850
2021	260	2,090	1,500	3,850
2022	250	2,950	1,390	4,590
2023	350	2,100	1,240	3,690
2024	360	2,170	1,540	4,070
2025	370	2,250	1,580	4,200
2026	380	2,330	1,630	4,340
2027	380	2,420	1,690	4,490
2028	390	2,500	1,740	4,630
2029	400	2,600	1,790	4,790

QUESTION (A):

a) Please review and either verify or correct the information in the preamble.

RESPONSE (A):

Toronto Hydro made a data entry error when populating "% of Corporate Costs Allocated" column for the year 2020 in OEB Appendix 2-N Shared Services and Corporate Cost Allocation (Exhibit 4, Tab 5, Schedule 2). Toronto Hydro has corrected and refiled OEB Appendix 2-N as an addendum to this interrogatory. Additionally, Toronto Hydro can confirm this error was isolated to the OEB Appendix 2-N, therefore no changes are required to any other shared services table such as those presented in OEB Appendix 2-H, and Exhibit 4, Tab 5, Schedule 1.

As a result of the aforementioned correction, Toronto Hydro has reproduced Table 4-1-1 with the corrected information whereas, OEB staff produced Table 4-2 is confirmed to be correct.

Table 4-1-1: Percent of Corporate Costs Allocated from THC to THESL

Year	Corporate Stewardship - Board of Directors	Corporate Stewardship - CEO	Finance Stewardship - CFO
2020	**96%**	**96%**	**83%**
2021	**96%**	**96%**	**93%**
2022	**89%**	**90%**	**89%**
2023	**89%**	**89%**	**89%**
2024	**89%**	**89%**	**89%**
2025	**89%**	**89%**	**89%**
2026	**89%**	**89%**	**89%**
2027	**89%**	**89%**	**89%**
2028	**89%**	**89%**	**89%**
2029	**89%**	**89%**	**89%**

QUESTION (B):

b) Reference 1 states "Toronto Hydro's shared services methodology has not changed since the utility's last rebasing application." Please explain why the Corporate Stewardship costs for the Board of Directors and CEO changed from 52% in 2020 to 89% in 2025.

RESPONSE (B):

Please see the response to part (a) above.

QUESTION (C):

c) Please explain what costs are captured in Corporate Stewardship - Board of Directors, Corporate Stewardship - CEO and Corporate Stewardship - CFO.

RESPONSE (C):

The services costs that are allocated from THC to Toronto Hydro mainly consist of: (i) board of director fees, (ii) compensation costs for THC employees including the CEO, the CFO and an executive assistant to the CEO, and (iii) legal and consulting fees related to corporate initiatives.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 4-STAFF-311

Reference: Exhibit 4, Tab 5, Schedule 1

QUESTION (A):

a) Please provide any third-party review of the corporate cost allocation methodology used for transactions between Toronto Hydro and any of its affiliates.

RESPONSE (A):

Toronto Hydro has not conducted any third-party review of the corporate cost allocation methodology used for transactions between Toronto Hydro and any of its affiliates. As noted in the evidence,[1] the utility's shared services methodology has not changed since the last rebasing application.

[1] Exhibit 4, Tab 5, Schedule 1, at p. 2-4.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-68

Reference: Exhibit 4, Tab 1, Schedule 1, Page 4

Please provide a copy of Toronto Hydro's resource plan.

RESPONSE:

Toronto Hydro's resource plan is described in Exhibit 4, Tab 4, Schedule 3, Table 1 (pages 12-13) and Section 3 (pages 13-22). Table 1 outlines the requisite skillsets and job types and Section 3 outlines the resourcing levels the utility needs to: (i) deliver its work programs safely, reliably and efficiently, and (ii) achieve the performance outcomes that customers need and stakeholders value as outlined in Exhibit 1B, Tab 3, Schedules 1 and 2.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-69

Reference: Exhibit 4, Tab 1, Schedule 1, Page 10

QUESTION:

The evidence states "Managing workforce-related costs downwards to live within a standard IRM funding paradigm would entail a reduction to Toronto Hydro's overall staffing complement of up to 200 resources by the end of the rate period, putting total FTEs below 2015 levels.

Please provide the details of this calculation.

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 4-VECC-57.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-70

Reference: Exhibit 4, Tab 1, Schedule 1, Page 15

With respect to Figure 3, Toronto Hydro indicates it spends considerably less OM&A relative to capital in comparison to the peer group, in many years showing an OM&A-to-CAPEX ratio of less than half that of the peer group.

Please provide an explanation for this variance.

RESPONSE:

As stated on page 14 of Exhibit 4, Tab 1, Schedule 1, it is Toronto Hydro's assertion that it "(i) has a lean workforce compared to its Ontario peers and (ii) is a strong OM&A cost performer compared to other large and mid-sized distributors in the province". The specific drivers of the variance noted will be a reflection of each utility's investment needs, workforce decisions, and other relevant cost factors; detailed data which is not readily available to Toronto Hydro.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-71

REFERENCES: Exhibit 4, Tab 1, Schedule 1, p. 15

QUESTION:

With respect to Figure 5, Toronto Hydro has a considerably lower FTE per $1 million in capital expenditures relative to the peer group, staffing an average of 2.86 FTE per $1 million in capital expenditure, compared to an average of 7.5 FTE for the peer group.

Please provide an explanation for this variance.

RESPONSE:

Toronto Hydro does not have the utility-specific data regarding other members of the peer group necessary to explain this variance, but presumes that variance is in part attributable to Toronto Hydro having a comparatively lower staffing complement than the peer group average.[1] This presumption is supported by the other per FTE metrics in the referenced evidence.

[1] Exhibit 4, Tab 1, Schedule 1, p.14

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-72

Reference : Exhibit 4, Tab 1, Schedule 1, Page 18-19

Please provide Figures 8, 9 and 10 for the years 2023 to 2029.

RESPONSE:

Toronto Hydro cannot provide versions of these figures inclusive of the peer group past 2022 (the most recent year for which RRR data is available), as it does not have forecast data pertaining to other utilities. For Toronto Hydro, these figures extended to 2029 can be found at the following references:

- FTE per 1,000 Customers: 1B-CCC-14
- OM&A per Customer: Exhibit 4, Tab 1, Schedule 1, page 12
- MWh per Customer: 4-CCMBC-14

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-73

Reference: Exhibit 4, Tab 1, Schedule 1, Page 22

For each of the years 2020-2024, please provide the staffing levels projected in the 2020-2024 rate application.

RESPONSE:

The 2020 forecast of 1459 FTEs is reflected in the updated Appendix 2-K filed with the 2020 Draft Rate Order (EB-2018-0165). Toronto Hydro did not have a forecast of staffing levels for 2021-24 and cannot create one by applying the I-X calculation.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-74

References: Exhibit 4, Tab 1, Schedule 1, Pages 32-50

AMPCO calculates the change in FTEs allocated to the Major Programs and Functions between the end of 2022 and the end of 2029 as follows:

# FTEs	End of 2022	End of 2029	Variance
Internal Work Execution	360	421	61
External Work Execution	69	120	51
System Planning	85	116	31
Information Technology	107	126	19
Control Centre Operations	85	118	33
Customer Care	106	147	41
Corporate Services	233	263	30
Total	1,045	1,311	266

Figure 11 on page 20 shows 1631 Total FTEs in 2029 compared to 1227 at the end of 2022, an increase of 404 FTEs.

Please provide the allocation of the 138 incremental FTEs (404-266) not allocated to the Major Program and Functions in the above table.

RESPONSE:

Please see response to interrogatory 4-SEC-92 a).

Included below are specific program segments requested.

1 **Table 1: FTE Allocation for Specified Program Segments**

Specified Program Segments	End of 2022	End of 2029	Variance
Asset and Program Management - System Planning	81	120	39
Work Program Execution - Internal	353	424	71
Work Program Execution - External	67	120	53

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-75

References: Exhibit 4, Tab 1, Schedule 1, Page 50

Preamble:

With respect to Corrective Work Requests, Toronto Hydro uses a prioritization framework that classifies asset deficiencies into four categories (P1, P2, P3, P4) depending upon the urgency/severity of the deficiency.

QUESTION (A):

a) Please complete the following Table:

# of Deficiencies	2018	2019	2020	2021	2022	2023
P1						
P2						
P3						
P4						

RESPONSE (A):

Please see Table 1 below.

Table 1: Number of Deficiencies by Priority Category

# of Deficiencies	2018*	2019	2020	2021	2022	2023
P1	-	671	668	625	737	507
P2	-	1,936	2,442	2,512	2,269	2,548
P3	-	3,954	3,390	7,190	8,701	10,019
P4	-	6,600	5,763	7,849	13,367	8,044

*2018 data is excluded due to the transition to SAP that occurred during that year.

QUESTION (B):

b) Please provide the same table in part a) on the basis of deficiencies not addressed at the end of each year.

RESPONSE (B):

Please see Table 2 below.

Table 2: Number of Deficiencies by Priority Category Not Addressed at End of Year

# of Deficiencies	2018*	2019	2020	2021	2022	2023
P1	-	0	0	0	0	0
P2	-	1	62	5	3	15
P3	-	388	1,192	4,627	5,914	8,873
P4	-	6,600	5,763	7,849	13,367	8,044

*2018 data is excluded due to the transition to SAP that occurred during that year.

QUESTION (C):

c) Please complete the following Table:

# of Deficiencies Allocated to:	2018	2019	2020	2021	2022	2023
Overhead						
Underground						
Stations						
Network						
Other						

RESPONSE (C):

Please see Table 3 below.

Table 3: Allocation of Deficiencies by System

# of Deficiencies Allocated to:	2018	2019	2020	2021	2022	2023
Overhead	-	2,206	2,297	1,976	3,597	1,703
Underground	-	9,155	8,277	13,437	17,151	15,111
Stations	-	766	664	699	978	963
Network	-	1,034	1,025	2,064	3,348	3,341
Other	-	All deficiencies are included above				

*2018 data is excluded due to the transition to SAP that occurred during that year.

QUESTION (D):

d) Please complete the following Table:

# of Deficiencies Allocated to:	2018	2019	2020	2021	2022	2023
Corrective Maintenance						
Reactive Capital						

RESPONSE (D):

Please see Table 4 below.

Table 4: Allocation of Deficiencies to Reactive Capital and Corrective Maintenance

# of Deficiencies Allocated to:	2018*	2019	2020	2021	2022	2023
Reactive Capital	-	1,990	1,644	1,033	1,307	783
Corrective Maintenance	-	13,161	12,263	18,176	25,074	21,118

*2018 data is excluded due to the transition to SAP that occurred during that year.

QUESTION (E):

e) Please complete the following Table:

# of Deficiencies Allocated to:	2018	2019	2020	2021	2022	2023
Horseshoe						
Downtown						

RESPONSE (E):

Please see Table 5 below.

Table 5: Corrective Maintenance Deficiencies Allocated to Downtown and Horseshoe

# of Deficiencies Allocated to	**2018***	**2019**	**2020**	**2021**	**2022**	**2023**
Downtown	-	3,134	3,268	6,076	10,237	7,950
Horseshoe	-	10,027	8,995	12,100	14,837	13,168

*2018 data is excluded due to the transition to SAP that occurred during that year.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-76

References: Exhibit 4, Tab 2, Schedule 1, Page 7

For the Overhead Line Patrol segment, starting in 2019 Toronto Hydro has tracked the exact number of kilometers of overhead distribution patrolled each year in order to ensure it is more accurately charged for areas patrolled.

Please provide the number of kilometres patrolled for each of the years 2019 to 2029 (actual & forecast).

RESPONSE:

Please see Table 1 below for 2019-2023 actual and 2024-2029 forecasts of the number of kilometres of overhead distribution patrolled.

Table 1: Actual (2019-2023) and Forecast (2024-2029) Overhead Distribution Line Patrolled

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Overhead Line Patrol (km)	2,928	2,169	3,962	2,922	2,165	3,962	2,922	2,165	3,962	2,922	2,165

The forecasts are based on historical actuals and do not take into consideration changes to the overhead distribution system.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-77

Reference: Exhibit 4, Tab 2, Schedule 1, Page 12

Figure 2 provides data for wood poles in HI4 & HI5 from 2020-2022. Please add 2023 to Figure 2.

RESPONSE:

Please see Figure 1 below.

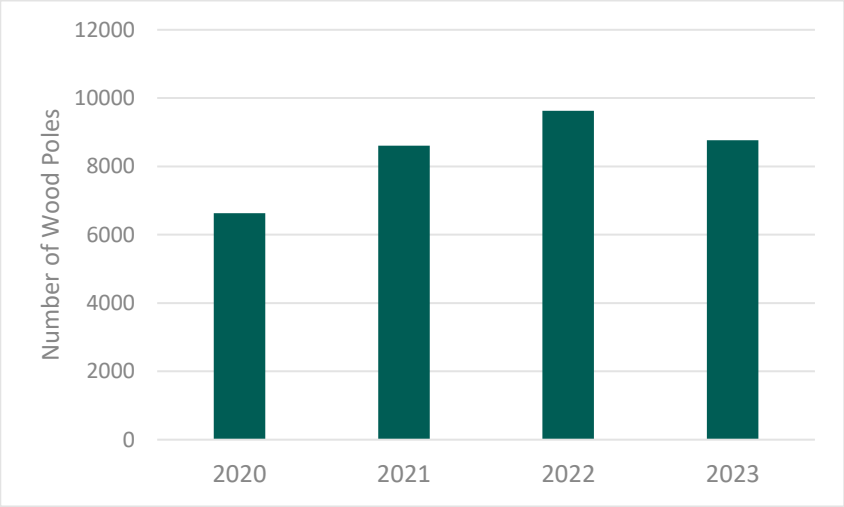


Figure 1: Wood Poles in HI4 & HI5 from 2020-2023

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-78

Reference: Exhibit 4, Tab 2, Schedule 5, Page 3

The Emergency Response Program includes funding for Storm and Major Event Restoration.

Please provide the spending for each of the years 2020 to 2023 and the forecast for 2025-2029.

RESPONSE:

Please see the table below.

Table 1: Storm and Major Event Restoration Costs

	Actual				Forecast					
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Storm & Major Event Restoration Costs ($ million)	2.0	1.4	3.0	0.9	3.2	3.4	3.5	3.6	3.6	3.7

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-79

Reference: Exhibit 4, Tab 2, Schedule 2, Page 31

Figure 19 shows cable diagnostic testing deficiencies identified between 2021 and 2022.

Please provide the number of deficiencies for transformer, switchgear, accessory and other for each of the years 2020 to 2023.

Please explain what equipment is included in "Other".

RESPONSE:

Please see Table 1 below for the breakdown of deficiencies reported from cable diagnostic testing performed over 2020 to 2023.

Table 1: Cable Diagnostic Testing Deficiencies Identified 2020-2023

Asset Class	2020	2021	2022	2023
Transformer	-	2	1	-
Switchgear	-	4	1	3
Accessory	2	16	26	20
Other	-	14	8	10
Cable Segments[1]	-	5	15	47
Total	**2**	**41**	**51**	**80**

The "Other" category includes deficiencies pertaining to grounding apparatus, faulted circuit indicators, lid bolts, switches and transformers requiring CO_2 washing, low SF_6 gas for switchgear, bollards, and nomenclature.

[1] This category includes longer term actions required for cable segments – either planned capital replacements or future testing to monitor condition.

Toronto Hydro notes that in 2020 there was limited activity as it was in the early stages of cable diagnostic testing and started to ramp-up in January 2021.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-80

References: **Exhibit 4, Tab 2, Schedule 16, page. 14: "Internal audit provides independent and objective reporting to Toronto Hydro Corporation's Audit Committee and management through operational, compliance, and performance audits. "**

QUESITON (A) :

a) Please provide the current internal Audit Plan for 2024-2029.

RESPONSE (A):

Toronto Hydro plans internal audits in terms of three-year cycles and assesses its internal audits annually. The audits to be performed in 2027-2029 will be added to the three-year cycle in due course. Please refer to the table below.

2024 Reviews	2025 Reviews	2026 Reviews
Customer Connections, Financial Processes	Customer Billing, Post CC&B System Upgrade	Distribution Asset Management
Asset Removal and Derecognition Process	Contract Management Process	Sole Source and Time and Material Contracts
Inventory and Warehousing, Post System Upgrade	Customer Connection, Operational Processes	Meter Data Processing Systems
Construction, Change Order Process	Entity Level Controls Review	Regulatory Reporting, Financial Processes
Employee Reimbursement, Post System Upgrade	Executive Travel and Expense	Employee Reimbursement
Duplicate Invoice Review	Duplicate Invoice Review	Duplicate Invoice Review
Fraud Risk Assessment	Fraud Risk Assessment	Fraud Risk Assessment
Information Technology General Controls	Information Technology General Controls	Information Technology General Controls

2024 Reviews	2025 Reviews	2026 Reviews
Cyber Security, External Perimeter Controls	SAP Security	Cyber Security, Smart Grid Devices
Cyber Security, OEB Compliance	Cyber Security, Grid Operational Technology	Cyber Security, Data Loss Prevention
Cyber Security, Incident Response Process	ESG Disclosure Processes and Controls	Cyber Security, NIST Compliance
Misc. Accounts Receivable, Reaudit & Advisory	ESG Disclosure Processes and Controls	ESG Disclosure Processes and Controls
Customer Billing, Post CC&B System Upgrade (Internal Control Advisory)		

QUESTION (B) :

b) Please provide a list of any external audits undertaken over 2020-2024 with respect to Toronto Hydro.

RESPONSE (B):

Please see the table below.

Auditing Entity/Organization	Topic	Date
City of Toronto Auditor General	Cyber Security Audit	2024
Comtech Group	Program/Project Management Office Best Practices Assessment	2021-2022
Critical Infrastructure Directorate of Public Safety Canada	Regional Resilience Assessment Program ("RRAP")	2019-2020
Electrical Safety Authority (ESA)	Annual Audit and Declaration of Compliance under O. Reg. 22/04	2020-2024 (annual)
IESO	Annual Metering Installation Audits	2020-2023 (annual)
IESO	CDM Conservation First Framework Compliance Audit	2023-2024
KPMG	Annual Audit and Quarterly Reviews of Financial Statements	2020-2024
Measurement Canada	Market Monitoring Installation Inspection	2024
Ontario Energy Board	Inspection of Power and Global Adjustment DVAs	2019-2020
Ontario Ministry of Finance	Income tax returns (2015-2019)	2020-2024
Ontario Ministry of Finance	Ontario Rebate for Electricity Consumers ("OREC") and Ontario Electricity Support Program ("OESP") Audits	2021-2024
Validation Estimating	Project Variance Analysis Process Review	2022
Workplace Safety and Insurance Board ("WSIB")	Claim Suppression Audit	2023

1

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-81

Reference: Exhibit 4, Tab 4, Schedule 1, Page 8

From 2019 to 2023 year-to-date, newly hired employees were brought into their roles at an average of 87 percent of the salary grade.

Please provide Toronto Hydro's assumptions in the 2025-2029 budget with respect to placement in salary grades, i.e. does Toronto Hydro include 100% of salary grades for all positions in the compensation budget?

RESPONSE:

Toronto Hydro 2025-2029 budget assumptions with respect to placement in salary grades is 90% for management and non-union management. Starting wage rate is used for unionized non-management positions.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-082

Reference: Exhibit 4A, Tab 4. Schedule 3, Page 27

QUESTION (A):

a) Please complete the following Table:

OM&A Outsourcing	2020	2021	2022	2023	2024
Forecast $					
Actual $					
% OMA Outsourced					

RESPONSE (A):

In EB-2018-0165, the OEB approved the 2020 OM&A test year on an envelope basis.[1] As such, Toronto Hydro does not have an OEB-approved forecast against which to measure its actuals. Please refer to the table below for historical actuals (2020-2022) and bridge year forecasts (2023-2024).

Table 1: OM&A Outsourcing (in $ millions)

	Actual				Bridge
	2020	**2021**	**2022**	**2023**	**2024**
Outsourced OM&A	118.7	134.9	139.2	146.0	151.0
% Of OM&A Outsourced	41.2%	48.6%	49.6%	49.6%	47.1%

QUESTION (B) AND (C):

b) Please summarize the work activities outsourced over 2020-2024.

c) Please summarize the work activities to be outsourced over 2025-2029.

[1] EB-2018-0165 - Decision and Order (December 19, 2019) at page 140

RESPONSE (B) AND (C):

Outsourced activities over the 2020-2024 and 2025-2029 include functions as capital and maintenance work, customer care operations, information technology support, fleet and equipment services and facilities management. Outsourcing in these areas is based on considerations including: (i) the need to maintain flexibility to scale work in times of peak demand, (ii) the ability to rely on external service providers to conduct repeatable high-volume work processes effectively and efficiently, and (ii) gaining access to particular expertise and knowledge that is not available and cannot be readily developed in-house.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-83

Reference: Exhibit 4, Tab 4

Please provide Toronto Hydro Retirement Actuals and Projections for the years 2018 to 2029.

RESPONSE:

Please see Table 1.

Table 1: Toronto Hydro Retirement Actuals and Projections for 2018 to 2029

Actuals						Projection					
2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
72	71	117	119	22	17	41	17	19	9	4	7

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-84

Reference: Appendix 2-K

Please recast Appendix 2-K with the following:

QUESTION (A):

a) Please breakout Management, Executive, Union and Non-Union Separately.

RESPONSE (A):

Please see 4-AMPCO-84 Appendix A

QUESTIONS (B) AND (C):

b) Please explain the variance in Executive positions between 2020 (71) and 2023 (86).

c) Please explain the variance in Executive positions between 2023 (86) and 2024 (96).

RESPONSES (B) AND (C):

Toronto Hydro would like to clarify that the noted variances refers to Management (including executive).

After nearly a decade of managing with a headcount plan that is essentially flat, this workforce segment was not an exception. From 2015 through 2021, senior management capacity was right-sized by growing existing portfolios to adapt to additional demand for changing systems, processes and technologies.

In 2022, given the criticality of the segment, it was no longer a viable strategy to continue to stretch the existing senior management complement to absorb the emerging work capacity. The organization needed to build its resourcing capacity and capabilities to sustain the foundations of a safe and reliable grid and meet the imperatives of an urban city and customers who are increasingly relying on electricity to expand, digitize and decarbonize their footprint. Positions within this segment had become over-extended as new capabilities were required to achieve the utility's objectives in a complex, highly specialized and regulated environment.

In 2022, as first step, new leadership positions were added within the senior management segment, across the organization to improve the effectiveness of the senior leadership team to lead, and initiate talent processes to hire, onboard, train and develop the talent required for the 2023-2029 period. For more information, please see Exhibit 4, Tab 4, Schedule 3 at Page 21-22.

The variance between 2023 and 2024 cited in Appendix 2-K is largely explained by the difference in the headcount budgeting assumption for 2023 hires which are not budgeted at a full FTE in the year of hire.

QUESTION (D):

d) Please define part-time.

RESPONSE (D):

A part-time employee is employed to work 24 hours per week or less.

QUESTION (E):

e) Please provide the number of part-time FTEs included in the total number of employees by year.

RESPONSE (E):

There are 3 part-time FTEs included in each year of Appendix 2-K.

QUESTIONS (F) – (H):

f) Please provide a breakdown of Salary, Overtime and Incentive Pay separately.

g) Please update for 2023 Actuals.

h) Please provide the compensation costs allocated to OMA and Capital by year in Appendix 2-K.

i) Please provide an excel version of Appendix 2-K including a), f), g) and h).

RESPONSES (F) – (H):

Please see 4-AMPCO-84 Appendix A.

QUESTION (J) :

j) Please discuss if overtime hours are converted into FTEs and included in the FTE totals.

RESPONSE (J):

Overtime hours are not converted into FTEs or included in the FTE totals.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-85

QUESTION (A):

a) Please complete the following Table:

Overtime (OT)	2020	2021	2022	2023	2024
OEB Approved $					
Actual $					
Forecast Hours					
Actual Hours					

RESPONSE (A):

Please refer to the table below for overtime actuals. Toronto Hydro does not have overtime forecast hours to compare to actuals.

Table 1: Overtime Actuals

Overtime (OT)	**2020**	**2021**	**2022**	**2023**
Actual ($ million)	$10.4	$10.0	$11.2	$12.1
Actual Hours	115,770	106,516	112,793	116,585

QUESTION (B):

b) Please complete the following Table:

Overtime (OT)	2025	2026	2027	2028	2029
Forecast Hours					

RESPONSE (B):

Toronto Hydro cannot provide the requested information for 2025-2029 because it forecasts overtime by historical cost, rather than by hours.

QUESTION (C):

c) Please provide the total hours worked (actuals/projections) excluding overtime in each of the years 2020 to 2029.

RESPONSE (C):

See table below for total hours worked (actuals) excluding overtime from 2020 to 2023 (in millions of hours

Table 2: Total Hours Worked (Actuals)(excl Overtime from 2020-2023)

2020 Actual Hours (M)	2021 Actual Hours (M)	2022 Actual Hours (M)	2023 Actual Hours (M)
2.08	1.89	1.89	2.00

Toronto Hydro does not forecast the number of hours worked, and therefore cannot provide the requested information for 2024-2029.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-86

QUESTION (A):

a) Please provide vacancy data (calculated FTEs and $) for each of the years 2020 to 2024 (YTD actuals).

RESPONSE (A):

Please refer to Toronto Hydro's response to interrogatory 4-SEC-111.

QUESTION (B):

b) Please provide the current number of vacancies.

RESPONSE (B):

It is Toronto Hydro's position that it is too early to comment on the number of vacancies for 2024. Toronto Hydro will undertake to provide the requested information at the Technical Conference.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-87

Reference: Exhibit 4, Tab 4, Schedule 1, Page 7

Total cash compensation costs include base salary wages, overtime and incentive payments.

QUESTION (A) :

a) Please identify which employee groups are not eligible for incentive payments.

RESPONSE (A):

Employees represented by the Power Workers' Union do not have incentive payments as part of their total cash compensation package. Fixed-term contracts employees, part-time employees and students are not typically eligible for incentive payments.

QUESTION (B) :

b) For each of the years 2020-2024, please provide the forecast and actual incentive payments paid.

RESPONSE (B):

Please refer to 4-AMPCO-84 part (f)

QUESTION (C) :

c) Please discuss any changes in the Incentive Pay Program since 2020.

RESPONSE (C):

Toronto Hydro regularly reviews its variable performance pay programs to ensure targets remain market-competitive and the program continues to retain, motivate and reward employees for

achieving performance objectives. Based on its market-reviews, Toronto Hydro recently implemented a Long-Term Incentive Plan (LTIP) for its executive leaders in order to maintain retention and better align the incentive program with relevant market comparators. The LTIP is a three-year based incentive and will commence measurement in 2024.

QUESTION (D) :

d) Please provide Toronto Hydro's assumptions regarding achievement of incentive payments for 2025-2029 as it relates to forecast compensation costs.

RESPONSE (D):

Toronto Hydro forecasts incentive payments by workforce category (as broken down in AMPCO-84-part a) using the applicable ratios of incentive pay target to base salaries for each category. For example, for the non-union non-management category, which represents the largest pool of employees eligible for incentive pay, incentive pay targets as a percentage of base pay range from 6% to 15%. For 2025-2029 Toronto Hydro assumed that incentive pay targets and achievements for each category will be consistent with historical results and remain stable throughout the period.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-088

Reference: Exhibit 4, Tab 4, Schedule 3, Page. 25

Table 2 provides Training and Development Programs for 2020-2022. Please provide training costs for the years 2020 to 2029.

RESPONSE:

The costs associated with the administration of the Training and Sustainability department, which includes the costs to procure or build programs, manage the overall training plan, schedule courses and instructors and conduct training, including the costs associated with the apprentice time and materials , while at the Trades School, are captured below. Administrative and support costs for the portion of Toronto Hydro's capital and maintenance program executed by apprentices as part of their placement within Operations as part of their growth and development is captured as part of internal work execution. See Exhibit 4, Tab 2, Schedule 10, page 3.

Segment	Actual			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Training and Development	$5.6M	$7.1M	$6.1M	$8.1M	$8.5M	$8.9M	$9.2M	$9.3M	$9.6M	$9.9M

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-89

QUESTION (A):

a) For the period 2020-2024, please provide a list of one-time expenses.

RESPONSE (A):

Toronto Hydro is unable to answer this question because it is unclear as to what information is being requested.

QUESTION (B):

b) Please provide a list of one-time expenses for 2025-2029.

RESPONSE (B):

Toronto Hydro is unable to answer this question because it is unclear as to what information is being requested.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-90

Please complete the following Table:

	Formula	2020	2021	2022	2023
Retention Rate %					
Turnover Rate %					
Absenteeism Rate %					
Attrition Rate %					
Internal Hires %					

RESPONSE:

Please see Table 1 below.

Table 1: Metrics re Retention, Turnover, Absenteeism, Attrition and Internal Hires

	Formula	2020	2021	2022	2023
Retention Rate %	# of full time new hires in the year still employed at the end of the year / # full time new hires in the year	96.4%	92.3%	92.5%	92.8%
Turnover Rate %	# of full time voluntary exits / full time headcount at the start of the year	3.21%	5.86%	9.6%	7.3%
Absenteeism Rate	average number of days absence full time employees	3.48	2.92	3.70	3.12
Attrition Rate %	# of full time exits / full time headcount at the start of the year	13.4%	17.4%	12.9%	9.6%
Internal Hires %	# of full time job changes / (# of full time job changes + # of full time external new hires)	39%	39%	33%	38%

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-91

References: EB-2018-0165, Exhibit 4, Tab 2, Schedule 1, Page 29

Preamble:

On average, Toronto Hydro pruned 1,628 circuit kilometres and approximately 53,000 trees annually between 2015 and 2017.

QUESTION (A):

a) Please provide the circuit km pruned for each of the years 2018 to 2023.

RESPONSE:

Please see Table 1 below for the number of kilometers trimmed during the period 2018-2023.

Table 1: Number of km Trimmed per Year 2018-2023

	2018	2019	2020	2021	2022	2023
Number of km Trimmed	1,364	1,244	1234	1,402	1,560	1,248

QUESTION (B):

b) Please provide the number of trees pruned for each of the years 2028 to 2023.

RESPONSE (B):

Please see Table 2 below for the number of trees trimmed during the period 2018-2023.

Table 2: Number of Trees Trimmed per Year 2018-2023

	2018	2019	2020	2021	2022	2023
Number of Trees Trimmed	49,813	48,945	29,215	40,383	70,920	73,317

QUESTION (C):

c) Please provide a map of Toronto Hydro's current vegetation management cycles.

RESPONSE (C):

Toronto Hydro's vegetation management cycle operates on an annual basis and feeder cycles are selected depending on emergent concerns such as reliability as described in Exhibit 4, Tab 2, Schedule 1 at page 30. The map in Figure 1 below represents years since each feeder was last trimmed as of 2023 year-end.

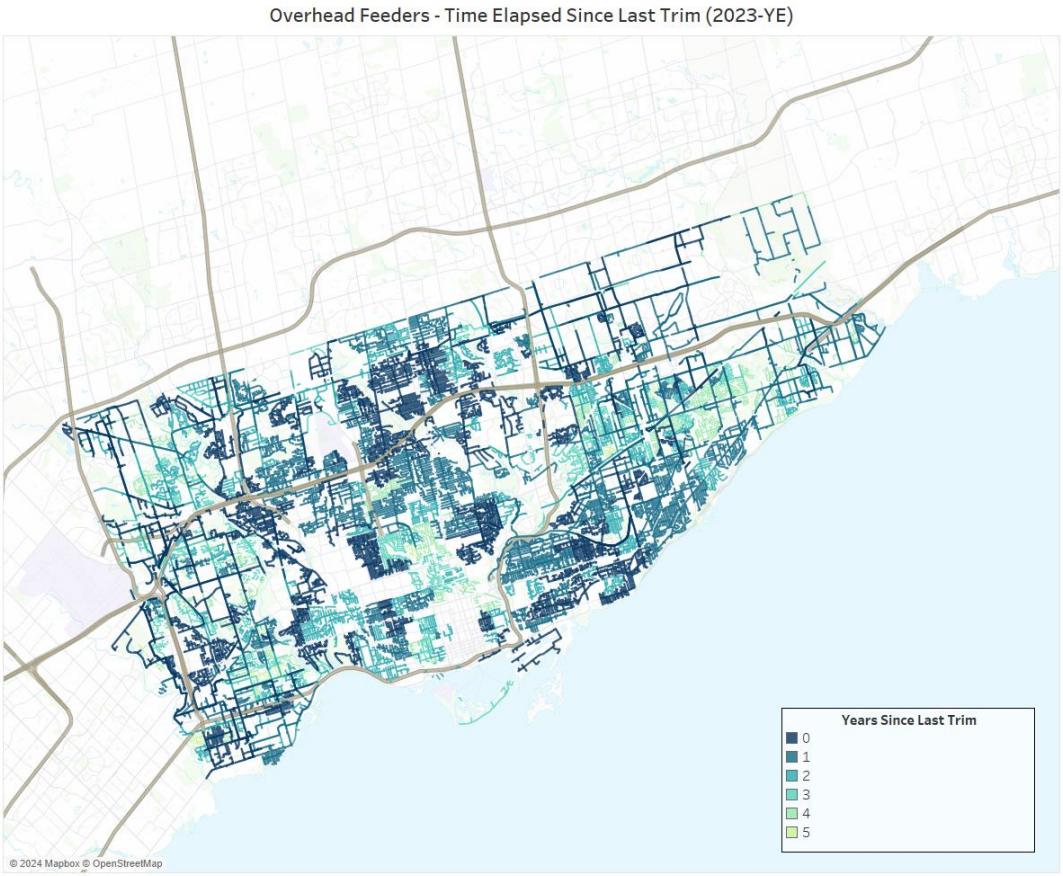


Figure 1: Map of Feeder Cycles (Time Since Last Trim)

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-92

Reference: EB-2018-0165 Exhibit 4A, Tab 2, Schedule 7, Page 16

Table 4 provides historical control centre work volumes for 2013 to 2017.

Please provide the same table for the years 2018 to 2023.

RESPONSE:

The table below provides historical control centre work volumes for the years 2018 to 2023:

	2018	2019	2020	2021	2022	2023
Total Order to Operate ("OTO") Steps	231707	229702	251904	262679	252615	260603
Executed OTOs	4341	3680	4175	6956	6560	7863
Hold Offs	18464	21795	21396	21465	20117	21162

For clarity:

- "Total Order to Operate Steps" includes the total number of switching steps prepared as part of a planned or unplanned switching order during the year.
- "Executed OTOs" includes the total number of planned and unplanned switching orders executed during the year.
- "Hold Offs" includes the total number of planned and unplanned Hold Offs issued by the Control Authority during the year.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-93

Reference: EB-2018-0165, Exhibit 4A, Tab 2, Schedule 9, Page 17

Figure 2 provides the number of deficiencies processed for the years 2015 to 2020.

Please provide the same data for the years 2020 to 2023 and include the numerical values in the bar chart.

RESPONSE:

Please see Figure 1 below.

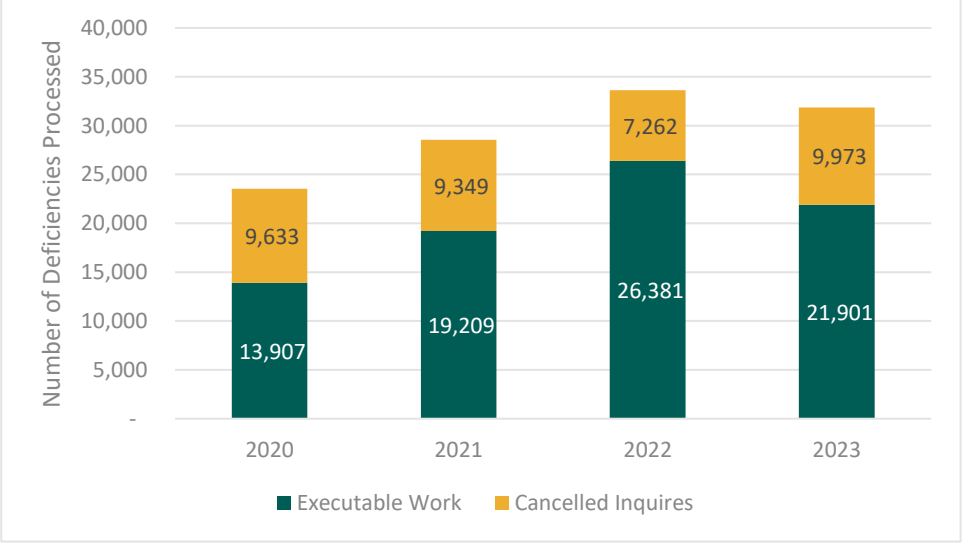


Figure 1: Number of Deficiencies Processed from 2020 to 2023

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-94

Reference: EB-2018-0165, Exhibit 4A, Tab 2, Schedule 9, Page 19

When Toronto Hydro installs new assets on its distribution system on a planned or reactive basis, key data management systems must be updated based on relevant installation and inspection records. Figure 3 shows the historical and projected trend in the number of equipment change-outs processed and forecasted to be processed through the above systems for the years 2015 to 2020.

Please provide the same Figure with data for the years 2020 to 2023 and include the numerical values in the Figure.

RESPONSE:

Please see Figure 1 and Table 1 below.

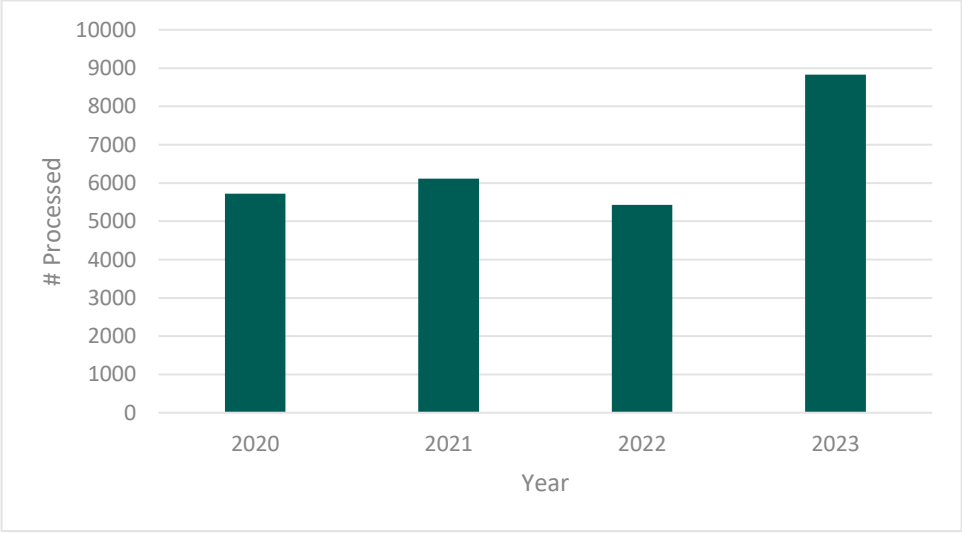


Figure 1: Equipment Change Out Forms Processed

Table 1: Number of Equipment Change-Out Forms Processed 2020-2023

	2020	2021	2022	2023
# Processed	5,724	6,115	5,427	8,830

The total number of Equipment Change Out Forms ("ECFs") processed may vary year to year and is a lagging indicator for equipment updates as ECFs will be returned after a project is completed. In addition, Toronto Hydro notes that ECFs do not capture linear assets.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-095

References: EB-2018-0165, Exhibit 4A, Tab 4, Schedule 3, Page 10

From 2013 to 2017, THRESL had a 32 percent improvement in corporate attendance, from 5.23 days in 2013 to 3.54 days in 2017.

QUESTION:

Please provide corporate attendance in days for each of the years 2018 to 2023.

RESPONSE:

Corporate attendance in days over this period was as follows:

Table 1: 2018-2023 Corporate Attendance (Days)

	2018	2019	2020	2021	2022	2023
Corporate Attendance (Days)	3.77	3.77	3.48	2.92	3.70	3.12

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-96

Reference: Exhibit 9, Tab 1, Schedule 1, Page 29

QUESTION (A) - (B):

a) Please provide the calculations for Actual Historic & Forecast Bridge Capital-Related Revenue Requirement for each of the years 2020-2024.

b) Please explain what is included under other adjustments.

RESPONSE (A) - (B):

The calculation of the Actual/Bridge Capital-Related revenue requirement is as shown in Table 1 below.

Table 1: Calculation of Actual/Bridge Capital-Related Revenue Requirement ($ Millions)

	2020	2021	2022	2023	2024	2020-2024
ROE	154.5	159.3	167.2	177.0	190.7	848.8
Deemed Interest	99.0	102.1	107.2	113.5	122.2	544.0
Depreciation	261.0	274.7	287.0	257.0	270.6	1,350.3
PILS	18.0	22.1	25.0	5.7	9.0	79.7
Total	**532.5**	**558.1**	**586.4**	**553.2**	**592.6**	**2,822.8**

The Other Adjustments line relates to revenue requirement variances due to rate base variances that are not associated with 2020-2024 In-Service Additions, Derecognition, or the Externally Driven Capital Variance Accounts. Given the complexity of the several factors that can impact the revenue requirement (e.g. 2020 approved compared to actual rate base, other changes in rate base unrelated to in-service additions such as disposal of property) the revenue requirement impact from each of these cannot be discretely presented.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 4-AMPCO-97

References: EB-2018-0165, Decision, Page 195

Preamble:

The CRRRVA records the variance between the capital-related revenue requirement included in rates and the actual capital-related revenue requirement (excluding balances captured in the Externally Driven Capital and Derecognition variance accounts).

The OEB finds merit in better understanding the program level details that cause variances in overall capital spending as proposed by VECC. The approach offered by Toronto Hydro to require it to report on in-service additions by investment category for the 2020-2024 period at the time of its next rebasing is approved.

QUESTION (A):

a) Please provide the OEB-approved ISA compared to actual ISA at the investment level for each of the years 2020 to 2024.

RESPONSE (A):

Please refer to Exhibit 2A, Tab 1, Schedule 1, Appendix A: 2020-2024 In-Service Additions by Investment Category, for a comparison of OEB-approved ISAs compared to actual/forecast.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 4-CCC-56

Reference: Exhibit 3, Tab 1, Schedule 1, Page 2, Table 1 - Historical and Bridge Year OM&A Expenditures by Program

For the years 2020-2023 please recast Table 1 to provide the forecast OM&A numbers for each Program. Please provide the 2023 Actuals.

RESPONSE:

Please refer to Toronto Hydro's response to 4-SEC-89 subpart c.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 4-CCC-57

References: Exhibit 4, Tab 1, Schedule 1, Page 11

a) Does Toronto Hydro continue to provide suite metering services? If so, how many customers does it serve through suite metering? How does Toronto Hydro set the rates for its suite metering customers?

RESPONSE:

Toronto Hydro provides suite metering services. There is a dedicated rate class (Competitive Sector Multi-Unit Residence Service) for suite meter customers. In 2022, the number of customers in this rate class totaled 92,126.

Toronto Hydro sets the CSMUR rates based on cost outcome from OEB's cost allocation model. Please see Exhibit 7, Tab 1, Schedule 1, page 5.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 4-CCC-58

Reference: Exhibit 4, Tab 1, Schedule 1, Page 19

Exhibit 4, Tab 4, Schedule 2 – OEB Appendix 2-K

Preamble:

Compensation costs represent a large portion of the utility's 2025-29 OM&A budget and the need for resources and the ability to fund prudent costs to attract and retain those resources is the biggest driver of the multi-year OM&A need:

QUESTION (A):

a) Please provide a table setting out for each year 2025-2029 total OM&A costs and total compensation costs

RESPONSE (A):

Please see Table 1 below.

Table 1: Total OM&A and Compensation Costs ($ Millions)

	Forecast				
	2025	**2026**	**2027**	**2028**	**2029**
Total OM&A	343.0	358.0	370.2	385.5	399.6
Compensation Costs (Net of capitalization)[1]	149.3	159.1	168.0	177.4	186.6

QUESTION (B) – (C):

b) Please revise Appendix 2-K to include 2023 actual numbers;

[1] Table 1 includes total compensation costs for Toronto Hydro including Students. Compensation costs and FTE presented in OEB Appendix 2-K excludes students.

c) Please break down salary and wages providing, base salary, overtime and incentive pay;

RESPONSE (B) – (C):

Please refer to the Appendix filed in response to interrogatory 4-AMPCO-84.

QUESTION (D):

d) Please explain, in detail, how Toronto Hydro has determined how many incremental FTEs it requires in each year 2025-2029.

RESPONSE (D):

Workforce planning is a key component of Toronto Hydro's integrated business planning process, which is described in the evidence at Exhibit 2B, Section E2 and Exhibit 4, Tab 1, Schedule 1. A chronology of this process is outlined in the response to interrogatory 2B-SEC-32. Workforce planning generally unfolded as follows over the course of the planning process.

In the spring of 2022, an initial assessment was undertaken using historical assumptions for the replacement of exits and planned hiring to support current asset investment needs and operational requirements. This step focused on the hiring requirements necessary to catch-up with the workforce plan that was included in the 2020 rate application because as noted in the evidence, the utility's staffing complement reached a historically low point of 1,203 FTEs at the end of 2021.[2] This assessment by and large reflected a continuation of existing business conditions, and did not include a detailed consideration of the incremental workforce requirements necessary to support the execution of the utility's 2025-2029 investment plan, as Toronto Hydro was still in the process of developing this plan.

In the summer of 2022, as the draft capital plan and associated system maintenance and operational requirements began to emerge through integrated planning processes, a further workforce assessment was undertaken. The purpose of this assessment was to determine

[2] Exhibit 4, Tab 1, Schedule 1; Exhibit 1B, Tab 3, Schedule 3; Exhibit 4, Tab 4, Schedule 3.

incremental workforce requirements to support the safe, effective, and efficient execution of the planned volumes of work and investments necessary to achieve the utility's investment objectives and deliver outcomes with respect to sustaining, modernizing and expanding the utility's grid and operations. This assessment looked at historical versus future work requirements (e.g. capital expenditures and related volumes of work) and where possible, considered Toronto Hydro's capabilities and maturity compared to other jurisdictions that are comparatively more advanced with respect to grid modernization, including digital transformation (as noted in Toronto Hydro's response to interrogatory 1B-DRC-12). For example, with increasing technology on the grid (e.g. Advanced Distribution Management System ("ADMS"), Advanced Metering Infrastructure ("AMI"), sensors and other field monitoring technologies) comes a significant increase in the volume of data generated in the field. To effectively leverage this data and gain valuable insights that can be used for improved planning and optimized decision-making, Toronto Hydro needs to hire and develop resources with expertise in advanced data analytics, statistical modelling, data science and machine learning techniques. This assessment also included consideration of expected continuous improvements productivity and efficiency associated with technological investments. For example, in the area of Finance which supports the execution of the capital plan, workforce requirements were constrained or reduced on the expectation that process automation will continue to increase the throughput of finance resources who are responsible for processing capital-based financial transactions and reporting requirements. Similarly, in the area of Customer Operations, Toronto Hydro is expected to launch an online Customer Connections portal that will streamline the connections process and increase efficiency, while also improving data collection for reporting and future capacity planning purposes.

A final workforce assessment was undertaken in the spring of 2023 to further calibrate and balance resource needs with investment objectives and target outcomes that were being refined through ongoing planning activities. In this iterative exercise, the planning team refined the workforce growth assumptions to ensure resources could be effectively absorbed, trained and developed to deliver the planned volumes of work and associated outcomes of the 2025-2029 Investment Plan.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 4-CCC-59

References: Exhibit 4A, Tab 1, Schedule 1, Appendix 2-K

Please provide a detailed description of Toronto Hydro's overtime policy. Please explain how overtime is forecast for the years 2025-2029. Please provide the actual overtime costs for each year 2020-2023. Please provide the forecast for 2024-2029.

RESPONSE:

All employees are not permitted to work overtime without the express approval of their leaders. When necessary to accomplish a certain task or respond to extenuating circumstances, overtime will be paid to employees when specifically directed and pre-approved by an Employee's Senior Management leader.

Bargaining Unit Employees will be renumerated for overtime in accordance with the applicable collective agreements. Management Employees may request that lieu time be substituted for overtime pay, which will be allowed at their Senior Management leader's discretion.

Overtime is forecast by each cost center based on the work program and historical program costs adjusted for inflation.

Please refer to 4-AMPCO-84 Appendix A for 2020-2023 actuals and 2024 to 2029 forecasts.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 4-CCC-60

References: Exhibit 4, Tab 2, Schedule 18, Page 6

Please recast Table 3 - Legal Service and Regulatory Affairs program Expenditures to include forecast costs for 2020-2023. Please provide the 2023 actual amounts.

RESPONSE:

Please refer to Toronto Hydro's response to 4-SEC-89(d) at Table 24.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 4-CCC-61

References: Exhibit 4, Tab 2, Schedule 18, Page 6

QUESTION:

Please provide a detailed breakdown of the Legal Services and Regulatory Affairs Program Expenditures by segment for all years 2020-2029. Please provide FTEs for each year 2020-2029. Toronto Hydro refers to Cost Management and Productivity enhancements for this program. Please quantify the savings achieved.

RESPONSE:

For a detailed breakdown of the Legal Services and Regulatory Affairs Program Expenditures by segment for all years 2020 to 2029, please see Exhibit 4, Tab 2, Schedule 18, at page 6 (Table 3). For FTEs for 2020-2029, please refer to 4-VECC-74(a). With respect to quantification of savings achieved through cost management and productivity enhancements, please refer to 4-SEC-88(b).

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 4-CCMBC-12

Reference: Exhibit 4, Tab 1, Schedule 1, Page 2, Table 1: Historical and Bridge Year OM&A Expenditures by Program

QUESTION (A):

a) Please update the table to show Actual results for 2023 and 2024.

RESPONSE (A):

Please refer to Toronto Hydro's response to interrogatory 4-SEC-89 part (c).

QUESTION (B):

b) What is Work Program Execution and why did it increase from $14.2 million in 2021 to $17.3 million in 2022?

RESPONSE (B):

Please refer to Exhibit 4, Tab 2, Schedule 10 at pages 10 and 13.

QUESTION (C):

c) Please file a table to show FTEs by Program.

RESPONSE (C):

Please refer to Toronto Hydro's response to interrogatory 4-SEC-92.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 4-CCMBC-13

Reference: **Exhibit 4, Tab 1, Schedule 1, Page 9, Table 3: 2020-2025 OM&A Trends, Table 4: 2025-2029 OM&A Trends**

QUESTION (A):

a) What percentage of the OM&A per FTE is due to compensation including employee benefits?

RESPONSE (A):

Please see Table 1 below.

Table 1: Compensation Costs as a Percentage of OM&A per FTE

	Actual				Bridge	Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Compensation Costs as a % OM&A per FTE	41%	39%	38%	40%	42%	44%	44%	45%	46%	47%

QUESTION (B):

b) What are the other costs included in OM&A per FTE?

RESPONSE (B):

In addition to compensation costs, Toronto Hydro's OM&A costs per FTE includes external contractor costs, material and supplies, insurance premiums, regulatory costs and many other non-

workforce related costs as summarized in the OM&A Overview evidence at Exhibit 4, Tab 1, Schedule 1 and detailed in the programmatic evidence at Exhibit 4, Tab 2.

QUESTION (C):

c) Are the FTE numbers used in the table just permanent employees, or do the FTE numbers include contract and seasonal and part time employees?

RESPONSE (C):

FTE numbers used in Tables 3 and 4 include full-time, contract and part-time employees of Toronto Hydro, but do not include students. Toronto Hydro does not have any seasonal employees.

QUESTION (D):

d) Please add two lines to each table OM&A/MW and OM&A/MWhr and file them.

RESPONSE (D):

Please see below versions of Tables 3 and 4 from the reference noted inclusive of OM&A divided by demand and consumption, as requested. Both MVA and GWh figures are weather normalized, as presented on Exhibit 3, Tab 1, Schedule 1 at page 1.

Table 3: 2020-2025 OM&A Trends

	2020 Test	2021 Actual	2022 Actual	2023 Bridge[1]	2024 Bridge[1]	2025 Test	2020-25 CAGR
OM&A ($M)	266.7	277.5	280.4	301.5	325.5	343.0	**5.16%**
OM&A per Customer ($)	341.3	352.9	354.6	379.7	408.2	428.5	**4.66%**
OM&A per FTE ($)	201,892	230,673	228,524	230,680	222,488	224,036	**2.10%**
OM&A/MVA	7,245	7,574	7,448	8,105	8,799	9,427	**5.41%**
OM&A/GWh	11,265	11,771	11,688	12,733	13,748	14,621	**5.35%**

[1] 2023 Bridge and 2024 Bridge year as per originally filed data

Table 4: 2025-2029 OM&A Trends[2]

	2025 Forecast	2026 Forecast	2027 Forecast	2028 Forecast	2029 Forecast	2025-29 CAGR
OM&A ($M)	343.0	358.0	370.2	385.5	399.6	**3.89%**
OM&A per Customer ($)	428.5	445.6	459.3	476.7	492.6	**3.54%**
OM&A per FTE ($)	224,037	227,735	231,955	238,404	245,003	**2.26%**
OM&A/MVA	9,427	9,927	10,370	10,857	11,387	**4.84%**
OM&A/GWh	14,621	15,288	15,828	16,405	17,034	**3.89%**

[2] Toronto Hydro identified an error with respect to the calculation of the CAGR figures in this table.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

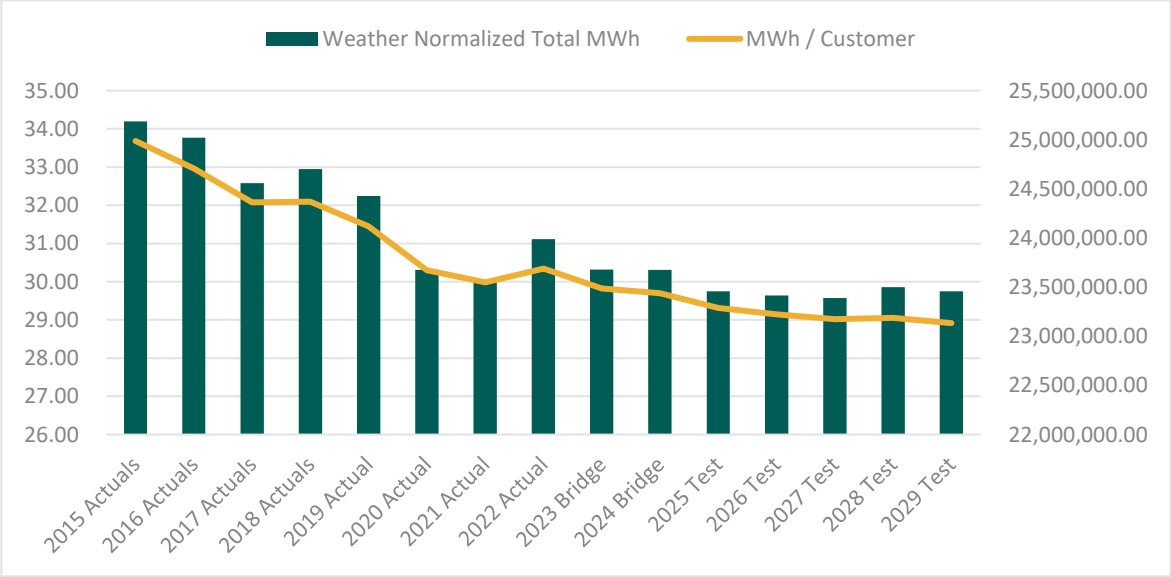
INTERROGATORY 4-CCMBC-14

Reference: **Exhibit 4, Tab 1, Schedule 1, Page 18, Figure 8: FTE per 1,000 Customers, Page 19, Figure 9: OM&A Expenditure per Customer, Figure 10: MWh of Load per Customer**

Please add histograms to each of the Figures to show 2023 to 2029.

RESPONSE:

Please see page 12 of Exhibit 4, Tab 1, Schedule 1 for OM&A Cost per Customer from 2015 to 2029. Please see response to 1B-CCC-14 for FTE per 1,000 Customers from 2015 to 2029. Please see below for MWh of Load per Customer from 2015 to 2029.



RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 4-CCMBC-15

Reference: Exhibit 4, Tab 1, Schedule 1, Page 33

QUESTION (A):

a) What proportion of Internal Execution, Internal Execution, and Planning workforce time is spent on work for capital projects?

RESPONSE (A):

It is Toronto Hydro's understanding that in this interrogatory – 4-CCMBC-15, CCMBC made a typo in referring to the key areas of investment in incremental resources. In responding to this question, it is Toronto Hydro's understanding that CCMBC was referring to internal work execution, external work execution and systems planning segments in Exhibit 4, Tab 1, Schedule 1, Page 33, lines 1, 5 and 8 respectively.

Toronto Hydro is not able to produce the total time spent on capital projects due to transfer of labour costs across different OM&A programs (please see 4-SEC-89, subpart b for additional details). However, Table 1 below shows the net cost recovery for the aforementioned segments which includes, for example, charges relating to capital and operational costs as a percentage of total OM&A costs before capitalization and transfers of these segments.

Table 1: 2025-2029 Average Labour Transfers and Capitalization (in $ millions)

Segments	2025-2029 Average
Internal Work Execution	-75.7%
External Work Execution	-92.9%
System Planning	-68.1%

QUESTION (B):

b) Are all of the costs of this workforce time spent on capital projects capitalized?

RESPONSE (B):

Yes, confirmed.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 4-CCMBC-16

Reference: Exhibit 4, Tab 1, Schedule 1, Page 40

Preamble:

"The Control Centre is also one of the key executors and enablers of Toronto Hydro's Grid Modernization Strategy - as the utility adds more distribution assets and modernizes its system operations through more sophisticated data analysis and automation, this program will require more staff both to handle increasing volumes of work and acquire specialized skills and knowledge, made necessary by technologies the utility plans to implement in the 2025-2029 rate period such as Network Condition Monitoring & Control, Advanced Metering Infrastructure 2.0, Fault Location, Isolation, and Service Restoration, and the Advanced Distribution Management System."

QUESTION (A):

a) Toronto Hydro intends to increase resources in this area to by 39 percent from 85 to 118 staff between the end of 2022 and 2029.

RESPONSE (A):

Toronto Hydro is unable to provide a response as this is a statement rather than a question.

QUESTION (B):

b) Why is Toronto Hydro's Grid Modernization Strategy so labour intensive?

RESPONSE (B):

Implementation and sustainment of the Grid Modernization Strategy will result in both an increase in work volumes for some existing Control Centre support functions, and development of net new

functions associated with the Energy Centre. Both of these drivers require additional labour resources to successfully realize the targeted benefits of Grid Modernization.

Incremental needs under the Control Centre Operations program are described in detail in both Exhibit 4, Tab 2, Schedule 7 and Exhibit 4, Tab 1, Schedule 1 (pages 40-43). In summary, the references discuss increases to work volumes associated with installation and operation of more remotely operable SCADA devices, a significant increase in Toronto Hydro's dependency on accurate and timely distribution system modelling, an increase in remotely monitored and managed data points, an increase in Distributed Energy Resources ("DERs"), and the potential for the Energy Centre to take on a critical role actively managing DERs and non-wires solutions to maintain grid stability and support an expanded market for distribution grid services. All these requirements will increase workload relative to what is required to safely and efficiently operate today's distribution grid.

QUESTION (C):

c) Will Toronto Hydro's Grid Modernization Strategy result in offsetting staff reductions in other areas? If the answer is yes, what are the offsetting staff reductions. If the answer is no, please explain why not.

RESPONSE (C):

Benefits from Grid Modernization investments include enhanced outage restoration capabilities to improve grid resilience, and enhanced operational flexibility to manage a more heavily utilized system with increasing bi-directional power flows. These investments, once fully implemented and integrated, are expected to yield improvements in reliability and operational efficiency. In turn, this will help mitigate cost pressures and potential future resource growth associated with electrification. At this stage in the modernization program, Toronto Hydro does not expect any direct reduction in staffing due to Grid Modernization.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 4-CCMBC-17

Reference: Exhibit 4, Tab 1, Schedule 1, Pages 41 and 42

Preamble:

"In addition, the utility forecasts total DERs installed on the grid to increase by approximately 67 percent from 2023 to 2029, which is driving investments in the Generation Protection, Monitoring and Control program. Each additional device installed in the system pursuant to these programs requires oversight from Control Centre Operations personnel for: 1) commissioning and testing in the field to reliably communicate with the SCADA system, and 2) daily operations and troubleshooting (e.g. responding to alarms or asset management tasks). Headcount increases in this area are essential to enabling the utility to safely and reliably accommodate these utility- and customer-driven changes to its grid."

QUESTION (A):

a) Please confirm that customers who own DERs are causing an increase in headcount and resulting OM&A costs?

RESPONSE (A):

The proliferation of Distributed Energy Resources ("DERs") and the role that DERs are playing in the energy transition is one factor contributing to the need for an increase in headcount and resulting OM&A costs in Control Centre Operations.

QUESTION (B):

b) Has Toronto Hydro considered charging customers who own DER's for the incremental costs they are imposing?

RESPONSE (B):

Please refer to Toronto Hydro's response to 1B-EP-9, subpart (b).

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 4-CCMBC-18

Reference: Exhibit 4, Tab 1, Schedule 1, Page 47

Preamble:

"Parallel to the insourcing effort, the utility plans to hire new staff to replace retiring staff and/or fill vacant positions. The addition of new and relatively inexperienced staff drives the need for more training time and quality assurance ("QA") work."

QUESTION (A):

a) Please confirm that in general, compensation and benefits of experienced employees who are retiring are higher than new inexperienced employees.

RESPONSE (A):

All things equal, the annual compensation-related cost associated with a retiring employee is higher than the annual compensation-related cost for new employee entering the workforce. That being said, the year-over-year increases are comparatively lower for experienced employees who are already at the top of their salary band, as compared to newer employees who are being developed into their roles and are progressing through the salary band / step increases in accordance with performance requirements.

QUESTION (B) :

b) What is the saving in OM&A costs from the replacement of experienced retiring employees with new employees over the 2023-2029 period?

RESPONSE (B):

Direct and indirect investment costs associated with the development of newer employees (i.e. training, onboarding, upskilling) are embedded in the OM&A program budgets outlined in Exhibit 4, Tab 2. Unfortunately, it is not possible to quantify the requested information. In any event, even if it could be quantified, this information would be of limited value as the utility has a younger workforce now (average age is 40 years), and thus retirement projections are decreasing significantly compared to historical volumes. Please see Table 1 below for the 2020-2029 annual breakdown of retirements.

Table 1 : 2016-2023 Actual Retirements and 2024-2029 Forecast

Actual								Forecast					
2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
77	81	72	71	117	119	22	17	41	17	19	9	4	7

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 4-CCMBC-19

Reference: Exhibit 4, Tab 4, Schedule 5, Mercer Non-Executive Compensation and Benefits Review, Executive Summary and Summary of Findings (Mercer Review does not have page numbers)

Preamble:

"On an overall organization basis, THESL's total remuneration, including the value of all cash compensation, benefit and pension plans are positioned within a market competitive range relative to the 50th percentile of the energy market, and are above the general industry market. The general industry market is generally representative of publicly traded, for-profit organizations."

QUESTION (A):

a) Please reconcile the quoted paragraph from the Executive Summary with the table in the Summary of Findings which shows that Toronto Hydro's Total Remuneration (TRem) is above that of the General Industry Peer Group for 13 out of 15 pay grades, with one pay grade 41% above industry average.

RESPONSE (A) – PREPARED BY MERCER:

We confirm that the quoted paragraph, from the Executive Summary, is aligned with the findings presented in the table, in the Summary of Findings section, on page 5 (cover page is considered page 1) of the report. Specifically, the table notes a 110% market positioning for Total Remuneration relative to the general industry comparator group, which contrasts with the lower market positioning relative to the Energy Industry comparator group. The total remuneration findings noted in the Executive Summary, as referenced above, is based on an overall organization

level and not on an individual job or grade basis. The results in the referenced table demonstrate the results outlined in the Executive Summary.

QUESTION (B):

b) Please reconcile the quoted paragraph from the Executive Summary with the table in the Summary of Findings which shows that Toronto Hydro's Total Cash Compensation (TTC) is above that of the General Industry Peer Group for 6 out of 15 pay grades, with one pay grade 33% above industry average.

RESPONSE (B) – PREPARED BY MERCER:

Kindly refer to our response to Question A above. The referenced findings in the Executive Summary presents Toronto Hydro's results on an overall organization basis with a focus on Total Remuneration. Those findings are consistent with what is shown in the referenced table.

QUESTION (C):

c) Do the results in the table indicate that Toronto Hydro's employees enjoy significantly higher benefits than employees in the General Industry Peer Group.

RESPONSE (C) – PREPARED BY MERCER:

Mercer Response:

A combination of benefit and pension values contributed to the above market positioning of Toronto Hydro's Total Remuneration compensation relative to the General Industry comparator group (in contrast to the results relative to the Energy Industry comparator group). We note that, Toronto Hydro, like the majority of Local Distribution Companies, participate in the OMERS pension plan. The OMERS pension plan is a Defined Benefits plan and it is generally more valuable than the Defined Contribution pension plans seen in the General Industry.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 4-CCMBC-20

Reference: Exhibit 4, Tab 4, Schedule 5, Mercer Non-Executive Compensation and Benefits Review, Appendix A (Mercer Review does not have page numbers)

QUESTION (A):

a) How were the General Industry Comparator Companies selected?

RESPONSE(A) – PREPARED BY MERCER:

Please refer to the Methodology section on page 3 (cover page is considered page 1) of the report for details on how the General Industry Peer Group was developed. To further elaborate, the selection criteria involved selecting organizations, across different industries, that have annual revenues that are within ½ to 2x the size of Toronto Hydro's annual revenue. Where data was limited, the peer group was expanded to include organizations within 1/3 to 3x the size of Toronto Hydro on the basis of annual revenue. The peer group was intended to present a General Industry view of the market. We note that the Energy industry is just one subset of the General Industry comparator group. All General Industry comparators are participants in Mercer's proprietary Mercer Benchmark Database survey.

QUESTION (B):

b) Of the 24 companies in the General Industry Comparator Companies, 9 are located in Alberta. Why was such a large proportion of Alberta companies selected? Does that not skew the results of the review?

RESPONSE(B) – PREPARED BY MERCER:

The 24 organizations included in Appendix A, on page 8, of the report represent only a sample of organizations included in the General Industry comparator group. In fact, over 90 organizations in

total, across different industries and locations, were included in the General Industry comparator group. As such, the question misunderstands the number of organizations in the General Industry comparator group. The organizations referenced in the question do not skew the overall findings.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 4-EP-33

Reference: Exhibit 4, Tab 1, Schedule 1, Page 1

Preamble:

In addition to enabling Toronto Hydro to attract and retain the necessary resources to carry out its DSP and deliver customer outcomes in next rate period and beyond, the OM&A plan addresses other key operational requirements, including:

- integrating cloud computing and non-wires solutions into operations;
- responding to evolving policy and customer expectations to connect behind-the meter technologies such as electric vehicles, solar panels, and energy storage;

QUESTION (A):

a) Does Toronto Hydro charge customers for behind the meter connections of electric vehicle chargers, solar panels, and storage batteries? If the answer is yes, please list such charges and indicate if they are expected to recover Toronto Hydro's incremental costs. If the answer is no, please explain why not.

RESPONSE (A):

A customer requesting a connection or service upgrade to install an electric vehicle charger is not distinguished from other connection requests. Sections 2.1.1.1 and 2.1.2 of Toronto Hydro's Conditions of Service (January 1, 2024), set out Toronto Hydro's connection charges for new and upgraded service connections, including those costs which are collected directly from customers.

Please see the response to interrogatory 2B-ED-26 a) for information regarding connection charges relating to microgeneration (≤10 kW) distribution energy resources (DER). Generally, charges relating to the connection of DERs are dependent on the site and scope of the project.

QUESTION (B)

b) Please file a table listing the forecast of 2025 OM&A costs for behind the meter connections for each of the following customer owned appliances: EV chargers, solar panels, and storage batteries.

RESPONSE (B):

Please see the response to a) above. Toronto Hydro notes that reference to the behind the meter technologies (i.e. EVs, solar panels and energy storage) in the excerpt cited above under "Preamble" are illustrations of electrification and modernization, which are addressed by the OM&A plan.

The following OM&A programs will support and enable customer connections, including DER connections, through the 2025-2029 period. Toronto Hydro notes that, except for the Customer Connections segment, the costs for the programs/segments listed below include costs beyond the scope of customer connections and DER connections as it is not possible to disaggregate customer/DER connection-specific costs from other cost drivers:

- **Control Centre Operations**, e.g. the Energy Centre monitors grid impacts from customer-owned DERs (See Exhibit 4, Tab 2, Schedule 7 at pages 10-11, 17).
- **Customer Operations**, e.g. the Customer Connections segment focuses on enhancing the experience for customers requesting access to the grid by providing a dedicated team to communicate and manage connection requests from initial contact through completion. (See Exhibit 4, Tab 2, Schedule 8 at pages 4-5, 16-22). The Key Accounts segment manages the utility's relationships with large electricity consumers (i.e. 1MW and greater and other critical customers) across all business sectors. Many Key Account customers have large or complex connections, such as data centres and real estate developments, which require additional support and resources through all phases of their projects (See Exhibit 4, Tab 2, Schedule 8 at pages 4-6, 22-27).
- **Asset and Program Management,** e.g. System Planning segment includes capacity planning and grid innovation function, responsible for planning the distribution system's future load

requirements driven by customer growth, and the requisite connection capacity to accommodate current and forecasted levels of DERs in Toronto Hydro's service area. This group also identifies opportunities for adopting non-wires alternatives (including flexibility services, local demand response) to maximize the use of existing distribution system assets (See Exhibit 4, Tab 2, Schedule 9, pages 6, 15-16, 19-21).

- **Customer Care**, e.g. the Customer Care program addresses the direct interactions between Toronto Hydro and its approximately 791,000 customers, through customer relationship management, billing, metering, and collections functions. Toronto Hydro's proposed investments in the Program over the 2025-2029 rate period include the following to enable the utility's effective response to the related new demands and challenges:
    - Contact Centre services designed to respond to new types and complexities of technical, metering, and billing enquiries associated with EVs and EV charging systems, DERs, and government programs and incentives; and
    - Metering solutions associated with net metering and remote metering (See Exhibit 4, Tab 2, Schedule 14, pages 1-6).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 4-PP-47

Reference: Exhibit 4, Tab 1, Schedule 1, Page 7

Please replicate the layout of Figure 1: Comparing 2014-2029 Linear Trends in CAPEX, OM&A and FTE using the following two datasets as separate figures:

- Comparing 2014-2024 Linear Trends in CAPEX, OM&A and FTE
- Comparing 2025-2029 Linear Trends in CAPEX, OM&A and FTE

RESPONSE:

Please note the title for the figure referenced stated 2014 to 2029 in error; the data presented spans the period of 2015 to 2029. Please see below the requested analysis:

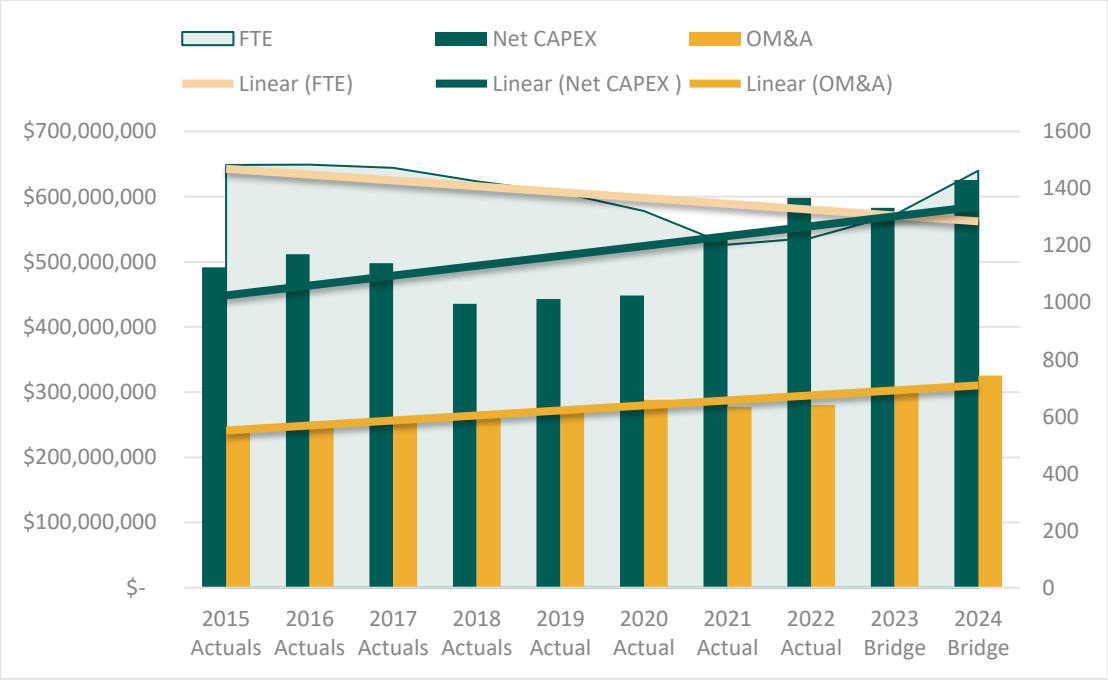


Figure 1: 2015-2024 Linear Trends in CAPEX, OM&A and FTE

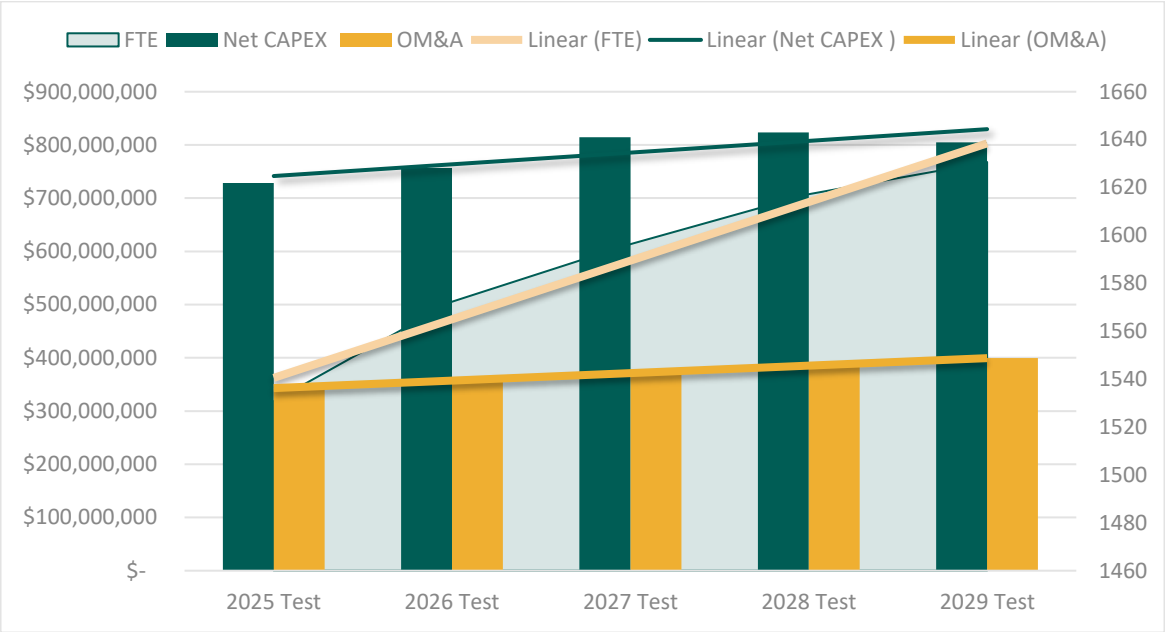


Figure 2: 2025-2029 Linear Trends in CAPEX, OM&A and FTE

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 4-PP-48

Reference: Exhibit 4, Tab 1, Schedule 1, Page 16 - Figure 4: OM&A Expenditure per MWh of Load

QUESTION:

Please replicate this graph with OM&A Expenditure per Customer information.

RESPONSE:

Please see Figure 9 on page 19 of the referenced evidence.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 4-PP-49

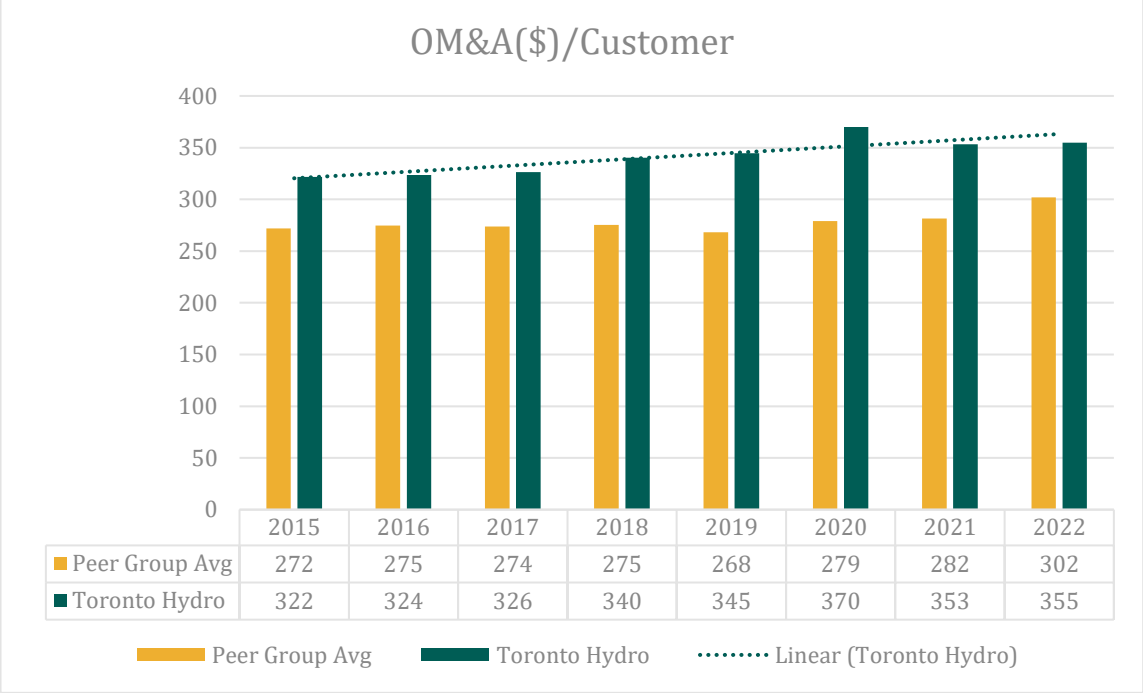
Reference: Figure 9: OM&A Expenditure per Customer

QUESTION (A)

a) Please provide the data for the bars in Figure 9.

RESPONSE (A):

Please see the table below with the data table.



	2015	2016	2017	2018	2019	2020	2021	2022
Peer Group Avg	272	275	274	275	268	279	282	302
Toronto Hydro	322	324	326	340	345	370	353	355

QUESTION (B):

b) Please explain how OM&A Cost per Customer is used in the industry and whether it is a suitable benchmark metric. If it is not a suitable metric, please explain what is better and why.

RESPONSE (B):

In accordance with sections 2.4.1 and 2.4.2 of the OEB's *Chapter 2 Filing Requirements For Electricity Distribution Rate Applications*,[1] OM&A cost per customer is a metric that the OEB evaluates in Cost of Service rebasing applications. However, as noted in Exhibit 4, Tab 1, Schedule 1 at section 1.1.2 starting on page 11, there is are some important considerations when comparing Toronto Hydro using OM&A cost per customer. Operating in Canada's densest and fastest (vertically) growing city, the utility serves far more end-use customers through bulk metering and competitive sub-metering arrangements than its actual customer count would otherwise indicate. The prevalence of unit sub-metering in Toronto Hydro's service territory skews comparative metrics that use customer count as the denominator because it results in the aggregation of hundreds of end-consumers behind a single bulk-meter and subsequently counting each multi-unit building with a bulk-meter connection as a single customer. Based on self-declarations submitted by multi-unit residential buildings for the purposes of Regulated Price Plan elections and the Ontario Electricity Rebate ("OER") program, Toronto Hydro estimates that it serves approximately 340,000 end-consumers or more behind bulk meters.

[1] Ontario Energy Board, *Filing Requirements for Electricity Distribution Rate Applications – 2023 Edition for 2024 Rate Applications* (December 15, 2022), Chapter 2 – Cost of Service

RESPONSES TO POWER WORKERS UNION INTERROGATORIES

INTERROGATORY 4-PWU-28

Reference: Exhibit 4, Tab 1, Schedule 1, Original Page 20, Figure 11 (2015-2029 FTE Completement)
Exhibit 3, Tab 1, Schedule 1, Original Page 23, Line 20
Exhibit 4, Tab 1, Schedule 1, Original Page 22, Lines 11-12

Reference 1: Figure 11 indicates a total FTE increase of 11.5% for the 2024-2029 period.

Reference 2: "From 2024 to 2029, as the utility's workforce grows by approximately 11.5 percent…"

Reference 3: "As Toronto Hydro prepares to enter its next rate period, staffing levels are forecasted to grow by 25 percent over the 2024 through 2029 period."

QUESTION (A):

a) Please confirm Toronto Hydro uses "workforce" to mean FTE.

RESPONSE (A):

In relation to the three above references in Exhibit 4 Tab 1 Schedule 1, the term "workforce" is represented by FTE.

QUESTION (B):

b) Please confirm if the "staffing levels" in Ref 3 implies headcount and describe how the 25% increase in staffing levels is calculated.

RESPONSE (B):

The 25% increase in "staffing levels" in reference 3 above refers to FTE. This calculation is the difference between the FTE from 2023 to 2029, divided by the 2023 FTE.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-88

Reference: Exhibit 4, Tab 1, Schedule 1, Page 1

Preamble:

Toronto Hydro states that the OM&A budget outlined in Exhibit 4 "represents the minimum investments necessary to deliver the Distribution System Plan ("DSP")" and "achieve key outcomes." The Custom Incentive Framework contains a 0.75% incentive adjustment which will reduce the OM&A dollars received.

QUESTION (A):

a) In what areas does Toronto Hydro see being able to reduce its OM&A expenditures to reflect this incentive adjustment?

RESPONSE (A):

The 0.75 percent X-factor does not reduce OM&A expenditures; it reduces the revenue (i.e. the OM&A dollars received) that Toronto Hydro will collect through rates to fund prudent and necessary OM&A expenditures. In doing so, the X-factor places an incentive on Toronto Hydro to pursue efficiency and productivity improvements, while also driving towards the achievement of the performance targets that are subject to the PIM.

QUESTION (B):

b) Please identify and quantify any planned efficiencies/productivity initiatives that are already built into the 2025-2029 budget.

RESPONSE (B):

Please see Toronto Hydro's response to interrogatory 1B-SEC-25. In addition, the programmatic evidence in Exhibit 4, Tab 2 includes a Cost Control and Productivity Measures section that explains

specific initiatives which are being undertaken in each OM&A program to manage costs. The productivity benefits resulting from these initiatives are embedded in the program budgets.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-89

Reference: Exhibit 4, Tab 1, Schedule 1, Table 1, Appendices 2-JA, JB, JC and L

With respect to OM&A:

QUESTION (A) :

a) Please provide 2020 OEB-approved OM&A amounts (adjusted for Accounts 4375 and 4380) in the same format as Table 1.

RESPONSE (A):

Toronto Hydro is unable to provide the requested breakdown because the OEB approved the 2020 test year OM&A on an envelope (rather than programmatic) basis.[1] The utility notes that subject to the adjustment for Accounts 4375 and 4380[2] and after normalizing for the impact of the COVID pandemic[3], the 2020 actuals are within $0.1M variance of the OEB-approved amount on an envelope basis.

QUESTION (B) :

b) At the segment level shown in Table 1, please provide the total OM&A separated by capitalized and non-capitalized. Please reconcile the amount provided in Appendix 2-D and explain any variances.

[1] EB-2018-0165 – Decision and Order (December 19, 2019) at page 140.
[2] See also 1B-SEC-8 for a discussion of adjustments for Account 4380 with respect to the OEB-approved 2020 OM&A budget.
[3] Exhibit 4, Tab 1, Schedule 2, OEB Appendix 2-JB for COVID impact of $17.1M to the Collections segment and $4.1M impact to Disaster Preparedness Management Program

RESPONSE (B):

Please note that in response to interrogatory 2B-Staff-118 Toronto Hydro corrected and filed an updated OEB Appendix 2-D. Additionally, Toronto Hydro notes that the information in Tables 1 to 5 includes the following: Positive charges (debits) represent net allocation of costs to the program from other programs. This includes, for example, charges related to labour, vehicle and material handling on-cost. Whereas, negative charges (credits) represent net cost recovery for the program as a result of capitalization and/or supply of resources to other programs. This includes, for example, charges relating to capital and operational costs.

1 **Table 1: Total OM&A Before Capitalization ($ Millions)**

Programs	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Preventative and Predictive Overhead Line Maintenance	8.2	7.5	7.0	8.8	9.8	11.0	11.4	11.9	12.0	12.0
Preventative and Predictive Underground Line Maintenance	4.6	3.9	5.1	5.6	4.4	5.0	5.1	4.9	5.2	5.0
Preventative and Predictive Station Maintenance Program	3.3	3.3	2.6	2.8	4.9	5.6	5.3	5.3	5.9	6.0
Corrective Maintenance	15.8	20.1	17.6	19.0	17.9	20.9	21.7	21.4	22.0	22.9
Emergency Response	24.1	25.4	25.0	22.3	25.1	28.2	28.8	29.9	30.8	31.6
Disaster Preparedness Management Program	5.6	5.3	4.8	0.8	1.8	1.9	1.9	2.0	2.1	2.2
Control Centre Operations	17.4	16.7	17.8	19.0	24.1	25.9	28.1	29.8	31.5	33.0
Customer Operations	25.3	6.4	9.4	13.0	11.8	13.8	14.5	15.5	16.4	17.4
Asset and Program Management	34.0	29.3	31.2	32.2	41.6	45.2	50.5	53.6	57.1	59.8
Work Program Execution	69.0	81.4	86.5	87.7	103.8	110.6	117.5	125.6	133.1	141.3
Fleet and Equipment Services	9.9	8.9	8.2	8.9	9.9	10.1	10.5	10.8	11.1	11.5
Facilities Management	25.1	26.8	25.8	27.2	28.7	29.0	29.6	29.9	30.6	31.5
Supply Chain Services	15.9	13.0	13.9	16.4	18.9	21.6	23.6	25.0	25.6	27.3
Customer Care	56.9	40.9	43.6	47.5	51.6	51.0	53.3	54.3	56.3	58.1
Human Resources, Environment and Safety	15.5	17.6	16.7	18.4	21.3	22.6	23.2	24.2	25.3	26.3
Finance	18.5	20.1	20.8	22.7	25.7	27.6	29.7	31.3	33.2	35.1
Information Technology	54.4	57.7	61.4	65.5	66.0	72.6	75.7	79.2	82.8	86.8
Public, Legal and Regulatory Affairs	19.2	19.8	20.3	23.4	29.0	30.9	32.0	33.1	34.4	35.4
Charitable Donations (LEAP)	1.0	1.0	1.0	1.0	1.4	1.5	1.6	1.7	1.8	1.9
Common costs and Adjustments	(0.2)	(0.3)	(1.0)	0.3	(0.9)	(0.9)	(0.9)	(0.8)	(0.8)	(0.8)
Allocation and Recoveries	(13.1)	(14.6)	(12.4)	(10.5)	(16.1)	(17.2)	(17.3)	(17.7)	(18.3)	(19.3)
Total OM&A Before Capitalization	**410.4**	**390.2**	**405.3**	**432.0**	**480.7**	**516.9**	**545.8**	**570.9**	**598.1**	**625.0**

Table 2: Total Labour Transfers and Capitalization ($ Millions)

Programs	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Preventative and Predictive Overhead Line Maintenance	(2.5)	(1.4)	(1.4)	(1.6)	(2.0)	(2.0)	(2.3)	(2.4)	(2.6)	(2.7)
Preventative and Predictive Underground Line Maintenance	0.4	0.4	0.5	0.5	1.6	1.7	1.8	1.7	1.8	1.9
Preventative and Predictive Station Maintenance Program	2.4	2.8	2.6	2.7	1.8	2.0	1.9	2.0	2.3	2.4
Corrective Maintenance	6.4	5.2	4.7	5.6	6.2	7.0	7.4	7.9	8.2	8.9
Emergency Response	(2.1)	(2.6)	(3.2)	(2.6)	(2.2)	(2.5)	(2.6)	(2.9)	(3.1)	(3.2)
Disaster Preparedness Management Program	0.4	0.2	0.1	0.1	-	-	-	-	-	-
Control Centre Operations	(9.8)	(10.7)	(11.3)	(12.5)	(16.2)	(17.6)	(19.1)	(20.3)	(21.5)	(22.5)
Customer Operations	(15.1)	0.9	(0.6)	(2.1)	(0.9)	(1.5)	(1.8)	(2.2)	(2.7)	(3.3)
Asset and Program Management	(20.6)	(17.4)	(18.1)	(20.4)	(27.6)	(31.0)	(34.7)	(37.0)	(39.2)	(41.1)
Work Program Execution	(53.9)	(59.8)	(61.8)	(66.9)	(80.6)	(86.4)	(92.4)	(99.2)	(106.0)	(113.1)
Fleet and Equipment Services	(0.3)	(0.1)	(0.1)	-	(0.5)	(0.5)	(0.6)	(0.7)	(0.8)	(0.9)
Facilities Management	(0.8)	(0.8)	(0.8)	(0.8)	(0.8)	(1.1)	(1.2)	(1.0)	(1.0)	(1.2)
Supply Chain Services	(0.1)	(0.1)	(0.1)	0.1	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.2)
Customer Care	(1.3)	(1.7)	(4.4)	(4.2)	(3.3)	(2.5)	(1.8)	(1.9)	(2.0)	(2.1)
Human Resources, Environment and Safety	-	-	-	(0.3)	-	-	-	-	-	-
Finance	(2.1)	(2.2)	(2.4)	(2.4)	(2.8)	(3.2)	(3.5)	(3.7)	(3.8)	(4.0)
Information Technology	(6.4)	(7.1)	(7.9)	(9.6)	(8.4)	(9.3)	(9.9)	(10.5)	(11.1)	(11.7)
Public, Legal and Regulatory Affairs	(0.7)	(0.8)	(1.1)	(0.8)	(1.0)	(1.0)	(1.1)	(1.1)	(1.2)	(1.2)
Charitable Donations (LEAP)	-	-	-	-	-	-	-	-	-	-
Common costs and Adjustments	-	-	-	-	-	-	-	-	-	-
Allocation and Recoveries	-	-	-	-	-	-	-	-	-	-
Total Labour Capitalization	**(106.1)**	**(95.2)**	**(105.3)**	**(115.2)**	**(136.8)**	**(148.0)**	**(160.0)**	**(171.4)**	**(182.8)**	**(194.0)**

Table 3: Total Vehicle Transfers and Capitalization ($ Millions)

Programs	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Preventative and Predictive Overhead Line Maintenance	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Preventative and Predictive Underground Line Maintenance	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Preventative and Predictive Station Maintenance Program	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Corrective Maintenance	0.9	1.2	1.2	1.1	1.5	1.6	1.6	1.7	1.8	1.8
Emergency Response	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Disaster Preparedness Management Program	-	-	-	-	-	-	-	-	-	-
Control Centre Operations	-	-	-	-	-	-	-	-	-	-
Customer Operations	(0.9)	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.5
Asset and Program Management	-	-	-	-	-	-	-	-	-	-
Work Program Execution	(4.1)	(7.4)	(7.4)	(6.4)	(8.0)	(8.2)	(8.3)	(8.5)	(8.6)	(8.8)
Fleet and Equipment Services	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)
Facilities Management	-	-	-	-	-	-	-	-	-	-
Supply Chain Services	-	-	-	-	-	-	-	-	-	-
Customer Care	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Human Resources, Environment and Safety	-	-	-	-	-	-	-	-	-	-
Finance	-	-	-	-	-	-	-	-	-	-
Information Technology	-	-	-	-	-	-	-	-	-	-
Public, Legal and Regulatory Affairs	-	-	-	-	-	-	-	-	-	-
Charitable Donations (LEAP)	-	-	-	-	-	-	-	-	-	-
Common costs and Adjustments	-	-	-	-	-	-	-	-	-	-
Allocation and Recoveries	-	-	-	-	-	-	-	-	-	-
Total Vehicle Capitalization	**(3.8)**	**(5.5)**	**(5.5)**	**(4.7)**	**(5.6)**	**(5.6)**	**(5.7)**	**(5.8)**	**(5.8)**	**(5.9)**

Table 4: Total Material Handling On-cost Capitalization ($ Millions)

Programs	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Allocation and Recoveries	(12.4)	(12.0)	(14.1)	(17.9)	(17.8)	(20.3)	(22.1)	(23.5)	(24.0)	(25.5)
Total Material Handling On-cost Capitalization	**(12.4)**	**(12.0)**	**(14.1)**	**(17.9)**	**(17.8)**	**(20.3)**	**(22.1)**	**(23.5)**	**(24.0)**	**(25.5)**

Table 5: Total OM&A after Capitalization

Programs	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Total OM&A Before Capitalization (Table 1)	410.4	390.2	405.3	432.0	480.7	516.9	545.8	570.9	598.1	625.0
Less: Labour Capitalization (Table 2)	(106.1)	(95.2)	(105.3)	(115.2)	(136.8)	(148.0)	(160.0)	(171.4)	(182.8)	(194.0)
Less: Vehicle Capitalization (Table 3)	(3.8)	(5.5)	(5.5)	(4.7)	(5.6)	(5.6)	(5.7)	(5.8)	(5.8)	(5.9)
Less: Material Handling On-cost (Table 4)	(12.4)	(12.0)	(14.1)	(17.9)	(17.8)	(20.3)	(22.1)	(23.5)	(24.0)	(25.5)
Total OM&A	**288.1**	**277.5**	**280.4**	**294.2**	**320.5**	**343.0**	**358.0**	**370.2**	**385.5**	**399.6**

QUESTION (C):

c) Please provide an update to 2023 numbers based on year-end actuals for both Table 1 and Appendices 2-JA, JB, JC and L.

RESPONSE (C):

Please see Table 6 below which includes 2023 actuals; and 2024 bridge year forecast reflecting the impact of the Cloud and Locates DVAs as set out in the DVA Continuity appended to 9-Staff-349. Toronto Hydro has also updated following OEB appendices to reflect these changes and have filed them as an appendix to this response.

- OEB Appendix 2-JA, Summary of Recoverable OM&A Expenses
- OEB Appendix 2-JB, Recoverable OM&A Cost Driver Table
- OEB Appendix 2-JC, OM&A Programs Table
- OEB Appendix 2-L, Recoverable OM&A Cost per Customer and per FTE

Table 6: 2020-2024 Actual and Bridge Year OM&A Expenditures by Program ($ Millions)

Programs	Actual				Bridge	Total
	2020	2021	2022	2023	2024	
Preventative and Predictive Overhead Line Maintenance	5.8	6.2	5.7	7.3	7.9	32.9
Preventative and Predictive Underground Line Maintenance	5.1	4.4	5.7	6.2	6.1	27.5
Preventative and Predictive Station Maintenance	5.9	6.4	5.5	5.8	7.0	30.6
Corrective Maintenance	23.1	26.5	23.5	25.7	25.6	124.4
Emergency Response	22.1	23.0	22.0	19.8	23.1	110.0
Disaster Preparedness Management Program	6.0	5.5	4.9	0.9	1.8	19.1
Control Centre Operations	7.6	6.0	6.5	6.5	7.9	34.5
Customer Operations	9.3	7.5	9.0	11.1	11.3	48.2
Asset and Program Management	13.4	11.9	13.1	11.8	14.0	64.2
Work Program Execution	11.0	14.2	17.3	14.4	15.2	72.1
Fleet and Equipment Services	9.3	8.5	7.8	8.6	9.1	43.3
Supply Chain Services	15.8	12.9	13.8	16.5	18.8	77.8
Facilities Management	24.3	26.0	25.0	26.4	27.9	129.6
Customer Care	55.7	39.3	39.3	43.4	48.4	226.1

Programs	Actual				Bridge	Total
	2020	2021	2022	2023	2024	
Human Resources, Environment and Safety	15.5	17.6	16.7	18.1	21.3	89.2
Finance	16.4	17.9	18.4	20.3	22.9	95.9
Information Technology	48.0	50.6	53.5	55.9	57.6	265.6
Legal and Regulatory	18.5	19.0	19.2	22.6	28.0	107.3
Charitable Donations and LEAP	1.0	1.0	1.0	1.0	1.4	5.4
Common Costs and Adjustments	(0.2)	(0.3)	(1.0)	0.3	(0.9)	(2.1)
Allocations and Recoveries	(25.5)	(26.6)	(26.5)	(28.4)	(33.9)	(140.9)
Total	**288.1**	**277.5**	**280.4**	**294.2**	**320.5**	**1,460.7**

QUESTION (D) :

d) For every segment shown in the Schedules 1-21, please provide the 2023 actuals.

RESPONSE (D):

Please see Table 7 to 27 below which shows the updates for 2023 actuals and 2024 Bridge for every segment shown in Exhibit 4, Tab 2, Schedule 1 to 21 and reflects the impact of the Cloud and Locates DVAs as set out in the DVA Continuity appended to 9-Staff-349 in the applicable programs.

Table 7: Preventative and Predictive Overhead Line Maintenance Program Expenditures by Segment - Schedule 1 ($ Millions)

	Actuals				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Overhead Line Patrols & Pole Inspections	0.5	0.5	0.5	0.6	0.6	0.8	0.8	0.9	0.9	0.9
Overhead Switch Maintenance & Insulator Washing	1.4	1.6	1.3	1.5	1.7	2.4	2.4	2.5	2.6	2.6
Vegetation Management	2.8	3.4	3.5	4.6	3.8	4.0	4.1	4.2	4.3	4.4
Metering Services	1.1	0.7	0.4	0.6	1.8	1.9	1.9	2.0	1.7	1.5
Total	**5.8**	**6.2**	**5.7**	**7.3**	**7.9**	**9.1**	**9.2**	**9.6**	**9.5**	**9.4**

Table 8: Preventative and Predictive Underground Line Maintenance Program Expenditures by Segment - Schedule 2 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Below-Grade Equipment Maintenance	2.5	2.9	3.0	3.4	3.2	3.5	3.6	3.3	3.5	3.5
Padmounted Equipment Maintenance	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
Cable Diagnostic Testing	-	0.3	0.4	0.6	0.6	0.7	0.8	0.8	0.8	0.8
Contact Voltage Scanning	2.0	0.7	1.8	1.7	1.8	2.0	2.0	2.0	2.2	2.1
Total	**5.1**	**4.4**	**5.7**	**6.2**	**6.1**	**6.8**	**7.0**	**6.7**	**7.1**	**7.0**

Table 9: Preventative and Predictive Stations Maintenance Program Expenditures by Segment, - Schedule 3 ($ Millions)

	Actuals				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Customer Location Maintenance	1.3	1.1	1.3	1.1	1.6	1.5	1.7	1.6	2.0	1.5
Station Inspections and Auxiliary Equipment Maintenance	1.1	1.1	1.2	0.9	1.1	1.3	1.2	1.2	1.3	1.6
Stations Switchgear Maintenance	2.7	3.2	2.4	3.0	3.4	4.1	3.6	3.6	4.2	4.5
Station Equipment Maintenance	0.8	1.0	0.6	0.8	0.9	1.1	1.1	1.3	1.1	1.2
Total	**5.9**	**6.4**	**5.5**	**5.8**	**7.0**	**8.0**	**7.6**	**7.7**	**8.6**	**8.8**

Table 10: Corrective Maintenance Program Expenditures - Schedule 4 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Corrective Maintenance	23.1	26.5	23.5	25.7	25.6	29.5	30.7	31.0	32.0	33.6
Total	**23.1**	**26.5**	**23.5**	**25.7**	**25.6**	**29.5**	**30.7**	**31.0**	**32.0**	**33.6**

Table 11: Emergency Response Program Expenditures - Schedule 5 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Emergency Response	22.1	23.0	22.0	19.8	23.1	25.9	26.4	27.2	27.9	28.6
Total	**22.1**	**23.0**	**22.0**	**19.8**	**23.1**	**25.9**	**26.4**	**27.2**	**27.9**	**28.6**

Table 12: Disaster Preparedness and Management Program Expenditures - Schedule 6 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Disaster Preparedness Management Program	6.0	5.5	4.9	0.9	1.8	1.9	1.9	2.0	2.1	2.2
Total	**6.0**	**5.5**	**4.9**	**0.9**	**1.8**	**1.9**	**1.9**	**2.0**	**2.1**	**2.2**

Table 13: Control Centre Operations Program Expenditures - Schedule 7 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Control Centre Operations	7.6	6.0	6.5	6.5	7.9	8.3	9.0	9.5	10.0	10.5
Total	**7.6**	**6.0**	**6.5**	**6.5**	**7.9**	**8.3**	**9.0**	**9.5**	**10.0**	**10.5**

Table 14: Customer Operations Expenditures by Segment - Schedule 8 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Customer Connections	3.7	1.6	1.6	3.1	3.6	3.2	3.3	3.5	3.6	3.8
Key Accounts	-	0.5	0.8	0.8	1.2	1.5	1.5	1.7	1.8	1.9
Public Safety & Damage Prevention	4.7	4.4	5.4	6.0	5.3	6.7	6.9	7.0	7.2	7.3
Customer-Owned Equipment Services	0.9	1.0	1.2	1.2	1.2	1.3	1.4	1.5	1.5	1.6
Total	**9.3**	**7.5**	**9.0**	**11.1**	**11.3**	**12.7**	**13.1**	**13.7**	**14.1**	**14.6**

Table 15: Asset and Program Management Program Expenditures - Schedule 9 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
System Planning	5.6	6.1	7.5	6.0	8.1	8.4	9.1	9.5	10.0	10.3
Standards and Policies	4.7	4.5	4.3	3.6	3.0	3.2	3.2	3.3	3.4	3.5
Flexibility Services	0.4	0.2	0.2	0.6	0.8	0.2	0.9	1.1	1.6	1.9
Program Management and Support	2.7	1.1	1.1	1.6	2.1	2.4	2.6	2.7	2.9	3.0
Total	**13.4**	**11.9**	**13.1**	**11.8**	**14.0**	**14.2**	**15.8**	**16.6**	**17.9**	**18.7**

Table 16: Work Program Execution Program Expenditures - Schedule 10 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
External Work Execution	1.0	1.5	1.1	0.5	1.4	1.5	1.6	1.7	1.8	1.8
Internal Work Execution	10.0	12.7	16.2	13.9	13.8	14.5	15.2	16.2	16.7	17.6
Total	**11.0**	**14.2**	**17.3**	**14.4**	**15.2**	**16.0**	**16.8**	**17.9**	**18.5**	**19.4**

Table 17: Fleet and Equipment Services Program Expenditures - Schedule 11 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Fleet and Equipment Services	9.3	8.5	7.8	8.6	9.1	9.3	9.6	9.8	10.0	10.3
Total	**9.3**	**8.5**	**7.8**	**8.6**	**9.1**	**9.3**	**9.6**	**9.8**	**10.0**	**10.3**

Table 18: Facilities Management Program Expenditures by Segment - Schedule 12 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Facilities Maintenance Services	16.6	18.4	17.4	19.0	19.6	19.4	19.8	20.1	20.6	21.0
Rentals & Leases	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6
Utilities & Communications	2.3	2.2	2.1	1.8	2.4	2.5	2.5	2.6	2.6	2.7
Property Taxes	5.0	4.9	5.0	5.1	5.4	5.5	5.6	5.7	5.8	6.0
Total	**24.3**	**26.0**	**25.0**	**26.4**	**27.9**	**27.9**	**28.4**	**28.9**	**29.6**	**30.3**

Table 19: Supply Chain Services Program Expenditures - Schedule 13 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Supply Chain Services	15.8	12.9	13.8	16.5	18.8	21.5	23.5	24.9	25.5	27.1
Total	**15.8**	**12.9**	**13.8**	**16.5**	**18.8**	**21.5**	**23.5**	**24.9**	**25.5**	**27.1**

Table 20: Customer Care Program Expenditures by Segment - Schedule 14 ($ Millions)

Segment	Actuals				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Billing, Remittance and Meter Data Management	19.4	18.9	19.4	20.7	23.1	23.7	25.0	25.4	26.2	27.0
Collections	24.9	9.0	7.8	9.1	10.2	10.2	10.9	11.0	11.3	11.6
Customer Relationship Management	11.4	11.4	12.1	13.6	15.1	14.7	15.7	16.1	16.9	17.5
Total	**55.7**	**39.3**	**39.3**	**43.4**	**48.4**	**48.6**	**51.6**	**52.5**	**54.4**	**56.1**

Table 21: Human Resource and Safety Program Expenditures - Schedule 15 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Environment, Health & Safety	2.4	2.3	2.4	2.7	3.1	3.3	3.4	3.6	3.8	3.9
Human Resource Services & Systems, Organizational Effectiveness & Employee Labour Relations	5.9	6.3	5.9	7.2	9.4	10.0	10.4	10.8	11.3	11.8
Talent Management, Change Leadership & Sustainability	7.2	9.0	8.4	8.2	8.8	9.3	9.4	9.8	10.2	10.6
Total	**15.5**	**17.6**	**16.7**	**18.1**	**21.3**	**22.6**	**23.2**	**24.2**	**25.3**	**26.3**

Table 22: Finance Program Expenditures by Segment - Schedule 16 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Controllership	6.5	6.9	6.9	7.9	8.8	9.4	10.1	10.5	11.0	11.4
Financial Services	6.7	7.7	8.4	8.8	9.7	10.5	11.4	12.2	13.3	14.4
External Reporting	3.2	3.3	3.1	3.6	4.4	4.5	4.7	4.9	5.1	5.3
Total	**16.4**	**17.9**	**18.4**	**20.3**	**22.9**	**24.4**	**26.2**	**27.6**	**29.4**	**31.1**

Table 23: Information Technology Program Expenditures by Segment - Schedule 17 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Security & Enterprise Architecture	3.7	4.5	6.1	6.3	7.3	7.6	7.9	8.4	8.8	9.3
IT Operations	36.9	38.4	39.9	42.6	44.8	46.0	47.5	49.1	50.8	52.2
Project Execution	4.7	4.9	5.0	4.7	3.2	7.4	8.0	8.8	9.7	11.1
IT Governance	2.7	2.8	2.5	2.3	2.3	2.3	2.4	2.4	2.4	2.5
Total	**48.0**	**50.6**	**53.5**	**55.9**	**57.6**	**63.3**	**65.8**	**68.7**	**71.7**	**75.1**

Table 24: Legal Services and Regulatory Affairs Program Expenditures - Schedule 18 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Legal Services	6.1	5.7	5.8	7.0	9.2	9.8	10.3	10.7	11.2	11.6
Regulatory Affairs	3.8	4.4	4.1	5.3	6.4	7.0	7.1	7.5	7.9	8.1
OEB Fees	3.4	3.2	3.6	4.0	4.4	4.5	4.6	4.6	4.7	4.8
Regulatory Applications (Custom IR)	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.0
Communications & Public Affairs	3.6	4.1	4.1	4.7	6.4	6.6	6.9	7.1	7.3	7.6
Total	**18.5**	**19.0**	**19.2**	**22.6**	**28.0**	**29.9**	**30.9**	**32.0**	**33.2**	**34.2**

Table 25: Charitable Contributions Summary - Schedule 19 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Rate Recoverable	1.0	1.0	1.0	1.0	1.4	1.5	1.6	1.7	1.8	1.9
Non-Rate Recoverable	0.1	0.1	0.1	-	-	-	-	-	-	-

Table 26: Common Costs and Adjustments - Schedule 20 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Ongoing or recurring	(0.2)	(0.3)	(1.0)	0.3	(0.9)	(0.9)	(0.9)	(0.8)	(0.8)	(0.8)
Total	**(0.2)**	**(0.3)**	**(1.0)**	**0.3**	**(0.9)**	**(0.9)**	**(0.9)**	**(0.8)**	**(0.8)**	**(0.8)**

Table 27: Allocations and Recoveries Adjustments to OM&A - Schedule 21 ($ Millions)

Segment	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
On-cost recovery	(13.2)	(12.9)	(14.2)	(16.2)	(19.1)	(21.7)	(23.7)	(25.1)	(25.7)	(27.3)
Fleet Recovery Offset	(9.6)	(9.8)	(9.4)	(9.6)	(10.7)	(11.0)	(11.3)	(11.5)	(11.8)	(12.2)
IT and Occupancy Charges	(0.8)	(0.8)	(0.6)	(0.8)	(0.8)	(0.9)	(0.9)	(0.9)	(0.9)	(0.9)
Shared Services	(1.0)	(2.3)	(1.5)	(1.3)	(2.9)	(3.4)	(3.0)	(3.2)	(3.4)	(3.8)
Other Allocated Costs	(0.9)	(0.8)	(0.8)	(0.5)	(0.4)	(0.5)	(0.5)	(0.5)	(0.5)	(0.6)
Total	**(25.5)**	**(26.6)**	**(26.5)**	**(28.4)**	**(33.9)**	**(37.5)**	**(39.4)**	**(41.2)**	**(42.3)**	**(44.8)**

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-90

Reference: Exhibit 4, Tab 1, Schedule 1, Appendix J-C

Please provide a revised version of Appendix 2-JC, that shows Toronto Hydro's annual internal budget for each year between 2020 and 2024.

RESPONSE:

Table 1 below shows Toronto Hydro's internal OM&A budgets and actual expenditures for the current 2020-2024 rate period.[1] Below the table Toronto Hydro provides variance analyses comparing actual to budgeted expenditures for each. For the years 2023 to 2024, Toronto Hydro's internal budgets are consistent with the bridge year forecasts filed as part of the application.[2] In addition, it is important to note that when preparing internal budgets for 2020-2024, Toronto Hydro largely assumed the normal continuation of business and did not build in any material assumptions or changes regarding the ongoing and long-term operational impacts of the COVID-19 pandemic.

Table 1: 2020-2024 OM&A Internal Budget and Actuals ($ Millions)

	2020	2021	2022	2023	2024
Budget	269.5	284.6	294.8	301.5	320.5
Actual	288.1	277.5	280.4	294.2	N/A

/C

[1] Toronto Hydro is unable to provide a revised version of Appendix 2-JC that shows internal budgets for the same period because the utility does not manage its internal budgets in the program view that is presented in the rate application in accordance with the Filing Requirements.

[2] Following the approval of the 2023-2025 Business Plan in the fall of 2022, Toronto Hydro continued its planning process into Q1 of 2023 in order to support the rate application. This resulted in an updated 2023 internal budget which aligned with the 2023 bridge year forecast submitted as part of the rate application.

2020 Budget – 2020 Actual Variance Explanation

An overspend of $18.6 million primarily due to:

- Higher bad debt expense of $17.2 million as a result of the COVID-19 emergency and related financial pressures as detailed in the evidence Exhibit 4, Tab 2, Schedule 14 at p. 29.
- Higher non-routine operational and emergency expenses of $3.9 million related to the COVID-19 response as detailed in the evidence at Exhibit 4, Tab 2, Schedule 6 at Table 1.
- Higher corrective maintenance costs of $2.1 million to address system, environmental and safety risks, including cap and grounding of unused lines, switchgear repair to address known quality risks and sustained corrective work volume as detailed in the evidence at Exhibit 4, Tab 2, Schedule 4 at pages 1-3 and 7-15.
- Higher emergency response costs of $1.5 million due to storm and major event restoration costs as detailed in the evidence at Exhibit 4, Tab 2, Schedule 5, Table 3.
- Lower payroll costs of $5.7 million due to workforce vacancies as a result of unplanned retirements and delayed implementation of the hiring plan due to the challenges related to COVID-19 across various programs as detailed in the evidence at Exhibit 1B, Tab 3, Schedule 3 at pages 10-11; Exhibit 4, Tab 4, Schedule 3 at page 4; and Toronto Hydro's responses to interrogatories 4-SEC-111, 4-Staff-308 (c), and 4-AMPCO-83. /C
- Lower other costs of $0.4 million across various areas.

2021 Budget – 2021 Actual Variance Explanation

An underspend of $7.1 million primarily due to:

- Lower payroll costs of $10.0 million due to workforce vacancies as a result of unplanned retirements and delayed implementation of the hiring plan due to the challenges related to COVID-19 across various programs as detailed in the evidence at Exhibit 1B, Tab 3, Schedule 3 at pages 10-11; Exhibit 4, Tab 1, Schedule 1 at page 21; Exhibit 4, Tab 4, Schedule 3 at page 4; and Toronto Hydro's responses to interrogatories 4-SEC-111, 4-Staff-308(c), and 4-AMPCO-83.
- Lower other costs of $0.7 million across various areas.
- Higher non-routine operational and emergency expenses of $3.6 million related to the COVID-19 response as detailed in the evidence in Exhibit 4, Tab 2, Schedule 6, Table 1.

2022 Budget – 2022 Actual Variance Explanation

An underspend of $14.4 million primarily due to:

- Lower payroll costs of $10.0 million due to workforce vacancies as a result of unplanned retirements and delayed implementation of the hiring plan due to the persisting impacts of the COVID-19 challenges explained above.[3]
- Lower Public, Legal and Regulatory Affairs costs of $2.1 million due to underspend in external services of $1.2 million related to deferred implementation of enhanced customer awareness and public communications work plans, and lower volume of externally-driven legal claims of $0.9 million.
- Lower payroll costs of $2.0 million due to one-time favourable labour capitalization in Customer Care as a result of employee time allocated to the Customer Information System ("CIS") upgrade project as detailed in Toronto Hydro's response to undertaking JT4.14.
- Lower other costs of $0.3 million across various areas.

2023 Budget – 2023 Actual Variance Explanation

An underspend of $7.2 million was primarily due to:

- One-time underspend totaling to $2.5 million driven by:
  - lower payroll costs of $1.1 million due to one-time favourable labour capitalization in Customer Care as a result of employee time allocated to the CIS upgrade project as noted in Toronto Hydro's response to undertaking JT4.14;
  - transfer of $0.9 million to the *Getting Ontario Connected Act* ("GOCA") variance account as noted in Toronto Hydro's response to interrogatory 4-Staff-296.; and
  - transfer of $0.5 million to the Cloud Computing Implementation deferral account as noted in Toronto Hydro's response to JT3.6.
- Lower Public, Legal and Regulatory Affairs costs of $2.1 million driven by: (i) $1.2 million underspend in external services primarily related to deferred implementation of enhanced customer awareness and public communications work in the Communications and Public Affairs segments, and deferred implementation of continuous improvement work plans and

/C

[3] Exhibit 4, Tab 1, Schedule 1; Toronto Hydro's responses to interrogatories 4-SEC-111, 4-Staff-308 (c), and 4-AMPCO-83.

initiatives in the Regulatory Affairs segment due to the need support the rate application; (ii) $0.5 million payroll variance in the Legal Services segment driven by higher-than-expected turnover, internal promotions and challenges in attracting talent in this segment; and (iii) $0.4 million variance due to lower volume of externally-driven legal claims.

- Lower Asset and Program Management program cost of $1.7 million due to underspend in external services in the System Planning segment primarily related to the deferral of various continuous improvement work plans and initiatives in order to support the rate application (i.e. capital and maintenance planning and evidence drafting).
- Lower Information Technology program cost of $1.1 million driven by underspend in the Project Execution segment primarily related to the deferred vendor procurement relating to solutions for the Customer Relationship Management segment.
- Higher other costs of $0.2 million across various areas.

Please also refer to Toronto Hydro's response to undertaking JT3.28 for a causal track view comparing 2023 forecast to actual expenditures.

/C

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-91

Reference: [Ex.4-1-1, p.11]

Preamble:

"Toronto Hydro serves far more end-use customers through bulk metering and competitive sub-metering arrangements than its actual customer count would otherwise indicate." For buildings with end-use consumers behind bulk meters:

QUESTION (A):

a. Please explain how servicing this customer is different than a commercial customer with the same load.

RESPONSE (A):

In Toronto Hydro's experience, there is no material OM&A cost difference between serving a bulk metered multi-unit residential customer and a bulk metered commercial customer of equivalent load.

For a discussion comparing OM&A service costs between suite metered and bulk metered residential buildings, please refer to Toronto Hydro's response to 1B-Staff-60(e).

QUESTION (B):

b. How do these end-use consumers, which Toronto Hydro does not bill, increase costs?

RESPONSE (B):

The statement referenced in this question does not speak to an increase or decrease of costs but rather poses considerations for evaluating the benchmark performance metrics which use

customer count in their calculation, as discussed in subsection 1.1.2 of Exhibit 4, Tab 1, Schedule 1.[1] Customer count is a driver for certain variable costs, but not necessarily so for fixed system costs. As Toronto Hydro serves more end-use customers through bulk metering and competitive sub-metering arrangements, it is expected that costs per customer will increase as the fixed system costs are divided by a smaller number of customers compared to other arrangements where each end-consumer is a customer.

[1] At p. 11-12.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-92

References: Exhibit 4. Tab 1, Schedule 1, Page 34, Appendix 2-K

Appendix 2-K shows an increase in FTEs of 404 from 2022 to 2029. Sections 5.1.1-5.1.7 provided the following information on the increases in headcount for each major program and function,

Increase from 2022-2029		2023	2024	2025	2026	2027	2028	2029
	404	80	156	68	41	24	21	14
External Work Execution	51							
Internal Work Execution	61							
System Planning	31							
Control Centre Operations	33							
IT	19							
Customer Care	41							
Corporate Services	30							
Total	266							

QUESTION (A):

a) Please allocate the planned increases shown above to each year.

RESPONSE (A):

The Table 1 below details the variance in FTEs allocated to all Programs between 2022 through 2029. Please note that the 404 FTEs derived from Appendix 2-K are not equivalent to the 266 headcount presented in Exhibit 4, Tab 1, Schedule 1, Sections 5.1.1 - 5.1.7 (pages 34-50), as Appendix 2-K refers to FTEs, while Exhibit 4, Tab 1, Schedule 1, Sections 5.1.1 - 5.1.7 refers to headcount.

Table 1: Annual FTE by Program

Programs	Actual			Bridge		Forecast					2022-2029 Variance
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Preventative and Predictive Overhead Line Maintenance	26	16	13	16	19	20	22	22	22	22	9
Preventative and Predictive Underground Line Maintenance	-	-	-	-	-	-	-	-	-	-	-
Preventative and Predictive Station Maintenance Program	-	-	-	-	-	-	-	-	-	-	-
Corrective Maintenance	7	7	5	3	3	3	3	4	4	4	(1.0)
Emergency Response	48	39	35	24	26	29	28	29	29	29	(6.0)
Disaster Preparedness Management Program	10	9	8	5	8	8	8	8	8	8	-
Control Centre Operations	81	78	84	97	108	113	117	119	120	120	36
Customer Operations	115	8	18	27	35	38	40	42	44	47	29
Asset and Program Management	165	144	143	153	184	198	212	217	219	219	76
Work Program Execution	366	415	420	446	478	498	511	520	535	544	124
Fleet and Equipment Services	24	16	16	18	20	20	20	20	19	20	4
Facilities Management	26	24	22	23	23	24	24	22	22	22	-
Supply Chain Services	29	24	26	30	37	37	39	39	40	40	14
Customer Care	110	102	106	115	140	146	146	150	151	151	45
Human Resources, Environment and Safety	69	69	71	74	82	85	85	85	85	85	14
Finance	80	87	85	90	99	103	106	106	106	106	21
Information Technology	105	102	106	113	118	124	126	128	128	129	23
Public, Legal and Regulatory Affairs	60	63	69	73	83	85	85	85	85	85	16
Charitable Donations (LEAP)	-	-	-	-	-	-	-	-	-	-	-
Common costs and Adjustments	-	-	-	-	-	-	-	-	-	-	-
Allocation and Recoveries	-	-	-	-	-	-	-	-	-	-	-
Total	**1,321**	**1,203**	**1,227**	**1,307**	**1,463**	**1,531**	**1,572**	**1,596**	**1,617**	**1,631**	**404**

Toronto Hydro has also listed FTE changes for Asset and Program Management which is one of the segments under the System Planning Program, and External Work Execution and Internal Work Execution under Work Program Execution Program in the table below.

Table 2: Annual FTE by SEC Requested Programs

Programs	Actual			Bridge		Forecast					2022-2029 Variance
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
System Planning – Asset and Program Management	62	70	81	82	98	105	115	119	120	120	39
External Work Execution – Work Program Execution	54	56	68	83	99	107	113	117	120	120	52
Internal Work Execution – Work Program Execution	312	359	352	363	379	391	398	403	415	424	72
Total	**428**	**485**	**501**	**528**	**576**	**603**	**626**	**639**	**655**	**664**	**163**

QUESTION (B):

b) Please confirm that all of the increased positions listed in Sections 5.1.1-5.1.7 are OM&A, and the remaining 404-299 = 105 will be capitalized. If not confirmed, please provide the breakdown of the 404 FTEs between OM&A and capital, for each year, for each program.

RESPONSE (B):

The increases in positions listed in Sections 5.1.1 - 5.1.7 contribute to both capital and OM&A work. The difference between the 404 FTE from Appendix 2-K and the 266 headcount from Sections 5.1.1-5.1.7 is not due to capitalization. The table below shows the breakdown of the FTE increases between capital and OM&A.

Table 3: 2023-2029 Annual FTE increase compared to 2022 Actuals

	Bridge		Forecast					2022-2029 Increase
	2023	2024	2025	2026	2027	2028	2029	
Total FTE increases Per Year	80	156	68	41	24	21	14	404
FTE Increase Capital	49	72	37	28	18	15	12	231
FTE Increase OM&A	31	84	31	13	6	6	2	173

QUESTION (C):

c) For each of the 404 planned new positions, please provide the name of the position, the program, and the planned year for hiring.

RESPONSE (C):

Please see the response to (a) above. For further information regarding the breakdown of position type, please see Exhibit 4, Tab 4, Schedule 3, Table 1 at pages 12-13.

QUESTION (D):

d) Please provide an update on the status of the hiring for 2023. Which positions were filled and which have not been filled.

RESPONSE (D):

For 2023, based on organizational priorities, 97% of planned positions were filled. Positions filled included a cross section of jobs and skills discussed in Exhibit 4, Tab 4, Schedule 3, Table 1 at pages 12-13.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-93

Reference: Exhibit 4, Tab 2, Schedule 1, Pages 32-33, Figure 15

QUESTION (A):

a) Please explain why the Average Number of Sustained Outages per Feeder decreases with four years between trimming versus three years.

RESPONSE (A):

The reliability data and observations provided in Figure 15 show that the average number of sustained outages per feeder increases from year 1 to year 3 and then decreases at year 4. This pattern underscores that feeders experiencing a large number of sustained outages are typically trimmed within 1-3 years and usually do not go 4 years without trimming. Feeders with good reliability tend to reach the 4-year mark, but will eventually experience outages comparable to the system average.

QUESTION (B):

b) How were the forecasts for five and six years developed?

RESPONSE (B):

Toronto Hydro forecasted the number of sustained outages per feeder for years 5-6 using linear regression based on the average number of historical sustained outages per feeder.

QUESTION (C) AND (D):

c) Toronto Hydro is piloting multiple technologies, such as LiDAR and satellite imagery in order to adopt a data and condition-based approach for feeder-based tree trimming. How would the technologies referenced affect the amount of tree trimming required?

d) Provide a forecast of the potential savings.

RESPONSE (C) AND (D):

Implementing technologies such as LiDAR and satellite imagery enables Toronto Hydro to transition towards a data and risk-based approach for vegetation management. By leveraging these advanced technologies, the utility can conduct more precise assessments of vegetation encroachment on power lines and have better insights into the risk posed by tree contacts. Through more accurate identification of hazardous trees and proactive mitigation, Toronto Hydro can further optimize each feeder's unique cycle. While the technology might not greatly reduce the total amount of trimming, it will allow the utility to prioritize the work by directing resources to areas with the highest risk of causing outages by minimizing spend on conventional time-based trimming.

Toronto Hydro has observed an optimization of resource allocation from an Intelligent Vegetation Management System ("IVMS") pilot project, which was limited to North York and Etobicoke regions, as part of the annual cycle trim. A complete deployment and integration of IVMS with the utility's existing process is required to enable accurate forecasting of potential savings. Preliminary estimates from the pilot project show that Toronto Hydro was able to validate feeders experiencing sustained outage due to potential tree contacts and identify low-risk areas within the piloted regions resulting in reallocation of around $280,000 to other areas for cycle trim in 2024. However, to provide a more accurate forecast, Toronto Hydro will need to analyze data from a broader implementation of the system over time, considering factors such as operational efficiency gains and improvement to future reliability. As the utility continues to refine and expand the IVMS project, it expects to gain clearer insights into the long-term cost-saving benefits it offers to Toronto Hydro.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-94

Reference: Exhibit 4, Tab 2, Schedule 2, Table 7

QUESTION:

Contact Voltage scanning costs are increasing by 11% in 2025 over 2024 and 10% in 2028 over 2027. Please explain what is causing these increases above and beyond "inflationary pressures".

RESPONSE:

Above and beyond inflationary pressures, the increases in expenditures for the years specified are attributed to an increase in the number of wards planned for scanning. Specifically, Toronto Hydro plans to scan 15 wards in 2024 and 2027 and 16 wards in 2025 and 2028.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-95

References: Exhibit 4, Tab 2, Schedule 1
Exhibit 4, Tab 2, Schedule 3
Exhibit 4, Tab 2, Schedule 4

QUESTION:

These Preventive and Corrective Maintenance programs all have as an objective "Contribute to the overall system performance and reliability – as measured by performance metrics like SAIFI, SAIDI…" The total cost of these programs is forecasted to increase 58% from 2020 to 2029. Please quantify the expected impact of this spending on SAIDI and SAIFI for 2024-2029.

RESPONSE:

It is unclear how the 58 percent increase for the three programs referenced was calculated, as Toronto Hydro is forecasting the increase from 2020 to 2029 to be 49 percent.

The increased spending in the Preventative and Predictive Maintenance programs is driven by factors other than just reliability, as discussed in Toronto Hydro's response to interrogatory 2B-Staff-179. Similarly, the Corrective Maintenance program (Exhibit 4, Tab 2, Schedule 4) serves to mitigate safety, environmental, operational, or compliance risks in addition to system reliability risks.

Certain maintenance activities such as the activities performed under the Vegetation Management segment as described in Section 7 of Exhibit 4, Tab 2, Schedule 1, can have a direct and immediate impact on preserving system reliability and can be quantified to some degree as shown in Figure 15. Toronto Hydro expects longer-term system reliability benefits by correcting and repairing deficiencies or substandard conditions before they lead to failure through the Corrective Maintenance program. An example is the installation of an animal guard for a transformer to mitigate the risk of future animal contacts which can lead to an outage, which in some cases can be

highly impactful, as was evident on the February 1, 2024 incident of a racoon making contact with a Hydro One owned station power transformer. Because these reliability benefits are related to the prevention of failures that may or may not occur and are influenced by a variety of factors such as an asset's type, age, and environmental conditions it is exposed to, it can be difficult to quantify the impact Toronto Hydro's Preventative and Predictive Maintenance and Corrective Maintenance Programs can have on mitigating system reliability risks.

Furthermore, Toronto Hydro notes that any reliability-related increases in spending are intended to keep up with increasing challenges (e.g., expanding tree canopy, increasing corrective work request backlog) and are not meant to drive overall improvement. Therefore, while Toronto Hydro cannot specifically quantify the SAIDI and SAIFI impact of the increased maintenance spending, the impact of this spending is inherently reflected in the extrapolation of the utility's historical reliability performance into the future.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-96

Reference: Exhibit 4, Tab 2, Schedule 4

Preamble: With respect to the Corrective Maintenance Program:

QUESTION (A):

a) [p.6] For each year between 2020 and 2023, and for each of P1 to P3, please provide the percentage of deficiencies that are resolved with the specified timeframe (i.e. P1 within 15 days.)

RESPONSE (A):

Please see Table 1 for the percentages of deficiencies resolved within the specified timeframes over 2020-2023.

Table 1: Percentages of Deficiencies Resolved Within Timeframe

Priority	2020	2021	2022	2023
P1	25%	56%	59%	65%
P2	44%	66%	72%	79%
P3	47%	30%	28%	10%

QUESTION (B):

b) [p.10] Please provide a revised version of the information requested in part (a), further broken down by risk level (high, medium, and low).

RESPONSE (B):

P1 priority is always considered as high risk and is issued out and assigned to construction team immediately (e.g. oil leak). P2 priority is considered as medium risk and is also issued out and assigned to construction team promptly. In 2023, Toronto Hydro introduced the breakdown of risk

level (high, medium and low) within the P3 backlog to help triage and expediate deficiencies that pose the greatest safety, environmental, reliability, and financial risk. Please see Table 2 for the breakdown by risk level of P3 deficiencies resolved within timeframe in 2023.

Table 2: Breakdown by Risk Level of P3s Resolved within Timelines

Risk Level	2023
High	67%
Medium	18%
Low	15%

QUESTION (c):

c) [p.6] For each year between 2020 and 2023, what percentage of P4 deficiencies are ultimately resulted in work being done to address the deficiency. Please provide a breakdown of the information by risk level.

RESPONSE (C):

P4 deficiencies are the lowest risk level when compared to P1, P2 and P3. As described in Exhibit 2B, Section D3 at page 9, P4 notifications are for deficiencies that are to be monitored but for which no work requests are issued. P4 deficiencies do not include a risk level. If the deficiency for P4 items worsens then the request can be reprioritized to P1, P2 or P3 and issued out for execution.

QUESTION (D):

d) [p.10] Please explain how Toronto Hydro classifies deficiencies as high, medium or low risk.

RESPONSE (D):

Within the P3 backlog, Toronto Hydro categorizes the work based on the corrective action (e.g. anchor replacement, bollard installation, trip hazard, etc.) required to address the deficiency. Depending on the corrective action, Toronto Hydro takes into account the location of the hazard (e.g. main trunk versus lateral/sub-lateral, sidewalk vs. boulevard) plus the number of customers

affected. For example, if a bollard needs to be straightened or replaced and it is located in a high traffic area, then the risk level would be higher than a low traffic area. Furthermore, if a deficiency can cause a safety or environmental issue (e.g., removing an abandoned transformer to avoid potential PCB oil leak) then this would be flagged as higher priority compared to a bent ventilation grill on a boulevard. Toronto Hydro considers the impact to safety, environmental, reliability, and financial risks to triage and expediate deficiencies that pose the greatest risk in these areas.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-97

References: Exhibit 4, Tab 2, Schedule 5, Page 22

QUESTION:

Costs in this segment are increasing by $3.9 million between 2022 and 2025, partially related to "…a new contract for external resources will become effective in 2025." Please provide further details on this contract.

RESPONSE:

Toronto Hydro's emergency response field services are provided by external contractors working under multi-year contracts. The contracts require the service providers to supply fully qualified powerline technicians, vehicles, and tools at an hourly rate on a 24/7/365 basis. The current contract expires in early 2025. In anticipation, Toronto Hydro undertook an extensive RFP process throughout 2023 to secure new multi-year contracts with qualified vendors at current market rates. The contracts for emergency response services were ultimately awarded to two respondents. The term for the new contracts begins in 2025.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-98

Reference: Exhibit 4, Tab 2, Schedule 7, Pages 24-25

With respect to Control Centre Operations:

QUESTION (A):

a) Costs are increasing by $1.8 million between 2022 and 2025 due to an increased headcount. Please provide details on existing headcounts, new positions to be added by year, and position descriptions.

RESPONSE (A):

Table 1 below provides details on existing headcount and new positions to be added by year:

Table 1: Control Centre Operations Headcount by Function – 2022 to 2025

	2022	2023	2024	2025
Distribution System Operations Management and power system controllers	66	65	66	67
Control Centre Support (Work and Outage Scheduling, Grid Analytics, SCADA Support) Management, engineers, technologists and analysts	17	33	39	42
Energy Centre Management and consultants	2	2	3	5
Total Headcount	85	100	108	113

Toronto Hydro notes that between 2022 and 2023, eleven existing FTEs were remapped from the Emergency Response (Exhibit 4, Tab 2, Schedule 5) and Disaster Preparedness Management (Exhibit 4, Tab 2, Schedule 6) programs to the Control Centre Operations program. Accordingly, of the fifteen incremental headcounts shown in 2023 relative to 2022, only four are net new.

Please refer to pages 39-43 of Exhibit 4 Tab 1, Schedule 1 and Toronto Hydro's response to 4-CCMBC-16(b) and (c) for further discussion of headcount drivers for the 2022-2029 period.

QUESTION (B):

b) Between 2025-2029 costs are increasing by $2.2 million to "maintain the resourcing capacity and capabilities". Please expand on what this entails, e.g., new positions, new contracts, etc.

RESPONSE (B):

Cost increases between 2025 and 2029 in this program are based on forecasted increases to compensation costs and a forecasted increase of Energy Centre professionals from 5 in 2025 to 8 in 2029, and an increase of Control Centre support professionals from 42 in 2025 to 44 in 2029.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-99

Reference: Exhibit 4, Tab 2, Schedule 8, Pages 5 - 9

With respect to the Customer Operations Program:

QUESTION (A):

a) For each year between 2020 and 2029, please provide a breakdown of Customer Operations – Public Safety & Damage Prevention to show total cost for locates.

RESPONSE (A):

The total cost for locates, i.e. excluding the effects of the *Getting Ontario Connected Act* Variance Account, is the total cost of the Public Safety and Damage Prevention segment, reflected in Table 6 on page 29 of Exhibit 4, Tab 2, Schedule 8.

QUESTION (B):

b) Please further breakdown the increases in the cost of locates each year between 2020 and 2029 by each of the following drivers: the proliferation of large multi-unit segment locates and the requirements of the Getting Ontario Connected Act. (GOCA).

RESPONSE (B):

For a breakdown of costs attributable to the *Getting Ontario Connected Act* ("GOCA") and recorded in the associated variance account for the period of April 1, 2023 to December 31, 2024, please refer to Toronto Hydro's response to 4-Staff-296(e). With respect to the proportion of costs that will be attributable to the effects of the GOCA over the 2025-2029 rate period, as discussed in the pre-filed evidence,[1] there remains a great degree of uncertainty regarding the full extent of locates costs due

[1] Exhibit 4, Tab 2, Schedule 8 at p. 9-10 and 29-30.

to past and ongoing legislative amendments. To the extent that any additional material developments affect Toronto Hydro's forecasts for the Public Safety and Damage Prevention segment, the utility will adduce additional evidence while the evidentiary record is open. In any case, Toronto Hydro has requested the continuation of a variance account to capture locates costs in the 2025-2029 period to adequately fund non-discretionary locates work[2] and also produced a forecast of estimated costs in the event that the OEB does not grant that request.[3]

For a breakdown of costs attributable to multi-unit segment locates, please refer to the below table. Toronto Hydro is also showing 2019 to demonstrate the trend from before the onset of the COVID-19 pandemic (10% increase between 2019 and 2022). The utility forecasts increased volumes of multi-unit segment locate tickets at the levels seen in 2022 to continue into the 2025-2029 rate period, given the high level of complex construction activity happening in the city of Toronto from large building developments and infrastructure projects. Although the proportion of costs attributable to multi-unit segments in 2023 were lower than forecasted—potentially due to macroeconomic factors such as high interest rates—Toronto Hydro maintains its forecast for the reasons discussed above.

Table 1: 2019-2029 Multi-Segment Locates Costs ($ Millions)

Actual					Bridge		Forecast				
2019	**2020**	**2021**	**2022**	**2023**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
21.8%	25.5%	25.9%	31.6%	23.9%	31.6%	31.6%	31.6%	31.6%	31.6%	31.6%	31.6%
n/a	$1.2	$1.1	$1.7	$1.6	$2.3	$2.1	$2.1	$2.2	$2.2	$2.3	$2.3

*This table compares the proportion of costs in the Customer Operations – Public Safety & Damage Prevention segment from multi-segment locates versus other locate types.

[2] Exhibit 9, Tab 1, Schedule 1 at p. 27.
[3] *Supra* note 1 at p. 30, lines 1-9.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-100

Reference: Exhibit 4, Tab 2, Schedule 8, Page 10, 26

QUESTION (A):

a) Toronto Hydro attributes the cost increase under the Customer-Owned Equipment Services segment over 2025-2029 to the increase in customer demand for vault access services, including repeat customer requests. Please confirm that Toronto Hydro allows one vault access every 12 months at no charge, however customers pay for subsequent requests. If confirmed, please explain how costs are being increased.

RESPONSE (A):

Toronto Hydro confirms that property owners can request one free 4-hour appointment on a rolling 12 month schedule to access their customer-owned vault. Free access is at the cost of Toronto Hydro. Should the property owner require additional hours or visits they are required to cover the cost of this.

The forecasted cost increases are primarily due to rising demand for the program. Toronto Hydro is seeing an increase in the number of property owners scheduling free and paid vault access appointments each year as well as an increase in the number of customer-owned vaults added through the growth and development in the City of Toronto. In addition to volume driven increases, annual costs increase due to inflationary impacts to annual costs.

QUESTION (B):

b) For Key Accounts, please outline the increases in headcount contributing to the 2022-2029 increases.

RESPONSE (B):

Below is Table 1 which outlines the headcount for Key Accounts from 2022-2029.

Table 1: Key Accounts Headcount – 2022 to 2029

	2022	2023	2024	2025	2026	2027	2028	2029
Key Account Headcount	5	7	7	7	7	7	7	7

QUESTION (C):

c) Please provide the number of Key Accounts for 2023 and a forecast for 2024-2029.

RESPONSE (C):

As of January 2024, Toronto Hydro has 513 Key Account customers (connected loads greater than 1 MVA). This represents 423 unique customers (entities), some with multiple connected loads. As noted in subsection 5.1.4.1 of Exhibit 2B, Section 5.1,[1] Toronto Hydro has experienced a higher than anticipated increase in system access requests for large projects, which is forecasted to continue through the 2024-2029 period. Based on customer driven connections projects currently in design and construction, Toronto Hydro estimates an additional 60-70 new key accounts to be added over the 2024-2029 period. This estimate is exclusive of customer driven projects that are not yet submitted to Toronto Hydro and customer conservation measures that may reduce their load below the 1 MVA threshold.

[1] At p. 21-22.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-101

Reference: Exhibit 4, Tab 2, Schedule 10, Page 5

The evidence states that "an appropriate resource level has each manager, with a supporting analyst, executing approximately $11-13 million in capital projects annually." For each year 2022-2029, please provide the following information: Total capital projects, # of managers with an analyst.

RESPONSE:

Please see Table 1 below summarizes the number of projects and respective managers with an analyst within the external work program. Toronto Hydro is unable to provide the number of projects beyond 2024 as they have yet to be planned, designed, and issued for execution. The utility typically plans capital projects on a 30-month rolling forecast.

Table 1: Summary of Capital Projects

Year	# of Capital Projects	# Managers with Analyst
2022	281	14
2023	486	17
2024	490	17
2025	N/A	19
2026		21
2027		23
2028		23
2029		23

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-102

Reference: Exhibit 4, Tab 2, Schedule 12, p.14

An increase of $1.7M in Facilities Maintenance Services from 2022-2025 is to address increased security. Please provide details of:

QUESTION (A)

a) How the $1.7 has been/is to be spent?

RESPONSE (A):

The $1.7M is to be spent towards:

- Improving CCTV uptime:
  - Troubleshooting connectivity issues
  - Addressing obstructions
  - Focusing and re-positioning cameras for increased effectiveness
  - Camera cleaning and general troubleshooting/repairs.

- Maintaining site accessibility:
  - Card access uptime
  - General door repairs
  - Reducing mean time to repair for gates and automated doors

- System configuration (implementing advanced capabilities for existing systems):
  - Continued implementation of video analytics
  - Testing and tuning analytics to minimize false alarms/noise
  - Testing and tuning door alarms
  - Auditing and configuring (virtual) video surveillance tours

- Improving effectiveness of the Physical Security Operations Centre by validating system maps and embedded instructions/procedures.
- Any additional physical security controls or enhancements driven by cyber security needs.

QUESTION (B)

b) Data supporting the statement of increased criminal activity.

RESPONSE (B):

From 2022 to 2023, Toronto Hydro experienced a combined 43% increase in trespassing, theft, and police requests. This year over year trend is in line with the major crime indicators ("MCI") published by Toronto Police Services, which increased 40% from 2022 to 2023. This includes the subcategory of "Theft Over $5,000".

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-103

References: Exhibit 4, Tab 2, Schedule 13, Page 24

Preamble:

Supply Chain Services is expected to experience a $7.7 million increase from 2022 to 2025.

QUESTION (A):

a) Please provide more details on the increased costs due to external contract costs and a new contract setting process.

RESPONSE (A):

Of the $7.7 million increase, $3.8 million is due to increases in Third-Party Logistics ("3PL") and Third-Party Procurement ("3PP") costs (i.e., external contract costs) and expected costs from the new contract setting process.

The increased external contract costs are due to higher volumes of requests for materials and a challenging procurement environment as described in Exhibit 4, Tab 2, Schedule 13 at page 17. Material handling costs are driven by the projected throughput of materials and associated resources required to support the execution of the capital expenditure plan over the 2025-2029 period (see Table 12 of Exhibit 2B, Section A).

Third-Party Logistics and Third-Party Procurement provider services are competitively sourced. As the contract for the 3PP and 3PL provider is set to expire at the end of 2024, Toronto Hydro is initiating a new contract setting process to competitively source the services in 2025. Through the existing service provider contract, Toronto Hydro negotiated rates based on material throughput, which is reflected in the costs incurred for the current period. New rates as a result of the new

contract setting process for the forecast period are assumed to be a reflection of the current global inflationary pressures resulting from major world events in the 2020-2024 rate period.

QUESTION (B):

b) Please explain the purpose of the review of Toronto Hydro's Procurement Policy.

RESPONSE (B):

As described in Exhibit 4A, Tab 2, Schedule 13, at page 13, in 2023, Toronto Hydro initiated an independent review and analysis of its Procurement Policy to ensure it was in line with industry standards and to establish ongoing supply chain market intelligence reports to enable continuous improvement of the utility's procurement practices.

Toronto Hydro expects that the engagement of procurement consulting services will enhance the overall maturity of the supply chain and procurement function and result in the following benefits and outcomes:

- Update Policy and other related documents to improve operational effectiveness through incorporation of leading practices into the Procurement Policy;
- Adopt a category-based approach to managing and maximizing value from key areas of spend to achieve cost efficiencies in sourcing execution;
- Develop foundational procurement operational excellence capabilities to improve supplier performance and innovation and realize efficiencies through the implementation of buying channel strategy;
- Establish a sustainable and social procurement framework aligned with enterprise Environmental, Social and Corporate Governance ("ESG") policy to enable a wider supplier base and increase brand reputation as a leading organization; and
- Enhance Ariba functionality and promote collaboration to increase user productivity and user experience.

QUESTION (C):

c) Please quantify the savings expected from the "$0.8 million increase driven by procurement consulting services to conduct a review of Toronto Hydro's Procurement Policy and establish the delivery of ongoing supply chain market intelligence reports."

RESPONSE (C):

As noted in its response to part (b), to further strengthen Toronto Hydro's procurement strategy and procurement practices, Toronto Hydro engaged a procurement consulting service for an independent review of its Procurement Policy to highlight areas of improvement to align the policy to peer organizations and leading practice.

At this time, Toronto Hydro is unable to comment on the specific amount of expected savings. While future cost savings is a goal in the long-term, the resulting policy analysis and market intelligence reports will provide insights to emerging opportunities and potential threats to the business to allow for better strategic decision making and improved sourcing strategies. The outcomes of the procurement consulting service will enhance the maturity of the supply chain and procurement function and result in operational efficiencies and increased productivity in the long term.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-104

Reference: Exhibit 4, Tab 2, Schedule 14

QUESTION (A):

a) Toronto Hydro notes that for 2022-2025 costs are increasing in Customer Care due to fewer business resources capitalized to projects, primarily meter technology projects and the CIS project. Please provide details on how many resources were capitalized in which years, whether they were backfilled and when they return to OM&A work.

RESPONSE (A):

Resources in the Customer Care program often work on both operational functions and capitalizable projects and technology initiatives in any given year. The first row of the table below shows the average number of business FTEs that were capitalized as a result of project and technology initiative work.

Only resources working in a full-time capacity on the Customer Information System ("CIS") upgrade project are backfilled and although Toronto Hydro aims to do so on a one-to-one ratio, in any given year, the actual backfill resourcing level may be slightly higher or lower than an exact one-to-one ratio due to the high attrition rates of contracted staff. The declining number of FTEs capitalized for the CIS Upgrade project in row two, between the years 2022 and 2026, indicate the timing of the return of these FTEs to OM&A work, as well as the approximate number of backfills whose release date would roughly correspond.

	Actual	Bridge		Forecast
	2022	2023	2024	2025
Total - # of FTEs Capitalized	31	25	24	18
CIS Upgrade Project - # of FTEs Capitalized (included in above) and approximate # of backfills	18	16	14	5

QUESTION (B):

b) For 2025-2029 please provide information on the number of FTEs in Customer Care which are forecasted to be capitalized and backfilled.

RESPONSE (B):

Similar to the response in Part A, staff working full time on the CIS project are backfilled on a one-to-one basis, as broken out in row 2 of the below table. Please see Toronto Hydro's response to 4-SEC-89 subpart b, Table 2 for total labour cost transfers and capitalization from the Customer Care program.

	Forecast				
	2025	**2026**	**2027**	**2028**	**2029**
Total - # of FTEs Capitalized	18	13	13	13	13
CIS Upgrade Project - # of FTEs Capitalized (included in above) and approximate # of backfills	5	0	0	0	0

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-105

Reference: Ex.4-2-14, p.17, 27,30, Table 5

Preamble:

With respect to the Customer Care program:

QUESTION (A):

a. Please show the breakdown of the Collections costs in Table 5, including the amounts for bad debt.

RESPONSE (A):

Segment	Summary in millions									
	Actual			Bridge		Forecast				
Collections	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Net Payroll	$ 0.6	$ 0.8	$ 0.5	$ 0.5	$ 0.9	$ 1.2	$ 1.5	$ 1.6	$ 1.7	$ 1.8
External/ Contract Costs	$ 2.6	$ 2.4	$ 3.1	$ 4.3	$ 4.3	$ 4.0	$ 4.1	$ 4.2	$ 4.2	$ 4.3
Bad Debt	$ 21.7	$ 5.8	$ 4.2	$ 4.8	$ 4.9	$ 5.0	$ 5.1	$ 5.2	$ 5.3	$ 5.4
Grand Total	$ 24.9	$ 9.0	$ 7.8	$ 9.6	$ 10.2	$ 10.2	$ 10.9	$ 11.0	$ 11.3	$ 11.6

Note: Variances due to rounding may exist.

QUESTION (B):

b. Please explain why bad debt is increasing by inflation from 2022 to 2029, given the increase in pre-authorized debit ("PAD") of 15% and the remote disconnection for Smart Meters, both of which Toronto Hydro states reduce the risk of bad debt.

RESPONSE (B):

Although pre-authorized debit ("PAD") and the ability to remotely disconnect customers are tools that help control the risk of bad debt, there are several other factors, including economic conditions, electricity rate increases, potential regulatory changes, sudden bankruptcies, that contribute to the overall bad debt. To account for these factors outside the utility's control, Toronto Hydro forecasted bad debt using a 2% inflation factor from 2024 to 2029.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-106

Reference: Exhibit 4, Tab 2, Schedule 14, Page 12

Preamble:

With respect to the Customer Care program:

QUESTION (A):

a) Please provide the percentage of customers that are on or are forecast to be on e-billing for each year between 2022-2029.

RESPONSE (A):

Table 1: Percent of Customer on E-bills

Year	2022	2023	2024	2025	2026	2027	2028	2029
Percent of customer on ebills	48.3%	50.9%	53.5%	55.2%	56.7%	57.8%	59.2%	60.1%

QUESTION (B):

b) What is the annual saving per customer that switches to e-billing?

RESPONSE (B):

Table 2: Estimated Annual Saving per Customer on E-bills

Year	2022	2023	2024	2025	2026	2027	2028	2029
Estimated annual saving per customer on ebills	$11.58	$11.17	$11.53	$11.86	$12.22	$12.58	$12.94	$13.30

QUESTION (C):

c) What savings have been included for 2025-2029 related to e-billing?

RESPONSE (C):

Toronto Hydro expects to save approximately $0.8M over the 2025 to 2029 period, with annual incremental amounts shown in the table below. Savings resulting from transitioning customers to ebills are primarily seen in forecast paper, printing, and postage costs, partially offset by the cost of producing an ebill.

Table 3: Expected Annual Savings

Year	2025	2026	2027	2028	2029	Total
Expected Annual Savings	$0.18M	$0.16M	$0.14M	$0.16M	$0.12M	$0.8M

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-107

Reference: Exhibit 4, Tab 2, Schedule 15, Page 7

Please quantify the "additional legal costs" forecast to result from the renegotiation of the PWU and Society IT collective agreements and specific which year they will be incurred

RESPONSE:

Toronto Hydro's 2020-2029 legal budget for this program is set out in the table below. This budget relates to a number of activities, including: arbitrations, grievances, civil matters, human rights claims, environmental and safety compliance. The costs specifically associated with renegotiation of the collective agreements in any given year are not material.

Table 1: Summary of Additional Legal Costs related to Renegotiation of PWU and Society IT Collective Agreements ($)

Segment Name	Cost Element	2025	2026	2027	2028	2029
Human Resources Environment and Safety	Legal Fees	1,362,412	1,389,660	1,417,453	1,445,802	1,474,719
Human Resources Environment and Safety Total		1,362,412	1,389,660	1,417,453	1,445,802	1,474,719

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-108

References: Exhibit 4 Tab 2, Schedule 16, Pages 11, 16, & 19

QUESTION (A):

With respect to the Finance Program:

a) How many additional resources are being hired in 2022-2025 in the Controllership segment to "support the increased size and complexity of the capital program and to support the 2025-2029 rate application."

RESPONSE (A):

Between 2022-2025 Toronto Hydro is adding seven (7) additional resources in the Controllership segment, of these resources, four (4) resources are to backfill open positions that were left vacant in 2022 whereas the remaining three (3) are forecasted to support the increased size and complexity of the capital program and to support the 2025-2029 rate application.

QUESTION (B):

b) Please provide details of what the $0.5 million per year from 2025-2029 for the Controllership is specifically for, i.e. FTEs, contracts, etc.

RESPONSE (B):

Please see the discussion of cost drivers at Exhibit 4, Tab 2, Schedule 16 page 5. The average increase of $0.5 million per year from 2025-2029 in the Controllership segment is due to forecasted general compensation increase of existing employees.

QUESTION (C):

c) Please provide details of what the $1.0 million per year from 2025-2029 for Financial Services is specifically for, i.e., FTEs, contracts, etc.

RESPONSE (C):

Please see the discussion of cost drivers at Exhibit 4, Tab 2, Schedule 16 pages 5-6. The average increase of $1.0 million per year from 2025 to 2029 in the Financial Services segment is driven forecasted increase in insurance premiums ($0.8 million) and forecasted general compensation increase of existing employees ($0.2 million).

QUESTION (D):

d) What is the dollar relationship between increases in rate base to increase in property and liability insurance premiums?

RESPONSE (D):

There are three primary drivers for insurance premiums: (i) self-insured deductible, (ii) policy limit, and (iii) the value of the insured assets. Insurance premiums are also a function of specific loss ratios on policies experienced by the underwriters, while Toronto Hydro has enjoyed a claims free record across many of its policies, its liability insurance premium has been affected by losses experienced by the underwriters. For more information, please see Exhibit 4, Tab 2, Schedule 16, Section 6.2.

QUESTION (E):

e) Please provide details of what the $0.8 million per year from 2025-2029 for External Reporting is specifically for, i.e., FTEs, contracts, etc.

RESPONSE (E):

It is Toronto Hydro's understanding that in the question, SEC made a typographical error in quoting the annual variance from 2025-2029 for External Reporting. In responding to this interrogatory Toronto Hydro believes the correct annual increase is $0.2 million per years from 2025-2029.

Please see the discussion of cost drivers at Exhibit 4, Tab 2, Schedule 16 page 5. The average increase of $0.2 million per year from 2025-2029 in the External Reporting segment is due to forecasted general compensation increase of existing employees.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-109

Reference: Exhibit 4, Tab 4, Schedule 17, Page 7, Table 3

With respect to the Information Technology Program:

QUESTION (A):

a) For each segment in Table 3, please breakdown the costs which are related to subscription fees, licensing fees, maintenance contracts, and consulting.

RESPONSE (A):

Toronto Hydro does not differentiate between licensing fees and maintenance contracts. Table 1 below shows maintenance (including licensing fees), subscription and consulting costs for 2020-2029.

1 **Table 1: Maintenance, Subscription and Consulting Costs 2020-2029**

Security & Enterprise Architecture	**2020 Actual**	**2021 Actual**	**2022 Actual**	**2023 Bridge**	**2024 Bridge**	**2025 Forecast**	**2026 Forecast**	**2027 Forecast**	**2028 Forecast**	**2029 Forecast**
Maintenance	1.7	2.4	2.5	3.6	4.1	4.5	4.9	5.7	6.2	6.8
Subscription	0.0	0.0	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.6
Consulting	0.3	0.4	1.1	1.4	2.4	2.3	2.1	1.7	1.5	1.6

IT Operations	**2020 Actual**	**2021 Actual**	**2022 Actual**	**2023 Bridge**	**2024 Bridge**	**2025 Forecast**	**2026 Forecast**	**2027 Forecast**	**2028 Forecast**	**2029 Forecast**
Maintenance	15.6	17.3	17.8	16.8	17.1	16.4	16.2	16.7	16.9	17.1
Subscription	0.3	0.3	0.7	0.4	0.8	0.0	0.0	0.0	0.0	0.0
Consulting	0.2	1.1	1.2	1.1	1.1	1.1	1.0	1.1	1.1	1.2

Project Execution	**2020 Actual**	**2021 Actual**	**2022 Actual**	**2023 Bridge**	**2024 Bridge**	**2025 Forecast**	**2026 Forecast**	**2027 Forecast**	**2028 Forecast**	**2029 Forecast**
Maintenance	0.0	0.0	0.0	0.0	0.0	1.3	1.7	1.6	1.7	1.8
Subscription	1.6	2.2	2.4	3.0	3.1	4.1	4.8	5.2	5.8	6.4
Consulting	0.1	0.4	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1

IT Governance	**2020 Actual**	**2021 Actual**	**2022 Actual**	**2023 Bridge**	**2024 Bridge**	**2025 Forecast**	**2026 Forecast**	**2027 Forecast**	**2028 Forecast**	**2029 Forecast**
Maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subscription	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Consulting	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Total All Segments	**2020 Actual**	**2021 Actual**	**2022 Actual**	**2023 Bridge**	**2024 Bridge**	**2025 Forecast**	**2026 Forecast**	**2027 Forecast**	**2028 Forecast**	**2029 Forecast**
Total Maintenance	17.3	19.7	20.3	20.4	21.2	22.2	22.8	24	24.8	25.7
Total Subscription	1.9	2.5	3.2	3.6	4.1	4.4	5.2	5.6	6.3	7.0
Total Consulting	0.6	2.0	2.6	2.5	3.6	3.5	3.3	2.9	2.7	2.9

QUESTION (B):

b) For each year between 2024 to 2029, please provide a listing of all forecasted subscription fees, licensing fees and maintenance contracts. For those that are new in a year please indicate if they are replacing a previously capitalized solution.

RESPONSE (B):

Toronto Hydro is unable to provide the requested information within the interrogatory response timelines, as the utility has over 180 IT maintenance contracts (including licensing) and subscription contracts, some with start or end dates outside of the indicated period. Disclosing a full list of such information would also require significant time and effort for legal analysis (e.g. whether vendor consent is required or any confidential information is involved) for each contract. Furthermore, providing a full list of the contracts within scope may expose Toronto Hydro to risks by identifying the utility's cybersecurity vendors and controls. As an approximation of the requested information, Table 2 below shows a breakdown of current maintenance and subscription contracts by the four segments of the Information Technology OM&A program.

Table 2: Total Number of Maintenance (including Licensing) and Subscription Contracts by Segment

Segments	Maintenance Contracts (including licensing)	Subscription Contracts
Security & Enterprise Architecture	36	9
IT Operations	87	27
Project Execution	20	10
IT Governance	0	0
Total	**143**	**46**

Toronto Hydro is currently unable to provide a list of new contracts anticipated for the 2024-2029 period or verify whether these contracts will replace previously capitalized solutions until project evaluation and prioritization is completed for the 2025-2029 timeframe in accordance with Toronto

Hydro's IT Investment Planning Process.[1] Furthermore, through the application of Toronto Hydro's procurement policy and processes[2], the utility determines the solution that fulfills Toronto Hydro's business needs, and based on the selected solution, new contracts are established.

QUESTION (C):

c) For each year please provide a list of forecasted consulting contracts.

RESPONSE (C):

For the reasons outlined in the response to subpart (b), Toronto Hydro is unable to provide the requested information within the interrogatory response timelines. As an approximation of the requested information, Table 3 below shows a breakdown of current consulting contracts by the four segments of the Information Technology OM&A program.

Table 3: Total Number of Consulting Contracts by Segment

Segments	Consulting Contracts
Security & Enterprise Architecture	9
IT Operations	10
Project Execution	6
IT Governance	1
Total	**26**

QUESTION (D):

d) For Project Execution, please provide a listing of forecasted new IT cloud solutions, year of implementation, dollars associated with project initiation, planning and execution versus monitoring and control.

[1] Exhibit 2B, Section D8, subsection D8.5 at p. 7-10.
[2] Exhibit 4, Tab 3, Schedule 1, Appendix A.

RESPONSE (D):

Toronto Hydro is currently unable to provide a detailed list of forecasted IT cloud solutions for the 2025-2029 period pending the evaluation and prioritization of projects through the utility's IT Investment Planning Process.[3] At a high level, Toronto Hydro plans to deploy cloud-based solutions to support vegetation management and customer relationship management, and enhance mobile workforce management during the 2025 to 2029 rate period. However, these initiatives need to be assessed in accordance with the IT Investment Planning Process, including whether, when and what cloud solutions will be implemented. In addition, based on industry trends, Toronto Hydro anticipates that its reliance on cloud-based solutions may increase, as many vendors are opting to offer cloud-only solutions with no on-premise options.

[3] Exhibit 2B, Section D8, subsection D8.5 at p. 7-10.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-110

Reference: Exhibit 4, Tab 2, Schedule 18; Appendix 2-M

With respect to Public, Legal and Regulatory Affairs:

QUESTION (A):

a) [p.19] Toronto Hydro provides three reasons for the increase in legal costs between 2022 to 2025, including (i) increased volumes of customer connections activity, (ii) higher procurement activity, and (iii) enhanced scope complexity in planning and coordination with third parties. Please provide actual numbers of customer connections and procurement contracts for 2022 to 2023 and a forecast of activity for each year between 2024 and 2029.

RESPONSE (A):

For 2020-2022 contract volumes, please see Figures 1 and 2 at pages 15 and 16 of the referenced evidence. For 2023 data please see the table below.

Table 1: Legal Services Contract Volumes (2023)

Contract Type	2023
Procurement Contracts initiated by Supply Chain	329
Offers to Connect Requiring Expansion	38

Toronto Hydro is unable to forecast the number of contracts that it will receive in the future period, but reasonably expects that higher volumes of supply chain work and customer connection gross expenditures forecasted as part the 2025-2029 Investment Plan (as shown in the table below), will drive a corresponding increase in contract volumes as part of this segment.

Table 2: Supply Chain and Customer Connections Expenditures

	2020-2024 ($M)	2025-2029 ($M)	Percent Change
Supply Chain	77.9	122.5	57%
Customer Connections – Capital Expenditures (Gross)	689.9	949.8	38%

QUESTION (B):

b) Please provide the number of FTEs in each segment for each year between 2022 and 2029.

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 4-VECC-74.

QUESTION (C):

c) [Appendix 2-M] Please provide a table that shows for each of EB-2018-0165 (actuals) and EB-2023-0195 (forecast) application, total one-time application costs, broken down by category (i.e. legal costs, consultant/expert witness costs, incremental operating expenses with staff resources, intervenor costs, OEB section 30 costs, and other costs.)

RESPONSE (C):

Please find attached to this response a corrected and updated Appendix 2-M based on 2023 actuals.[1] The table below compares total one-time application costs for EB-2018-0165 (2020 CIR actuals) and EB-2023-0195 (2025 CIR forecast).

Table 3: 2020 vs. 2025 One Time Application Costs

Expense Category	EB-2018-0165 2020 CIR Actuals	EB-2023-0195 2025 CIR Forecast	2020 vs. 2025 Variance
Legal Costs	$3,173,427	$2,627,790	-17.19%
Consultant/Expert Witness Costs	$ 3,447,033	$4,043,400	17.30%

[1] Toronto Hydro corrected a minor calculation error in cells D8 and D9 with respect to 2020 Actuals, and C8 and 9 with respect to OEB Approved for printing and miscellaneous expenses.

Expense Category	EB-2018-0165 2020 CIR Actuals	EB-2023-0195 2025 CIR Forecast	2020 vs. 2025 Variance
Incremental Operating Expenses[2]	-	$559,628	N/A
Intervenor Costs	$827,228	$1,000,000	20.89%
OEB s. 30 Costs	$494,244	$600,000	21.40%
Other costs (printing and miscellaneous)	$133,614	$50,000	-62.58%
Total	**$8,075,546**	**$8,880,818**	**9.97%**

QUESTION (D):

d) [Appendix 2-M] With respect to one-time legal costs related to this application, what was the total actual legal costs incurred by Toronto Hydro up until it filed its application?

RESPONSE (D):

Please see sum of Legal Cost for 2022 and 2023 Actuals in the updated Appendix 2-M attached.

QUESTION (E):

e) [Appendix 2-M] Please provide an updated version of Appendix 2-M that forecasts regulatory costs through to the end of 2029.

RESPONSE (E):

Toronto Hydro does not have an Appendix 2-M for the 2030 rebasing application. One fifth of the 2025 Rate Application total costs shown in the table above will be amortized into the 2025-2029 annual budget for the Regulatory Affairs segment in the Public, Legal and Regulatory Affairs program.

Table 4: Amortized Total Costs Based on Updated 2-M

	2025	2026	2027	2028	2029
2025 CIR Forecast	$1,776,164	$1,776,164	$1,776,164	$1,776,164	$1,776,164

[2] Incremental expenses associated with project resource secondments and overtime pay.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-111

References: Exhibit 4, Tab 4, Schedule 1

QUESTIONS (A and B):

With respect to workforce vacancies:

a. What vacancy rate is Toronto Hydro forecasting as part of its 2025 to 2029 budget?
b. What is the actual vacancy rate that Toronto Hydro experienced annually between 2020 and 2024.

RESPONSE TO (A) AND (B):

The table below shows Toronto Hydro's 2020-2029 vacancy rates:

Headcount	Actual				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Vacancy Rate	13%	14%	7%	0%	8%	8%	7%	7%	6%	6%

The historical vacancy rates are higher than the forecast vacancy rates because in the preparation of the 2023-2029 workforce plan, Toronto Hydro refined its methodology of forecasting vacancies associated with retirements and other exits. As a result, the 2020-2022 vacancy rates do not reflect an apples-to-apples comparison of the 2023-2029 vacancy rates. Toronto Hydro also notes actuals for these three years (i.e., 2020-2022) reflect extraordinary workforce challenges associated with retirements, voluntary exists and recruitment processes that were highly impacted during this time, as noted in the evidence in Exhibit 1B, Tab 3, Schedule 3 starting on page 14. Furthermore, Toronto Hydro notes that the forecast vacancy rates for 2023 and 2024 are higher than the 2025-2029 forecast due an overall higher volume of hiring in the bridge years. As the hiring volumes stabilize, the vacancy rate is expected to stabilize in the outer years of the plan. Toronto Hydro also notes that its 2023 actual vacancy rate is 0% reflecting the utility's commitment to implementing its workforce plan as put forward in the rate application.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-112

Reference: Exhibit 4, Tab 4, Schedule 2; Appendix 2-K

With respect to Appendix 2K, please provide a revised version of Appendix 2-K that includes:

QUESTION (A):

a) 2023 year-end information.

RESPONSE (A):

Please refer to 4-AMPCO-84g.

QUESTION (B):

b) A breakdown of the non-management categories into, i) PWU, ii) Society, and iii) Non-Union.

RESPONSE (B):

Please refer to 4-AMPCO-84a. Toronto Hydro declines to provide a breakdown on a union basis as it is irrelevant for the purposes of determining reasonable costs. As an alternative, Toronto Hydro has consolidated the information relating to the PWU and Society into one category labelled "Union".

QUESTION (C):

c) For salary and wages, a breakdown of the total costs as between base salary, overtime and incentive pay.

RESPONSE (C):

Please refer to 4-AMPCO-84f

QUESTION (D):

d) For Total Benefits, a breakdown of the total costs between active benefits and pension.

RESPONSE (D):

Table 1: 2020-2024 Total Benefits Breakdown

	2020 Actual	2021 Actual	2022 Actual	2023 Actual	2024 Bridge
Active Benefits	19.6	18.5	19.9	20.8	30.8
Pension Contributions	17.1	15.8	16.3	18.4	22.8
Post Employment Benefits costs	15.7	14.6	13.9	13.5	13.0
TOTAL	**52.4**	**49.0**	**50.1**	**52.7**	**66.6**

Note: Numbers in table may not sum due to rounding

Table 2: 2025-2029 Total Benefits Breakdown

	2025 Forecast	2026 Forecast	2027 Forecast	2028 Forecast	2029 Forecast
Active Benefits	35.7	40.4	45.1	50.4	56.2
Pension Contributions	24.8	26.4	28.0	29.6	31.0
Post Employment Benefits costs	14.1	15.0	15.8	16.6	17.4
TOTAL	**74.5**	**81.8**	**88.9**	**96.6**	**104.6**

Note: Numbers in table may not sum due to rounding

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-113

References: Exhibit 4A, Tab 4, Section 2, OEB Appendix 2-K

With respect to compensation costs:

QUESTION (A):

a) Has Toronto Hydro done a benchmarking study on the overtime it pays? If so, please provide a copy.

RESPONSE (A):

Toronto Hydro has not done a benchmarking study specifically on overtime paid.

QUESTION (B):

b) Please provide the list of assumptions that underlie the compensation forecasts related to all future collective agreements and non-management compensation increases.

RESPONSE (B):

As noted in Exhibit 4, Tab 4, Schedule 4 at page 3, in consultation with its compensation expert Mercer Canada, Toronto Hydro relied on a historical information to forecast reasonable future compensation levels for each employee group noted in the response to 4-AMPCO-84(a). More specifically:

- To determine base salaries, Toronto Hydro applied an annual percentage increase derived based on a historical rolling average of wage and salary increases, including union step increases for progression reflecting performance and development.
- To determine incentive pay, Toronto Hydro applied the approach described in the response to interrogatory 4-AMPCO-87(d).

- To determine pensions and benefits, Toronto Hydro assumed no change in pension contribution rates or benefits plan design or programs. In addition, post-employment benefits forecasts were determined with a third-party actuarial analysis.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-114

References: Exhibit 4A, Tab 4, Section 2, OEB Appendix 2-K

With respect to pension and benefits:

QUESTION (A):

a) Please explain the 12% increase in Total Benefits/Management FTE in 2023.

RESPONSE (A):

The increase in benefits costs per FTE from 2022 to 2023 is primarily driven by health and wellness benefits claims, and the underlying compensation costs upon which OMERS pension plan contributions are calculated. Toronto Hydro's health and wellness benefits are an important component of a market-competitive total compensation strategy that supports the utility's ability to attract and retain talent in a highly competitive labour market. The utility has made recent enhancements to health and wellness benefits coverage to promote a healthy workforce. For example, see Exhibit 4, Tab 4, Schedule 4, page 16, which describes how partway through 2022, Toronto Hydro enhanced its coverage for mental health services (e.g. psychologists and social workers) in recognition of the rising importance of mental health wellness.

OMERS is a multi-employer defined benefit pension plan in which both participating employers and their employees are required to make contributions based on pensionable earnings. Contribution rates are determined by OMERS; neither Toronto Hydro nor its employees have the option to reduce these contribution rates. Benefits costs are also impacted by increases in Canada Pension Plan contributions, Employment Insurance contributions and other benefits insurance premiums (e.g. life insurance, long-term disability).

QUESTION (B):

b) Please explain why the Total Benefits/Non-Management FTE increase from 3% to 7% in 2024.

RESPONSE (B):

The increase in benefits costs per FTE from 2023 to 2024 are driven by many of the same factors as outlined above in response a).

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-115

Reference: Exhibit 4, Tab 4, Schedule 5

QUESTION (A):

With respect to the Mercer, Non-Executive Compensation and Benefits Review:

a) Please explain all changes in the methodology from the Mercer compensation study included in the EB-2018-0165 application, and explain the reasons for any changes in the chosen peer groups.

RESPONSE (A) PREPARED BY MERCER:

The methodology used in the Mercer Study filed in the EB-2018-0165 application is consistent with the methodology used in the most recent Mercer Study. Changes in the composition of the peer groups are not driven by changes in the inherent design of the peer groups (i.e. an Energy Peer Group and General Industry Peer Group), but by factors such as the availability of data. Specifically, though Mercer tries to maintain a consistent peer group, Study over Study, factors such as changes in an organization's desire to participate in a survey or changes in the availability of data may impact the composition of a peer group.

QUESTION (B):

b) In the previous study, Toronto Hydro was described as being "positioned within a market competitive range relative to the 50th percentile of the energy market, and are below the general industry market", whereas in this study Toronto Hydro is "positioned within a market competitive range relative to the 50th percentile of the energy market, and are above the general industry market." Please identify the specific grades and reasons for this change in findings.

RESPONSE (B) PREPARED BY MERCER:

The change in Toronto Hydro's Study over Study competitiveness, relative to the General Industry peer group, may be attributed to different factors. Within the market, changes in the peer organizations that provided data and changes in how peer organizations matched jobs to survey sources can impact Study results. Additionally, the continued introduction of Defined Contribution plans, that are less generous than the Defined Benefit plans seen amongst the majority of Ontario Local Distribution Companies, had an impact on Toronto Hydro's positioning relative to the General Industry Peer Group. With regards to Toronto Hydro, changes in the incumbents / jobs within each grade, due to changes in Toronto Hydro's workforce composition since the last Study, may also have an impact on Study results. We note that not all grades experienced a Study over Study increase in competitiveness relative to the General Industry Peer Group.

QUESTION (C):

c) [Appendix A] With respect to the general industry peer group:

i. How many of the 24 companies are in the energy industry? Please list them.

ii. Please confirm that 5 of the 24 companies (EPCOR Utilities, Capital Power, Hydro One, TransAlta, and SaskPower) in the general industry peer group are also in the energy peer group?

iii. Please provide a revised version of the results table on p.5 removing all energy industry companies from the general industry peer group results.

iv. In other compensation benchmarking studies undertaken by Mercer, it has considered a much wider array of non-energy sector companies in its general peer group. Please explain why it did not do so in this study.

RESPONSE (C) PREPARED BY MERCER:

i. Kindly refer to our response to Question B in interrogatory 4-CCMBC-20. The question above misunderstands the number of organizations in the General Industry Comparator Group. The 24 organizations included in Appendix A, on page 8 of the Mercer report, represents only a sample of organizations included in the General

Industry comparator group. Over 90 organizations were included in the General Industry comparator group, of which energy companies represent only a subset.

ii. 5 of the 24 organizations listed in the second table in Appendix A, which reflect only a sample of organizations in the general industry comparator group, are also in the list of organizations for the Energy Peer Group. However, as mentioned in our response to question (i) above, the 24 organizations represent only a sample of the over 90 organizations included in the General Industry Comparator Group.

iii. Revising the results on p.5, of the Mercer Study, to remove all Energy Industry companies from the General Industry peer group would be inconsistent with the methodology of the Study. Specifically, the intention of the Mercer Study is to compare Toronto Hydro to both the Energy Peer Group and a General Industry Peer Group. The Energy industry is a subset of the General industry; as such, removing Energy companies from this peer group would create a comparison and results that are not representative of the methodology or intention of the Study.

iv. As indicated in our responses to questions (i) and (ii) above, Mercer in fact included a broader array of non-energy companies in the General Industry Peer Group, not only the smaller group of companies the question assumes.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-116

Reference: Exhibit 4, Tab 4, Schedule 5

With respect to the Mercer, Non-Executive Compensation and Benefits Review:

QUESTION (A):

a) For each of the Toronto Hydro groups, please provide a table that shows the total number of employees, the number of employees that were benchmarked and the variance to P50 for that group.

RESPONSE (A) PREPARED BY MERCER:

The table below presents the total number of employees and total number of benchmark employees, for each Toronto Hydro group, represented in the Study. As indicated in the Mercer report, the Study's main objective was to benchmark a representative sample of Toronto Hydro's employee population at an organization level. With this approach, the incumbents included in the Study represent approximately 67% of Toronto Hydro's employee population considered in-scope for the review. Mercer believes this to be a statistically reliable and representative sample for assessing the overall competitive levels of total remuneration for Toronto Hydro's employees. When assessing market competitiveness, Mercer defines competitiveness on an overall/aggregate basis as being within +/- 5% of the target market positioning (i.e. being within +/-5% of the 50th percentile or median).

The numbers in Table 1 below represent Toronto Hydro's population at the time the Study was conducted.

Table 1: Toronto Hydro Population

Employee Group	Total Employees	Total Employees in Benchmarked Jobs
PWU	495	400
Society (STI & SE)	139	129
Non-Union	547	274

Given that the Study was designed to assess Toronto Hydro's competitiveness at an overall level, without undertaking a new Study, generating accurate and representative variances by each employee group cannot properly be done using the current Study methodology. Doing so would deviate from the intention of the Study and yield results that are not consistent with the Study's methodology and purpose. Having said that, we note that the table presented on page 5 (we consider the cover page as page 1), of the Mercer report, presents market findings for the SIT, SE and PWU unions.

QUESTION (B):

b) For each Grade that was used in the benchmarking, please provide the total number of employees that Toronto Hydro has and the number of employees that were benchmarked.

RESPONSE (B) PREPARED BY MERCER:

Please refer to Table 2 below for a summary of the in scope total number of employees in each Toronto Hydro grade, and the number of employees from each grade that were benchmarked and included in the Study. As indicated in the response to question (A) above, the focus of the Mercer Study was to achieve an appropriate representation of Toronto Hydro's employee population at an organization level. Any variations in representation by grade can be attributed to the number of employees in a grade as well as the types of jobs in a grade.

Table 2: Toronto Hydro Employee Grades

Grade	Total Employees	Total Employees in Benchmarked Jobs
PWU	495	400
SE	70	68
SIT	69	61
Y3	39	11
Y1	31	6
W4	60	18
W3	87	52
W2	19	8
V4	5	5
V3	34	19
V2	92	38
V1	75	61
V0	42	13
U2	8	8
U1	45	32
T1	10	3

QUESTION (C):

c) For each of the Toronto Hydro groups, please provide an estimate of the dollar difference between the weighted average total compensation for Toronto Hydro employees and the P50 median used in the study. Please provide the amount for the year the study is representative of and for each year up to 2029. Please provide a step-by-step explanation of how the estimate was reached and include all supporting calculations so the numbers can be verified.

RESPONSE (C) PREPARED BY MERCER:

When assessing organization market competitiveness, Mercer defines competitiveness, on an overall/aggregate basis, as being within +/- 5% of the target market positioning (i.e. being within 5% of the market 50th percentile). As such, when assessing the competitiveness of Toronto Hydro's

compensation program relative to the market, +/- 5% of the market 50th percentile should be the basis of that assessment. Similarly, Mercer's view is that a dollar differential calculation should be done on this basis and with this focus.

With that said, Mercer has estimated Toronto Hydro's weighted average dollar difference relative to the market competitive range. Specifically, we have calculated any amounts by which Toronto Hydro is above or below the upper end of the market competitive range, i.e. in relation to P50 plus 5%. Focusing on the market competitive range is particularly appropriate given Toronto Hydro's need to be competitive, for a highly skilled and specialized workforce, in a hyper competitive market as well as retain tenured staff with specialized skills.

Table 3 below presents the estimated dollar difference between the weighted average total compensation for Toronto Hydro compared to the market competitive range (+\- 5% of market 50th percentile), of the Energy peer group. This comparison focuses on the Energy Peer Group because, as indicated in the Mercer Study, it represents the most comparable peer group given the need for industry specific skillsets. In addition, the PWU employee population were not compared to the General Industry Peer Group given the energy specific responsibilities seen in the majority of the PWU benchmark jobs. Without this data, we would not be able to accurately estimate an overall dollar difference for the General Industry Peer Group.

Table 3: Total Compensation Difference Relative to Market Competitive Range in CAD ($M)

Total Compensation Dollar Difference Relative to the Market Competitive Range (+/- 5% of market P50)
-$4.58

Because the question above requests the total dollar difference be calculated relative to the P50 / market median, we have also provided the estimated dollar difference between the weighted average total compensation for Toronto Hydro compared to the market median/P50 in Table 4.

Table 4: Total Compensation Difference Relative to Market P50 in CAD ($M)

Total Compensation Dollar Difference Relative to Market P50
$3.89

The estimated total compensation dollar differences were calculated by determining the weighted average total compensation between Toronto Hydro versus (a) the market competitive range and then (b) the market P50, for the Toronto Hydro employee population considered in-scope for the review. This involves (i) calculating any amounts by which Toronto Hydro was above or below the upper end of the market competitive range, i.e. above or below P50 plus 5%; and (ii) calculating any amounts by which Toronto Hydro was above or below the market P50. To reiterate, any market positioning within +/- 5%, of the market median, on an overall basis is deemed to be market competitive.

Dollar difference values, beyond the year of the current Study, are not available and cannot be done in a manner that yields substantive results because the methodology of the Study reflects a point in time approach. Specifically, the Study was not designed to be forward looking – its purpose was to assess the competitive positioning of Toronto Hydro, on an overall basis, compared to 2022 market rates.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-57

References: Exhibit 4, Tab 1, Schedule 1, Page 10

"Neither cutting compensation costs nor cutting headcount are viable strategies to manage these key objectives within a standard IRM funding framework. Managing workforce-related costs downwards to live within a standard IRM funding paradigm would entail a reduction to Toronto Hydro's overall staffing complement of up to 200 resources by the end of the rate period, putting total FTEs below 2015 levels.....

QUESTION (A):

a) Please show the calculations which supports this statement. Please provide and describe all assumptions

RESPONSE (A):

The table below provides the estimation of the number of FTE reductions required to live within a standard IRM funding paradigm.

Table 1: FTE Reduction Estimation for Standard IRM Funding Paradigm

	Test	Forecast				Total
	2025	**2026**	**2027**	**2028**	**2029**	
OM&A Ask	343.0	358.0	370.2	385.5	399.6	**1,856.3**
OM&A Funding (I-X)	343.0	347.8	352.7	357.6	362.6	**1,763.7**
(I-X)		*1.4%*	*1.4%*	*1.4%*	*1.4%*	
Funding Gap (A)	**-**	**10.2**	**17.5**	**27.9**	**37.0**	**92.6**

	Test	Forecast				Total
	2025	**2026**	**2027**	**2028**	**2029**	
Avg. Annual Compensation per FTE[1]	191,631	200,300	209,785	219,746	230,280	
Labour Capitalization Rate[2]	50%	50%	51%	51%	51%	
Cumulative FTE Reductions		218	218	218	218	
Forecasted OM&A Reduction (B)	**-**	**21.7**	**22.6**	**23.6**	**24.6**	**92.5**
Variance (C)=(A)-(B)	**-**	**(11.5)**	**(5.1)**	**4.3**	**12.4**	**0.1**

[1] Exhibit 4, Tab 4, Schedule 1, Appendix 2-K
[2] Exhibit 4, Tab 4, Schedule 2, Appendix 2-D

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-58

Reference: Exhibit 4, Tab 1, Schedule 1, Pages 15-17

"Toronto Hydro spends considerably less OM&A relative to capital in comparison to the peer group, in many years showing an OM&A-to-CAPEX ratio of less than half that of the peer group."

QUESTION (A) AND (B) :

a) Why is the proportion of OM&A to capital spending a relevant comparison statistic? Specifically, what is THESL attempting to demonstrate with this statistic vis-à-vis its performance compared to other distributors in Ontario?

b) A similar comparison is made with respect to FTEs against capital expenditures. However, different utilities may employ different labour strategies (i.e., internal and contracted labour) which impact the FTEs reported to the OEB. What evidence/studies has THESL completed to understand the relevance or comparability of an FTE against capital expenditure statistic?

RESPONSE (A) AND (B):

The OM&A to CAPEX and FTE to CAPEX ratio show that Toronto Hydro has been delivering customer outcomes (see Exhibit 1B, Tab 3, Schedule 2) and executing its capital program with OM&A expenditure and FTE levels that are comparatively much lower than its Ontario peers.

As Toronto Hydro's capital work program increases, OM&A expenditure levels (a large portion of which are driven by workforce requirements) must also increase to support the safe and effective execution of the capital work program. As detailed in the pre-filed evidence, this includes

costs/expenses associated with skilled trades and technical resources in System Planning and Program Execution functions (including Control Centre), as well as back-end support functions such as Finance and Legal Services to process higher volumes of capital work (e.g. procurements, contract negotiations, claims/disputes, financial management).

These ratios, along with the other key metrics in the referenced evidence, show that Toronto Hydro has a comparatively thin OM&A budget and FTE/workforce contingent compared to its Ontario peers. In doing so, they support that the need for incremental investment in Toronto Hydro's operations and workforce is reasonable from a top-down benchmarking perspective.

FTE metrics related to CAPEX and customers, and similar metrics presented in the evidence normalize industry data that is readily available through the OEB's yearbook to account for the size and scale of a company's workforce, providing a standardized basis for comparison. These metrics are relevant for assessing operational efficiency (i.e., allocation of resources) and evaluating workforce needs for a top-down comparative perspective. They also offer insights into how effectively the workforce is being leveraged to generate value (per customer) or manage capital investments (per CAPEX and net fixed assets).

With the advent of the OEB's RRR open data initiative, these types of analyses have become more accessible for internal teams to undertake. As such, Toronto Hydro did not engage an expert to complete this work. In preparing the analysis, Toronto Hydro did general research to understand the relevance or comparability of FTE metrics, the findings of which are described above.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-59

Reference: Exhibit 4, Tab 1, Schedule 1

QUESTION (A):

a) With respect to OM&A per MWh of Load what proportion of THESL's load is bulk metered in comparison with the average (or median) bulk metered load of other Ontario electricity distributors?

RESPONSE (A):

Toronto Hydro does not have insight into the bulk metered loads of other Ontario electricity distributors. Given the City of Toronto's housing density and number of condominiums, it is reasonable to assume that Toronto Hydro's proportion is substantially higher than most of the Ontario electricity distributors.

QUESTION (B):

b) What proportion of THESL's MWh load is provided to customers of GS>50 or higher customer class? How does this compare with the median or average of other Ontario distributors (for the purpose of this response please do not include Hydro One).

RESPONSE (B):

Close to 70% of Toronto Hydro's electricity consumption serves customers in the GS>50kW or greater rate classes, while on average about 60% of Ontario's electricity consumption (excluding Hydro One) is supplied to customers in the same rate class.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-60

Reference: Exhibit 4, Tab 1, Schedule 1

QUESTION (A):

a) Please provide a table for the years 2020 through 2029 (forecast) which shows the various components of sub/suite metered customers costs to THESL.

RESPONSE (A):

Toronto Hydro tracks costs by the Uniform System of Accounts (USoA) in accordance with the OEB's Accounting Procedures Handbook for Electricity Distributors, instead of by rate class. The utility allocates total costs among rate classes in accordance with the OEB's Cost Allocation Model. The 2025 costs attributed to Toronto Hydro's Competitive Sector Multi-Unit Residential (CSMUR) rate class) are provided in Table 1 below. Toronto Hydro does not have cost for CSMUR rate class for 2026-2029 since there is no Cost Allocation Model for these years. Toronto Hydro has not proposed Cost Allocation Model for 2026-2029 in this rate application.

Table 1: Toronto Hydro's Competitive Sector Multi-Unit Residential Rate Classes

Description	Amount
Distribution Costs	$3,883,556
Customer Related Costs	$5,890,549
General and Administration	$7,660,181
Depreciation and Amortization	$9,254,603
PILs	$989,887
Interest	$5,079,920
Direct Allocation	$5,797,120
Allocated Net Income	$7,843,988
Revenue Requirement	**$46,399,804**

QUESTION (B):

b) Please identify in Appendix 2-JC the categories from which the costs shown in response to question (a) are drawn.

RESPONSE (B):

Toronto Hydro prepared Appendix 2-JC by Programs and Segments instead of rate class. Therefore, Toronto Hydro is not able to provide breakdown of OM&A costs shown in response to question (a).

QUESTION (C):

c) Please explain and delineate the OM&A cost differences between servicing a bulk metered residential building and an equivalent load large load class customer.

RESPONSE (C):

Please refer to Toronto Hydro's response to 4-SEC-91(a).

QUESTION:

d) What rate class does a typical high-rise (or in Clearspring terminology "skyscraper") suite metered residential building reside?

RESPONSE (D):

The individual units in a typical high-rise building that is suite metered by Toronto Hydro would be placed in the Competitive Sector Multi-Unit Residential rate classification or the Residential rate classification based on the type of meter technology utilized. High-rises that are bulk metered by Toronto Hydro (and that may or may not be sub-metered by unit sub-metering providers downstream of the bulk meter) could range from the General Service 50 to 999 kW up to the Large Use service classification.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-61

References: Exhibit 4, Tab 1, Schedule 1, Tab 4, Schedule 4

QUESTION (A):

a) Please provide the most current actual FTEs as per Appendix 2-K format (with students removed).

RESPONSE (A):

Please refer to 4-AMPCO-84 g). Students are not included.

QUESTION (B):

b) For the years 2020 and 2024 please provide a table which shows:
   i. all THESL's job positions/classifications;
   ii. annotation for each position/classification to show whether the position is new or eliminated since 2020;
   iii. the number of persons employed in that position/classification;
   iv. the number of current vacancies in that position/classification; and,
   v. the salary range for that position/classification (if confidentiality is a concern - show salary range for only those positions with 5 or more employees or if the salary band is otherwise generally made available - for example in job postings).

RESPONSE (B):

Toronto Hydro is unable to provide the requested information and believes this request is, in any event, overly broad. Toronto Hydro continuously assesses jobs/positions in the ordinary course of business. Given the dynamic nature, reconciliation of historical job/position information would be a significant and cumbersome undertaking for results that would not be incrementally useful to

similar evidence that is already on the record in Exhibit 4, Tab 4, Schedule 3. Toronto Hydro has prepared responses to this interrogatory on the basis of that evidence by workforce segment. Those segments as described in Exhibit 4, Tab 4, Schedule 3 pages 13-22.

i. ii. iii. Below is a table that provides requested detail organized by workforce segment, reported by headcount, including the total number of positions and persons employed as of December 31, 2023:

Table 1: Number of Positions by Work Segment

	Administrative & Support	Designated & Technical Professionals	Certified & Skilled Trades	Front Line Leadership	Senior Management	Total
Number of Positions	**13**	**21**	**10**	**12**	**16**	**72**
Total Number of Employees (Headcount)	**165**	**564**	**325**	**195**	**89**	**1338**

Please note, the numbers referenced in headcount, not FTE, and won't reconcile to Appendix 2-K.

iv. Please refer to IR 4-SEC-92 (d) for status of vacancies.

v. With respect to salary ranges, Toronto Hydro does not believe that the requested information is probative because this information does not provide an evaluative basis to assess whether the ranges are commensurate with position and the experience. That information is provided in the Mercer Non-Executive Compensation Study Exhibit 4A, Tab 4, Schedule 5, Non-executive Compensation and Benefits Review (Mercer Canada) which shows that Toronto Hydro's compensation strategy consistently yields costs (i.e. salary and wages) that are market-competitive with the 50th percentile within both the energy sector and general industry.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-62

Reference: Exhibit 4, Tab 2, Schedule 1, Page 34

"Given the nature of the workload completed by the External Work Execution segment, Toronto Hydro must increase the number of contract managers and project management staff to ensure the utility is able to effectively manage external contractors as the capital program grows. From the end of 2022 to 2029, Toronto Hydro intends to increase resourcing in this area by 74 percent from 69 to 120 staff. In Toronto Hydro's experience, an appropriate resource level has each manager, with a supporting analyst, executing approximately $11 to 13 million in capital projects annually."

QUESTION (A):

a) Please explain how the correlation between dollars of capital and internal management staff is derived and relevant. For example, it is not clear why a single project with high-cost materials would need as much or more internal management resource than a greater number of smaller projects but with lower cost materials.

RESPONSE (A):

The ratio is based on Toronto Hydro's historical experience managing and overseeing capital work executed by external resources. As detailed in the evidence at Exhibit 4, Tab 2, Schedule 10 at pages 8-9 the ratio covers oversight responsibilities and work activities which include, but are not limited to, providing oversight of contractor services and administering support of the specific projects assigned to external contractor crews, such as:

- Job package development and issuance;
- Liaising with system planners to address specific design matters;
- Field issues management;
- Ordering of materials;

- Facilitating changing of project scopes;
- Monitoring contractor safety and quality practices;
- Invoicing and receipting; and
- Inspection of newly constructed assets.

The External Work Execution segment also proactively engages with customers through the Community Relations team (See Exhibit 4, Tab 2, Schedule 18). This is an integral part of the project management and execution process. In addition to working with the Community Relations team, Project Execution Managers may also meet directly with customers on site to address any concerns that customers may have, before, during and after construction.

Table 1 below provides the actual and forecast work to be completed/executed by external service providers over the 2020-2029 period. For the purpose of determining the 2025-2029 resource requirement in this segment, Toronto Hydro applied the historical ratio of approximately $11 to 13 million of gross capital expenditure per manager.[1] This an appropriate assumption because the nature and mix of the work to be undertaken by external service providers over the 2025-2029 period is consistent with historical experience.

Table 1: Gross Capital Expenditure Output by Manager Calculation

Year	Number of Planned Capital Projects	Manager Head Count	Gross Capital Expenditure ($ Millions)	Gross Capital Expenditure per Manager ($ Millions)
2020	150	16	$129.56	$8.10
2021	224	13	$147.10	$11.32
2022	281	14	$186.04	$13.29
2023	486	17	$204.77	$12.05
2024	490	17	$212.86	$12.52

[1] For more details, refer to Exhibit 4, Tab 2, Schedule 10 at page 5-6. and Exhibit 4 Tab 1 Schedule 1, 5.1.1 – External Work Execution at pages 34-36.

Year	Number of Planned Capital Projects	Manager Head Count	Gross Capital Expenditure ($ Millions)	Gross Capital Expenditure per Manager ($ Millions)
2025	Project details for the 2025-2029 period are not available (see 2B-AMPCO-29)	19	$233.18	$12.27
2026		21	$239.40	$11.40
2027		23	$259.14	$11.27
2028		23	$274.32	$11.93
2029		23	$290.16	$12.62

QUESTION (B):

b) In 2022 the total capital expenditure is reported as 713.7 ('000) or $10.3M per staff of 69. The largest amount of spending in the rate plan occurs in 2028 at 970.9 ('000) which would equate to $8.1M implying a smaller dollar project value for THESL staff to manage than was the case in 2022. Please clarify how there is an equivalence as between 2022 capital spending with 69 staff and the average capital spending for the rate period and the 120 proposed staff need to manage external contractors in the future.

RESPONSE (B):

Toronto Hydro notes that the referenced $713.7 million from Exhibit 2B, Section E4 Table 2 (page 7 of 23) includes capital expenditures not managed by External Work Execution staff. This amount includes expenditures associated with General Plant programs such as Fleet & Facilities, IT & OT, as well as capital work executed by the internal staff. The total capital expenditures managed by resources in this segment is outlined in Table 1 above.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-63

References: Exhibit 4, Tab 2, Schedule 4, Page 2

Preamble:

"Furthermore, the increase in corrective work requests is due to enhanced inspection forms and introducing new inspection work, such as cable diagnostic testing, which identifies additional deficiencies that may need to be addressed. This results in approximately $20 million worth of backlog for the lower priority ("P3", requiring resolution within 180 days) work requests, which will need to be addressed before the issues worsen and cause a system fault which may lead to a power outage, or other safety incidents"

QUESTION (A):

a) Please confirm (or correct) that the implication of the above reference is that the cable diagnostic program has added an incremental $4M per year to the Corrective Maintenance budget.

RESPONSE (A):

The implication that cable diagnostic testing has added an incremental $4 million per year to the Corrective Maintenance budget is incorrect. Cable diagnostic testing is just one of a number of factors driving the approximate $20 million backlog. As noted in Exhibit 4, Tab 2, Schedule 4 at page 2, other drivers include deteriorating asset condition, enhanced inspection forms that enable better visibility of deficiencies, and new inspection programs (of which cable diagnostic testing is an example). Furthermore, Toronto Hydro clarifies that, while it intends to reduce the backlog and ensure that higher-risk P3 deficiencies are addressed, the utility's plan is not actually designed to completely eliminate it.

QUESTION (B):

b) THESL is proposing a 35% increase in System Renewal capital spending (2B/E1). This implies significant incremental replacement of aged assets with new ones. Since new assets require less maintenance than old, what was the reduction in annual corrective maintenance spending made due to the planned increase in capital asset replacements during the rate plan period?

RESPONSE (B):

Toronto Hydro did not reduce its forecast spending in the Corrective Maintenance program due to the increase in System Renewal spending as the utility does not expect the capital increase to reduce the amount of Corrective Maintenance work required. Please refer to Toronto Hydro's response to interrogatory 2B-Staff-180 for more details.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-64

Reference: Exhibit 4, Tab 2, Schedule 5, Pages 17-

Table 4: Emergency Response Program Expenditures ($ Millions)

Segment	Actual			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Emergency Response	22.1	23.0	22.0	20.4	23.1	25.9	26.4	27.2	27.9	28.6
Total	**22.1**	**23.0**	**22.0**	**20.4**	**23.1**	**25.9**	**26.4**	**27.2**	**27.9**	**28.6**

"Between 2025 and 2029 costs in this segment are expected to increase by $2.7 million, or an average of $0.7 million per year, to maintain the resourcing capacity and capabilities required to support the volume and complexity of work discussed above"

QUESTION (A):

a) The Emergency Response spending was on average $21.9 million between 2020 and 2023. It is unclear how the $4 million increase for 2025 was derived. Please clarify.

RESPONSE (A):

Year over year costs for the Emergency Response program are volatile due to the inherent uncertainty in forecasting the volume and nature of emergency events and the volume and magnitude of storm events in a given year. Toronto Hydro forecasts the costs for this program using historical average event volumes and known/anticipated changes to underlying labour and contract rates. In 2025, new contracts will take effect with rates that are representative of the current market for skilled electrical contractors working 24/7/365 and high economic inflation. As a result, there is a step increase in costs expected in 2025 relative to 2024. Please refer to the year-over-year variance analysis on pages 22-23 of Exhibit 4, Tab 2, Schedule 5 for more details.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-65

Reference: Exhibit 4, Tab 2, Schedule 8, Pages 5-

Table 3: Customer Operations Expenditures by Segment ($ Millions)

Segment	Actual			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Customer Connections	3.7	1.6	1.6	3.2	3.6	3.2	3.3	3.5	3.6	3.8
Key Accounts	-	0.5	0.8	0.9	1.2	1.5	1.5	1.7	1.8	1.9
Public Safety & Damage Prevention	4.7	4.4	5.4	7.3	6.8	6.7	6.9	7.0	7.2	7.3
Customer-Owned Equipment Services	0.9	1.0	1.2	1.2	1.2	1.3	1.4	1.5	1.5	1.6
Total	**9.3**	**7.5**	**9.0**	**12.6**	**12.8**	**12.7**	**13.1**	**13.7**	**14.1**	**14.6**

QUESTION (A):

a) Please confirm (or correct) that the Public Safety line includes spending for locates, but no costs forecast for the implications of Bill 93.

RESPONSE (A):

As discussed in Toronto Hydro's response to 4-Staff-296(b), the forecast costs of the Public Safety and Damage Prevention segment for 2023 and 2024 in Table 6 of the Customer Operations program evidence[1] include all locate costs and do not incorporate the effects of the variance account for those years. For more information about the 2025-2029 period please refer to Exhibit 4, Tab 2, Schedule 8,[2] in particular Tables 6 and 7.

QUESTION (B):

[1] Exhibit 4, Tab 2, Schedule 8 at p. 29.
[2] At p. 29, lines 8-25 and p. 30, lines 1-9.

b) What were the actual costs for Public Safety category (or the category which includes locates) in 2023?

RESPONSE (B):

Please refer to Toronto Hydro's response to 4-Staff-296(c).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-66

Reference: Exhibit 4, Appendix 2-K Feb 8/24 update

QUESTION (A):

a) Please modify the most recent Appendix 2-K to include for each year the total labour amount capitalized and expensed or confirm that the amounts are the same as those shown in Appendix 2-D under the line "Labour Capitalization" (also updated Feb 8/24).

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 4-AMPCO-84, subpart (h).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC -67

Reference: Exhibit 4, Tab 2, Schedule 9, Asset and Program Management

QUESTION (A)

a) Please show the number of FTEs employed in this program in each year 2020 through 2029.

RESPONSE (A):

Please see Toronto Hydro's response to interrogatory 4-SEC-92 a).

QUESTION (B):

b) Are the number of FTE's employed in this program in any way correlated with the level of capital expenditures? If yes, please explain how.

RESPONSE (B):

Yes. The FTEs covered by this program are required to plan and estimate capital investments in the system, accommodate new and expanding customer loads and DER connection applications as part of the Capacity Planning function, manage expenditure programs and maintain related financial and operational reporting, develop standards and policies to adapt to increasing and evolving customer demands, and undertake initiatives (such as ISO 55001 alignment and the development of new analytical tools) to find efficiencies and improve the quality of asset management and planning outputs within the prevailing financial constraints (among many other responsibilities). All of these activities scale in correlation with the size of the capital program. However, the relationship is not one-to-one. Increases in capital expenditures can also be partly due to input price inflation and changes in the nature of the work required (and the associated costs). Please

see response to 4-Staff-309, part (b) for additional details on the System Planning portion of this program.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-68

Reference: Exhibit 4, Tab 2, Schedule 10, Work Program Execution

"Work Program Execution (the "Program") is responsible for oversight, administrative training, and other functions performed in the process of executing Toronto Hydro's capital and maintenance work programs, which are not eligible for capitalization in accordance with the utility's capitalization policy."

"Over the 2025-2029 rate period, the utility expects the cost of this Program to increase by an annual growth rate of 5 percent."

QUESTION (A):

a) Please show the number of FTEs employed in this program/segment in each year 2020 through 2029.

RESPONSE (A):

Toronto Hydro has provided breakdown of FTE by program in response to 4-SEC-92 a).

QUESTION (B):

b) Which programs as delineated in Appendix 2-JC is spending in this program correlated (for example is it only related to spending in the Preventative and Predictive programs or other programs as well)?

RESPONSE (B):

Spending in the Work Program Execution program is correlated to expenditure in capital and maintenance programs as detailed in Exhibit 4, Tab 2, Schedule 10, as well as, Exhibit 4, Tab 1,

Schedule 1 at pages 34-38. Please also see interrogatories 4-Staff-297 a) and 4-SEC-89 b). Within OM&A programs listed in Appendix 2-JC, spending this program is correlated to the following OM&A programs:

- Preventative and Predictive Overhead Line Maintenance
- Preventative and Predictive Underground Line Maintenance
- Preventative and Predictive Station Maintenance
- Corrective Maintenance
- Emergency Response
- Customer Operations

QUESTION (C)

c) How was the 5% figure derived?

RESPONSE (C):

The 5% figure was derived by calculating compound annual growth rate (CAGR) of OM&A between 2029 OM&A forecast of $19.4 million and 2025 OM&A forecast of $16.0 million as presented in Exhibit 4, Tab 2, Schedule 10, Table 3. Please see the formula below which was used to derive the 5% CAGR figure.

$$CAGR = \left(\frac{\$19.4}{\$16.0}\right)^{1/4} - 1$$

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-69

Reference: Exhibit 4, Tab 2, Schedule 10, Work Program Execution

Table 1: Supply Chain Services Program Summary

Supply Chain Program Summary									
Outcomes: Operational Effectiveness - Reliability, Environmental, Financial Performance									
Segments: • Supply Chain Services									
Program Costs ($ Millions)									
2020A	**2021A**	**2022A**	**2023B**	**2024B**	**2025F**	**2026F**	**2027F**	**2028F**	**2029F**
15.8	12.9	13.8	16.7	18.8	21.5	23.5	24.9	25.5	27.1

Table 3: On-cost rates for 2023-2029

Year	**Actual**			**Bridge**		**Forecast**				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
On-Cost Rate	12.0 %	10.5 %	10.0 %	13.1 %	13.3 %	13.2 %	13.6 %	13.8 %	14.5 %	14.9 %

QUESTION (A)

a) Please show the number of FTEs employed in this program/segment in each year 2020 through 2029.

RESPONSE (A):

Please see the response to interrogatory 4-SEC-92 (a) for the number of FTEs employed under Supply Chain Services for 2020 through 2029.

QUESTION (B):

b) Are the "on-cost" rates the same as the labour capitalization rate for this program area?

RESPONSE (B):

No. On-cost rates are not the same as the labour capitalization rate for this program. On-cost rates provide a recovery for a number of costs associated with this program as described in Exhibit 2A, Tab 4, Schedule 2 at page 2. The recovery of these costs are not part of the Supply Chain Program. These recoveries are presented as part of the Allocations and Recovery Program as described in Exhibit 4, Tab 2, Schedule 21.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-70

Reference: Exhibit 4, Tab 2, Schedule 14, Billing, Remittance

Segment	Actual			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Billing, Remittance and Meter Data Management	19.4	18.9	19.4	20.9	23.1	23.7	25.0	25.4	26.2	27.0

a) What is the reason(s) for the 10% increase as between 2023 and 2024 in this segment?

RESPONSE:

The $2.2M change in budget between 2023 and 2024 is driven by a number of factors including change in net payroll costs due to filling vacancies, higher contract costs and increases in postage and payment processing fees. These increases are offset by decreases in temporary staff costs and greater ebill adoption.

The largest contribution to the change is 15 headcount to restore staffing levels and support insourcing and modernization efforts. These positions were to be filled over 2022, 2023 and 2024; however, the challenging post-COVID labour market plus key leadership vacancies moved the hiring efforts into late 2023 and 2024.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-71

Reference: Exhibit 4, Tab 2, Schedule 14, Customer Relationship

Table 6: Customer Relationship Management Segment Expenditures ($ Millions)

Segment	Actual			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Customer Relationship Management	11.4	11.4	12.1	14.4	15.1	14.7	15.7	16.1	16.9	17.5

QUESTION (A):

a) For each year 2020 to 2025 (forecast) please provide a table showing the number of FTEs in this segment, the total compensation and, separately, the number of residential, GS<50, GS>50 customers in each year (year average).

RESPONSE (A):

This response should be considered in conjunction with Exhibit 4, Tab 2, Schedule 14, Pages 34-46, which detail a number of functions within this segment where staffing is not directly related to the changes in the utility's customer count over the period.

Segment		**Cost in $ millions**					
		Actual			**Bridge**		**Forecast**
	Expense Type	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Customer Relationship Management	Compensation	5.5	5.2	5.6	6.4	7.8	8.6
Segment		**# of FTEs**					
		Actual			**Bridge**		**Forecast**
		2020	**2021**	**2022**	**2023**	**2024**	**2025**
Customer Relationship Management	Total	37.3	35.2	36.8	41.5	48	50.5

For customer numbers by rate class, please refer to Table 2 in Exhibit 3, Tab 1, Schedule 1, at Page 3.

QUESTION (B):

b) What is the assumed customer growth (residential + GS<>50) for the years 2026 through 2029.

RESPONSE (B):

Please refer to Table 2 in Exhibit 3, Tab 1, Schedule 1, at Page 3.

Year		**Residential**	**Competitive Sector Multi-Unit Residential**	**General Service <50 kW**	**General Service 50-999 kW**	**General Service 1,000-4,999 kW**	**Large Use**	**Total**	**Absolute Growth**	**% Growth Rate**
2026	Forecast	618,292	100,404	73,632	9,712	462	48	802,551	2,969	0.37%
2027	Forecast	618,985	102,150	73,857	9,725	460	47	805,224	2,674	0.33%
2028	Forecast	619,849	103,674	74,165	9,740	463	46	807,938	2,713	0.34%
2029	Forecast	620,742	104,994	74,455	9,754	461	46	810,452	2,515	0.31%

Note: This table is excluding Streetlighting and Unmetered load customer numbers.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC -72

Reference: Exhibit 4, Tab 2, Schedule 15, Human Resource

Table 3: Human Resource and Safety Program Expenditures ($ Millions)

Segment	Actual			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Environment, Health & Safety	2.4	2.3	2.4	3.0	3.1	3.3	3.4	3.6	3.8	3.9
Human Resource Services & Systems, Organizational Effectiveness & Employee Labour Relations	5.9	6.3	5.9	8.0	9.4	10.0	10.4	10.8	11.3	11.8
Talent Management, Change Leadership & Sustainability	7.2	9.0	8.4	7.9	8.8	9.3	9.4	9.8	10.2	10.6
Total	**15.5**	**17.6**	**16.7**	**18.9**	**21.3**	**22.6**	**23.2**	**24.2**	**25.3**	**26.3**

QUESTION (A):

a) For each year 2020 to 2029 what are the forecast FTEs employed in this segment?

RESPONSE (A):

Table 1: FTEs in Human Resources, Environment and Safety Segment

Segment Name	Actuals			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Human Resources Environment and Safety	69	69	71	74	82	85	85	85	85	85

QUESTION (B):

b) What are the number of new hires in each year (actual and forecast)?

RESPONSE (B):

The figures in the table below represent FTEs:

Table 2: New Hire FTEs

Actuals			Bridge		Test				
2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
2	0	2	3	8	3	0	0	0	0

QUESTION (C):

c) What is THESL's annual churn (vacancy) rate?

RESPONSE (C):

Please refer to Toronto Hydro's response to interrogatory 4-SEC-111.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-73

Reference: Exhibit 4, Tab 5, Schedule 1

Table 2: Summary of the Costs of Shared Services Provided by and Received by Toronto Hydro to/from THC ($ Millions)

Segment	Approved	Actual			Bridge		Forecast				
	2020	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Services Provided by Toronto Hydro	3.9	2.7	2.6	3.0	3.1	2.9	3.2	3.4	3.4	3.6	3.9
Services Recovered by Toronto Hydro	4.6	4.0	3.8	4.6	3.6	4.1	4.2	4.4	4.4	4.6	4.9

QUESTION (A):

a) It is unclear to us what this table is attempting to demonstrate. Please confirm (or correct) that the first row shows total payment amounts remitted by THC to THESL for services provided (i.e., a credit) and the second row shows the total payments remitted by THESL for services provided by THC (i.e., a debit).

RESPONSE (A):

Confirmed.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-74

Reference: Exhibit 4, Tab 2, Schedule 18

Table 3: Legal Services and Regulatory Affairs Program Expenditures ($ Millions)

Segment	Actual			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Legal Services	6.1	5.7	5.8	7.9	9.2	9.8	10.3	10.7	11.2	11.6
Regulatory Affairs	3.8	4.4	4.1	5.6	6.4	7.0	7.1	7.5	7.9	8.1
OEB Fees	3.4	3.2	3.6	4.0	4.4	4.5	4.6	4.6	4.7	4.8
Regulatory Applications (Custom IR)	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.0
Communications & Public Affairs	3.6	4.1	4.1	5.5	6.4	6.6	6.9	7.1	7.3	7.6
Total	**18.5**	**19.0**	**19.2**	**24.7**	**28.0**	**29.9**	**30.9**	**32.0**	**33.2**	**34.2**

QUESTION (A):

a) Please provide the number of FTEs (year average) for this segment for each year 2020-2029 (forecast).

RESPONSE (A):

The projected number of FTE for 2020 to 2029 for the Public, Legal and Regulatory Affairs segment is displayed in the below table:

Table 1: Projected Number of FTE for 2020 - 2029 for PLRA Segment

Segment Name	Actuals			Bridge		Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Legal Services	26	24	25	28	34	36	37	37	37	36
Communications & Public Affairs	18	19	22	21	23	23	23	23	23	23
Regulatory Affairs	16	19	22	23	25	26	26	26	26	26
Total	**60**	**63**	**69**	**73**	**83**	**85**	**85**	**85**	**85**	**85**

QUESTION (B) :

b) Please provide the actual OEB annual cost assessment for 2023.

RESPONSE (B):

Please see Appendix 2-M filed in response to 4-SEC-110.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 4-VECC-75

Reference: Exhibit 4, Tab 2, Schedule 18

a)

	Regulatory Costs (One-Time Application)	2025 Test Year Budget	Incurred to date
1	Expert Witness costs		
2	Legal costs		
3	Consultants' costs		
4	Incremental operating expenses associated with staff resources allocated to this application.		
5	Incremental operating expenses associated with other resources allocated to this application.		
6	Intervenor costs		
	TOTAL		

QUESTION (A):

a) Please complete the above table for the one-time application costs that are to be amortized over the rate plan period.

RESPONSE (A):

Please see Toronto Hydro's response to interrogatory 4-SEC-110. The one-time application costs incurred to date are listed in the 2022 and 2023 actuals columns of the updated OEB Appendix 2-M.

QUESTION (B):

b) Are the amortized costs of this application included in the presentation tables on OM&A (e.g. Appendix 2-JC etc.)?

RESPONSE (B):

The amortized costs are not broken out in the noted appendices, but are included in the presentation of the Regulatory Affairs segment at Exhibit 4, Tab 2, Schedule 18.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 5-STAFF-312

References: **Exhibit 5, Tab 1, Schedule 1, Page 7**
EB-2009-0084, Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, December 11, 2009, Page 57
EB-2018-0165, 2020 Custom IR, Decision and Order, December 19, 2019, Page 153
Excel Appendix OA-OB, November 17, 2023
Excel Revenue Requirement Workforms (2025, 2026, 2027, 2028, and 2029), November, Tab 7 Cost of Capital, November 17, 2023
OEB Letter, 2024 Cost of Capital Parameters, October 31, 2023

Preamble:

Toronto Hydro stated that its short-term debt rate for ratemaking purposes is based on a "One-Month Banker's Acceptance rates (Bloomberg L.P.)", plus a five-basis point administration fee.

Toronto Hydro provided the following table in its evidence.

Table 5-1: Short-Term Rates

Year	Short Term Rates
2023	5.15%
2024	5.40%
2025	5.40%

OEB staff notes that Toronto Hydro has calculated its short-term debt rate for ratemaking purposes in a different manner than that set for electricity distributors in the Report of the Board on the Cost of Capital for Ontario's Regulated Utilities. However, the OEB accepted Toronto Hydro's different approach in its last Custom IR proceeding.

In Appendix-OA filed November 17, 2023, Toronto Hydro proposes a short-term debt rate of 5.25%. A short-term debt rate of 5.25% is also reflected in Toronto Hydro's Excel revenue requirement workforms for the rate years 2025 through 2029.

The deemed short-term debt rate of 6.23% for electricity distributors was issued by the OEB on October 31, 2023.

QUESTION (A) – (F):

a) Please confirm that to determine the final revenue requirement for 2025 and the subsequent years (i.e., 2026-2029), Toronto Hydro intends to use a short-term rate of 5.25%, or a different rate as updated through interrogatories. If this is not the case, please explain.

b) Please explain why a short-term debt rate of 5.40% is reflected in Toronto Hydro's Table 6, but a different rate of 5.25% is used in Appendix-OA and the Excel revenue requirement workforms for the rate years 2025 through 2029.

c) Please provide the supporting calculations for the short-term debt percentages shown in Toronto Hydro's Table 6 and Appendix-OA, including which Bloomberg ticker(s) was used.

d) Please confirm that the manner in which Toronto Hydro has calculated its short-term debt rate and to determine the final revenue requirement for 2025 and the subsequent years (i.e., 2026-2029), is consistent with that approved by the OEB in Toronto Hydro's 2020 Custom IR proceeding. If this is not the case, please explain.

e) Please explain why it is appropriate for Toronto Hydro to continue to depart from using the deemed short-term debt rate approved by the OEB (which is generally used by other electricity distributors).

f) Please explain the impact on Toronto Hydro's 2025 through 2029 revenue requirements if Toronto Hydro used the deemed short-term debt rate of 6.23% issued by the OEB on October 31, 2023.

RESPONSE (A) – (F):

To determine the final revenue requirement for the purpose of setting rates, at the time of Draft Rate Order, Toronto Hydro intends to update the short-term rate based on the deemed short-term debt rate to be issued by OEB in October 2024.

Table 6 provided forecasted short-term rates for the respective years. For the year 2023, forecasted rate was provided based on short-term rates that prevailed in Q3, 2023. For the years 2024 and 2025, an additional 25 basis points were added to factor in the possibility of an interest rate hike. However, given the uncertainty related to future monetary policy changes, for the 2025-2029 revenue requirement workforms included in the pre-filed evidence, Toronto Hydro applied the most recent actual short-term rate in Appendix-OA.

The utilization of the 6.23% rate issued by OEB will change the cost of capital from 6.17% to 6.21% and it will result in an increase of $2.3M in revenue requirement. Toronto Hydro notes that the rate issued by the OEB was not applied in the pre-filed evidence because the revenue requirement evidence was already locked-down by that point in time.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 5-STAFF-313

References: Exhibit 5, Tab 1, Schedule 1 , Pages 4, 6
Excel Appendix OA-OB, November 17, 2023
Exhibit 1C, Tab 3, Schedule 6
OEB letter, 2024 Cost of Capital Parameters, October 31, 2023
Excel Revenue Requirement Workforms (2025, 2026, 2027, 2028, and 2029), November, Tab 7 Cost of Capital, November 17, 2023

Preamble:

Toronto Hydro stated that is had an all-in coupon rate of 4.93% on Toronto Hydro Corporation's (THC) 30-year issuance on August 28, 2023. However, OEB staff could not find this bond listed in Toronto Hydro's Appendix OB Debt Instruments for the rate year 2025.

In Appendix OB, Toronto Hydro indicated that on October 2, 2023, it had issued a debenture for $200,000,000 with a rate of 5.25%, however, no promissory note was filed in Toronto Hydro's evidence in Exhibit 1C. Also, "Table 5: Forecasted Long-Term Debt Issues" on page 6 of Exhibit 5 shows a forecasted rate of 5.00% and not 5.25% for the debt issued in October 2023.

The deemed long-term debt rate of 4.58% for electricity distributors was issued by the OEB on October 31, 2023.

Toronto Hydro has calculated a long-term debt rate of 3.95% in Appendix OB for the 2025 rate year. A long-term debt rate of 3.95% is also reflected in Toronto Hydro's Excel revenue requirement workforms for the rate years 2025 through 2029.

QUESTION (A):

a) Please reconcile the debt that Toronto Hydro stated was issued on August 28, 2023 with the debt issuances shown in Appendix OB.

RESPONSE (A):

The all-in coupon rate of 4.93% for 30-year THC debt issuance as at August 28, 2023 was an indicative rate mentioned in the context of comparing credits spreads and absolute all-in-yields between 2022 and 2023. There was no actual issuance of THC debt on August 28, 2023.

QUESTION (B):

b) Please provide the promissory note for the debenture issued October 2, 2023 for $200,000,000, explain whether the rate was 5.00% or 5.25%, and update the evidence as required.

RESPONSE (B):

The promissory note issuances mentioned in Table 5 were forecasted long-term debt issuances. There was no THC promissory note issuance on October 2, 2023. Toronto Hydro issued $200M promissory note at an all-in coupon rate of 5.18% on October 12, 2023. Toronto Hydro has updated Appendix OA-OB to reflect the same, which is attached as Appendix A to this interrogatory response.

QUESTION (C):

c) If any debt instruments have been issued since the preparation of the pre-filed evidence for the current proceeding, please update the relevant evidence (including Appendix OA and Appendix OB), and provide a copy of the relevant promissory note(s).

RESPONSE (C):

Please see the attached Appendix A and B to this response.

QUESTION (D) AND (E):

d) For each promissory note shown on Appendix OB with rates greater than the current deemed long-term debt rate of 4.58%. please provide the following:
   i. The start date of the debt.
   ii. The deemed long-term debt rate in place at the time the debt was issued
   iii. The need for the debt and rationale supporting taking the debt at the rate offered

e) Please provide rationale supporting the need for the forecasted debt issues shown in Appendix OB, including any specific capital project(s) that the debt funding is for.

RESPONSE (D) – (E):

Toronto Hydro is assigned debt through promissory notes from its parent, Toronto Hydro Corporation. These promissory notes are written on the same market terms as the parent debt applicable to Toronto Hydro Corporation (plus an additional five basis points for an administration fee). Toronto Hydro has the following promissory notes with rates greater than 4.58 percent:

Description	Amount ($)	Rate (%)	Start Date of the debt	Deemed long-term debt rate at the time of issuance (%)	Issuance - Actual/ Forecast
2022 Series 19	300,000,000	5.00%	13-Oct-22	3.49%	Actual
2023 Series 20	250,000,000	4.66%	14-Jun-23	4.88%	Actual
2023 Series 21	200,000,000	5.18%	12-Oct-23	4.88%	Actual
2024 Series 22	200,000,000	5.85%	01-Nov-24	4.58%	Forecast
2025 Series 23	300,000,000	5.45%	07-Jul-25	NA	Forecast

Toronto Hydro issues debt to fund its capital and operational requirements and to refinance its maturing debt. For actual issuances, the rate reflects market conditions at the time of issuance. The variance to the deemed long-term debt rate issued by OEB is mainly due to timing differences, as OEB issued rates are calculated based on bond yields during the month of September for the prior year.

QUESTION (F):

f) Please confirm that to determine the final revenue requirement for 2025 and the subsequent years (i.e., 2026-2029), Toronto Hydro intends to use a long-term rate of 3.95%, or a different rate as updated through interrogatories. If this is not the case, please explain.

RESPONSE (F):

To determine the final revenue requirement for the 2025-2029 rate period, the utility intends to use a single long-term ("LT") debt rate, which is currently 3.95% as supported by the evidence in Exhibit 6, Tab 1, Schedules 2-6. If during the course of the proceeding there are any updates or material changes to the evidence supporting the deemed LT rate during the course of the proceeding, Toronto Hydro intends to update the rate accordingly and flow through the impact to the revenue requirement impacts at the time of the Draft Rate Order process. /C

PROMISSORY NOTE

Principal Sum Cdn$200,000,000.00

FOR VALUE RECEIVED, the undersigned hereby unconditionally promises to pay to the order of Toronto Hydro Corporation ("THC") on October 12, 2028 (the "Due Date") the principal sum of **Two Hundred Million Dollars ($200,000,000.00)** (the "Principal Sum") in lawful money of Canada at 14 Carlton Street, Toronto, Ontario M5B 1K5, or such other place as THC may designate by notice in writing to the undersigned and to pay interest on the Principal Sum at the rate of **5.18**% per annum calculated and accruing from the date hereof to the Due Date and thereafter until the Principal Sum is repaid to THC.

Interest shall be calculated and payable semi-annually in arrears in equal instalments on the 12th of April and the 12th of October in each year at the same address where the 12th of April or the 12th of October is a Business Day. Where the 12th of April or the 12th of October is not a Business Day, then the interest shall be payable on the following Business Day. For the purpose of this Promissory Note, a "Business Day" shall mean a day on which banks are open for business in the City of Toronto, Ontario but does not include Saturday, Sunday, or a statutory holiday in the Province of Ontario. Interest both before and after default and judgment on the principal amount and overdue interest shall be payable at the aforementioned rate.

All payments or any part thereof may be extended, rearranged, renewed or postponed by THC. On or after September 12, 2028 (1 month prior to the Due Date), THC may demand payment of the Principal Sum outstanding, together with accrued and unpaid interest to the date of the demand at its option, in whole at any time or in part from time to time, on not more than 60 and not less than 10 days prior notice, and the undersigned shall make payment of such amount as demanded. No delay or failure by THC to exercise any right or remedy against the undersigned shall be construed as a waiver of that or any right or remedy nor shall any waiver hereunder be deemed to be a waiver of subsequent default.

The undersigned hereby waives presentment, demand, protest or other notice of every kind in the enforcement of this promissory note. All amounts owning hereunder will be paid by the undersigned without regard for any equities between the undersigned and THC or any right of set-off or cross-claim.

In the event of a default hereunder the undersigned agrees to pay all expenses, including without limitation, reasonable legal fees (on a solicitor and his own client basis), incurred by THC in endeavoring to enforce its rights hereunder.

This promissory note is non-negotiable and non-assignable without the prior written consent of the undersigned.

DATED at Toronto, Ontario, effective as of the 12th day of October, 2023.

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

By: _____
Name: Anthony Haines
Title: President and Chief Executive Officer

By: _____
Name: Celine Arsenault
Title: EVP and Chief Financial Officer

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 5-STAFF-314

References: Exhibit 5, Tab 1, Schedule 1, Page 1
EB-2009-0084, OEB Report, Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, December 11, 2009, Page 50
Filing Requirements For Electricity Distribution Rate Applications - 2023 Edition for 2024 Rate Applications, Chapter 2 Cost of Service, December 15, 2022, Page 36

Preamble:

Toronto Hydro proposes to set its capital structure for ratemaking purposes in accordance with the OEB's cost of capital policy (EB-2009-0084) issued on December 11, 2009 (OEB Report). Toronto Hydro's debt to equity split for the test years is set at 60:40, with the debt component including a deemed 4% short-term debt component.

The OEB's filing requirements require explanations for material changes in actual capital structure or material differences between actual and deemed capital structure.

QUESTION (A) - (C):

a) Please provide Toronto Hydro's actual debt to equity ratio for each year 2020 to 2023.
b) Please explain any material differences between the actual debt to equity ratio for each year 2020 to 2023 and the deemed ratio of 60:40 previously used to set rates.
c) Please explain any material changes in the actual capital structure for the period 2020 to 2023, year-over-year.

RESPONSE (A) – (C):

Please see the table below for Toronto Hydro Consolidated (THC) debt-to-capital and debt-to-equity ratios. Toronto Hydro manages these ratios are the consolidated company level for the purpose of

enabling public debt issuances. As shown below, the average ratios over the current rate period are aligned with the OEB deemed capital structure.

Table 1: Toronto Hydro Consolidated Debt-to-Capital and Debt-to-Equity Ratio

	2020	2021	2022	2023	Average
Debt-to-Capital	57.1%	57.8%	60.0%	61.5%	59.1%
Debt-to-Equity	1.33	1.37	1.50	1.60	1.45

For the 2025-2029 rate period, Toronto Hydro proposes to continue to set its capital structure with a deemed debt-to-capital split of 60:40, with the debt component continuing to reflect a 4% short-term debt and 56% long-term debt structure.

/C

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 5-STAFF-315

Reference: Exhibit 5, Tab 1, Schedule 1, Pages 1, 2
EB-2009-0084, OEB Report, Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, December 11, 2009, p. 50

Preamble:

Toronto Hydro proposes to set its capital structure for ratemaking purposes in accordance with the OEB Report. Toronto Hydro's debt to equity split for the test years is set at 60:40, with the debt component including a deemed 4% short-term debt component.

Toronto Hydro also stated that to determine the final revenue requirement for 2025 and the subsequent years (i.e., 2026-2029), Toronto Hydro intends to rely on the ROE set by the OEB in the final quarter of 2024.

QUESTION (A):

a) Under current and forecasted macroeconomic conditions, what are the key business risks and financial risks faced by Toronto Hydro?

RESPONSE (A):

As detailed through the evidence in this application, Toronto Hydro faces existing and emerging business and financial risks including, but not limited to:

- Operational risk with respect to aging infrastructure, technical obsolescence and other critical asset risks that can result in failure and service interruptions.
- Protecting against rising cybersecurity threats is a critical business risk that Toronto Hydro must continue to manage as the grid and utility operations become more interconnected and digitized.

- The need for significant investments in infrastructure and human capital, coupled with a regulatory framework that does not permit full and sufficiently timely cost recovery, puts pressure on Toronto Hydro's balance sheet and financial metrics which the utility must continue to manage effectively to maintain its credit rating and favourable market borrowing costs.
- Fluctuations in interest rates can impact borrowing costs and financial stability, as Toronto Hydro continues to incur and carry a significant amount of debt to finance its capital work program.
- Macroeconomic uncertainty (e.g. as observed with the pandemic), shifts in energy consumption patterns, the proliferation of distributed energy resources, and changes in customer behavior driven by policy and technology evolutions affect the predictability of year-over-year customer demand and revenue.
- The adoption of new technologies, such as grid automation, energy storage systems, and advanced metering infrastructure carries implementation and operational risks, including ensuring that the workforce has the necessary skills to operate and maintain these technologies.
- Labour market shortages and high-demand for specialized skills creates competition for top talent, and places incremental risk on the ability to attract and retain skilled employees.
- Maintaining a productive working environment that is necessary to deliver customer outcomes requires effective employee relations strategies to maintain high employee engagement and satisfaction, and to avoid labour unrest which can disrupt operations, impact business continuity and lead to service interruptions.
- Supply chain disruptions and fluctuations in the prices of critical materials and services observed in recent years pose incremental risks to the execution of the utility's capital program.
- Navigating changing consumer needs and preferences as more customers automate and digitize their homes and businesses, and adopt electrified technologies such as EVs and heat pumps, increasing their dependence on electricity for day-to-day energy needs.

- An incentive-based regulatory framework which places a greater degree of risk on Toronto Hydro's profitability based on the achievement of performance outcomes that provide value to customers.
- Climate change-related events, such as storms and floods, can damage infrastructure and disrupt operations, leading to increased maintenance and repair costs.
- Inherent safety risks for employees and the public arising from the nature of the electricity distribution business.
- Legal challenges, such as lawsuits related to environmental issues, safety concerns, or contractual disputes, can lead to financial losses and damage the company's reputation.
- Failure to comply with regulatory requirements, safety standards, financial reporting obligations, or environmental regulations can result in administrative fines and penalties and reputational risk.

QUESTION (B):

b) Please identify and explain how all risk factors were considered by Toronto Hydro, including energy transition risk, volumetric risk (i.e., energy and demand), financial risk, operational risk, and regulatory risk. Has Toronto Hydro taken into account these risks in its evaluation of its business risk and financial risk, its requested allowed ROE, and its requested deemed capital structure?

RESPONSE (B):

With respect business enterprise risks as outlined in part (a) above, Toronto Hydro's proposed ROE and deemed capital structure is aligned with existing OEB policy as set out in reference 2, and the follows the guidance articulated in section 2.5 of the OEB's Chapter 2 of the Filing Requirements. In this application, Toronto Hydro is not proposing a distributor-specific cost of capital and/or capital structure, as the utility believes that the current cost of capital parameters continue to be appropriate for setting its 2025-2029 rates on a just and reasonable basis.

Toronto Hydro's Custom Rate Framework as outlined in Exhibit 1B, Tab 2, Schedule 1, appropriately allocates risk and benefit between the utility and the ratepayers with respect to the execution of the proposed 2025-2029 Investment Plan, the ability to recover prudent and necessary costs to deliver the plan and maintain a fair return, and the achievement of productivity and performance outcomes that provide demonstrable value to customers.

QUESTION (C):

c) Please explain whether Toronto Hydro's view is that OEB regulation can mitigate all business risks and financial risks, including the risk associated with the energy transition, or that there are certain business risks and financial risks that cannot be mitigated by regulation.

RESPONSE (C):

Toronto Hydro's view is that OEB regulation should be responsive to the existing and evolving business conditions that Toronto Hydro faces, and contemplate how to use existing and evolved regulatory mechanisms to enable and incent the utility to effectively manage its business and deliver its outcome-based multi-year plan within these business conditions. All of this should be done in harmony with the OEB's statutory objectives and the principles of performance-based regulation, including (i) protecting consumers with respect to price and service quality outcomes in the near and long-term, (ii) aligning and balancing the interests of ratepayers and utilities, and (iii) safeguarding financial viability by maintaining the opportunity for the utility and its shareholder to earn a fair return on investment. /C

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 5-STAFF-316

References: Exhibit 5, Tab 1, Schedule 1, Pages 1, 2

Exhibit 1C, Tab 3, Schedule 7, Appendix A and Appendix B

Preamble:

OEB staff requests further information from Toronto Hydro that relates to its requested allowed ROE and deemed capital structure and other utility comparables.

Toronto Hydro has provided its rating agency reports in Exhibit 1C, as follows:

- Appendix A: S&P, May 11, 2023
- Appendix B: DBRS, May 1, 2023

QUESTION (A):

a) Please provide any subsequent rating agency reports from S&P and DBRS issued after May 2023.

RESPONSE (A):

There are no Toronto Hydro specific subsequent rating agency reports.

QUESTION (B):

b) Please explain whether any rating agency has expressed concerns with Toronto Hydro's requested allowed ROE and requested deemed capital structure.

RESPONSE (B) :

The credit rating agencies have not expressed any concerns about Toronto Hydro's requested allowed ROE or requested deemed capital structure.

QUESTION (C):

c) Has Toronto Hydro performed any analysis that compares its business risk and financial risk, its requested allowed ROE, and its requested deemed capital structure to other large electricity distribution companies in Canada or the U.S.? If so, please provide that analysis.

RESPONSE (C):

Toronto Hydro has not performed such analysis for the reasons noted in 5-Staff-315(b) .

QUESTION (D):

d) Please confirm that Toronto Hydro has lower business risk and financial risk than most other Ontario electricity distributors due it being able to leverage its sheer size (i.e., considering operational efficiencies and economies of scale). If this is not the case, please explain.

RESPONSE (D):

No. This statement is incompatible with current OEB policy, as set out in EB-2009-0084 affirmed in numerous rates proceedings since then, whereby the OEB determined that the business and financial risks of local distribution companies (LDCs) in the province are sufficiently comparable for the purposes of determining the cost of capital parameters to be applied for setting just and reasonable distribution rates. Additionally, this statement is also contrary to the extensive evidence on record in this application, including an empirical Total Cost Benchmarking study (Exhibit 1B, Tab 3, Schedule 3, Tab 3, Appendix A) as well the responses to interrogatories 2B-Staff-121 and 5-Staff-315, which demonstrates that Toronto Hydro continues to face many existing and emerging business risks, challenges and costs associated with maintaining and operating a complex and mature distribution system, and serving the diverse needs of customers in a large urban service territory.

QUESTION (E):

e) Please explain whether Toronto Hydro has any problems attracting capital and provide a comparison of the rates it has recently borrowed at, compared to its utility peers.

RESPONSE (E):

Toronto Hydro has successfully attracted equity and debt capital to date at rates consistent with those established and funded through the OEB cost of capital framework.

QUESTION (F):

f) Please provide evidence that shows how Toronto Hydro's key actual financial metrics have trended from 2016 through 2023.

RESPONSE (F):

The key financial metrics that Toronto Hydro monitors for capital structure purposes are debt to capitalization (D/C) ratio and adjusted funds from operations to debt (AFFO/Debt).

Table 1: 2016-2023 Key Financial Metrics for Credit Standing

THC	2016	2017	2018	2019	2020	2021	2022	2023
Debt-to-Capital	62.2%	55.6%	54.1%	55.1%	57.1%	57.8%	60.0%	61.5%
AFFO-to-Debt (S&P)	18.4%	16.7%	17.3%	18.0%	12.6%	13.1%	10.3%	11.9%

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 5-CCC-62

Reference: Exhibit 5, Tab 1, Schedule 1, Page 1

Toronto Hydro sets its capital structure according to the OEB's Cost of Capital guidelines. The debt/equity split included in the calculation of the revenue requirement is 60:40. Given that as compared to Toronto Hydro's last Custom IR plan this plan reduces Toronto Hydro's business risk by including the Demand-related Variance Account and cost of service treatment for OM&A costs why does a 40% equity component remain appropriate for Toronto Hydro?

RESPONSE:

Please see the response to Interrogatory 5-EP-34(b).

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 5-EP-34

Reference: Exhibit 5, Tab 1, Schedule 1, Page 1, Capital Structure

Exhibit 9, Tab 1, Schedule 1, Page 27

Preamble:

"Toronto Hydro's sets its capital structure for ratemaking purposes in accordance with the OEB's Cost of Capital guidelines issued in EB-2009-0084, Report of the Board on the Cost of Capital for Ontario's Regulated Utilities (December 11, 2009) ("Report of the Board"). For Toronto Hydro, the debt to equity split for the test years is set at 60:40. The debt component in each year includes a deemed 4 percent short-term debt component".

QUESTION (A):

a) Is Toronto Hydro's debt to equity split of 60:40 the same as that of other electricity distributors regulated by the OEB?

RESPONSE (A):

To the best of Toronto Hydro's knowledge, and in keeping with the OEB Decision in its generic cost of capital proceeding (EB-2009-0084), the OEB has consistently applied the 60:40 debt-to-equity split to all electricity distributors in the province.

QUESTION (B):

b) Please confirm that the proposed Custom IR lowers the business risk of Toronto Hydro. If the answer is no, please explain why not?

RESPONSE (B):

No. Toronto Hydro's Custom Rate Framework as outlined in Exhibit 1B, Tab 2, Schedule 1, appropriately allocates risk between the utility and the ratepayers with respect to the execution of the proposed 2025-2029 Investment Plan, the ability to recover prudent and necessary costs to deliver the plan, and the achievement of productivity and performance outcomes that provide demonstrable value to customers.

Custom IR is a performance-based rate-setting ("PBR") approach that carries multi-year business risk for utilities. The proposed framework focuses on outcomes: further shifting considerable business performance and earnings risk onto the utility to the benefit of customers. As noted in the response to 1B-EP-12(f) and demonstrated in the response to 1B-Staff-12(a), the utility faces a significant revenue deficiency (earnings risk) of approximately $81 million under the proposed rate framework, which can only be mitigated through the attainment of productivity and performance objectives that provide demonstrable benefits to customers in the next rate period and beyond. Please see the response to 1B-SEC-13 for an analysis of the financial risk that the utility carries in the proposed Custom Rate Framework relative to minimum direct customer benefits that the Performance Incentive Mechanism delivers.

Please see the response to 5-Staff-315 for a discussion of the enterprise risks that Toronto Hydro faces.

QUESTION (C) :

c) Please confirm that the recent OEB decision in EB-2023-0143 Getting Ontario Connected Act Variance account lowers the regulatory risk of Toronto Hydro.

RESPONSE (C):

The variance account does not reduce regulatory risk, since the recovery of the costs tracked in this variance account remain subject to a future, OEB prudence review, as affirmed in the OEB's Decision and Order (October 31, 2023).

QUESTION (D):

d) If the OEB approves Toronto Hydro's Custom IR, should it adjust the debt to equity split commensurate with the reduction in the business risk and regulatory risk? Please explain your answer.

RESPONSE (D):

Respectfully, the question confuses two entirely separate constructs: (i) the Custom IR framework and (ii) the OEB's cost of capital parameters.

With respect to (i) the OEB established the Custom Incentive Rate-setting (CIR) option through the Renewed Regulatory Framework in October 2012. Neither the purpose, nor the effect, of CIR was to alter business or regulatory risk for utilities. The public interest purpose and effect were to establish a means of escalating utility investments required to meet rapidly growing grid and customer needs more effectively and efficiently than other forms of OEB Performance-Based Rate-setting (PBR). As noted in the response to (b) above, business and financial risk has not been reduced under the proposed Custom Rate Framework. Through the PIM, the proposed framework places a significant incremental business performance and earnings risk on the utility to the benefit of ratepayers.

With respect to (ii) the OEB established the cost of capital policy in EB-2009-0084, and determined that the current deemed capital structure of 60% debt, 40% equity is appropriate for all electricity distributors, and the use of a formula-based equity risk premium approach continues to meet the Fair Return Standard (FRS). In 2016, the OEB affirmed that the 2009 cost of capital framework remained appropriate for all distributors. To the best of Toronto Hydro's knowledge, the OEB has consistently applied these cost of capital parameters to every electricity distributor in the province.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 5-SEC-117

Reference: Exhibit 5, Tab 1, Schedule 1, Page 1

With respect to its proposed capital structure, please provide a copy of any analysis undertaken by, or for, Toronto Hydro since 2016, regarding changes in its business and/or financial risk

RESPONSE:

Toronto Hydro has not undertaken specific analysis of its proposed capital structure since 2016 that is related to changes in its business and/or financial risk.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 5-SEC-118

Reference: Exhibit 5, Tab 1, Schedule 1, Page 6

With respect to the forecast long-term debt issuances:

QUESTION (A) :

a) Please provide the basis for the corporate spread estimates.

RESPONSE (A):

The corporate spreads on the forecast long term debt issuances were based on credit spreads of A rated utility companies. The average 10-year and 30-year credit spreads for A rated utilities during the twelve months ended July 31, 2023 were ~145 basis points and ~165 basis points respectively. The highest 10-year and 30-year credit spreads for A rated utilities during the same period were ~165 basis points and ~185 basis points respectively.

A credit spread of 150 basis points was used for the 10-year $200M Series-21 promissory note planned in October 2023. A credit spread of 190 basis points, was used for the 30-year $200M Series-22 promissory note planned in November 2024 and a credit spread of 170 basis points was used for the 10-year $300M Series-23 promissory note planned in July 2025. The highest spreads seen during the twelve-month period were used for both Series-22 and Series-23 to compensate for market risks.

QUESTION (B)

b) Toronto Hydro states that the debt rates are based, in part, on the 10 and 30 year-Government of Canada Bond Yield from Bloomberg L.P. Is this the current Bond Yields, or forecast Bond Yields?

RESPONSE (B):

They are forecast bond yields.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 5-SEC-119

Reference: Exhibit 5, Tab 1, Schedule 1, Page 7

What is the interest rate that Toronto Hydro pays on its revolving credit facility?

RESPONSE:

Since there has been no draw down on the credit facility, Toronto Hydro pays no interest on the facility. However, if Toronto Hydro had to draw down on the facility, then the interest rate would be CORRA (Canadian Overnight Repo Rate Average) plus 80 basis points.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 5-VECC-76

Reference: Exhibit 5, Tab 1, Schedule 1, Page 7

QUESTIONS (A) AND (B) :

a) Please clarify whether it is THESL's intention to apply the Board's deemed short-term debt rate (as updated in 204) or apply an updated forecast based on the methodology described at the above reference, for the short term debt component of the cost of capital.

b) If the latter please explain the reasons it is reasonable for ratepayers to pay an additional 5 basis point administration fee for access to short-term debt.

RESPONSE (A) AND (B):

Yes, it is Toronto Hydro's intention to apply the Board's deemed short-term debt rate for the short-term debt component of the cost of capital. Please refer to the response to 5-Staff-312(d).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 5-VECC-77

Reference: Exhibit 5, Tab 1, Schedule 1, Pages 5-7

QUESTION (A):

a) Please provide an update as to the actual rate to be applied for the $200m note to be issued October 15, 2023.

RESPONSE (A):

The Series-21 $200M promissory note was issued on October 12, 2023 at a coupon rate of 5.18% maturing October 12, 2028. The coupon rate included an underlying Government of Canada bond yield of 4.16% and a credit spread of 102 basis points.

QUESTION (B):

b) Please explain why it is appropriate to include a basis point administration fee on this debt.

RESPONSE (B):

The 5 basis points administration fee on this debt is consistent with prior rate applications filed and approved that included the same administration fee.

QUESTION (C):

c) Does the rate for all of the other notes shown in Table 4 all include a similar 5 basis point administration fee?

RESPONSE (C):

Yes. All the promissory notes issued by Toronto Hydro include an additional spread of 5 basis points.

QUESTION (D):

d) Please explain what costs administration fees recoup as distinct from the various Finance Costs paid by ratepayers in OM&A and as shown in Appendix 2-JC.

RESPONSE (D):

The costs included in the administration fee of 5 basis points include but are not limited to the following: (i) Management's monitoring of market financial data to recommend the size, term, and timing of any debt issuance(s) (ii) the preparation of materials for Audit and Board approval of the recommendation to issue debt (iii) the selection of a lead bank dealer(s) to work with the Toronto Hydro Corporation on the preparation of all due diligence materials and to advise on market timing and execution, and (iv) the co-ordination of all documentation in order to successfully price and close a transaction with investors. The nature of these costs is consistent with the costs included and approved in Toronto Hydro's previous rate application (EB-2018-0165).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 6-STAFF-317

References: **Excel spreadsheet,**
THESL_6_T02_S02_2025_Income_Tax_PILs_Updated_20231219
Exhibit 6, Tab 2, Schedule 1, December 19, 2023, Page 1

Preamble:

OEB staff notes significant fluctuations of PILs submitted for bridge and test years through 2024 to 2029, as shown below in the Table 6-1. The PILs provisions were taken from the above-noted Exhibit 6 reference.

Table 6-1: Comparison of 2024 through 2029 PILs Provisions

	Bridge	Forecast				
	2024	**2025**	**2026**	**2027**	**2028**	**2029**
PILs	9.1	27.9	30.5	20.0	56.2	47.7
$ Change		18.8	2.6	(10.5)	36.2	(8.5)
% Change		207%	9%	(34%)	181%	(15%)

QUESTION (A – C):

a) Please confirm that Toronto Hydro agrees with values and calculations in Table 6-1.
b) If this is not the case, please update Table 6-1 for 2024 through 2029 values.
c) Please also update Table 6-1 to show 2023 values and the associated $ Change and % Change.

RESPONSE (A – C):

Toronto Hydro agrees with values and calculations in Table 6-1 subject to the following:

- The forecast PILs for 2024 Bridge year was updated from $9.1 million to $10.8 million (please refer to the response to Interrogatory 6-Staff-320 b). Therefore, the associated $ change and % change for 2025 was also updated as shown in the table below.

Toronto Hydro has also updated the Table 6-1 to show 2023 Values, Updated 2024 Forecast, and the associated $ and % change

Table 6-1: Comparison of 2023 through 2025 PILS Provisions

	2023 Historical	2024 Bridge	2025 Test
PILs	6.8	10.8	27.9
$ Change		4.0	17.1
% Change		59%	158%

Note that 2023 Historical forecast PILs in the table represents the forecast PILs expense to be paid by Toronto Hydro for 2023 taxation year. The forecast PILs for 2024 Bridge Year and 2025 Test Year represent the PILs expense included in revenue requirement.

QUESTION (D):

d) Please provide an explanation to year over year increases and decreases shown in Table 6-1, or in any updated Table 6-1 by Toronto Hydro.

RESPONSE (D):

2023-2024(Updated) Variance Explanation:

2023 forecast PILs are actual taxes to be paid per the tax return and 2024 forecast PILs are PILs calculated for the revenue requirement. The variance is due to two main reasons:

1. Regardless of the actual tax treatment accorded to regulatory assets and liabilities (both when they are created and disposed of), regulatory assets and liabilities are excluded from PILs for the purposes of calculating revenue requirement.[1] This difference in tax treatment is the primary reason to explain the PILs variance from 2023 to 2024. The variances will be reversed over time when the disposition of regulatory account balances is determined by the OEB and when they are included in future rates.

[1]In accordance with Section 2.6.2.1 of the *Filing Requirements For Electricity Distribution Rate Applications - 2023 Edition for 2024 Rate Applications issued December 15, 2022*

2. 2023 forecast PILs does not include an amount grossed up for taxes, whereas the 2024 forecast PILs includes a gross up amount for tax.

2024(Updated) -2025 Variance Explanation:

PILs increased by $17.1 million from 2024 to 2025 primarily due to higher regulatory income before taxes, and lower deductions for tax purposes in respect of temporary differences between capital cost allowance ("CCA") and accounting depreciation.

2025-2026 Variance Explanation:

PILs increased by $2.6 million from 2025 to 2026 primarily due to higher regulatory income before taxes, partially offset by higher deductions for tax purposes in respect of temporary differences between CCA and accounting depreciation.

2026-2027 Variance Explanation:

PILs decreased by $10.5 million from 2026 to 2027 primarily due to higher deductions for tax purposes in respect of temporary differences between CCA and accounting depreciation, partially offset by higher regulatory income before taxes.

2027-2028 Variance Explanation:

PILs increased by $36.2 million from 2027 to 2028 primarily due to lower deductions for tax purposes in respect of temporary differences between CCA and accounting depreciation, and higher regulatory income before taxes. Note that CCA deduction is lower in 2028 as compared to 2027 primarily due to the accelerated CCA rules ending as at December 31st, 2027.

2028-2029 Variance Explanation:

PILs decreased by $8.5 million from 2028 to 2029 primarily due to higher deductions for tax purposes in respect of temporary differences between CCA and accounting depreciation, partially offset by higher regulatory income before taxes.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 6-STAFF-318

References: Excel spreadsheet,
THESL_6_T02_S02_2025_Income_Tax_PILs_Updated_20231219
Exhibit 6, Tab 2, Schedule 3, 2022 T2 Corporation Income Tax Return, November 17, 2023
Exhibit 6, Tab 2, Schedule 1, December 19, 2023, Page 5

Preamble:

OEB staff compared the tax return provided by Toronto Hydro to the historical tax data in PILs model. The provided tax return is for the taxation year 2022, while historical data required is for taxation year 2023.

In the Excel PILs model, Toronto Hydro stated that certain sections of the PILs model will be updated once the 2023 tax return is filed in June 2024.

Toronto Hydro stated that it does not have any non-capital or capital loss carry-forwards as of the end of December 2022, and does not expect to have such loss carry-forwards as of the end of December 2029.

QUESTION (A):

a) Please provide the 2023 tax return when it is available.

RESPONSE (A):

Toronto Hydro confirms it will provide the 2023 tax return once it becomes available.

QUESTION (B):

b) the 2023 tax return is not available at the time of interrogatory responses, please explain how Toronto Hydro proposes to have discovery on any evidence related to the 2023 tax return.

RESPONSE (B):

Please refer to the response in 6-Staff-320 b), 2023 forecast PILs to be paid by Toronto Hydro per the tax return and associated information was updated in the PILs model Excel spreadsheet. The forecast is calculated based on the 2023 year-end financials and can be used for purposes of discovery of evidence related to the 2023 taxation year.

QUESTION (C):

c) Please update the PILs model for 2023 historical data in all tabs of the PILs model relating to 2023 amounts.

RESPONSE (C):

Please see the response in Part b).

QUESTION (D):

d) Please reconcile the historical data relating to 2023 amounts in the PILs model to the 2023 tax return, including the UCC closing balance in Tab H8 Sch 8 CCA Hist

RESPONSE (D):

Please see the response in Part b).

QUESTION (E):

e) Please confirm that there are no loss carry forwards that will be included on Toronto Hydro's 2023 tax return. If there are loss carry forwards, please incorporate into the PILs model.

RESPONSE (E):

There are no loss carry forwards forecasted for Toronto Hydro's 2023 taxation year.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 6-STAFF-319

References: Excel Spreadsheet,
THESL_6_T02_S02_2025_Income_Tax_PILs_Updated_20231219
Exhibit 6, Tab 2, Schedule 1, December 19, 2023, Pages 2, 6

Preamble:

Toronto Hydro stated that for Tabs "B8 Sch 8 CCA Bridge" and "T8 Sch 8 CCA Test", it updated the following in the "Relevant factor" column for 2024 Bridge year and 2025 Test year:

- Class 43.1 updated from 2.33 to 1.5
- Class 43.2 updated from 1.0 to 0.5
- Added Class 54 row and added relevant factor with 1.5
- Other Classes updated from 0.5 to 0

Toronto Hydro described the phase-out of accelerated CCA in its evidence. Toronto Hydro stated that for eligible assets acquired after November 20, 2018 and put in service after 2023 and before 2028, the accelerated CCA is up to two times the normal first-year CCA deduction.

QUESTION (A):

a) Please explain the rationale for any non-zero relevant factors in the bridge year (2024) and test years (2025), as noted in the preamble to this interrogatory.

RESPONSE (A):

Subsection 1100(2) of *Income Tax Regulations* ("ITR") includes the half-year rule as well as the rules relating to accelerated investment incentive property ("AIIP") and the rules relating to zero-emission property ("ZEP"). The half-year rule is suspended for AIIP and does not apply to ZEP. The undepreciated capital cost ("UCC") adjustment factors ("relevant factor") for AIIP and ZEP for the

following CCA classes, if the eligible property became available for use by the taxpayer in 2024 or 2025, are:

- 1 1/2 (i.e., 1.5) for Class 43.1 [subparagraph 1100(2)(b)(ii) of the ITR]
- 1/2 (i.e., 0.5) for Class 43.2 [subparagraph 1100(2)(c)(ii) of the ITR]
- 1 1/2 (i.e., 1.5) for Class 54 [subparagraph 1100(2)(e)(ii) of the ITR]

By incorporating the above relevant factors in 2024 Bridge year and 2025 Test year, Schedule 8 (the enhanced first-year CCA allowance for Class 43.1, Class 43.2 and Class 54) will provide a 75%[1] deduction for the eligible property that became available for use by the taxpayer in 2024 or 2025. For more information, please see Exhibit 6, Tab 2 Schedule 1 (Updated December 19, 2023) at Page 6, Table 2.

QUESTION (B):

b) Please explain why the non-zero relevant factors noted in the preamble to this interrogatory were not factored into Toronto Hydro's 2026 and 2027 CCA schedules in the PILs model.

RESPONSE (B):

With reference to the response in part a), the relevant factors for the following CCA classes, if the eligible property became available for use by the taxpayer in 2026 or 2027, are:

- 5/6 (i.e., 0.8333) for Class 43.1 [subparagraph 1100(2)(b)(iii) of the ITR]
- 1/10 (i.e., 0.1) for Class 43.2 [subparagraph 1100(2)(c)(iii) of the ITR]
- 5/6 (i.e., 0.8333) for Class 54 [subparagraph 1100(2)(e)(iii) of the ITR]

[1] https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/sole-proprietorships-partnerships/report-business-income-expenses/claiming-capital-cost-allowance/accelerated-investment-incentive.html

The above relevant factors are embedded in CCA Column (Column O) in 2026 Test year and 2027 Test year Schedule 8, the enhanced first-year CCA allowance for Class 43.1, Class 43.2 and Class 54 will provide a 55%[2] deduction for the eligible property became available for use by the taxpayer in 2026 or 2027. For more information, please see Exhibit 6, Tab 2 Schedule 1 (Updated December 19, 2023) at Page 6, Table 2.

QUESTION (C):

c) Please confirm that non-zero relevant factors are not applicable to the Toronto Hydro's 2028 and 2029 CCA schedules in the PILs model, as the phase out is expected to be finished on December 31, 2027. If this is not the case, please explain.

RESPONSE (C):

Toronto Hydro confirms that non-zero relevant factors are not applicable to the Toronto Hydro's 2028 and 2029 CCA schedules in the PILs model.

QUESTION (D):

d) Please confirm that the relevant factors noted in the preamble to this interrogatory will be used by Toronto Hydro in its actual 2024 tax return to be filed with the Canada Revenue Agency. If this is not the case, please explain.

RESPONSE (D):

In accordance with the current tax rules and legislations, Toronto Hydro confirms that the relevant factors noted in the preamble to this interrogatory will be used by Toronto Hydro in its actual 2024 tax return.

[2] https://www.canada.ca/en/revenue-agency/services/tax/businesses/topics/sole-proprietorships-partnerships/report-business-income-expenses/claiming-capital-cost-allowance/accelerated-investment-incentive.html

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 6-STAFF-320

References: **Excel Spreadsheet,**
THESL_6_T02_S02_2025_INCOME_TAX_PILS_UPDATED_20231219
Excel Spreadsheet, THESL_2A_T01_S02 - OEB APPENDIX 2-BA_20240129

Preamble:

OEB staff compared the capital additions per year for Bridge (2024) and Test (2025 to 2029) years between Reference 1 and Reference 2 and noted the differences below.

Table 6-2: Comparison of Capital Additions

Capital Additions	PILS module Sch 8	Appendix 2-BA	Difference
Historical Year 2023	-	607,858,845	
Bridge Year 2024	591,256,223	607,861,685	(16,605,462)
Test Year 2025	632,309,581	647,410,639	(15,101,058)
Test Year 2026	685,392,626	696,660,168	(11,267,542)
Test Year 2027	772,784,474	811,377,756	(38,593,282)
Test Year 2028	753,616,719	776,588,421	(22,971,702)
Test Year 2029	853,206,373	898,351,761	(45,145,388)

Question (A):

a) Please update Table 6-2 to show 2023 actual capital additions in the PILs model Schedule 8 and the difference versus Appendix 2-BA.

RESPONSE (A):

Please see Table 1 below for the updated 2023 and 2024 forecast capital additions in the Updated PILs model Schedule 8, and 2023 actual and 2024 updated forecast capital additions in the Updated Appendix 2-BA[1]. Toronto Hydro has also updated Income Tax/PILS work form found in the evidence at Exhibit 6, Tab 2 Schedule 2, to include updated for 2023 Historical year and 2024 Bridge Year, which is attached as Appendix A to this response.

[1] Please see the response to interrogatory 1B-SEC-1 e)

Table 1: Comparison of Capital Additions for the updated 2023 and 2024 forecast

Capital additions	PILs model Sch 8	Appendix 2-BA	Difference
Historical Year 2023	578,747,322	594,237,479	(15,490,157)
Bridge Year 2024	604,748,823	626,323,423	(21,574,600)

Please see Table 2 below for the reconciliation of 2023 and 2024 capital additions differences in the Updated PILS model as compared to the Updated Appendix 2-BA.

Table 2: Reconciliation of Capital Additions in the Updated PILs model Schedule 8 and the Updated Appendix 2-BA for 2023 Historical Year and 2024 Bridge Year

Capital additions	[A] PILS model Sch 8	[B] Capital additions for Non Rate-Regulated Utility Assets	[C] Capital additions for Socialized Renewable Energy Generation Investments	[D] Interest capitalized for accounting (AFUDC), not for tax	[E] Other post employment benefits (OPEB) amounts capitalized for accounting, not for tax	[F] Capitalized depreciation for accounting, not for tax	[G] Accrued decommissioning provisions capitalized for accounting, not for tax	[A] + [B] + [C] + [D] + [E] + [F] + [G] Appendix 2-BA
Historical Year 2023	578,747,322	-	-	8,303,302	5,928,377	1,293,555	(35,077)	594,237,479
Bridge Year 2024	604,748,823	5,990,032	552,685	7,366,822	6,444,840	1,220,221	-	626,323,423

Question (B):

b) Please confirm that Toronto Hydro agrees with the values and calculations in Table 6-2. If not confirmed, please update as applicable.

RESPONSE (B):

Please see the response in part a) for the updated 2023 and 2024 values.

For 2025-2029 values, Toronto Hydro notes that the version of Appendix 2-BA used in Table 6-2 is from the Update filed on January 29, 2024. As mentioned in the Application Evidence Update[2], the PILS model was not updated for the forecast capital additions in the January 29, 2024 version. Toronto Hydro has updated the 2025-2029 values for Appendix 2-BA in Table 6-2 in Table 3 below with a comparison to the version of Appendix 2-BA submitted on November 17, 2023.

Table 3: Updated Comparison of Capital Additions for 2025-2029 Test Years

Capital additions	PILs model Sch 8	Appendix 2-BA	Difference
Test Year 2025	632,309,581	651,222,632	(18,913,051)
Test Year 2026	685,392,626	704,361,977	(18,969,351)
Test Year 2027	772,784,474	817,152,427	(44,367,953)
Test Year 2028	753,616,719	776,606,769	(22,990,050)
Test Year 2029	853,206,373	899,317,519	(46,111,146)

Question (C):

c) Please explain the differences for the historical, bridge and test years (2023 to 2029). If required, please provide updated evidence, as necessary.

RESPONSE (C):

See response in part a) for the reconciliation of the updated 2023 and 2024 forecast. Table 4 below shows the reconciliation for 2025-2029 capital additions using the comparable version as mentioned in part b)

[2] THESL_2025-2029 Rate Application Evidence Update_20240129.PDF, page 1

Table 4 - Reconciliation of Capital Additions in the PILs model Schedule 8 (December 19, 2023) and Appendix 2-BA (November 17, 2023) for 2025-2029 Test Years

Capital additions	[A] PILS model Sch 8	[B] Capital additions for Non Rate-Regulated Utility Assets	[C] Capital additions for Socialized Renewable Energy Generation Investments	[D] Interest capitalized for accounting (AFUDC), not for tax	[E] Other post employment benefits (OPEB) amounts capitalized for accounting, not for tax	[F] Capitalized depreciation for accounting, not for tax	[G] Land additions not required to include in PILs model Sch 8	[A] + [B] + [C] + [D] + [E] + [F] + [G] Appendix 2-BA
Test Year 2025	632,309,581	5,350,956	-	5,634,925	6,478,384	1,448,786		651,222,632
Test Year 2026	685,392,626	4,954,055		5,647,262	6,613,087	1,754,947		704,361,977
Test Year 2027	772,784,474	7,674,815	13,857,710	7,522,153	6,752,991	2,021,000	6,539,284	817,152,427
Test Year 2028	753,616,719	7,387,485		6,441,961	6,880,722	2,279,882		776,606,769
Test Year 2029	853,206,373	16,627,144	7,337,579	12,539,200	7,008,131	2,599,092	-	899,317,519

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 6-STAFF-321

References: **Excel Spreadsheet,**
THESL_6_T02_S02_2025_Income_Tax_PILs_Updated_20231219
Excel Spreadsheet, OEB Appendix 2-BA_20240129

Preamble:

OEB staff compared the depreciation per year for years 2023 through 2029 between Reference 1 and Reference 2 and noted the differences below:

Table 6-3: Comparison of Depreciation

Depreciation Expense	PILS module Sch 1	Appendix 2-BA	Difference
Historical Year 2023	-	244,251,250	
Bridge Year 2024	270,629,442	254,366,994	16,262,448
Test Year 2025	285,335,169	266,434,512	18,900,657
Test Year 2026	299,636,600	281,231,459	18,405,141
Test Year 2027	319,928,789	301,948,227	17,980,562
Test Year 2028	342,059,947	325,977,318	16,082,629
Test Year 2029	354,470,110	339,731,877	14,738,233

Question (A):

a) Please update Table 6-3 to show 2023 actual depreciation in the PILs model Schedule 8 and the difference versus Appendix 2-BA.

RESPONSE (A):

Please see below Table 1 updated for 2023 actuals and 2024 updated forecast:

Table 1: Updated Comparison of Depreciation table (2023-2024)

Depreciation Expense	PILS module Sch 1[1]	Appendix 2-BA	Difference
Historical Year 2023	259,865,782	247,107,134	12,758,648
Bridge Year 2024	276,564,046	259,753,795	16,810,251

Please see below Table 2 for the reconciliation of the differences between 2023-2024 depreciation in the PILS model compared to Appendix 2-BA:

Table 2: PILs module Sch 1 and Appendix 2-BA depreciation bridge (2023-2024)

Depreciation Expense	PILS module Sch 1 [A]	Exclude Deferred Revenue [B]	Exclude Derecognition [C]	Appendix 2-BA [D] = [A]-[B]-[C]
Historical Year 2023	259,865,782	- 15,745,226	28,503,875	247,107,134
Bridge Year 2024	276,564,046	- 17,911,385	34,721,635	259,753,795

Question (B):

b) Please confirm that Toronto Hydro agrees with the values and calculations in Table 6-3. If not confirmed, please update as applicable.

RESPONSE (B):

Toronto Hydro notes that the version of Appendix 2-BA used in Table 6-3 is from the update filed on January 29, 2024. As set out in Application Evidence update,[2] the PILS models were not yet updated based on that forecast update. Toronto Hydro has updated the 2025-2029 values in Table 6-3 from the preamble above to reflect a comparable version of the Appendix 2-BA forecast as shown in below table 3:

[1] 6-Staff-320 b)
[2] EB-2023-0195, Toronto Hydro 2025-2029 Custom Rate Application For Electricity Distribution Rates and Charges – Evidence Update, January 29,2024, page 1.

Table 3: Updated Comparison of Depreciation table (2025-2029)

Depreciation Expense	PILS module Sch 1	Appendix 2-BA	Difference
Test Year 2025	285,335,169	266,455,942	18,879,227
Test Year 2026	299,636,600	281,335,356	18,301,243
Test Year 2027	319,928,789	302,170,853	17,757,936
Test Year 2028	342,059,947	326,275,602	15,784,345
Test Year 2029	354,470,110	340,146,430	14,323,680

Question (C):

c) Please explain the differences for the historical, bridge and test years (2023 to 2029). If required, please provide updated evidence upon any revisions.

RESPONSE (C):

Please see response to a) for the reconciliation of 2023 actuals and 2024 forecast. Table 4 shows the reconciliation for 2025-2029 using comparable versions of the schedule based on the November 17, 2023 version.

A comparable view of depreciation expense can also be found in Exhibit 2A, Tab 2, Schedule 1, Appendix A.

Table 4: PILs module Sch 1 and Appendix 2-BA depreciation bridge

Depreciation Expense	PILS module Sch 1 [A]	Exclude Deferred Revenue [B]	Exclude Derecognition [C]	Appendix 2-BA [D] = [A]-[B]-[C]
Test Year 2025	285,335,169	- 19,027,618	37,906,845	266,455,942
Test Year 2026	299,636,600	- 21,074,726	39,375,969	281,335,356
Test Year 2027	319,928,789	- 23,375,371	41,133,307	302,170,853
Test Year 2028	342,059,947	- 25,829,927	41,614,273	326,275,602
Test Year 2029	354,470,110	- 28,461,204	42,784,885	340,146,430

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 6-STAFF-322

References: Exhibit 6, Tab 2, Schedule 1, December 19, 2023 Page 5
Exhibit 9, Tab 1, Schedule 1, December 19, 2023, Page 15
EB-2022-0065, 2023 Custom IR Update Decision and Rate Order, December 8, 2022, Page 15
Exhibit 9, Tab 1, Schedule 1, December 19, 2023, Page 30
EB-2018-0165, 2020 Custom IR Decision and Order, December 19, 2019, Pages 149, 150
Filing Requirements For Electricity Distribution Rate Applications, 2023 Edition for 2024 Rate Applications, Chapter 2, Cost of Service December 15, 2022, Pages 63, 64

Preamble:

Toronto Hydro stated that it claimed the maximum CCA amount in 2025-2029. Toronto Hydro confirmed that the accelerated CCA rules introduced by Bill C-97 were applied in the PILs tax models, and that the maximum accelerated CCA were claimed.

Toronto Hydro confirmed that the revenue requirement impacts of the accelerated CCA rules were reflected in its approved 2020-2024 rates. Toronto Hydro stated that the entire 2018 and forecasted 2019 revenue requirement impact of the accelerated CCA rule changes was recorded within the sub-account of Account 1592.

Toronto Hydro noted that the impact recorded in the new sub-account of Account 1592 was approved for disposition starting on January 1, 2023, and was trued-up as part of the application for rates and other charges effective January 1, 2023. Toronto Hydro stated that any forecasting variances over 2020-2024 period will be captured in the Capital Related Revenue Requirement Variance Account (CRRRVA).

Toronto Hydro has proposed to discontinue the CRRRVA in the 2025-2029 rate period.

In its 2020 Custom IR decision, the OEB agreed with Toronto Hydro's treatment of accelerated CCA and the CRRRVA relating to the 2020-2024 period. Toronto Hydro noted that the PILs impact of Bill C-97 (i.e., accelerated CCA) will be embedded in its 2020-2024 capital forecast at the time of the draft rate order, which means that the CRRRVA will capture any forecasting variances over that period.

However, the OEB also determined that Toronto Hydro was required to record the entire 2018 and forecasted 2019 revenue requirement impact of the CCA tax rule changes within Account 1592, PILs and Tax Variances, Sub-account CCA Changes. The OEB directed Toronto Hydro to dispose of the noted sub-account as part of the 2020 Custom IR proceeding.

As per OEB's filing requirements, distributors must provide the following:
i. The full revenue requirement impact recorded in Account 1592, Sub-account CCA Changes and the balance sought for review and disposition.
ii. Calculations for accelerated CCA differences per year, based on actual capital additions. These calculations should include:
a. The undepreciated capital cost (UCC) continuity schedules for each year, itemized by CCA class.
b. The calculated PILs/tax differences.
c. The grossed-up PILs/tax differences.
d. Any other applicable information.
iii. Confirmation that Account 1592 amounts related to ICM/ACM have been included in the account, if applicable.
iv. A reconciliation of these amounts to the amounts presented in the Account 1592 sub-account for CCA changes in the DVA continuity schedule.
v. If a distributor does not have a balance in this sub-account, the distributor must explain why.

QUESTION (A):

a) Please confirm that the December 31, 2019 balance in Account 1592, PILs and Tax Variances, Sub-account CCA Changes was disposed on a final basis in Toronto Hydro's 2020 Custom IR proceeding, subject to a subsequent true-up to reflect actual capital additions. If this is not the case, please explain.

RESPONSE (A):

Toronto Hydro confirms that the December 31, 2019 balance in Account 1592, PILs and Tax Variances, Sub-account CCA Changes was disposed on a final basis in Toronto Hydro's 2020 Custom IR proceeding, subject to a subsequent true-up to reflect actual capital additions.

QUESTION (B):

b) Please confirm that the balance described in part a) above was approved for disposition in Toronto Hydro's 2020 Custom IR proceeding (subject to a true-up), but the rate rider related to this sub-account was implemented in Toronto Hydro's 2023 Custom IR Update proceeding. If this is not the case, please explain.

RESPONSE (B):

Toronto Hydro followed the OEB's direction in its 2020 Custom IR proceeding (subject to a true-up). The 2019 balance described in part a) was approved for disposition over a 24-month period rate-rider commencing on January 1, 2023[1]. The true-up amount was approved in Toronto Hydro's 2023 Custom IR Update proceeding. OEB staff supported Toronto Hydro's proposal to transfer the true-up amount to Account 1595 (2023) and found that a separate rate rider to dispose of this balance was not required, consistent with prior OEB decisions regarding Group 2 true-up balances. Toronto Hydro followed the OEB's decision to transfer the true-up amount to Account 1595 (2023)[2].

[1] EB-2018-0165 Decision and Order, February 20, 2020, pages 44-65, Schedule 17-4A and 17-5A.
[2] EB-2022-0065 Decision and Order, December 8, 2022, page 16.

QUESTION (C):

c) Please confirm that although the revenue requirement impacts of the accelerated CCA rules were reflected in Toronto Hydro's approved 2020-2024 rates, a true-up to reflect actual capital additions has been recorded in the CRRRVA account. If this is not the case, please explain.

RESPONSE (C):

Toronto Hydro confirms that the PILs revenue requirement variances with respect to any forecasting capital additions variances over 2020-2024 period were/will be captured in CRRRVA. Please refer to pages 28 and 29 of Exhibit 9 Tab 1 Schedule 1 (Updated December 31, 2023), the CRRRVA is an asymmetrical account in that it only records for disposition variances that result in a credit (refund) to customers. Since the forecasted CRRRVA balance over 2020-2024 period is in a receivable position (debit collectible) from customers, Toronto Hydro has not recorded any balances in the CRRRVA for the period 2020-2024.

QUESTION (D):

d) Please confirm that Toronto Hydro plans to record any true-ups to reflect actual capital additions for the 2025 through 2029 period in Account 1592, PILs and Tax Variances, Sub-account CCA Changes, given that Toronto Hydro has requested that the CRRRVA account be discontinued in this proceeding. If this is not the case, please explain.

RESPONSE (D):

Toronto Hydro does not plan to record any true-ups to reflect actual capital additions for the 2025 through 2029 period in Account 1592, PILs and Tax Variances, Sub-account CCA Changes, since this account is specifically for the purposes of tracking the impact of changes in CCA rules[3], not for tracking forecasting variances. Please refer to Exhibit 9 Tab 1 Schedule 1 (Updated December 19,

[3] Accounting Direction Regarding Bill C-97 and Other Changes in Regulatory or Legislated Tax Rules for Capital Cost Allowance (July 25, 2019).

2023), page 30. Toronto Hydro proposes to discontinue the CRRRVA in the 2025-2029 rate period and proposes to continue to track variances in capital expenditures that have a higher degree of sensitivity or variability due to external factors through the proposed Demand-Related Variance Account ("DRVA") outlined in Exhibit 9 Tab 1 Schedule 1 (Updated December 19, 2023) at Section 9.2, page 40. Toronto Hydro plans to capture any related forecasting variances on its PILs revenue requirement in this proposed DRVA.

QUESTION (E):

e) Please provide a high-level derivation of the accelerated CCA amounts recorded in the CRRRVA account (and/or Account 1592, PILs and Tax Variances, Sub-account CCA Changes, as applicable) for the 2020 to 2029 period. Please show anything that is missing after addressing all of the OEB's filing requirements noted in the preamble to this interrogatory.

RESPONSE (E):

See responses in part a) to d).

QUESTION (F):

f) In Toronto Hydro's response, please also reconcile the 2023 to 2029 accelerated CCA amounts used in the CRRRVA / Account 1592 calculations to the amounts shown in the CCA calculations (Schedule 8) in the PILs model.

RESPONSE (F):

Refer to the responses in part a) to d), 2023 to 2029 accelerated CCA amounts were not recorded in the CRRRVA / Account 1592 calculations, therefore, reconciliation is not applicable.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 6-STAFF-323

Reference: Excel spreadsheet,
THESL_6_T02_S02_2025_Income_Tax_PILs_Updated_20231219

Preamble:

Toronto Hydro is proposing to re-class $2.5 million of tax credits to OM&A for each of the 2024 through 2029 periods, plus a gross-up of $0.9 million for each of these years.

QUESTION (A):

a) Please confirm that instead of incorporating these $2.5 million of tax credits to reduce the PILs provisions for each of the 2024 through 2029 periods, Toronto Hydro is proposing to reduce OM&A by $3.4 million for each of the 2024 through 2029 periods (including the gross-up impact).

RESPONSE (A):

Toronto Hydro confirms that $2.5 million of tax credits has already reduced the OM&A for each of the 2024 through 2029 periods in the original submission (November 17, 2023) and in the Update (January 24, 2024) (see Section 2.2, page 2, Exhibit 4 Tab 2 Schedule 20). Toronto Hydro adjusted the tax credits reclass to OM&A and the related gross up portion in Exhibit 6 Tab 2 Schedule 2.

Toronto Hydro is not proposing to further reduce the gross-up of $0.9 million in OM&A for each of the 2024 through 2029 periods. The gross up of $0.9 million reflected in the PILs model represents the regular gross up calculation assuming tax credits of $2.5 million were not included in Regulatory income before tax. If Toronto Hydro included the $0.9 million gross-up to reduce OM&A, the tax credits would be reduced twice in OM&A as well as in the PIL revenue requirement.

QUESTION (B):

b) If yes, please provide a reference to where the tax credits of $2.5 million (plus the gross-up of $0.9 million) are shown to reduce Toronto Hydro's 2024 through 2029 OM&A budgets.

RESPONSE (B):

Please see response in part a).

QUESTION (C):

c) If no, please explain.

RESPONSE (C):

Please see response in part a).

QUESTION (D):

d) Please explain what is being proposed for the 2023 period, in relation to the re-class of tax credits and associated gross-up.

RESPONSE (D):

Please refer to the response in Interrogatory 6-Staff-317 c) and d). 2023 Historical forecast PILs represents the forecast PILs expense to be paid by Toronto Hydro for 2023 taxation year. There is no gross up amount for actual tax.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 6-CCC-63

Reference: Exhibit 6, Tab 1, Schedule 1

Please provide the following - The impact on the 2025-2029 Revenue Requirements if Toronto Hydro's in-service additions were reduced by $100 million each year. Please include all assumptions.

RESPONSE:

The impact of in-service additions on capital-related revenue requirement depends on the specific assets in question. Different assets types carry different assumptions with respect to useful life (and consequent impacts on depreciation, return on equity and interest), and CCA rates for PILs/tax purposes. For example, an IT software-related in-service addition typically has a useful life of 4 years and CCA of 100% (with half-year rule/accelerated CCA rules where applicable) for tax purposes, whereas transformers can have useful life between 30-50 years and a CCA of 8% (with half-year rule/accelerated CCA rules where applicable). As a result of these differences, revenue requirement of a $10 million in-service addition related to software is not the same as a $10 million in-service addition related to transformers. Thus, without specific details with respect to the type of in-service additions that would be reduced, it is not possible to model the capital-related revenue requirement impact.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 6-SEC-120

Reference: Exhibit 6, Tab 1, Schedule 1, Page 4

With respect to the revenue deficiency drivers table, please revise the table to include, a) each year of the rate term, and b) separately calculate the distribution revenue and total deficiency, as compared to the previous years approved/proposed rates (i.e. For 2026, distribution revenue at proposed 2025 rates).

RESPONSE:

See the table below.

	2020 OEB Approved	2025 Forecast	2026 Forecast	2027 Forecast	2028 Forecast	2029 Forecast
Rate Base	4,514.8	5,901.2	6,284.5	6,714.7	7,177.9	7,608.2
ROE	8.52%	9.36%	9.36%	9.36%	9.36%	9.36%
Debt Rate	3.64%	4.04%	4.04%	4.04%	4.04%	4.04%
DRIVERS OF DEFICIENCY						
OM&A	266.7	343.0	355.4	364.8	377.2	388.2
Depreciation	263.7	285.3	297.5	315.4	334.9	344.5
Deemed Interest Expense	98.5	143.2	151.3	160.5	170.4	179.3
Return on Equity	153.9	220.9	233.6	247.9	263.1	276.9
PILS	9.7	27.9	30.3	19.6	55.1	46.4
Total Service Revenue Requirement	**792.5**	**1,020.3**	**1,068.1**	**1,108.2**	**1,200.7**	**1,235.4**
Distribution Revenue at previous years approved/ proposed rates	771.4	870.2	970.9	1,017.4	1,059.6	1,144.7
Revenue Offsets	42.3	47.9	48.5	49.1	49.7	50.3
Total Operating Revenue	**813.7**	**918.1**	**1,019.4**	**1,066.5**	**1,109.3**	**1,195.1**
Total Deficiency		**102.2**	**48.7**	**41.7**	**91.4**	**40.4**

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 6-SEC-121

Reference: Exhibit 6, Tab 2, Schedule 1, Page 4

With respect to the PILs:

QUESTION (A):

a) Does the summary of PILs in Table 1 include utilization of accelerated CCA that has been captured in the PILs and Tax Variances – CCA Changes Sub-Account? If so, please provide a revised version of the table that removes those amounts.

RESPONSE (A):

Please refer to Exhibit 6 Tab 2 Schedule 1 (updated December 19, 2023), accelerated CCA is included in the actual/forecasted taxes paid/to be paid for 2020-2023 (page 10, Table 4) and in the forecasted PILs revenue requirement for the 2024 Bridge Year (page 1, Table 1). Note that accelerated CCA has not been captured in the PILs and Tax Variances – CCA Changes Sub-Account. We have therefore not provided a revised version of the tables to remove those amounts.

QUESTION (B):

b) Please provide a similar table that shows the PILs expense for each year between 2025 and 2029.

RESPONSE (B):

PILs revenue requirement for 2025-2029 Test Years are summarized in Exhibit 6 Tab 2 Schedule 1 (updated December 19, 2023), Table 1, page 1.

QUESTION (C):

c) For each year between 2020 and 2024, please provide a table that shows the approved PILs expense n EB-2018-0165, and the actual/forecast PILs expense. Please explain the annual variance.

RESPONSE (C):

Please see Tables 1 and 2 below.

Table 1: Summary of approved PILs expense included in revenue requirement in EB-2018-0165 ("Approved PILs RR") ($ Millions)

	2020	2021	2022	2023	2024
Approved PILs RR	9.7	19.2	10.3	24.8	36.1

Table 2: Summary of the actual/forecast PILs expense paid by Toronto Hydro per tax return ($ Millions)

	Actual			Forecast	
	2020	2021	2022	2023	2024
Actual/Forecast PILs	2.0	8.0	7.6	6.8	3.5

In accordance with Section 2.6.2.1 of the *Filing Requirements For Electricity Distribution Rate Applications - 2023 Edition for 2024 Rate Applications issued December 15, 2022*, regulatory assets and liabilities have been excluded from PILs for purposes of calculating revenue requirement, both when they were created and when they were disposed, regardless of the actual tax treatment accorded those amounts. This difference in tax treatment is the primary reason to explain the variance between approved PILs expense and actual/forecast PILs expense. The variance will be reversed over time when disposition of regulatory account balances is determined by the OEB and when the balances are included in future rates. In addition, actual/forecast PILs expense does not include an amount grossed up for taxes, whereas the approved PILs RR includes a gross up amount for tax. Both of these differences primarily contribute to the variance between approved PILs expense and actual/forecast PILs expense.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 7-STAFF-324

Reference: Exhibit 7, Tab 1, Schedule 1, Pages 1-2

Preamble:

The services weighting factor for all rate classes except CSMUR, USL, and Street Lighting has been set at one. For the Street Lighting and USL rate classes, the customer is required to pay for the services.

QUESTION (A):

a) For customers of rate classes with a services weighting factor of one, when a connection costing more than the basic allowance is required, please detail a. If the customer pays the entire cost of the service, please explain why a weighting factor of one is appropriate.

RESPONSE (A):

Where a connection costs more than the basic connection allowance, Toronto Hydro recovers the excess amount through a variable connection charge, in accordance with the Distribution System Code.

QUESTION (B):

b) For all rate classes, when a service connection requires maintenance, please detail how the cost is apportioned between the Toronto Hydro and the customer.

RESPONSE (B):

Toronto Hydro bears the entirety of maintenance costs for connection assets within Toronto Hydro's side of the demarcation point. For projects that require expansion, maintenance costs are apportioned in accordance with Appendix B of the Distribution System Code.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 7-STAFF-325

Reference: Exhibit 7, Tab 1, Schedule 1, Pages 1-2

Preamble:

Toronto Hydro indicates that the billing and collections weighting factor reflects estimates of billing effort and costs related to each class based on the experience and expertise of Toronto Hydro's billing specialists.

QUESTION:

Please provide the derivation of the billing and collections weighting factors used.

RESPONSE:

The weighting factors used in Sheet I5.2 of the Cost Allocation Model for Billing and Collections are calculated based on metrics which are broadly representative of the amount of work and expertise required by Billing and Collections to service Toronto Hydro's customer classes. Examples of metrics include reconnections and billing adjustments. Each metric is broken out between customer classes and is assigned a weighting based on the varying complexity of the work between those customer classes, the level of expertise required and the time involved. Then, the results are weighted against the residential customer class baseline.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 7-STAFF-326

Reference: Exhibit 7, Tab 1, Schedule 1, Pages 2-3

Preamble:

The load profiles were updated using 2019 historic actual data. Toronto Hydro states that "For the Residential, CSMUR and General Service rate classes Toronto Hydro used sample metering data sets, while entire rate class data sets were used for Unmetered Scatter Load Class ("USL") and Street Lighting rate classes."

QUESTION (A):

a) Please indicate the sample size used for each rate class, relative to the overall customer base.

RESPONSE (A):

Please refer to Table 1 for the sample sized used. Please note that entire rate class data sets were used for Unmetered Scatter Load Class ("USL") and Street Lighting rate classes.

Table 1: Sample Sizes used by Rate Class

Rate Class	Sample Size*	Total Customer Base[1]	Sample percentage compare to total customer base
Residential	7,000	614,206	1%
CSMUR	2,500	79,882	3%
GS<50 kW	4,000	71,515	6%
GS 50-999 kW	7,500	10,444	72%
GS 1,000-4,999 kW	300	455	66%
Large Use	30	40	75%

*Please note that the sample sizes listed above are rounded

[1] As per Table 2 in Exhibit 3, Tab 1, Schedule 1

QUESTION (B):

b) Please explain the process used to select the sample used for each rate class - e.g. random selection, stratified (based on which criteria), etc.

RESPONSE (B):

Toronto Hydro randomly selected customers in these rate classes that were active in the year 2019.

QUESTION (C):

c) Did Toronto Hydro consider using aggregate data of all customers in any of the residential, CSMUR, or general service rate classes? If not, why not? If so, why was this option rejected?

RESPONSE (C):

Toronto Hydro considered using aggregate data of all customers across these rate classes, but did not pursue it for all rate classes for the reasons outlined below.

Toronto Hydro utilized sample data through the random selection process for Residential, CSMUR and GS<50kW rate classes due to substantial data volumes. For the remaining classes (GS 50-999kW, GS 1-5MW and Large Users rate classes), only the customers with the full datasets were considered.

QUESTION (D):

d) In using a sample of customers for general service, does this include the GS 1,000 to 4,999 and Large Use rate classes, both of which contain under 500 customers?

RESPONSE (D):

As outlined in Table 1 above in part a) and described in part c), the sample sizes for these classes were significant, reaching 66% and 75% for GS1-5MW and Large User, respectively.

QUESTION (E):

e) Please explain the methodology used to perform weather normalization of the 2019 load profiles.

RESPONSE (E):

Toronto Hydro weather normalized the 2019 load profiles by creating monthly ratios between the 2019 weather normalized loads and 2019 non-weather normalized loads by rate class. Both load types are sourced from Exhibit 3. Please refer to Exhibit 3, Tab 1, Schedule 1 for details outlining Toronto Hydro's weather normalization methodology in its load forecast.

QUESTION (F):

f) Please provide the resulting 2019 and 2025 load profiles, including any regression outputs used to weather normalize the 2019 load profiles.

RESPONSE (F):

Please refer to Appendix A for the resulting 2019 (weather normalized) and 2025 (forecast including EV and DER) load profiles. Please refer to part e) for weather normalization details and to Exhibit 3, Tab 1, Schedule 1, Appendix B for the regression outputs.

QUESTION (G):

g) Please explain why a single year of historical data, 2019 was used to underpin 2025 load profiles.

RESPONSE (G):

Toronto Hydro utilized only 2019 since 2020 and 2021 were abnormal years due to the pandemic (COVID-19) as addressed in Exhibit 7, Tab 1, Schedule 1, section 1.2. This methodology is in accordance with Toronto Hydro's previous filings (EB-2018-0165 and EB-2014-0116).

QUESTION (H):

h) As a scenario, please provide load profiles using 2023 historical actual data.

RESPONSE (H):

The requested analysis entails complex data extraction, data cleaning, analysis and modelling process. Toronto Hydro does not have sufficient time to complete 2023 historical actual update within the timelines for responding to interrogatories. 2019 is a sufficiently representative data set of the historical load profiles.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 7-STAFF-327

References: Exhibit 7, Tab 1, Schedule 1, Pages 3-4

Cost Allocation Model, sheet I6.1 Revenue; sheet O1 Revenue to Cost

Preamble:

Toronto Hydro states that per OEB decisions EB-2014-0116 and EB-2018-0165, approved Street Lighting assets and operating expenses have been included in its 2025 revenue requirement. It goes on to state that for the purpose of cost allocation, these assets and expenses are directly allocated 95% to the street lighting rate class and 5% to the USL class.

Overall, allocated costs for Street Lighting are $26.4M, and allocated costs for USL are $3.8M. Street Lighting therefore reflects 87% of the revenue requirement.

Toronto Hydro states that 100% of the Street Lighting related revenue requirement is offset through a direct allocation to Revenue Offsets. The Cost Allocation model indicates that $19,377,998 of revenue is calculated for the street lighting rate class by multiplying existing base rates times forecasted volumes.

QUESTION (A):

a) Please provide the basis under which the 95% to 5% split remains appropriate ten years after it was first established.

RESPONSE (A):

The table provided shows the continuity of devices/connections for Street Lighting and USL. It is apparent that USL connections continue to maintain the proportion around 7% which is within the 5% range. For this reason, Toronto Hydro feels the split of 95% and 5% continues to be reasonable to use.

Year	Street Lighting Devices	USL Connections	Total Connections/ Devices	USL / Total Connections and Devices
2015	164,011	11,954	175,965	7%
2016	164,286	12,054	176,340	7%
2017	164,541	12,211	176,751	7%
2018	164,700	12,233	176,933	7%
2019	168,723	12,181	180,905	7%
2020	170,373	12,309	182,682	7%
2021	171,187	12,505	183,692	7%
2022	171,681	12,770	184,451	7%

QUESTION (B):

b) Do these assets, used only by street lighting and USL, serve a purpose similar to a common distribution asset such that the street lighting and USL rate class does not require the use of the common assets?

   i. If so, what steps, if any, has Toronto Hydro taken to ensure that Street Lighting and USL are not allocated costs associated with the common assets.

RESPONSE (B):

No. The street lighting and USL rate class do require the use of common assets.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 7-STAFF-328

Reference: Exhibit 7, Tab 1, Schedule 1, Pages 6-13

Preamble:

The OEB required Toronto Hydro to review the cost allocation to the CSMUR rate class. It stated that "The Board expects that THESL will incorporate the distinction between the secondary and primary systems in future cost allocation studies." Toronto Hydro identified two areas for study, customer count, as well as Line Transformer and Secondary System usage, and noted that these would impact the cost allocation model in sheets I6.2 and I8.

Under the areas of study, Toronto Hydro identified that in addition to CSMUR, portion of customers in each of the Residential, GS < 50 kW rate classes occupied units a building which shared connections with other customers.

Toronto Hydro noted that customers could appropriately refer to customer units served, or buildings served. However, in multi-unit buildings with a bulk meter, it does not have visibility to the number of units and would need to estimate the number. Using a count of buildings is available.

Under the Line Transformer and Secondary System study, estimates were provided for number of buildings that rely on Toronto Hydro's line transformers, and on Toronto Hydro's secondary distribution system. No estimates were provided for the number of kW served using Toronto Hydro Line Transformers and Secondary for each of the examined rate classes.

Impacts of using the building count methodology for total customer counts, or for line transformer and secondary system usage, or the combination of both modifications were provided.

QUESTION (A):

a) Under the alternative line transformer and secondary approach, please indicate any updated values used in sheet I8.

RESPONSE (A):

This is to confirm that, under the alternative line transformer and secondary approach, the updated values are used in sheet I8 of the cost allocation model.

QUESTION (B):

b) If the values in sheet I8 were not updated, please indicate the kW required by each class for Line Transformer and Secondary under each of the 1NCP, 4NCP, and 12NCP scenarios, and please provide the impact of performing such an update.

RESPONSE (B):

Not applicable since the values for sheet I8 were updated.

QUESTION (C):

c) Under the alternative approach of counting units within buildings, including units served behind bulk meters, please explain how unit counts are indicative of cost causation when Toronto Hydro does not provide any service or customer interaction behind the bulk meters, and the aggregate load is already reflected in I8.

    i. If Toronto Hydro believes this is a suitable option for cost allocation, please provide the impacts of using this approach.

RESPONSE (C):

The rationale for using unit count, as opposed to buildings, is that larger buildings have more units, and consequently, more units will ultimately exert a greater proportionate impact on the system at large.

i. Toronto Hydro does not believe this is a suitable option at this time, as Toronto Hydro does not have sufficiently accurately or verifiable data with respect to the number of units in buildings served by bulk meters.

QUESTION (D):

d) In the context of the OEB direction around incorporating the distinction between primary and secondary systems in future cost allocation studies, please explain what lead Toronto Hydro to select the status quo methodology as it's proposal for cost allocation.

RESPONSE (D):

Please see Exhibit 7, Tab 1, Schedule 1 at page 13. Toronto Hydro has not selected the status quo methodology as its proposal for cost allocation.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 7-STAFF-329

Reference: Exhibit 7, Tab 1, Schedule 1, Page 5

EB-2018-0165, Decision and Oder, December 19, 2019, Page 157

Preamble:

The residential rate class revenue-to-cost ratio is proposed to be reduced to 100% from 102.1%, and the CSMUR rate class revenue-to-cost ratio is proposed to be reduced to 100% from 111.7%. Toronto Hydro states that "In accordance with past OEB decisions, rates in the Residential and CSMUR class are set such that the revenue to cost ratios are equal at unity.

In its decision, the OEB stated: "The OEB notes that the revenue-to-cost ratio for the CSMUR class was set at 100% by the OEB when the class was first established for 2012 rates (and as implemented in 2013). There are now several years of actual data for this new class that can be assessed. The OEB concludes that it is appropriate to review in Toronto Hydro's next rebasing application the characteristics of this class, and whether a range should be adopted for the revenue-to-cost ratios going forward."

QUESTION (A):

a) Did Toronto Hydro consider adopting a range approach for revenue-to-cost ratios in the CSMUR rate class?
    i. If this was not considered, please explain why not.
    ii. If this was considered and rejected, please provide the reasons for that determination.

RESPONSE (A):

Toronto Hydro did not consider adopting a range approach for revenue-to-cost ratios in the CSMUR rate class in order to maintain consistency with the past decisions.

QUESTION (B):

b) Please reference the OEB decision instructing Toronto Hydro to adjust the revenue-to-cost ratios for residential and CSMUR rate classes to 100% and explain why it continues to be appropriate in this proceeding.

RESPONSE (B):

Toronto Hydro adjusted the residential rate class revenue-to-cost ratio to 100 percent in order to maintain consistency with the decision but takes no position on the issue of cost allocation.[1]

QUESTION (C):

c) If a revenue-to-cost ratio range approach were to be adopted for the CSMUR, what range would be most appropriate in Toronto Hydro's view?

RESPONSE (C):

Toronto Hydro is of the view that cost allocation policy, including revenue-to-cost ratios, should be set by the OEB on a sector-wide basis through policy consultations, as it has done from time-to-time (e.g. EB-2007-0667, EB-2012-0383). While Toronto Hydro's CSMUR rate class is atypical in the sector, the cost allocation and revenue-to-cost principles for this class should reflect as much as possible the principles developed for other classes.

[1] EB-2018-0165, Decision and Order, dated December 19, 2019, page 157 and EB-2010-0142, Decision and Order on Suite Metering Issues, Issued Feb 22, 2012 and as corrected March 9, 2012, page 27.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 7-EP-35

Reference: Exhibit 7, Tab 1, Schedule 1, Page 3

Preamble:

"The load profiles were scaled to the 2025 baseline load forecast based on the ratio of 2025 kWh to 2019 kWh by class. Resulting load profiles were modified to include electric vehicles ("EVs") and distributed energy resources ("DERs") forecasted load impacts."

QUESTION (A):

a) Are customers with EV chargers and customers with DER's distributed evenly throughout the Toronto Hydro service area or are they concentrated in certain areas?

RESPONSE (A):

Toronto Hydro does not have visibility into the geographic distribution of customers with EV chargers or DER's throughout its service area.

QUESTION (B):

b) What is Toronto Hydro doing to ensure that customers in lower income areas who do not own EV chargers and DER's are not allocated costs that are caused by customers in higher income areas who own EV chargers and DER's?

RESPONSE (B):

Toronto Hydro does not allocate costs to customers based on the technologies used by its customers.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 7-SEC-122

Reference: Exhibit 7, Tab 1, Schedule 1, Table 4

QUESTION:

For each of the scenarios presented in Table 4, B, C & D, please provide details of how Toronto Hydro would propose to rebalance revenues to return the Revenue to Cost ratios to the OEB's ranges and the resulting distribution bill impacts.

RESPONSE:

As stated at the same reference, Toronto Hydro "sees merit to a collaborative approach which takes into account the views, preferences, and expertise of all the parties whose interests are affected by cost allocation matters."

To the degree Toronto Hydro were to rebalance CSMUR Revenue to Cost (R/C) ratios to return to OEB range, Toronto Hydro would propose the same approach across each of the B, C and D scenarios shown; gradually phase in a reduction of CSMUR R/C ratios over a five-year period. As a result, the reduction of revenue from the CSMUR rate class would be recovered from other rate classes, with a nil net impact on overall revenues.

To complete this task, Toronto Hydro would implement the following:

1) Complete the 2025 Cost Allocation Model for both Status Quo cost allocation, as included in its pre-filed application, and Alternative cost allocation. The result would be two sets of allocated total costs to each rate class, which would allow for the calculation of a Cost

Allocation Difference (CAD) for each rate class,[1] which quantifies in dollars the difference between Status Quo and Alternative cost allocation, by rate class;

2) For 2025 rates, first complete rate design on the basis of Status Quo cost allocation to bring R/C ratios into balance with accepted ranges on a Status Quo basis. Second, add 1/5 of the CAD applicable to each rate class to the Status Quo costs assigned to each rate class;
3) For 2026 rates, first calculate the 2026 revenue requirement in accordance with the CRCI (no different than would be the case absent a phased-in change to cost allocation). Second, assign the 2026 revenue requirement to rate classes on the basis of Status Quo cost allocation proportions. Third, add 2/5 of the CAD applicable to each rate class to the assigned 2026 revenue requirement based on Status Quo cost allocation;
4) For 2027 through 2029 rates, repeat approach to 2026 rates, with the exception that CAD additions to assigned costs will be 3/5 in 2027, 4/5 in 2028, and 5/5 in 2029.

The bill impacts associated with implementation of the Alternative Cost Allocation will vary year over year by rate class based on a series of methodological decisions required, namely:

- Whether Alternative Cost Allocation is implemented in one year (i.e. 2025) as opposed to over a longer period of time (e.g. 2025 to 2029, as described above); and,
- Whether the targeted R/C Ratios for Residential and CSMUR rate classes remain at 100%, or transition towards an OEB range. Lacking an OEB-determined range, a range must be selected for the CSMUR rate class (e.g. aligned with Residential as 85-115% or the 80-120% range applied to most rate classes).

For the purpose of providing bill impacts while illustrating the results associated with the above-noted methodological options, Toronto Hydro has prepared distribution bill impacts in Appendix A to this response, based on the following scenarios:

[1] CAD applicable only to distribution rate portion of assigned costs, exclusive of Revenue Offsets

- **Original:** Continuation of Status-quo Cost Allocation methodology as provided in pre-filed evidence.[2] There are no adjustments made to align all rate classes to building-count as opposed to customer (i.e. meter) count, and no additional adjustments to line transformer and secondary system customer counts are made.

- **Scenario 1:** Toronto Hydro moves to the Alternative Cost Allocation methodology effective in 2025. The target R/C Ratios for the Residential and CSMUR rate classes remain at 100%.

- **Scenario 2:** Toronto Hydro moves to the Alternative Cost Allocation methodology over a 5-year period from 2025 to 2029, in the manner described in the interrogatory response above. The target R/C Ratios for the Residential and CSMUR rate classes remain at 100%.

- **Scenario 3:** Toronto Hydro moves to the Alternative Cost Allocation methodology effective in 2025. The target R/C Ratios for the Residential and CSMUR rate classes move to a range of 85-115%.

- **Scenario 4:** Toronto Hydro moves to the Alternative Cost Allocation methodology over a 5-year period from 2025 to 2029, in the manner described in the interrogatory response above. The target R/C Ratios for the Residential and CSMUR rate classes move to a range of 85-115%.

[2] Exhibit 8, Tab 1, Schedule 1, Table 5.

Scenario 1 CSMUR class is adjusted in 2025 with maintaining R/C ratio at 1
Scenario 2 CSMUR class is adjusted in 5 years phase-in with maintaining R/C ratio at 1
Scenario 3 CSMUR class is adjusted in 2025 without maintaining R/C ratio at 1 for Residential and CSMUR
Scenario 4 CSMUR class is adjusted in 5 years phase-in without keeping R/C ration at 1

Sub Total A		$/30 days						Year-over-Year change				
Rate Classes	Change in Bill	2024	2025 Proposed	2026 Proposed	2027 Proposed	2028 Proposed	2029 Proposed	2025 Proposed	2026 Proposed	2027 Proposed	2028 Proposed	2029 Proposed
Residential	Original	$42.69	$45.93	$49.33	$53.05	$57.02	$59.88	7.6%	7.4%	7.5%	7.5%	5.0%
	Scenario 1	$42.69	$49.34	$52.90	$56.76	$61.03	$64.02	15.6%	7.2%	7.3%	7.5%	4.9%
	Scenario 2	$42.69	$46.61	$50.69	$55.09	$59.73	$63.28	9.2%	8.8%	8.7%	8.4%	5.9%
	Scenario 3	$42.69	$48.32	$51.83	$55.65	$59.83	$62.78	13.2%	7.3%	7.4%	7.5%	4.9%
	Scenario 4	$42.69	$47.71	$51.84	$56.29	$61.03	$64.61	11.8%	8.7%	8.6%	8.4%	5.9%
Competitive Sector Multi-Unit Residential	Original	$35.49	$34.22	$36.06	$38.24	$40.51	$42.15	-3.6%	5.4%	6.0%	5.9%	4.0%
	Scenario 1	$35.49	$20.57	$22.03	$23.91	$25.22	$26.56	-42.0%	7.1%	8.5%	5.5%	5.3%
	Scenario 2	$35.49	$31.49	$30.71	$30.35	$30.18	$29.36	-11.3%	-2.5%	-1.2%	-0.6%	-2.7%
	Scenario 3	$35.49	$24.26	$25.82	$27.79	$29.35	$30.77	-31.6%	6.4%	7.6%	5.6%	4.8%
	Scenario 4	$35.49	$36.02	$35.37	$35.10	$35.25	$34.53	1.5%	-1.8%	-0.8%	0.4%	-2.0%
General Service <50 kW	Original	$118.49	$132.67	$141.91	$151.52	$162.19	$169.48	12.0%	7.0%	6.8%	7.0%	4.5%
	Scenario 1	$118.49	$130.00	$139.10	$148.62	$159.07	$166.27	9.7%	7.0%	6.8%	7.0%	4.5%
	Scenario 2	$118.49	$130.70	$137.99	$145.64	$154.42	$159.80	10.3%	5.6%	5.5%	6.0%	3.5%
	Scenario 3	$118.49	$130.00	$139.10	$148.62	$159.07	$166.27	9.7%	7.0%	6.8%	7.0%	4.5%
	Scenario 4	$118.49	$128.03	$135.19	$142.76	$151.33	$156.61	8.1%	5.6%	5.6%	6.0%	3.5%
General Service 50-999 kW	Original	$1,808.34	$2,043.69	$2,210.11	$2,385.12	$2,577.79	$2,728.24	13.0%	8.1%	7.9%	8.1%	5.8%
	Scenario 1	$1,808.34	$2,012.26	$2,176.96	$2,350.49	$2,540.13	$2,689.09	11.3%	8.2%	8.0%	8.1%	5.9%
	Scenario 2	$1,808.34	$2,043.40	$2,209.55	$2,384.30	$2,576.66	$2,726.84	13.0%	8.1%	7.9%	8.1%	5.8%
	Scenario 3	$1,808.34	$2,031.26	$2,197.00	$2,371.44	$2,562.89	$2,712.77	12.3%	8.2%	7.9%	8.1%	5.8%
	Scenario 4	$1,808.34	$1,986.44	$2,149.43	$2,321.49	$2,508.41	$2,655.83	9.8%	8.2%	8.0%	8.1%	5.9%
General Service 1,000-4,999 kW	Original	$14,918.74	$16,912.20	$18,378.81	$19,895.46	$21,495.11	$22,876.41	13.4%	8.7%	8.3%	8.0%	6.4%
	Scenario 1	$14,918.74	$16,448.67	$17,885.65	$19,376.55	$20,929.66	$22,283.19	10.3%	8.7%	8.3%	8.0%	6.5%
	Scenario 2	$14,918.74	$16,859.11	$18,271.10	$19,731.85	$21,276.33	$22,597.88	13.0%	8.4%	8.0%	7.8%	6.2%
	Scenario 3	$14,918.74	$16,621.63	$18,069.72	$19,570.28	$21,140.72	$22,504.64	11.4%	8.7%	8.3%	8.0%	6.5%
	Scenario 4	$14,918.74	$16,163.81	$17,531.15	$18,953.09	$20,428.06	$21,707.85	8.3%	8.5%	8.1%	7.8%	6.3%
Large Use	Original	$76,993.60	$87,118.04	$92,992.74	$101,557.00	$111,087.78	$118,648.49	13.1%	6.7%	9.2%	9.4%	6.8%
	Scenario 1	$76,993.60	$85,636.40	$91,442.62	$99,905.95	$109,264.07	$116,723.98	11.2%	6.8%	9.3%	9.4%	6.8%
	Scenario 2	$76,993.60	$86,780.65	$92,320.44	$100,522.52	$109,685.88	$116,851.47	12.7%	6.4%	8.9%	9.1%	6.5%
	Scenario 3	$76,993.60	$85,823.19	$91,637.51	$100,114.39	$109,493.99	$116,966.27	11.5%	6.8%	9.3%	9.4%	6.8%
	Scenario 4	$76,993.60	$85,053.52	$90,512.18	$98,597.76	$107,558.31	$114,607.81	10.5%	6.4%	8.9%	9.1%	6.6%
Street Lighting	Original	$145,013.30	$160,930.60	$173,207.70	$193,898.80	$206,034.40	$221,260.40	11.0%	7.6%	11.9%	6.3%	7.4%
	Scenario 1	$145,013.30	$160,930.60	$173,207.70	$193,898.80	$206,034.40	$221,260.40	11.0%	7.6%	11.9%	6.3%	7.4%
	Scenario 2	$145,013.30	$164,846.30	$180,972.30	$205,791.50	$222,134.70	$241,588.80	13.7%	9.8%	13.7%	7.9%	8.8%
	Scenario 3	$145,013.30	$160,930.60	$173,207.70	$193,898.80	$206,034.40	$221,260.40	11.0%	7.6%	11.9%	6.3%	7.4%
	Scenario 4	$145,013.30	$164,846.30	$180,972.30	$205,791.50	$222,134.70	$241,588.80	13.7%	9.8%	13.7%	7.9%	8.8%
Unmetered Scattered Load	Original	$31.21	$34.17	$36.58	$39.07	$42.18	$44.20	9.5%	7.1%	6.8%	8.0%	4.8%
	Scenario 1	$31.21	$35.92	$38.42	$40.97	$44.24	$46.33	15.1%	6.9%	6.6%	8.0%	4.7%
	Scenario 2	$31.21	$36.30	$39.81	$43.91	$48.62	$52.26	16.3%	9.7%	10.3%	10.7%	7.5%
	Scenario 3	$31.21	$36.81	$39.35	$41.94	$45.29	$47.40	17.9%	6.9%	6.6%	8.0%	4.7%
	Scenario 4	$31.21	$36.30	$39.81	$43.91	$48.62	$52.26	16.3%	9.7%	10.3%	10.7%	7.5%

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-78

References: Exhibit 7, Page 1 / Exhibit 8, Page 9
Exhibit 6, Tab 1, Schedule 3 (2026 RRWF)

Preamble:

The Application states:

> "Consistent with the methodology relied upon in EB-2014-0116 and EB-2018-0165, Toronto Hydro completed a cost allocation study for the 2025 test year, and extended the results to allocate the 2026 to 2029 revenue requirement to rate classes." (Exhibit 7, page 1)
>
> "In each annual application, Toronto Hydro will propose new distribution rates based on the escalated base revenue requirement resulting from application of the CRCI, in accordance with the OEB's decision in this proceeding. Toronto Hydro proposes that for the years 2026 to 2029, the final approved base revenue requirements be allocated to each rate class based on the same allocations to rate classes established in this proceeding for 2025." (Exhibit 8, pdf page 9)

QUESTION (A):

a) Based on the forecast 2026 base revenue requirement (per the 2026 RRWF) please demonstrate how the revenue requirement would be allocated to rate classes for that year and the rates for each class subsequently derived.

RESPONSE (A):

The revenue requirement for 2025 will be escalated using the Custom Revenue Cap Index (CRCI) to come up with revenue requirement for 2026. Subsequently, the base revenue requirement for

2026 will be distributed across various rate classes and divided into fixed and variable split, both based on the 2025 data. In the final stage of rate design, the fixed and variable revenue for each rate class will be divided by the forecasted 2026 billing determinants to determine the distribution rates.

QUESTION (B):

b) Will the approach proposed by THESL result in each rate class experiencing a different overall increase in distribution rates, where classes experiencing higher annual increases in their billing determinant would see a lower average rate increase (for base distribution rates)?

RESPONSE (B):

Yes, the distribution rates increase will vary across the classes, depending on the annual projected growth in billing determinant for each rate class.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-79

References: **Exhibit 7, Tab 1, Schedule 1, Page 2**
Cost Allocation Model, Tabs I4 & I5.2
Exhibit 8, Tab 2, Schedule 1, Page 3
THESL's Conditions of Service, Pages 92 and 97
Exhibit 2B, Section E5.1, Page 20

Preamble:

With respect to the Services weighting factor, the Application states:

> "All rate classes, with the exception of the Competitive Sector Multi-Unit Residential ("CSMUR"), Unmetered Scattered Load ("USL") and Street Lighting classes, received a weighting factor of one, reflecting the reality that service costs greater than a basic allowance are recovered through a direct contribution from the customers. The weighting factor for the CSMUR rate class is derived by dividing the number of units by the number of buildings housing these units, as originally directed by the OEB in EB-2010-0142. For the USL and Street Lighting classes, the cost of services is directly collected from those customers, requiring that they receive a weighting factor of zero." (Exhibit 7)

With respect to the basic connection fee allowance, the Application states:

> "For the next rate period, Toronto Hydro proposes to increase its Basic Connection Fee allowance for Rate Class 1 to 5 from $1396 to $3059. The Basic Connection Fee has not been updated since 2009. The updated Basic Connection Fee reflects the cost of the current connection standards and includes upgraded transformation from 100kVA, to 167KVA." (Exhibit 2B)

QUESTION (A):

a) Please confirm that the current basic connection fee allowance is the same for all customer classes (excluding USL and Street Lighting)? If not, please provide the basic allowance for each class.

RESPONSE (A):

Toronto Hydro confirms that the basic connection allowance is the same for all customer classes as defined in Toronto Hydro's Conditions of Service, Section 2.1.2.2, Capital Contribution Policy.

QUESTION (B):

b) Please confirm that: i) the full costs of Services assets for all customer classes are recorded in Account 1855, ii) the offsetting direct contributions from customers recorded as contributed capital in Account 1995 and iii) these capital contributions are associated with Account 1855 in Tab I4. If
not confirmed, please explain how the cost and contributed capital are treated in the Cost Allocation Model.

RESPONSE (B):

Toronto Hydro confirms statement i), ii), iii) in the above interrogatory.

QUESTION (C):

c) Are the actual total costs (including direct contributions) for Services the same for all customer classes on a per connection basis? If not, what are the relative differences?

RESPONSE (C):

The actual total costs, and/or contribution for services for all customer classes are not necessarily the same. What is same is the methodology to evaluate the costs. Each customer service connection is evaluated as the total cost less the customer contribution and any applicable basic

connection allowance, as prescribed by the Distribution System Code Section 3, Connections and Expansions.

QUESTION (D):

d) Is THESL responsible for the maintenance, repair and replacement of the Services assets provided for all customer classes? If not, how do the responsibilities differ across customer classes?

RESPONSE (D):

Toronto Hydro is responsible for the maintenance, repair and replacement of the Services assets that Toronto Hydro owns.

QUESTION (E):

e) Please provide the calculations supporting the proposed Services weighting factor for the CSMUR class.

RESPONSE (E):

Please see Table 1 below.

Table 1: Service Weighting Factor for CSMUR rate class

Description	Residential	GS <50kW	GS - 50 to 999kW	GS - 1000 to 4999 kW	Large Use	CSMUR	Audit Trail (CSMUR)
Cost to provide services (as per condition of services)	3,059.0	3,059.0	3,059.0	3,059.0	3,059.0	14.7	A=$3,059/D
Number of Customers	-	-	-	-	-	98,427	B

Description	Residential	GS <50kW	GS - 50 to 999kW	GS - 1000 to 4999 kW	Large Use	CSMUR	Audit Trail (CSMUR)
in CSMUR Class							
Number of Buildings in CSMUR Class	-	-	-	-	-	472	C
Average Customer in Building (CSMUR Class)	-	-	-	-	-	208.5	D=B/C
Weighting Factor for Services	1.0	1.0	1.0	1.0	1.0	0.004796	$E=A/Cost_{Residential}$

QUESTION (F):

f) With respect to the USL class, Exhibit 7 states: "the cost of services is directly collected from those customers, requiring that they receive a weighting factor of zero". However, THESL' Conditions of Service (page 92) indicates that for Overhead supply the basic charge ($446 or $1,011 depending on the connection arrangements) is funded through rates. Please reconcile and explain whether it is appropriate for the USL class to have a zero weighting for Services.

RESPONSE (F):

Toronto Hydro's practice is to recover all the cost of connections through variable connection charge for both, Street Lighting and USL rate classes. The Conditions of Service currently displays outdated information and will be updated accordingly. Consequently, assigning zero weight to Service remains appropriate.

QUESTION (G):

g) With respect to Street Lighting, Exhibit 7 states: "the cost of services is directly collected from those customers, requiring that they receive a weighting factor of zero". However, THESL' Conditions of Service (page 97) indicates that the basic charge ($553.36 or $573.97 depending on the connection arrangements) is funded through rates. Please reconcile and explain whether it is appropriate for the Street Lighting class to have a zero weighting for Services.

RESPONSE (G):

Please refer to the response for part (f) of this interrogatory.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-80

Reference: Exhibit 7, Page 2 Cost Allocation Model (CAM), Tab I5.2

Preamble:

With respect to the Billing and Collecting weighting factors the Application states:

> "The class-specific weighting factors reflect estimates of billing effort and costs related to each class based on the experience and expertise of Toronto Hydro's billing specialists".

QUESTION (A):

a) Please provide any analysis undertaken to support/determine the proposed weighting factors for Billing and Collecting.

RESPONSE (A):

Please refer to 7-Staff-325.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-81

References: Exhibit 7, Page 2 and Footnote #5
Cost Allocation Model (CAM), Tab E1

Preamble:

With respect to the Density Factor, the Application states:

"In accordance with past OEB decisions, Toronto Hydro proposes to maintain the use of the modified density factor at 23 percent. This reflects a considerably higher customer density per kilometer in Toronto compared to the OEB's default value."

"Toronto Hydro's density of 133 customers per kilometers of line, as determined by the model, is well above the OEB's default of 60 customers per kilometers of line."

QUESTION (A):

a) What was the actual customer density for THESL in: i) EB-2014-0116 and ii) EB-2018-0165 as determined by the CAM model for each Application?

RESPONSE (A):

Customer density as per cost allocation model was as follows:

a. EB-2014-0116: 140 customers per km of line
b. EB-2018-0165: 140 customers per km of line

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-82

Reference: Cost Allocation Model (CAM), Tabs I7.1 and I7.2

QUESTION (A):

a) Do any of THESL's customers have more than one THESL-owned meter (e.g., customers with embedded generation)? If yes, please indicate which customer classes are involved and how many additional meters are associated with each.

RESPONSE (A):

The following table shows the customers that have more than one THESL-owned meter grouped by customer class:

Table 1: Customers with 1+ THESL-owned Meter

Customer Class	Number of additional meters
General Service Less than 50 kW	262
General Service 50 to 999 kW	1,380
General Service 1,000 to 4,999 kW	169
Large Use Service	44

QUESTION (B):

b) Do any of THESL's customers have more than one meter that THESL is responsible for reading on a regular basis? If yes, please indicate which customer classes are involved and how additional meters (over and above one per customer) THESL is required to read for each customer class.

RESPONSE (B):

For the meters listed in the previous response, Toronto Hydro is required to read all the additional meters for these customers.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-83

Reference: Cost Allocation Model (CAM), Tabs I3 and I9

Tab I3 identifies a number of accounts where some (or all) of the costs are directly allocated to one or more customer classes. Please provide a schedule that sets out for each such account: i) the nature of the assets being directly allocated and ii) why direct allocation is appropriate to the classes identified in Tab I9.

RESPONSE:

See the following table for the requested information.

USofA	UsofA Description	GS 50-999 kW[2]	GS 1,000-4,999 kW[2]	Large Use >5MW[2]	Street Light[1]	Unmetered Scattered Load[1]	Competitive Sector Multi-Unit Residential[3]
1830	Poles, Towers and Fixtures	-	-	-	51,670,667	2,719,509	-
1835	Overhead Conductors and Devices	-	-	-	4,444,946	233,945	-
1840	Underground Conduit	3,332,831	17,590,062	24,918,126	3,297,621	173,559	-
1845	Underground Conductors and Devices	2,817,669	14,871,131	21,066,481	5,436,780	286,146	-
1860	Meters	-	-	-	-		58,170,360
1940	Tools, Shop and Garage Equipment	-	-	-	2,261	119	-
2105	Accum. Amortization of Electric Utility Plant - Property, Plant, & Equipment	- 1,243,863	- 6,564,876	- 9,299,820	- 17,014,401	- 895,495	- 29,179,160
	Sub-Total	4,906,637	25,896,316	36,684,787	47,837,873	2,517,783	28,991,200

USofA	UsofA Description	GS 50-999 kW[2]	GS 1,000-4,999 kW[2]	Large Use >5MW[2]	Street Light[1]	Unmetered Scattered Load[1]	Competitive Sector Multi-Unit Residential[3]
5040	Underground Distribution Lines and Feeders - Operation Labour	2,547	13,445	19,046	-	-	-
5045	Underground Distribution Lines & Feeders - Operation Supplies & Expenses	7,777	41,046	58,145	-	-	-
5110	Maintenance of Buildings and Fixtures - Distribution Stations	-	-	-	78,739	4,144	-
5135	Overhead Distribution Lines and Feeders - Right of Way	-	-	-	2,500,372	131,599	-
5145	Maintenance of Underground Conduit	5,611	29,614	41,952	-	-	-
5150	Maintenance of Underground Conductors and Devices	14,174	74,810	105,976	-	-	-
5310	Meter Reading Expense	-	-	-	-	-	315,547
5705	Amortization Expense - Property, Plant, and Equipment	134,961	712,297	1,009,042	2,387,018	125,633	3,246,012
	Sub-Total	165,071	871,213	1,234,162	4,966,129	261,375	3,561,559
	Grand Total	5,071,707	26,767,529	37,918,949	52,804,002	2,779,158	32,552,759

Note:

1. All assets and expenses are directly allocated 95 percent to the Street Lighting class, and 5 percent to the USL class. Since these assets are used by only these two rate classes.

2. The cost related to feeders used by GS 50-999 kW, GS 1,000-4,999 kW and Large User rate class.

3. Expenses related to meter cost and meter reading by CSMUR class.

Toronto Hydro believes that the direct allocation is suitable for the classes outlined in tab I9, as the assets and expenses listed in the table exclusively serve their respective classes. For example,

streetlighting costs (both capital and OM&A) are tracked separately, providing direct benefits to the same class and thus should be the foundation for recovery within that particular rate class.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-84

References: Exhibit 7, Tab 1, Schedule 1, Pages 2-3

Exhibit 7, Tab 1, Schedule 2 Cost Allocation Model (CAM), Tabs I8

Preamble:

The Application states:

> "For the Residential, CSMUR and General Service rate classes Toronto Hydro used sample metering data sets, while entire rate class data sets were used for Unmetered Scatter Load Class ("USL") and Street Lighting rate classes."

QUESTION (A):

a) Please explain why sample metering data sets were used for the Residential, CSMUR and General Service rate classes.

RESPONSE (A):

Please refer to 7-Staff-326, parts b) and c).

QUESTION (B):

b) Please explain how the sample set for each rate class was determined and how THESL ensured the sample set was representative of the overall class.

RESPONSE (B):

Please refer to 7-Staff-326, parts a), b) and c).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-85

Reference: Exhibit 7, Tab 1, Schedule 1, Pages 2-3 & Tab 1, Schedule 2
Cost Allocation Model (CAM), Tabs I8

Preamble:

The Application states:

> "The hourly load profiles were reconciled to the 2019 purchased energy and wholesale market participant data and weather normalized to 2025 heating and cooling degree days. The weather normalization methodology is based on a ratio between the 2019 weather normalized and 2019 non-weather normalized loads from the revenue load forecast. Weather normalization in the revenue load forecast is calculated by making adjustments to the monthly energy purchases either in excess or below what would be purchased under average weather conditions. Average weather conditions are based on a ten-year historical average of heating and cooling degree-days, and dew-point temperature."
>
> And
>
> "The load profiles were scaled to the 2025 baseline load forecast based on the ratio of 2025 kWh to 2019 kWh by class."

QUESTION (A):

a) With respect to the first reference, was the ratio used to do the adjustment (per Exhibit 7, Tab 1, Schedule 2, Column (h)) based on the annual weather normal HDD and CDD values relative to the actual annual HDD and CDD values or was a different ratio calculated for each month?

RESPONSE (A):

Toronto Hydro weather normalized the 2019 load profiles by creating monthly ratios between the 2019 weather normalized loads and 2019 non-weather normalized loads by rate class sourced from Exhibit 3.

Please refer to Exhibit 3, Tab 1, Schedule 1, section 5.1 for details outlining Toronto Hydro's weather normalization methodology in its load forecast.

QUESTION (B):

b) With respect to the second reference, was the scaling factor (per Exhibit 7, Tab 1, Schedule 2, Column (i)) used based on the ratio of the annual 2025 forecast kWh versus the annual weather normalized 2019 kWh or was a different scaling factor calculated for each month?

RESPONSE (B):

The scaling factors used were based on the ratio of the monthly 2025 forecast kWh versus the monthly weather normalized 2019 kWh.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-86

References: **Exhibit 7, Tab 1, Schedule 1, pages 2-3 & Tab 1, Schedule 2**
Exhibit 3, Appendix J, page 37
Cost Allocation Model (CAM), Tabs I8
EB-2022-0016 (Bluewater Power), Exhibit 7, pages 5-11
EB-2022-0044 (Kingston Hydro), Exhibit 7, Tab 4, Schedule 1, Attachment 1

Preamble:

The Application states:

> "Resulting load profiles were modified to include electric vehicles ("EVs") and distributed energy resources ("DERs") forecasted load impacts." (page 3)
> And
> "One load profile needed to be added to the analysis: a residential LDEV load profile. For the Integration Model, it was not necessary to include a residential LDEV load profile because billing demand is not a component of residential rates. However, how LDEV's may impact the cost allocations between the residential and other classes in the CAM is pertinent." (Appendix J, page 37)

QUESTION (A):

a) With respect to the second reference, wouldn't it also have been necessary to develop (solely for cost allocation purposes) load profiles for: i) CSMUR LDEV energy usage and ii) GS<50 LDEV, MDEV and HDEV energy usage? If not, why not?

RESPONSE (A) PREPARED BY CLEASPRING:

Regarding part i), for cost allocation purposes the LDEV energy usage for the CSMUR customer class uses the same residential LDEV load profile as used by the residential customer class. Regarding part ii), the GS<50 customer class for cost allocation purposes uses the non-residential LDEV, MDEV, and HDEV load profiles. These are the same profiles used by the other general service and large use customer classes.

The LDEV load profile used for the residential and CSMUR customer classes are found in Table 43 of the Clearspring Integration Model Report. The LDEV load profile used for GS<50 (and the other GS and LU classes) is found in Table 7. The MDEV and HDEV load profiles used for GS<50 (and the other GS and LU classes) are found in Table 19.

QUESTION (B):

b) If yes, please explain how these profiles were determined and provide the profiles used?

RESPONSE (B) PREPARED BY CLEASPRING:

Please refer to response 7-VECC-86, a).

QUESTION (C):

c) With respect to Tab 1, Schedule 2, please explain why the total hourly demand for the customer class (Column (c)) was based on the average use per sample customer for the hour times the number of customers in the class.

RESPONSE (C):

The columns (c) and (d) in the Tab 1, Schedule 2 are the sample size and total of sample size loads based on the average hourly load profile multiplied by the number of customers. This exercise was done to estimate a percentage of usage for a rate class (column (e)). The resulting percentage was then applied to the actual load purchased by Toronto Hydro (column (f)) to determine the rate class's portion of the actual purchased load (column (g)).

Columns (d) and (e) were developed to estimate a rate class's portion of actual purchased load (column (f)), resulting in column (g).

QUESTION (D):

d) What implicit assumptions does this approach (per part (c)) assume regarding the nature of the sample used and how did THESL ensure these assumptions were met?

RESPONSE (D):

Toronto Hydro needed to estimate each rate class's contribution to its total actual purchased loads. The sample size and total of sample sizes (Columns (c) and (d)) were used to estimate a rate class's percentage of total hourly loads (Column (e)). Toronto Hydro used this resulting percentages to estimate a rate class's portion of the actual purchased loads (Column (f)).

QUESTION (E):

e) With respect to the calculation described in part (c), why wouldn't it be more appropriate to determine the hourly profile for the class by multiplying the hourly profile for the sample by the ratio of class's total energy to the energy use accounted for by the sample?

RESPONSE (E):

Toronto Hydro used the sample size and total of sample sizes (Columns (c) and (d)) to create a ratio of the rate class (Column (e)). However, because Column (d) is a sum of the calculations from all sample sizes and not the actual loads that took place, Toronto Hydro used the resulting ratios and applied them to the actual loads (Column (f)) to estimate a rate class's portion of what took place (Column (g)).

QUESTION (F):

f) With respect to Tab 1, Schedule 2, is the difference between the hourly values in Column (d) and Column (f) due solely to losses?

RESPONSE (F):

Toronto Hydro confirms that the difference is not due to losses.

QUESTION (G):

g) If the response to part (f) is no, what other factors account for the difference?

RESPONSE (G):

Column (d) is a sum of the calculations from all sample sizes, while Column (f) is the actual loads purchased. Column (d) does not represent any actual loads that took place; it is a sum of estimations used to calculate a rate class's percent allocation of the actual loads in Column (f).

QUESTION (H):

h) If the response to part (e) is yes, why does the percentage difference between the two columns vary so widely over the hours?

RESPONSE (H):

Please refer to 7-VECC-86 part f).

QUESTION (I):

i) With respect to Tab 1, Schedule 2, why is it more appropriate to use the maximum value in Column (c) as the NCP value as opposed to the maximum value in Column (h)?

RESPONSE (I):

Column (c) is a sample size estimation that is used calculate a ratio of a rate class's portion from the actual loads. Column (c) is not intended to represent a rate class's actual usage; it is used to create a ratio to applied to the actual loads.

QUESTION (J):

j) With respect to Tab 1, Schedule 2, why is it more appropriate to use the maximum value in Column (f) to determine the hour on which to base the CP for the month as opposed to the maximum value in Column (d)?

RESPONSE (J):

Please refer to 7-VECC-86 part g).

QUESTION (K):

k) With respect to Tab 1, Schedule 2, please confirm that the weather correction factor used in Column (h) uses the same ratio to adjust each hour's actual use to "weather normal" use and, in doing so, assumes that for each hour in January 2019 the actual HDD value differs from what would be weather normal for that hour in January by the same percent?

RESPONSE (K):

Toronto Hydro confirms the above statement.

QUESTION (L):

l) If part (k) is not confirmed what relationship does the approach used by THESL assumes exists between the actual HDD value for each hour in January and the weather normal for that hour in January?

RESPONSE (L):

Please refer to response 7-VECC-86, k).

QUESTION (M):

m) Did THESL consider the use of a methodology such as that employed by Bluewater and Kingston in their 2022 COS Applications which accounts for the fact that the difference

between actual and weather-normal HDD and CDD values can vary by day? If yes, why was such an approach rejected?

RESPONSE (M):

Toronto Hydro did not consider the employed by Bluewater and Kingston in their 2022 COS Applications.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-87

References: Cost Allocation Model (CAM), Tab I6.1
EB-2023-0054, OEB Decision re: THESL's 2024 Rates

QUESTION (A):

a) In the 2024 Tariff Sheet it is not clear if the Service Charge for USL is billed on a per customer or a per connection basis. Please clarify.

RESPONSE (A):

The Service Charge for USL rate class is charged on a per customer basis.

QUESTION (B):

b) Please explain how the 2024 rates used in Tab I6.1 account for both the Service Charge and the Connection Charge applicable to USL customers.

RESPONSE (B):

In the cost allocation model cell L39 is modified to calculate the service charges and connection charges as per customer and per connection respectively. This is described in Exhibit 7, Tab 1, Schedule 1, page 4.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-88

References: Exhibit 7, Tab 1, Schedule 1, Table 1, Page 5
Cost Allocation Model (CAM), Tab O1

QUESTION (A):

a) With respect to the proposed Revenue to Cost ratios for GS<50, GS 50-999, GS 1000-4999 and Large Use, are the differences in the proposed ratios simply due to rounding or did the approach used by THESL to determine each class's ratio lead to distinctly different results for each class?

RESPONSE (A):

The differences in the proposed ratios are not simply due to rounding. Toronto Hydro's approach to determine each class's ratio led to distinctly different results for each class.

QUESTION (B):

b) If the approach used by THESL led to distinctly different results for each class please explain the approach used and provide (in a working excel model) the supporting calculations.

RESPONSE (B):

Toronto Hydro maintained the revenue-to-cost ratio within the range, as provided in the Report of the Board: *Review of Electricity Distribution Cost Allocation Policy* (EB-2010-0219) and the updated policy for the Street Lighting class as provided in the Report of the Board: *New Cost Allocation Policy for Street Lighting Rate Class* (EB-2012-0383), for all the classes except for Residential and CSMUR rate class. Residential and CSMUR class revenue-to-cost ratio maintained at unity. In order to maintain the revenue-to cost ratio, rates are adjusted downwards for Residential, CSMUR and

USL. The extra revenue is allocated to those classes with revenue-to-cost ratios below 1.0 proportionately to amounts those classes were below their allocated costs.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-89

Reference: Exhibit 7, Tab 1, Schedule 1, page 5 (Table 1)
Cost Allocation Model (CAM), Tab O1

Preamble:

The EB-2018-0165 Decision states:

> "However, the OEB is concerned by the large shift for the residential class from well below 100% to above 100% (94.3% to 103.2%) at the same time that residential rates are transitioning to a fully fixed rate design. This shift of 8.9 percentage points has a direct impact on the distribution rates for the residential class, and, when combined with the transition to fixed rates, can have a compounding impact on the bills for low volume consumers. The OEB concludes that this impact should be mitigated. Therefore, the OEB is setting the revenue-to-cost ratio for the residential class at 100% for the Custom IR term. In the next rebasing application, the OEB will assess whether the standard policy range will again be applied, rather than continuing to fix the ratio at 100%."
>
> And
>
> "The OEB notes that the revenue-to-cost ratio for the CSMUR class was set at 100% by the OEB when the class was first established for 2012 rates (and as implemented in 2013). There are now several years of actual data for this new class that can be assessed. The OEB concludes that it is appropriate to review in Toronto Hydro's next rebasing application the characteristics
> of this class, and whether a range should be adopted for the revenue-to-cost ratios going forward."

The Application states:

> "In accordance with past OEB decisions, rates in the Residential and CSMUR class are set such that the revenue to cost ratios are equal at unity (i.e. 1.0 or 100 percent)."

QUESTION (A):

a) Please explain why THESL considers setting the Residential ratio at 100% to be in accordance with the OEB's EB-2018-0165 Decision (i.e., why the Residential ratio should continue to be fixed at 100% as opposed to applying the standard policy range).

RESPONSE (A):

Please refer to response 7-Staff-329, b).

QUESTION (B)

b) Please provide THESL's views as to whether, for the CSMUR class, a range should be adopted for the class's revenue to cost ratio.

RESPONSE (B):

Please refer to response 7-Staff-329, a).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 7-VECC-90

Reference: Exhibit 7, Tab 1, Schedule 1, Page 13

QUESTION (A):

a) Please provide the Cost Allocation Models used to produce the results set out in columns B, C and D of Table 4.

RESPONSE (A):

Please see enclosed attachments for the cost allocation model for scenario B, C, and D of Table 4. Toronto Hydro notes that the changes are made to the following inputs in the alternate approach compare to status quo including “Primary Customer Base”, “Line Transformer Customer Base”, “Secondary Customer Base” in tab I6.2 and consequential impact on load profile for NCP1, 4 and 12 in tab I8.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 8-STAFF-330

Reference: Exhibit 8, Tab 1, Schedule 1, Pages 4-6

Preamble:

Toronto Hydro is proposing to maintain the current fixed/variable split for its current rates. To do this, it is using estimated 2024 rates, multiplied by 2025 consumption to establish the current fixed/variable split.

Toronto Hydro applies a three-part charge for the unmetered scattered load rate class.

The current fixed charges for the GS < 50 kW, GS 1,000 - 4,999 kW and Large Use rate classes are above the ceiling as calculated by the cost allocation model.

QUESTION (A):

a) Will Toronto Hydro update the proposed 2025 rates using actual 2024 rates to establish the current fixed/variable split?

RESPONSE (A):

There is no change to Toronto Hydro 2024 estimated rates compared to 2024 actual rates. As a result, no update is required to fixed/variable split.

QUESTION (B):

b) As a scenario, please provide the variable charges that would result from maintaining the existing 2024 fixed charges in the GS < 50 kW, GS 1,000 - 4,999 kW and Large Use rate classes.

RESPONSE (B):

Please see the variable charges within Table 1 below:

Table 1 – Variable Charges from Maintaining 2024 Fixed Charges in GS<50 kW, GS 1,000-4,999 kW and Large Use Rate Class

	Proposed Rates ($)					Rates if maintaining at 2024 Fixed Charge ($)				
	2025	2026	2027	2028	2029	2025	2026	2027	2028	2029
GS<50kW	0.04604	0.04822	0.04993	0.05365	0.05514	0.04829	0.05132	0.05371	0.05899	0.06109
GS 1,000 TO 4,999 kW	8.9381	9.5024	9.9774	10.8259	11.3400	8.9976	9.5824	10.0922	11.0060	11.5558
LARGE USE	9.4854	9.9318	10.5266	11.5564	12.1653	9.5254	9.9625	10.6020	11.7152	12.3563

QUESTION (B):

c) Please indicate the fixed per connection charge that would result for the USL rate class if the revenue from the per customer charge and per connection were collected from a single per connection charge. Please indicate how this compares to the ceiling from the cost allocation model.

RESPONSE (C):

Please see Table 2 below for the requested information related to Unmetered Scattered Load rate class.

Table 2 – Monthly Fixed Charge for Unmetered Scattered Load Rate Class (Single Per Connection Charge)

Monthly Fixed Charge - 2025 ($)		**Unmetered Scattered Load**
Proposed per connection charge	per 30 days	0.81
Proposed per customer charge	per 30 days	7.87
Per connection charge (If all fixed revenue collected through connection charges)	per 30 days	1.30
Cost Allocation Model Ceiling	per month	8.82
Cost Allocation Model Ceiling	per 30 days	8.70

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 8-STAFF-331

References: Exhibit 8, Tab 1, Schedule 1, Pages 7-8
EB-2018-0165, Decision and Order, December 19, 2019
EB-2023-0278, Letter Dated September 28, 2023, Consultation on Policy for Standby Rates

Preamble:

Toronto Hydro harmonized its standby rates on an interim basis in 2006. In the 2020-2024 proceeding the OEB directed Toronto Hydro to file a proposal in this proceeding address the interim nature of its standby rates unless it has been otherwise superseded by a generic policy. Toronto Hydro notes that there is an ongoing consultation for standby rates. It also notes that there are ongoing initiatives in the space of DERs which appears to in conflict with standby rates.

QUESTION (A):

a) In the event that the standby consultation does not lead to a policy on standby rates in time for Toronto Hydro's rate order, does Toronto Hydro propose to address the interim nature of its standby rates in any manner?

RESPONSE (A):

In the event that the OEB's standby rates consultation does not conclude in time for Toronto Hydro's rate order, Toronto Hydro does not propose to address the interim nature of its standby rates, since any material alteration to the utility's standby rates would pre-empt, and potentially conflict with, any future direction provided by the OEB on this matter

QUESTION (B):

b) If the standby consultation does provide direction in time to be incorporated, does Toronto Hydro intend to adopt that direction in this proceeding?

RESPONSE (B):

Toronto Hydro cannot speculate what direction will be provided by the OEB's standby consultation. As a result, Toronto Hydro cannot comment on its intentions since any subsequent action would need to be informed and assessed on the basis of the specifics of the OEB's direction for standby rates.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 8-STAFF-332

Reference: Exhibit 8, Tab 1, Schedule 1, Page 9

Preamble:

Toronto Hydro used the 2024 RTSR model, with modifications to calculate the 2025 RTSRs, using the 2023 UTRs available at the time of preparation.

QUESTION (A, B, C):

a) Please update to the current 2025 model if available at the time of responding to interrogatories.

b) Please update to the current 2024 UTRs.

c) Please incorporate 2023 historic actual host volumes and customer volumes, if available at the time of responding to the interrogatories.

RESPONSE (A, B, C):

Performing the requested update is an extensive process. Given that RTSRs are pass-through charges, and do not relate to Toronto Hydro's revenue requirement, distribution rates, or Group 2 DVAs, in previous proceedings (e.g. EB-2018-0165) the OEB has left RTSR updates to the Draft Rate Order process. Doing so also allows for the most up-to-date information to be used. In the interest of efficiently focusing resources, Toronto Hydro recommends that this approach be followed in this proceeding as well.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 8-STAFF-333

References: Exhibit 8, Tab 1, Schedule 1, Page. 11-12

Appendix 2-R

Preamble:

Toronto Hydro is proposing to maintain its existing loss factors reflecting a distribution loss factor of 1.0249. Appendix 2-R indicates that the actual distribution loss factor in the most recent 5 years is 1.0278.

Over the most recent 4 years, the total loss factor has fluctuated in a relatively narrow band between 1.0281 and 1.0299. In 2018, it was 1.0221.

QUESTIONS (A):

a) Please explain why Toronto Hydro proposes to use the existing loss factors when more recent loss information is available.

RESPONSE (A):

Please refer to the response 8-VECC-95.

QUESTIONS (B)

b) Does Toronto Hydro have any insights into the cause of the increase in losses over the most recent 4 years?

RESPONSE (B):

Toronto Hydro did not undertake a detailed engineering study regarding line losses in the time period between 2018 and 2022 and therefore cannot offer additional insights into fluctuations in the loss factor over this period.

QUESTIONS (C)

c) What are the most cost-effective measures available to Toronto Hydro to offset some of the recent increase in losses?

RESPONSE (C):

Please refer to Toronto Hydro's response to interrogatory 2B-ED-43, e) and g).

QUESTIONS (D)

d) If the required data is available, please provided an updated Appendix 2-R using the years 2019-2023.

RESPONSE (D):

Please refer to 8-Staff-333, Appendix A.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 8-STAFF-334

References: Exhibit 8, Tab 1, Schedule 1, Page 13

Appendix 2-R

Preamble:

Toronto Hydro proposes implementation of a rate smoothing methodology, aimed at assisting customers in managing bill impacts.

QUESTION:

Please provide the derivation of the proposed rates for the 2025-2029 years, indicating fixed and variable revenue for each year, division by billing determinants, and implementation of Toronto Hydro's rate smoothing methodology.

RESPONSE:

Please see Tables 1-5 below for the revenue for 2025-2029 years by billing determinants.

Please see response 8-Staff-335 part (b) that describes rate smoothing methodology.

1

Table 1: 2025 Distribution Revenue

2025	Residential	CCSMUR	GS <50	GS 50-999 kW	GS 1,000-4,999 kW	Large Use >5MW	Street Light	USL	Total
Customers	372,078,020	44,305,893	44,448,209	7,704,550	6,530,359	2,839,477	-	75,976	477,982,484
Connections	-	-	-	-	-	-	4,324,672	127,459	4,452,131
kWh	-	-	110,965,081	-	-	-	-	4,163,024	115,128,105
kVA	-	-	-	251,041,720	79,919,937	38,594,568	17,329,089	-	386,885,314
kVA (Tx allowance)	-	-	-	- 4,634,340	- 4,901,526	- 2,549,955	-	-	- 12,085,821
Total	372,078,020	44,305,893	155,413,290	254,111,930	81,548,771	38,884,089	21,653,761	4,366,459	972,362,213

Table 2: 2026 Distribution Revenue

2026	Residential	CCSMUR	GS <50	GS 50-999 kW	GS 1,000-4,999 kW	Large Use >5MW	Street Light	USL	Total
Customers	390,161,012	46,459,159	46,608,392	8,078,991	6,847,735	2,977,475		79,669	501,212,433
Connections	-	-	-	-	-	-	4,534,851	133,653	4,668,504
kWh	-	-	116,357,984	-	-	-	-	4,365,347	120,723,331
kVA	-	-	-	263,107,115	83,483,097	40,316,186	18,171,283	-	405,077,681
kVA (Tx allowance)	-	-	-	- 4,724,337	- 4,818,791	- 2,519,805	-	-	- 12,062,932
Total	390,161,012	46,459,159	162,966,376	266,461,769	85,512,041	40,773,856	22,706,134	4,578,669	1,019,619,016

Table 3: 2027 Distribution Revenue

2027	Residential	CCSMUR	GS <50	GS 50-999 kW	GS 1,000-4,999 kW	Large Use >5MW	Street Light	USL	Total
Customers	405,260,243	48,257,128	48,412,137	8,391,648	7,112,742	3,092,704	4,710,350	82,752	525,319,704
Connections	-	-	-	-	-	-	-	138,825	138,825
kWh	-	-	120,861,038	-	-	-	-	4,534,286	125,395,324
kVA	-	-	-	273,196,692	86,456,102	41,684,318	18,874,512	-	420,211,623
kVA (Tx allowance)				- 4,814,500	- 4,747,487	- 2,425,218			- 11,987,204
Total	405,260,243	48,257,128	169,273,175	276,773,840	88,821,357	42,351,804	23,584,862	4,755,863	1,059,078,272

Table 4: 2028 Distribution Revenue

2028	Residential	CCSMUR	GS <50	GS 50-999 kW	GS 1,000-4,999 kW	Large Use >5MW	Street Light	USL	Total
Customers	440,436,832	52,445,847	52,614,310	9,120,043	7,730,128	3,361,150	5,119,208	89,935	570,917,454
Connections	-	-	-	-	-	-	-	150,875	150,875
kWh	-	-	131,351,776	-	-	-	-	4,927,862	136,279,638
kVA	-	-	-	296,600,304	93,512,864	45,011,061	20,512,819	-	455,637,048
kVA (Tx allowance)				- 4,922,538	- 4,711,941	- 2,344,270			- 11,978,749
Total	440,436,832	52,445,847	183,966,086	300,797,809	96,531,051	46,027,941	25,632,028	5,168,672	1,151,006,266

Table 5: 2029 Distribution Revenue

2029	Residential	CCCSMUR	GS <50	GS 50-999 kW	GS 1,000-4,999 kW	Large Use >5MW	Street Light	USL	Total
Customers	453,473,762	53,998,244	54,171,694	9,389,996	7,958,940	3,460,640	5,270,737	92,597	587,816,611
Connections	-	-	-	-	-	-	-	155,341	155,341
kWh	-	-	135,239,788	-	-	-	-	5,073,727	140,313,515
kVA	-	-	-	305,319,886	96,054,507	46,184,407	21,119,999	-	468,678,799
kVA (Tx allowance)	-	-	-	- 5,008,458	- 4,625,077	- 2,254,679	-	-	- 11,888,214
Total	453,473,762	53,998,244	189,411,482	309,701,424	99,388,370	47,390,368	26,390,736	5,321,665	1,185,076,052

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 8-STAFF-335

Reference: Exhibit 8, Tab 1, Schedule 1, Page 13

Preamble:

Toronto Hydro states that Consistent with EB-2018-0165, Toronto Hydro proposes implementation of a rate smoothing methodology, aimed at assisting customers in managing bill impacts. Toronto Hydro's proposed rate smoothing plan offers several benefits: (i) it avoids a one-time step-change increase for most customers in the rebasing year (2025), while (ii) maintaining relatively consistent year-over-year annual increases for all customer classes.

QUESTION (A):

a) Please confirm that this approach complicates consideration of the ratemaking treatment needed to address cost growth in the out years of the proposed plan.

RESPONSE (A):

Toronto Hydro confirms that this approach complicates consideration of the ratemaking treatment needed to address cost growth in the out years of the proposed plan.

QUESTION (B):

b) Please provide additional details on how this rate smoothing will be implemented (e.g., over what time frame will the smoothing take place, will Toronto Hydro receive interest on any deferred cost recovery).

RESPONSE (B):

Toronto Hydro's proposal for rate smoothing does not defer cost recovery; it carefully times the disposition of DVA balances in order to smooth the overall change in the distribution portion of the

customer bill. In accordance with OEB rules for DVAs, the balances of those accounts accumulate interest – a credit or debit as applicable – so long as they carry a balance.

QUESTION (C):

c) Please identify the OEB policy that supports using DVA credits for rate smoothing purposes.

RESPONSE (C):

The 2006 Electricity Distribution Rate Handbook dated May 11, 2005 and Filling Requirements for Electricity Distribution Rate Application – 2023 Edition for 2024 Rate Application Chapter 2 dated December 15, 2022 set out OEB policy on rate mitigation. On this basis, OEB policy for rate smoothing does not prohibit timing DVA disposition periods in order to smooth rate changes experienced by customers.

Toronto Hydro proposed this same approach to rate smoothing in its last rebasing application, EB-2018-0165. In its Decision and Rate Order on February 20, 2020, the OEB approved the approach.

In Toronto Hydro's experience, the OEB exercises its public interest mandate with a view to balancing the effects of rate changes on customers, and the financial interests of regulated entities. The OEB has approved rate smoothing through DVA disposition timing because of its efficacy in balancing those public interest outcomes.

QUESTION (D):

d) Please confirm that Toronto Hydro expects to be able to continue with the same rate smoothing mechanism at the next rebase proceeding. If not, please explain.

RESPONSE (D):

Toronto Hydro expects that the OEB will continue to welcome rate smoothing proposals over time, though it is not clear how any such expectation would be relevant to the current proceeding.

QUESTION (E):

e) Toronto Hydro's proposed revenue requirement surges in 2028. Since it is open to smoothing its rate trajectory during the years of the plan, could it not instead smooth its revenue requirement trajectory so that revenue cap indexing is more compensatory?

RESPONSE (E):

Please refer to Toronto Hydro's response to interrogatory 1B-CCC-35.

RESPONSES TO BUILIDING AND OPERATORS MAINTENANCE ASSOCIATION INTERROGATORIES

INTERROGATORY 8-BOMA-5

Reference: Exhibit 8, Tab 1, Schedule 1, Table 2: Monthly Fixed Charge ($)

Preamble:

In the referenced table, the proposed 2025 monthly fixed charge for the "GS 1000-4999 kW" and "Large Use" rate classes are listed as $1,191.22 and $5,138.68, respectively. Both these figures are substantially higher than the corresponding CA Model Ceiling figures (listed as $162.48 and $497.05, respectively).

QUESTION:

Please explain why Toronto Hydro did not reconcile the proposed monthly fixed charge for the "GS 1000-4999 kW" and "Large Use" rate classes with the corresponding CA Model Ceiling figures.

RESPONSE:

Toronto Hydro proposed rates for GS1,000-4,999 kW and Large User rate classes to be in line with the prior period to mitigate a significant variation in the rates.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 8-CCMBC-21

Reference: Exhibit 8, Tab 1, Schedule 1, 2.5 Standby Rates, (there are no page numbers in this exhibit)

Preamble:

"In its 2006 rate application, Toronto Hydro applied to harmonize the standby rates inherited from its six pre-amalgamation utilities. The OEB approved Toronto Hydro's proposal on an interim basis, pending a separate generic proceeding to establish standby rates for all Ontario electricity distributors."

QUESTION (A):

a) How does Toronto Hydro determine its standby rate?

RESPONSE (A):

The Standby Power Service Classification rates in Toronto Hydro's tariff are composed of a fixed Service Charge and the variable Distribution Volumetric Rate, as described below:

1) Distribution Volumetric Rate – The Distribution Volumetric Rate normally applies to the amount of backup distribution capacity a customer contracts for and the variable rate (per kVA) is the same as is applicable to the customer's demand under the standard distribution rates. However, to the extent that the backup capacity is actually drawn upon by the customer, as reflected in the customer's peak metered demand for the billing period, the Distribution Volumetric Rate is correspondingly reduced.
2) Service Charge – A monthly administration charge is applied to cover the incremental cost of monitoring, billing, and administration related to providing Standby Power service.

QUESTION (B)

b) Does Toronto Hydro charge its standby rate to customers who own large load displacement generators who generate their power at peak times to avoid paying the Global Adjustment charge under the Industrial Conservation Initiative?

RESPONSE (B):

Yes, Toronto Hydro may charge standby rates for customers who own large load displacement generators and participate in the Industrial Conservation Initiative.

QUESTION (C):

c) Does Toronto Hydro charge its standby rate to residential customers who own rooftop solar panels to generate electricity for their own use during sunny periods?

RESPONSE (C):

No, Toronto Hydro does not charge standby rates to residential customers who own rooftop solar panels.

QUESTION (D):

d) Where is the Standby Rate shown in the EB-2023-0195 evidence on Tariff of Rates and Charges?

RESPONSE (D):

Please refer to Exhibit 8, Tab 3, Schedule 2. Standby rates are shown under the Standby Power Service Classification.

QUESTION (E):

e) How many customers were charged a Standby Rate in 2023 and how much has Toronto Hydro collected in revenues from Standby Rates in 2023?

RESPONSE (E):

Toronto Hydro charged six customers standby rates and collected approximately $20,000 in standby charges in 2023.

QUESTION (F):

f) What is the revenue from Standby Rates that Toronto Hydro expects to collect from Standby Rates in 2024?

RESPONSE (F):

Toronto Hydro expects to collect approximately $21,000 in 2024.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 8-ED-45

Reference: **Cost Allocation Model, Sheet O2 Monthly Fixed Charge Min & Max also the data tables at http://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/Annual-Planning-Outlook-Data-Tables-Jan2020.xlsx?la=en.**

QUESTION (A):

a) Does Toronto Hydro agree that shifting costs for commercial and industrial customers from fixed charges to variable charges would incentivize positive customer behaviour such as shifting load off the peak, installing distributed energy, and implementing energy efficiency? Please explain.

RESPONSE (A):

Toronto Hydro agrees that "customer behaviour and the use of the grid is changing", as per OEB Staff's Report on Rate Design for Commercial and Industrial, dated February 21, 2019 (**EB-2015-0043**). Toronto Hydro further agrees rate design affects customer behaviour. Toronto Hydro is familiar with various OEB policy proceedings over the years that have examined the issue on a sector-wide basis.

Shifting more cost recovery from fixed rates to volumetric rates would foreseeably prompt a breadth of behavioural effects and customer reactions. Toronto Hydro agrees that some customers would likely respond to the incentive to enhance their energy efficiency. Other customers may recoil from making investments in building and transportation electrification, given the greater impact those choices would have on their electricity bill under a rate design with lower fixed and higher variable rates. Other customers still may object strenuously through various channels to the reduced predictability of their energy costs, which can be a major expense line for certain

commercial and industrial customers.[1] The rate design policy question raised in this interrogatory is not specific to Toronto Hydro, its customers, or this Application, and would require further, broader review of specific proposals.

QUESTION (B):

b) Does Toronto Hydro agree that setting the fixed monthly charges for commercial and industrial customers at the level of avoided cost would represent a shift of costs from fixed charges to variable charges?

RESPONSE (B):

Toronto Hydro agrees that setting the fixed monthly charges for commercial and industrial customers at the level of avoided cost would represent a shift of costs from fixed charges to variable charges.

QUESTION (C):

c) Does Toronto Hydro agree with Board Staff that setting fixed monthly charges at the level of avoided costs has benefits, including that avoided costs "are easiest to determine, are subject to minimal judgment and thus more accurate"?

RESPONSE (C):

No, the 'easiest' approach, and the one that provides the greatest level of stability and certainty to a utility and its customers, is to maintain stability of the rate design over time.

[1] See, for example, the reintroduction of Tiered RPP commodity rates in response to backlash over TOU commodity rates, which was a response to public concern over behavior-driven pricing.

QUESTION (D):

d) Would Toronto Hydro agree to set its commercial and industrial fixed monthly charges to equal avoided costs going forward? If not, would Toronto Hydro agree to study and consider this issue for potential implementation in its next annual rate application?

RESPONSE (D):

Toronto Hydro proposes in Exhibit 1B, Tab 1, Schedule 3, section 7 that for the years 2026 to 2029, the final approved base revenue requirements be allocated to each rate class based on the same allocations to rate classes established in this proceeding for 2025. As presented in Table 11 the revenue to cost ratios for all Toronto Hydro rate classes within the OEB's guideline ranges. Toronto Hydro will hold constant the fixed/variable revenue split for each rate class determined in 2025 for the purpose of designing rates from 2026 to 2029. Toronto Hydro is concerned that significant change to rates for commercial and industrial customers could have significant, unintended consequences that would be disruptive to those businesses, and the broader economy. Toronto Hydro is concerned that this could adversely affect the energy transition.

From time-to-time, the OEB re-assesses rate design on a sector-wide basis, and that continues to be the most appropriate approach, in order to maintain consistency across service areas. As a result, Toronto Hydro does not support a utility-specific study with its next rate application.

QUESTION (E):

e) Please confirm that the balance between fixed and variable charges does not and should not impact Toronto Hydro being made whole for its revenue requirement. Please explain.

RESPONSE (E):

Revenue requirement is calculated prior to the calculation of rate design, and therefore the calculation of the former is not impacted by calculated changes of the latter. However, Toronto Hydro is "made whole for its revenue requirement" to the extent that the calculated rates and

forecasted billing determinants materialize as anticipated in the OEB Decision and Rate Order. It is unknown what effects a significant change in rate design would have on actual revenues.

QUESTION (F):

f) Please confirm that Toronto Hydro has proposed fixed monthly charges for commercial and industrial customers that is above the maximum level.

RESPONSE (F):

The proposed fixed rates for GS<50kW, GS 1-5MW and Large User rate class are above the cost allocation model output ceiling level, however, the ceiling is not a maximum. In this and similar proceedings over the years, OEB is not, has not, and cannot be fettered by its cost allocation and rate design policies. Indeed, past decisions of Toronto Hydro and other LDCs demonstrate that, notwithstanding certain nomenclature in the cost allocation model, the model does not produce a "maximum", and that just and reasonable rates include fixed rates much greater than are output by bands calculated by its model.

QUESTION (G):

g) Please explain why Toronto Hydro is proposing fixed monthly charges for commercial and industrial customers that are above the maximum level. Please include a detailed breakdown quantifying and explaining for each rate class the difference between the proposed fixed charges and the maximum fixed charges.

RESPONSE (G):

The OEB cost allocation model does not establish maximum fixed charges. Toronto Hydro is proposing a rate design that produces results that are consistent with the fixed/variable splits with which Toronto Hydro customers are familiar.

See Table 1 below for the variance between proposed fixed charges and the calculated ceiling for fixed charges from the cost allocation model.

Table 1: Variance Between Proposed Fixed Charges and Calculated Ceiling for Fixed Charges

		Residential	CSMUR	GS<50 kW	GS 50-999 kW	GS 1000-4999 kW	Large Use	Street Lighting	USL
A	CA Model Floor	6.66	4.29	14.83	31.02	35.41	121.9	0.6	0.72
B	CA Model Ceiling	23.28	18.74	38.61	86.35	162.48	497.05	6.28	8.82
C	Proposed (2024)	45.93	37.68	44.31	58.88	1,109.35	4,910.79	1.87	7.25
D	Proposed (2025)	49.52	37	49.77	65.29	1,191.22	5,138.68	2.06	7.87
E	Proposed (2025) (not adjusted for 30 days)	50.21	37.51	50.46	66.2	1207.76	5210.05	2.09	7.98
F=E-B	Proposed 2025 vs CA Model Ceiling	26.93	18.77	11.85	-20.15	1045.28	4713	-4.19	-0.84

QUESTION (H):

h) Please provide the methodology, calculations, and any underlying documentation showing how Toronto Hydro calculates the fixed monthly charge for its commercial and industrial customers.

RESPONSE (H):

Toronto Hydro applied 2025 forecast customer connection counts to anticipated 2024 rates to determine 2025 fixed revenue at 2024 rates. The utility subsequently applied 2025 forecast kWh and kVA billing determinants to anticipated 2024 variable distribution rates to determine the percentage of fixed and variable revenue relative to total revenue, by rate class. Exhibit 8, Tab 1, Schedule 2 provides details on the current fixed/variable split for each rate class utilizing this methodology.

QUESTION (I):

i) Please provide the percent difference between the proposed monthly fixed charge for commercial and industrial customers and the Board minimum and maximum figures (i.e. Customer Unit Cost per month - Avoided Cost; Customer Unit Cost per month - Directly Related; and Customer Unit Cost per month - Minimum System with PLCC Adjustment).

Please calculate the percentage based on an average weighted by the number of customers in each class.

RESPONSE (I):

See Table 2 below for figures extracted from the cost allocation model.

Table 2: Cost Allocation Model

		GS<50 kW	GS 50-999 kW	GS 1000-4999 kW	Large Use	Total General Service Customers
A	Avoided Cost	14.83	31.02	35.41	121.90	
B	Directly Related	23.18	52.53	57.14	166.97	
C	Minimum System with PLCC Adjustment	38.61	86.35	162.48	497.05	
D	Proposed (2025)	49.77	65.29	1,191.22	5,138.68	
E	Proposed (2025) (not adjusted for 30 days)	50.46	66.20	1,207.76	5,210.05	
		GS<50 kW	**GS 50-999 kW**	**GS 1000-4999 kW**	**Large Use**	**Weightage to customer**
F=E/A-1	Proposed (2025) (not adjusted for 30 days) vs Avoided Cost	240%	113%	3311%	4174%	244%
G=E/B-1	Proposed (2025) (not adjusted for 30 days) vs Directly Related	118%	26%	2014%	3020%	119%
H=E/C-1	Proposed (2025) (not adjusted for 30 days) vs Minimum System with PLCC Adjustment	31%	-23%	643%	948%	28%
I	Number of Customers (2025 forecast)	73,396	9,699	451	45	
J=I/SUM(I:I)	Weightage Number of Customers	88%	12%	1%	0%	100%

QUESTION (J):

j) For the most recent year available, please provide the number of customers in each of the commercial and industrial rate classes.

RESPONSE (J):

Refer to the table below for General Service customers in the year 2022. Toronto Hydro's General Service rate classes extend beyond Commercial & Industrial customers, also covering residential buildings with bulk meters.

GS<50kW	GS 50-999 kW	GS 1-5MW	Large User
72,614	9,731	461	42

QUESTION (K):

k) Please complete the following table calculating the total annual amount of fixed charges by customer class (actual and forecast).

Total Fixed Charges Collected by Customer Classes ($)								
	GS <50kW	GS 50-999kW	GS	…	…	…	…	Total
2020 (actual)								
……..								
2029 (forecast)								

RESPONSE (K):

Please refer to Table 3 below for the requested information.

1 **Table 3: Total Fixed Charges Collected by Customer Classes ($ M)**

	GS<50 kW	GS 50-999 kW	GS 1000-4999 kW	Large Use	Total
2020 (Actual)	32.10	6.18	5.34	2.15	**45.77**
2021 (Actual)	34.00	6.17	5.52	2.22	**47.90**
2022 (Actual)	34.67	6.15	5.41	2.20	**48.43**
2023 (Bridge)	37.04	6.53	5.79	2.67	**52.03**
2024 (Bridge)	37.76	7.16	5.63	2.20	**52.76**
2025 (Forecast)	44.44	7.70	6.53	2.84	**61.52**
2026 (Forecast)	46.61	8.08	6.85	2.98	**64.52**
2027 (Forecast)	48.42	8.39	7.11	3.09	**67.01**
2028 (Forecast)	52.62	9.12	7.73	3.36	**72.83**
2029 (Forecast)	54.17	9.39	7.96	3.46	**74.98**

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 8-SEC-123

Reference: Exhibit 8, Tab 1, Schedule 1, Tables 5-1, 5-2, & 5-3

Preamble:

With respect to Toronto Hydro's rate smoothing proposal:

QUESTION (A):

a) Please explain specifically what Toronto Hydro has done to smooth rates.

RESPONSE (A):

Please see response to 8-Staff-335.

QUESTION (B):

b) Please provide similar tables to 5-1, 5-2, 5-3 showing bill impacts before Toronto Hydro's rate smoothing proposal.

RESPONSE (B):

Toronto Hydro submits the table below to show the bill impacts before Toronto Hydro's rate smoothing proposal.

		Change in Bill	2025 Proposed	2026 Proposed	2027 Proposed	2028 Proposed	2029 Proposed	2025-2029 Average Annual Increase
Residential	Distribution Subtotal A	$/30 days	$5.15	$2.35	$1.94	$4.43	$1.80	$3.13
		%	12.1%	4.9%	3.9%	8.5%	3.2%	6.5%
	Total Bill (After Taxes & Rebate)	$/30 days	$2.85	$2.38	$1.97	$4.07	$1.82	$2.62
		%	2.0%	1.7%	1.4%	2.8%	1.2%	1.8%
Competitive Sector Multi-Unit Residential	Distribution Subtotal A	$/30 days	$0.22	$1.03	$0.80	$2.63	$0.81	$1.10
		%	0.6%	2.9%	2.2%	7.0%	2.0%	2.9%
	Total Bill (After Taxes & Rebate)	$/30 days	-$0.59	$1.04	$0.81	$2.25	$0.82	$0.87
		%	-0.8%	1.4%	1.1%	3.0%	1.0%	1.1%
General Service <50 kW	Distribution Subtotal A	$/30 days	$19.00	$6.62	$5.27	$11.71	$4.63	$9.45
		%	16.0%	4.8%	3.7%	7.8%	2.9%	7.0%
	Total Bill (After Taxes & Rebate)	$/30 days	$12.22	$6.71	$5.34	$11.45	$4.69	$8.08
		%	3.3%	1.7%	1.4%	2.9%	1.1%	2.1%
General Service 50-999 kW	Distribution Subtotal A	$/30 days	$317.83	$120.50	$103.45	$207.35	$105.57	$170.94
		%	17.6%	5.7%	4.6%	8.8%	4.1%	8.2%
	Total Bill (After Taxes & Rebate)	$/30 days	$19.76	$136.16	$116.90	$234.31	$119.29	$125.29
		%	0.1%	1.0%	0.8%	1.6%	0.8%	0.9%
General Service 1,000-4,999 kW	Distribution Subtotal A	$/30 days	$2,647.63	$1,100.29	$955.20	$1,709.85	$1,027.33	$1,488.06
		%	17.7%	6.3%	5.1%	8.7%	4.8%	8.5%
	Total Bill (After Taxes & Rebate)	$/30 days	-$826.50	$1,243.33	$1,079.38	$1,932.13	$1,160.88	$917.84
		%	-0.5%	0.8%	0.7%	1.3%	0.8%	0.6%
Large Use	Distribution Subtotal A	$/30 days	$13,413.44	$4,022.74	$5,778.50	$10,048.74	$5,794.31	$7,811.55
		%	17.4%	4.4%	6.1%	10.0%	5.3%	8.7%
	Total Bill (After Taxes & Rebate)	$/30 days	-$3,743.28	$4,545.70	$6,529.71	$11,355.08	$6,547.57	$5,046.95
		%	-0.6%	0.7%	1.0%	1.7%	0.9%	0.7%
Street Lighting	Distribution Subtotal A	$/30 days	$ 21,892.70	$ 10,838.30	$ 9,668.80	$ 19,016.70	$ 10,055.20	$14,294.34
		%	15.1%	6.5%	5.4%	10.1%	4.9%	8.4%
	Total Bill (After Taxes & Rebate)	$/30 days	$ 20,619.56	$ 12,247.28	$ 10,925.74	$ 21,488.87	$ 11,362.38	$15,328.77
		%	6.5%	3.6%	3.1%	5.9%	3.0%	4.4%
Unmetered Scattered Load	Distribution Subtotal A	$/30 days	$4.09	$1.78	$1.49	$3.32	$1.39	$2.42
		%	13.1%	5.0%	4.0%	8.6%	3.3%	6.8%
	Total Bill (After Taxes & Rebate)	$/30 days	$3.03	$1.80	$1.51	$3.37	$1.41	$2.22
		%	4.8%	2.7%	2.2%	4.8%	1.9%	3.3%

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 8-SEC-124

Reference: Exhibit 8, Tab 1, Schedule 1, Section 4

Why is Toronto Hydro not increasing its MicroFIT charge, to reflect the results of the Cost Allocation Model?

RESPONSE:

Toronto Hydro's calculated MicroFIT cost, determined by the cost allocation model, is $4.75 per month. Given that this figure is close to the default OEB rate of $4.55 per month,[1] Toronto Hydro chose not to request a distributor-specific charge.

[1] Letter Re: Review of Fixed Monthly Charge for MicroFIT Generator Service Classification OEB File Numbers EB-2009-0326 and EB-2010-0219, dated January 22nd, 2022

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 8-SEC-125

Reference: Exhibit 8

Please provide a table that shows, for each year between 2012 to 2029, and for each rate class, the, a) distribution monthly service charge, b) distribution volumetric charge, c) fixed group 2 DVA riders, and d) volumetric group 2 DVA riders.

RESPONSE:

Toronto Hydro submits 8-SEC-125, Appendix A and table 1 for the 2012-2029 distribution monthly service charge, distribution volumetric charge, fixed group 2 DVA riders, and volumetric group 2 DVA riders for each rate class.

Please note that amounts are based on a typical customer usage for each rate class.

TABLE 1 - 2012-2029 Sub-total A Breakdown

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 Proposed	2026 Proposed	2027 Proposed	2028 Proposed	2029 Proposed
	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)
Residential - 750 kWh																		
a) distribution monthly service charge	18.25	18.43	18.63	18.63	22.78	27.69	32.63	37.48	38.34	40.10	40.70	43.31	45.30	49.52	51.87	53.81	58.24	60.04
b) distribution volumetric charge	11.40	11.41	11.54	11.54	14.10	11.34	7.97	4.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c) fixed group 2 DVA riders	0.92	0.00	0.80	0.08	-0.07	0.20	0.38	2.03	-1.69	-2.38	-1.46	-2.61	-2.61	-3.59	-2.54	-0.76	-1.22	-0.16
d) volumetric group 2 DVA riders	0.00	1.90	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Competitive Sector Multi-Unit Residential - 300 kWh*																		
a) distribution monthly service charge		17.16	17.35	17.35	19.07	22.94	26.80	30.58	31.46	32.90	33.39	35.53	37.16	37.00	38.03	38.83	41.46	42.27
b) distribution volumetric charge		7.77	7.85	7.85	8.63	6.95	4.88	2.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c) fixed group 2 DVA riders		1.70	0.74	0.00	-0.34	-0.25	-0.07	0.51	-1.45	-1.82	-1.22	-1.67	-1.67	-2.78	-1.97	-0.59	-0.95	-0.12
d) volumetric group 2 DVA riders		0.00	0.32	0.00	0.00	0.00	0.00	0.38	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
General Service < 50 kW - 2,000 kWh																		
a) distribution monthly service charge	24.30	24.53	24.80	24.80	30.47	32.68	34.45	35.80	36.98	38.68	39.26	41.78	43.70	49.77	52.03	53.88	58.15	59.80
b) distribution volumetric charge	44.94	45.36	45.86	45.86	56.36	60.46	63.74	66.24	68.42	71.56	72.62	77.28	80.84	92.08	96.44	99.86	107.30	110.28
c) fixed group 2 DVA riders	1.37	1.74	10.34	5.60	8.25	2.59	2.59	2.59	0.11	-0.02	-0.13	-0.13	-0.13	0.00	0.00	0.00	0.00	0.00
d) volumetric group 2 DVA riders	0.00	1.82	1.90	0.00	-0.44	0.60	-1.22	3.24	-3.88	-1.66	-4.00	-5.92	-5.92	-9.18	-6.56	-2.22	-3.26	-0.60
General Service 50-999 kW - 200 kVA																		
a) distribution monthly service charge	35.56	35.90	36.29	36.29	43.82	47.00	49.55	51.50	49.14	51.40	52.17	55.52	58.07	65.29	68.37	70.92	76.75	79.12
b) distribution volumetric charge	1,119.12	1,129.90	1,142.32	1,142.32	1,379.40	1,479.54	1,559.74	1,621.04	1,578.44	1,650.90	1,675.50	1,783.06	1,865.08	2,136.32	2,253.74	2,354.64	2,556.16	2,659.36
c) fixed group 2 DVA riders	9.05	2.23	9.18	18.79	24.74	5.95	5.95	5.95	-0.21	-0.68	-0.47	-0.47	-0.47	0.00	0.00	0.00	0.00	0.00
d) volumetric group 2 DVA riders	0.00	45.86	69.74	0.00	5.50	32.11	13.70	60.68	-80.98	12.48	-87.50	-114.34	-114.34	-157.92	-112.00	-40.44	-55.12	-10.24
General Service 1,000-4,999 kW - 2,000 kVA																**1900 kVA**		
a) distribution monthly service charge	686.46	693.06	700.68	700.68	837.09	897.86	946.52	983.72	926.00	968.50	982.93	1,046.03	1,094.15	1,191.22	1,219.34	1,272.04	1,369.74	1,420.28
b) distribution volumetric charge	8,899.40	8,985.00	9,083.80	9,083.80	10,852.40	11,640.20	12,271.00	12,753.20	13,043.80	13,642.60	13,845.80	14,734.80	15,412.60	16,982.39	18,054.56	18,957.06	20,569.21	21,546.00
c) fixed group 2 DVA riders	70.49	30.51	29.83	0.00	24.37	24.37	24.37	24.37	-5.18	-5.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d) volumetric group 2 DVA riders	0.00	363.80	377.00	0.00	-230.20	-7.00	136.80	710.80	-557.00	20.80	-658.00	-860.40	-860.40	-1,261.41	-895.09	-333.64	-443.84	-89.87

Large Use - 9,700 kVA														**9200 kVA**				
a) distribution monthly service charge	3,009.11	3,038.05	3,071.47	3,071.47	3,694.97	3,963.22	4,178.03	4,342.23	4,099.14	4,287.29	4,351.17	4,630.52	4,843.52	5,138.68	5,054.54	5,360.88	5,935.46	6,127.89
b) distribution volumetric charge	45,983.82	46,426.14	46,936.36	46,936.36	56,463.70	60,562.92	63,845.40	66,354.79	68,545.05	71,691.73	72,759.70	77,431.22	80,993.06	87,265.68	91,372.56	96,844.72	106,318.88	111,920.76
c) fixed group 2 DVA riders	305.30	131.41	131.41	0.00	-1,092.75	535.88	111.02	111.02	-21.80	-21.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d) volumetric group 2 DVA riders	0.00	1,882.77	1,949.02	0.00	0.00	0.00	2,447.31	2,388.67	-3,138.92	1,747.94	-3,764.57	-4,921.78	-4,921.78	-5,286.32	-3,434.36	-648.60	-1,166.56	599.84
Street lighting - 2,700 kVA 16,000 Devices														**3000 kVA**		**17000 devices**		
a) distribution monthly service charge	20,800.00	20,960.00	21,120.00	21,120.00	21,920.00	23,520.00	24,800.00	25,760.00	24,960.00	26,080.00	26,400.00	28,160.00	29,440.00	35,020.00	36,720.00	38,080.00	41,140.00	42,500.00
b) distribution volumetric charge	77,556.96	78,302.97	79,164.27	79,164.27	82,196.37	88,163.91	92,942.37	96,594.93	93,947.04	98,259.21	99,723.15	106,125.39	111,007.26	137,826.60	146,964.90	155,273.70	171,230.40	179,925.60
c) fixed group 2 DVA riders	0.04	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d) volumetric group 2 DVA riders	639.96	3,939.78	4,073.97	0.00	-4,965.30	-4,101.03	-4,101.03	1,799.28	-6,070.95	-8,874.09	-6,618.51	-8,647.29	-8,647.29	-11,916.00	-10,477.20	545.10	-6,336.00	-1,165.20
USL - 285 kWh														**280 kWh**				
a) distribution monthly service charge (including per connection charge)	5.33	5.38	5.44	5.44	6.70	7.19	7.58	7.88	6.69	7.00	7.10	7.55	7.89	8.68	9.11	9.47	10.26	10.59
b) distribution volumetric charge	17.30	17.46	17.66	17.66	21.76	23.34	24.60	25.57	21.71	22.71	23.05	24.53	25.66	27.76	29.11	30.23	32.77	33.83
c) fixed group 2 DVA riders	0.09	0.23	0.23	0.00	0.09	0.24	0.24	1.36	-0.11	-0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d) volumetric group 2 DVA riders	0.00	0.72	0.74	0.00	0.00	0.00	0.00	0.00	-1.64	-2.26	-1.47	-1.92	-1.92	-2.26	-1.63	-0.63	-0.85	-0.22

Note 1: Consumption for some rate classes changes from 2025-2029

Note 2: Competitive Sector Multi-Unit Residential rates were first approved as part of 2013 Toronto Hydro Decision and Order (EB-2012-00-64)

1

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 8-VECC-91

Reference: Exhibit 8, Tab 1, Schedule 1, Page 4 (pdf)
Exhibit 8, Tab 1, Schedule 2

Preamble:

The Application states:

> "To determine Toronto Hydro's current fixed/variable split, consistent with previous applications, the utility applied 2025 forecast customer connection counts to anticipated 2024 rates to determine 2025 fixed revenue at 2024 rates. The utility subsequently applied 2025 forecast kWh and kVA billing determinants to anticipated 2024 rates, including variable distribution charges and adjustments for the transformer allowance, to determine the percentage of fixed and variable revenue relative to total revenue, by rate class." (emphasis added)

QUESTION (A):

a) If required, please revise Exhibit 8, Tab 1, Schedule 2 to reflect THESL's approved 2024 rates.

RESPONSE (A):

Toronto Hydro confirms that the approved rates are equal to the 'anticipated 2024 rates' outlined above.

QUESTION (B):

b) Exhibit 8, Tab 1, Schedule 2 does not appear to include adjustments to the variable revenues for the GS 50-999, GS 1,000-4,999 and Large Use classes to account for the transformer allowance. Please explain if/how the transformer allowance has been incorporated

RESPONSE (B):

The ratios are applied to the Revenue Requirement, as per Exhibit 8, Tab 1, Schedule 2. Following the split between fixed and variable revenues the transformer allowance is added to the variable revenues to then derive the final variable amount prior to developing the rates.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 8-VECC-92

Reference: Exhibit 8, Tab 1, Schedule 1, Page 6

QUESTION (A):

a) Please provide a revised version of Table 2 where the proposed rates for 2025 are not adjusted for the 30-day basis and are presented on a basis equivalent to the other values in the Table.

RESPONSE (A):

See Table 1 below.

Table 1: Fixed Charges: Floor and Ceiling

	Residential	CSMUR	GS<50 kW	GS 50-999 kW	GS 1000-4999 kW	Large Use	Street Lighting	USL
CA Model Floor	6.66	4.29	14.83	31.02	35.41	121.9	0.6	0.72
CA Model Ceiling	23.28	18.74	38.61	86.35	162.48	497.05	6.28	8.82
Proposed (2024)	45.93	37.68	44.31	58.88	1,109.35	4,910.79	1.87	7.25
Proposed (2025) (not adjusted for 30 days)	50.21	37.51	50.46	66.2	1207.76	5210.05	2.09	7.98

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 8-VECC-93

Reference: Exhibit 8, Tab 1, Schedule 1, Pages 9-10
RTSR Model, Tabs 3, 4 and 5

QUESTION (A):

a) Please confirm that both the RRR data in Tab 3 and the billing units in Tab 5 are based on data for the same year. If not confirmed, please indicate the basis for the data used in each Tab and update the RTSR Model as required.

RESPONSE (A):

Toronto Hydro confirms the data in Tab 3 (RRR data) and Tab 5 (Historical Wholesale) are based on data for the same year.

QUESTION (B):

b) Are the 2024 UTRs used in Tab 4 the same as those approved by the Board in EB-2023-0222. If not, please update the RTSR Model as required.

RESPONSE (B):

The 2024 UTRs used in Tab 4 are not the same as those approved by the Board in EB-2023-0222. The RTSR Model is based on Board approved rates in EB-2023-0101. Please see response to 8-Staff-332 for further details.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 8-VECC-94

References: Exhibit 8, Tab 1, Schedule 1, Pages 10-11 (pdf)

Preamble:

The Application states:

> "Furthermore, since the OEB updates RSCs annually, Toronto Hydro will flow through updated charges as part of the annual rates update process under the CRCI framework throughout the 2026-2029 rate period."
>
> And
>
> "Furthermore, since the OEB updates this charge (pole attachment) annually, Toronto Hydro will flow through updated charge as part of the annual rates update process under the CRCI framework throughout the 2026-2029 rate period."

QUESTION (A):

a) Will THESL also update the Other Revenues for the 2025-2029 period and the resulting base distribution revenue requirement to reflect the impact of any updates to the RSCs or the Pole Attachment charges?

RESPONSE (A):

Toronto Hydro proposes to update Other Revenue on an annual basis using the CRCI formula, in the same way that in the 2020-2024 period it is updating Other Revenue using the CPCI formula.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 8-VECC-95

Reference: Exhibit 8, Tab 1, Schedule 1, Pages 11-12
Appendix 2-R

Preamble:

The Application states:

> "Toronto Hydro is not proposing any changes to the current OEB-approved loss adjustment factors shown in Table 4."

QUESTION (A):

a) Based on the results set out in Appendix 2-R, please explain why THESL considers it appropriate not to update its loss adjustment factors.

RESPONSE (A):

The historical line losses are fluctuating within the range of 1.0256 to 1.0335 which aligns with the average of the OEB-approved line loss of 1.0295. (See the response to 8-Staff-333 Appendix A.) Toronto Hydro notes that any variances that accumulate between the actual and approved line losses are booked within the DVA to recover/ return to customers.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 8-VECC-96

Reference: Exhibit 8, Tab 1, Schedule 1, Page 13

Preamble:

The Application states:

> "As discussed in detail elsewhere in this application (e.g. Exhibit 1B, Tab 2, Schedule 1; Exhibit 2B; and Exhibit 4, Tab 1, Schedule 1), Toronto Hydro has incorporated consideration of rate impacts as part of its proposed capital and OM&A funding requests."
>
> And
>
> "Consistent with EB-2018-0165, Toronto Hydro proposes implementation of a rate smoothing methodology, aimed at assisting customers in managing bill impacts. Toronto Hydro's proposed rate smoothing plan offers several benefits: (i) it avoids a one-time step-change increase for most customers in the rebasing year (2025), while (ii) maintaining relatively consistent year-over-year annual increases for all customer classes."

QUESTION (A):

a) Does the rate smoothing methodology/plan proposed by THESL involve more than its incorporation of rated impacts as part of its proposed capital and OM&A funding requests? If yes, please explain what the methodology is and the impact it will have on smoothing year over year annual rate increases.

RESPONSE (A):

Please see the response to 8-Staff-335.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-336

References: Exhibit 9, Tab 1, Schedule 1, Page 12

THESL 2021 Audited Financial Statements, Note 8 Regulatory Balances

Preamble**:**

In section 4.4 of reference 1, Toronto Hydro states that they sold one of their surplus properties in 2021 resulting in an actual net gain of $1.6M.

In reference 2, the balance arising in 2021 relating to gains on disposals is $0.1M. In the 2020-2024 CIR decision and rate order, the incremental balance related to the actual realized gain and tax savings that exceeded the approved rate riders in connection with the disposal of the first two LDC properties was approved for disposition over a 22-month period commencing on March 1, 2020. The OEB also approved disposition of the actual realized gain and tax savings in connection with the disposal of the third property over a 22-month period commencing on March 1, 2020.

QUESTION (A):

a) Please explain and reconcile the difference in gains between reference 1 and reference 2.

RESPONSE (A):

Reference 1 relates to the Gain on Sale of Property Variance account which records both the actual gain on sale and the gain on sale embedded in rates. In 2021, Toronto Hydro realized a $1.6M gain from the sale of a property against the $1.0M gain embedded in rates. The balance arising in 2021 from this account is reported under the category “Other- Regulatory Balances” in the THESL 2021 Audited Financial Statements, Note 8 Regulatory Balances.[1]

[1] As noted in the response to 3-SEC-85, Toronto Hydro identified a correction to Table 8 on Exhibit 9, Tab 1, Schedule 1 at page 12 . Please see that response for the corrected table.

The properties discussed in Reference 2 pertains to the sale of properties as a result of the "Operating Centers Consolidation Program" and the "Gain on Sale – 50/60 Eglinton Avenue" accounts. These accounts were approved for disposition in EB-2018-0165. The balance arising in 2021 – $0.1M credit – pertains to the related carrying charges on the net principal balance which were approved for disposition commencing March 1, 2020.

QUESTION (B) :

b) Please confirm whether there are any residual balances to be disposed of from the sale of the three properties noted above.

RESPONSE (B):

There is a residual balance in relation to the Operating Centers Consolidation Program of $2.0 million (debit) which is included in the updated Group 2 account continuity schedule. The residual balance comprises $1.7 million that reflects an overpayment to rate payers, plus $0.3 million for related carrying charges. Due to the timing of the drawdown in January 2019 and the submission for the 2020-2024 CIR application, there was a balance of $1.7 million that was not included in the forecasted amount. This was also addressed in EB-2022-0065 Decision and Order, December 8, 2022, page 15 and 16. There are no other residual balances for the other two properties noted in Reference 2.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-337

Reference: Exhibit 9, Tab 1, Schedule 1, Pages 19-20

Preamble:

In 2018, Toronto Hydro disposed of its property at 5800 Yonge, resulting in a giveback to customers in the current 2020-2024 rate period of $73.7 million based on the fair market value payment that it received for this property. The gain on sale of 5800 Yonge was recorded in Account 1508 subaccount Variance Account for Gains on Sale of Properties Related to the Operating Centres Consolidation Program ("OCCP"), established by the OEB in the 2015-2019 rate application.

In addition to the fair market value of this property, a variable consideration ("bonus payment") was incorporated into the Agreement of Purchase and Sale ("APS") based on the potential increase in gross floor area as a result of zoning bylaw applications submitted by the purchaser. The increase in gross floor area was achieved and Toronto Hydro intends to return this variable consideration (bonus payment) to ratepayers to offset rate pressures in the 2025-2029 period, through the OCCP variance account. The amount proposed for clearance is a $33.4 million credit to customers.

Toronto Hydro requests the continuation of this variance account in the 2025-2029 period as there may be further variable consideration available to the utility under the APS.

QUESTION (A):

a) Given that the sale of 5800 Yonge occurred in 2018, please discuss what involvement Toronto Hydro still has with the property.

RESPONSE (A):

Toronto Hydro continues to monitor for new municipal permits and approvals, including any additional zoning applications with respect to the property, in order to determine any amounts of

variable consideration payable to Toronto Hydro in accordance with the provisions of the Agreement of Purchase and Sale ("APS").

QUESTION (B):

b) Please discuss what other variable considerations might be available to the utility under the APS.

RESPONSE (B):

Depending upon new zoning approvals associated with the 5800 Yonge property, further variable consideration may be available under the APS, however, Toronto Hydro deems this to be very unlikely.

QUESTION (C):

c) Does Toronto Hydro expect to realize any further variable considerations in the future? Are these considerations forecasted in the 2025-2029 revenue requirement?

RESPONSE (C):

Please refer to the response to subpart (b). Toronto Hydro did not incorporate any additional considerations in its 2025-2029 revenue requirement forecast because the utility deems such a scenario to be very unlikely.

QUESTION (D):

d) Please confirm whether Toronto Hydro has variable considerations with a purchaser on any other properties.

RESPONSE (D):

Yes, please refer to Exhibit 9, Tab 1, Schedule 1 at page 42, lines 9-14.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-338

References: **THESL_9_T01_S01_App A - Calculation of Useful Life Change Impacts_20231117.xls**
THESL_2A_T01_S02 - OEB Appendix 2-BA_20231117.xls

Preamble:

OEB staff notes a disposal amount of $454,416 for 2023 in reference 1. This amount agrees to the disposal amount for land in reference 2.

QUESTION (A) AND (B):

a) Please discuss why the disposal amount is positive rather than negative.
b) Please describe what the $454,416 relates to.

RESPONSE (A) AND (B):

Refer to the Note 10 found in year 2023 of Appendix 2-BA in Exhibit 2A, Tab 1, Schedule 2. The positive disposal value reflects a reversal/correction of land assets that were erroneously written off historically due to the naming convention used in the fixed asset register associated with this property which was originally acquired in 1995.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-339

References: Exhibit 9, Tab 1, Schedule 1, Pages 28-29

EB-2018-0165 Exhibit U, Tab 9, Schedule 1, Page 5, filed April 30, 2019

Preamble**:**

The Capital-Related Revenue Requirement Variance Account (CRRRVA) records the variance between the capital-related revenue requirement included in rates and the actual capital related revenue requirement (excluding balances captured in the Externally Driven Capital Variance Account).

The CRRRVA is an asymmetrical account in that it only records for disposition variances that result in a credit (refund) to customers. In the OEB's Decision and Order dated December 19, 2019 for EB-2018-0165, the OEB agreed with Toronto Hydro's proposal to dispose of ($88.4M) in a credit to ratepayers for the CRRRVA.

In reference 2, Toronto Hydro proposes to discontinue this account in the 2025-2029 rate period as it has proven over the last two custom rate periods (i.e. 2015-2019 and 2020-2024) its ability to deliver multi-year capital programs within very reasonable margins of variance. To protect customers against utility overearnings, Toronto Hydro proposes to continue the Earnings Sharing Mechanism approved in the last rate application. Furthermore, the utility proposes to track variances in capital expenditures that have a higher degree of sensitivity or variability due to external factors through the proposed Demand-Related Variance Account ("DRVA").

QUESTION (A) AND (B):

a) Please provide a table showing $ amount in debits or credits in the CRRRVA for the 2015-2019 period.

b) Please discuss why it is appropriate to discontinue the CRRRVA in light of the significant historical variance noted in EB-2018-0165.

RESPONSE (A) and (B):

Table 1 below summarizes the annual credits CRRRVA in the 2015-2019 period. The ending balance over the 2015-2019 rate period was $74.7M[1] credit to customers. However, a significant portion of this balance was driven by an adjustment related to the correction of metering useful lives,[2] which was unrelated to the execution of the plan. When normalized for the metering adjustment, the remaining balance in the 2015-2019 account was approximately $37.9 million. This remaining balance was driven by changes in the mix and timing of assets coming into service later than forecasted, in part due to the timing of the OEB's decision. Overall Toronto Hydro delivered the in-service additions associated with the 2015-2019 capital plan within a 2% variance from the forecast. In the current 2020-2024 rate period, Toronto Hydro has no balance in the CRRRVA and in-service additions are forecasted to be within a 1.1 per cent variance,[3] further demonstrating Toronto Hydro's ability to successfully deliver its capital work program.

Table 1: CRRRVA for the 2015-2019 period ($ Millions)

	2015	2016	2017	2018	2019
Opening Balance-Credit	**-**	**2.7**	**8.5**	**22.7**	**52.8**
Debits	-	-	-	-	-
Credits	2.7	5.8	14.3	30.1	21.8
Ending Balance-Credit	**2.7**	**8.5**	**22.7**	**52.8**	**74.7**

[1] See EB-2018-0165, Draft Rate Order (Updated: February 12, 2020), Schedule 13, page 9
[2] See EB-2018-0165, Exhibit 9, Tab 1, Schedule 1 at page 10.
[3] See Exhibit 2A, Tab 1, Schedule 1 at page 3; and Exhibit 9, Tab 1, Schedule 1, Section 5.2

QUESTION (C) :

c) Please discuss how the Demand Related Variance Account will offer the same or similar amount of protection to the ratepayer as the CRRRVA for the rate period 2025-2029, if the CRRRVA was discontinued.

RESPONSE (C):

As noted in the evidence at Exhibit 1B, Tab 2, Schedule 1 starting on page 36, the DRVA covers programs that are subject to greater degrees of uncertainty and variability based on a confluence of external factors that can affect customer demand in the next rate term. By being able to isolate and manage variances in these demand-driven programs from the rest of the investment plan, the DRVA provides a similar (and arguably greater) amount of protection to ratepayers than the CRRRVA did over the current rate period. In circumstances where demand-driven investments are lower than planned, the subaccount protects ratepayers by ensuring that (i) they do not pay for demand-driven work that can be deferred, and (ii) funds are not repurposed to manage variances in other aspects of the plan that are not driven by demand. Similarly, in circumstances where demand-related investments are higher than planned, the subaccount enables Toronto Hydro to respond to these externally-driven needs without having to defer other priority work within the plan and put key customer outcomes such as reliability and resiliency at risk.

QUESTION (D) :

d) Please provide the amount of capital forecasted to be included in the DRVA in comparison to the CRRRVA (assuming it continues) for the period 2025-2029.

RESPONSE (D):

Please see Table 2.

Table 2: DRVA Capital Expenditures vs. CRRRVA Capital Expenditures ($ millions)

	2025	2026	2027	2028	2029	Total
DRVA Capital Expenditures	164.8	163.6	166.8	195.8	206.4	897.4
CRRRVA Capital Expenditures	532.0	566.8	618.3	601.1	567.2	2,885.4

QUESTION (E)

e) Please discuss Toronto Hydro's thoughts on continuing the CRRRVA if its request to establish the PIM-DA, DRVA and IFVA are not granted.

RESPONSE (E):

Toronto Hydro stands behind its proposal to discontinue the asymmetrical CRRRVA irrespective of whether the other accounts are approved. If the DRVA and the other accounts are not granted as requested, Toronto Hydro requires even greater flexibility to manage the plan and deliver its performance objectives within the rates set. The asymmetrical CRRRVA limits flexibility to adapt the plan to respond to greater uncertainty and more dynamic business conditions that the utility faces in the next rate term. It could also create an improper incentive for the utility to prioritize capital investment over other solutions enabled by technology which may offer new and innovative ways to address grid needs and business requirements.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-340

References: Exhibit 9, Tab 1, Schedule 1, Page 42

Decision and Order EB-2018-0165, Page 188

Preamble**:**

In the 2020-2024 rate application (EB-2018-0165), Toronto Hydro requested approval to clear forecasted net gains on the sale of property at 50/60 Eglinton Avenue through a rate rider without a deferral or variance account. The OEB accepted the disposition of relevant amounts, noting that although the proposed refund of the proceeds of sale from the Eglinton property and other amounts is appropriate, the OEB may not permit in the future the disposition of a regulatory balance without an approved account.

In addition to the sale proceeds previously refunded to ratepayers, Toronto Hydro received a variable consideration (bonus payment) from the purchaser, based on the terms of the relevant agreement of purchase and sale, which stipulate additional consideration to the utility where the purchaser achieves an increase in gross floor area as a result of zoning bylaw applications. Toronto Hydro intends to return this variable consideration (bonus payment) to ratepayers in the 2025-2029 period.

Toronto Hydro is requesting to clear an estimated $10.2 million credit to customers.

QUESTION (A):

a) Please discuss why it is appropriate to create another subaccount for the 50/60 Eglinton bonus payment when a generic gain on sale of property subaccount has already been established.

RESPONSE (A):

Toronto Hydro proposed a separate sub-account to be responsive to the OEB's comment in the last decision. The utility has no particular preference for which account should be used to capture this material incremental benefit to customers, and thus defers to the Staff's view on this matter.

QUESTION (B):

b) Please discuss what other terms of contract might allow rate payers to receive variable consideration in the future.

RESPONSE (B):

If the gross floor area currently approved is further increased as a result of a variance, zoning by-law, official plan amendment or other binding approval within the 2025-2029 period, Toronto Hydro would be entitled to further variable consideration. The exact amount would be dependent on the additional gross floor area achievable by virtue of the further approval.

QUESTION (C):

c) When does Toronto Hydro expect to finalize the bonus payment amount to customers?

RESPONSE (C):

With respect to further variable consideration described in (b) above, Toronto Hydro notes that whether additional bonus payments can be unlocked is entirely contingent on the factors outlined above in (b). At this time, Toronto Hydro has no knowledge or evidence that any of these factors would be met. However, in the unlikely (but possible) event that there is a variance, zoning by-law, or official plan amendment that unlocks additional bonus payments, Toronto Hydro intends to return these bonus payments to ratepayers during the 2025-2029 period by bringing forward a request for disposition through the annual rate update process.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-341

References: Exhibit 9, Tab 1, Schedule 1, Page 40

Exhibit 1B, Tab 2, Schedule 1, Pages 29-33

Chapter 2 Filing Requirements Cost of Service, Section 2.9.2 dated Dec 15, 2022

Preamble**:**

Toronto Hydro's rate framework proposes a proactive 0.6 percent performance incentive factor that further reduces revenues by approximately $65 million over the rate term, providing customers an additional upfront rate reduction. The performance incentive mechanism ("PIM") is linked with the 2025-2029 Custom Scorecard detailed in Exhibit 1B, Tab 3, Schedule 1. Toronto Hydro proposes to defer the finalization of the targets to a second phase of this proceeding that can be run in parallel with the Draft Rate Order process. The PIM deferral account ("PIM-DA") would record the earnings and would be brought forward for revenue and disposition in next rebasing app.

In the event a distributor seeks an accounting order to establish a new DVA, the distributor must file evidence demonstrating how the following eligibility criteria have been met:

• Causation: the forecast amount to be recorded in the proposed account must be clearly outside of the base upon which rates were derived.

• Materiality: the annual forecast amounts to be recorded in the proposed account must exceed the OEB-defined materiality threshold and have a significant influence on the operation of the distributor, otherwise they must be expensed or capitalized in the normal course and addressed through organizational productivity improvements.

• Prudence: the nature of the amounts and forecast quantum to be recorded in the proposed account must be based on a plan that sets out how the amounts will be reasonably incurred, although the final determination of prudence will be made at the time of disposition. For any costs incurred, in terms of the quantum, this means that the distributor must provide evidence

demonstrating that the option selected represented a cost-effective option (not necessarily least initial cost) for ratepayers.

QUESTION (A):

a) Please discuss the PIM-DA considering the 3 eligibility criteria above.

RESPONSE (A):

The PIM-DA atisfies the OEB's criteria as follows:

- **Causation:** the PIM related revenue to be recorded in this account is clearly outside of the base upon which rates were derived. As noted in the evidence, the PIM is tied to a 0.6% incentives as part of the proposed X-Factor in the Custom Revenue Cap Index, which proactively reduces the revenue that the utility is able to collect through its base rates. Further, the recording and recovery of any amounts in the PIM-DA is uncertain, and will depend on Toronto Hydro's performance and ability to meet pre-defined targets. This uncertainty confirms that amounts in the PIM-DA are outside the basis on which rates have been calculated.
- **Materiality**: the PIM related revenue that would be recorded in this account if the utility achieves its targets is $65 million, which well exceeds the OEB-defined materiality threshold applicable to Toronto Hydro, and has a significant influence on the operation of the distributor.
- **Prudence**: the PIM related revenue that would be recorded in this account is tied to the prudence of the 2025-2029 Investment Plan (and resulting revenue requirement) which is being evaluated in this rate application. Furthermore, the detailed evidence in Exhibit 1B, Tab 3, Schedule outlines the specific measures and targets that are tied to the proposed PIM, and provides the relative weights of each measure to the overall incentive amount available under the PIM. This evidence also explains and quantifies (where possible) the customer benefits of achieving the target performance.

QUESTION (B):

b) What other alternative approaches were considered for achieving the objectives of the PIM that did not make use of a deferral account?

RESPONSE (B):

To that end, since a deferral account is a commonly used mechanism in utility rate regulation,[1] Toronto Hydro did not consider any alternative approaches capturing the revenues related to the PIM. In developing the custom rate framework, Toronto Hydro sought to apply established utility rate regulation approaches (wherever possible) in order to ensure that the elements and mechanisms of the proposed custom rate framework proposal are (1) structurally aligned with existing policies, practices and conventions[2] and (2) can be efficiently tested by the OEB and interested parties.

[1] In utility rate regulation, a deferral account is a financial mechanism used to track certain costs or revenues that are deferred for future recovery or adjustment. These accounts are established by regulatory authorities and are part of the regulatory framework designed to ensure fairness, transparency, and the proper allocation of costs and benefits among utility customers.

[2] E.g. long-standing practice of utilizing a Demand-Side Management Incentive Deferral Account ("DSMIDA") to record and dispose of shareholder incentive payments to natural gas distributors

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-342

References: **Exhibit 9, Tab 1, Schedule 1, Page 41**
Exhibit 1B, Tab 2, Schedule 1, Pages 33-35
Exhibit 1B, Tab 4, Schedule 2
THESL_9_T03_S01 - Rate Rider Table_20231117.xls

Preamble**:**

Toronto Hydro proposes to establish an Innovation Fund to support the design and execution of innovative pilot projects over the 2025-2029 rate period. The pilot projects undertaken through the Innovation Fund would be focused on testing new technologies, advanced capabilities and alternative strategies that enable electrification grid readiness and are responsive to the OEB's expectations with respect to facilitating DER integration, as expressed in the Framework for Energy Innovation (FEI) report.

Toronto Hydro proposes to collect an amount of $16M through a rate rider rather than through base rates to provide transparency to ratepayers on the bill and flexibility to the utility to determine how the funds should be allocated across capital and operational expenditures on the basis of the selected pilot projects. Toronto Hydro proposes to establish a new symmetrical variance account to record variances between the amounts collected by the rate rider and the actual costs incurred to execute the selected pilot projects as part of the Innovation Fund.

Toronto Hydro expects to collect the $16M during 2029.

QUESTION (A):

a) Please elaborate on the rate mechanism of Toronto Hydro's collection of the $16M fund in 2029 and how it plans to track the variance, given that the funding will be collected in

2029.

i. Please discuss why it is appropriate for the IFDA to be symmetrical.

RESPONSE (A):

The rate mechanism of Toronto Hydro's collection for the Innovation Fund consists of a rate rider (IFRR) and variance account (IFVA). The rate rider will recover an amount equivalent to 0.3% of the total revenue requirement approved by the OEB for 2025-2029. Assuming that the full revenue requirement that is being asked for gets approved, the rate rider will recover approximately $16 million. The Innovation Fund Variance Account (IFVA) will track variances between the revenues collected through the Innovation Fund Rate Rider and the actual costs incurred (i.e. revenue requirement) by the Innovation Fund pilot projects by the end of the rate period.

As depicted in the Rate Rider table in Exhibit 9, Tab 3, Schedule 1, there are no revenues being collected through the Innovation Rate Rider in years 2025-2028, meaning that the balance in this account will be in a debit position during this period of time. In 2029 when the rate rider revenues are being collected from customers, they will be applied as a credit to reduce the balance in the account. At the end of the rate term, the delta between the total revenue requirement booked in this account over the 2025-2029 rate term (inclusive of carrying charges) and the total revenues collected through the Innovation Fund Rate Rider, will be reconciled. The account will be brought forward for disposition in the 2030+ rebasing application.

Toronto Hydro considers it appropriate for the IFVA to be symmetrical because it is consistent with the intent of the Innovation Fund, which is to provide the flexibility needed to undertake innovative pilot projects by overcoming barriers s discussed at page 4 of the Innovation Fund evidence.This, coupled with the fact that Toronto Hydro is proposing a level funding that is at the lower end of the range identified through its research, leads Toronto Hydro to view symmetrical treatment of the variance account as providing Toronto Hydro with the necessary flexibility to pursue promising opportunities without being constrained by a "hard cap". That said, Toronto Hydro faces significant

regulatory oversight risk for overspending, and as such does not intend to stray far outside of its boundaries, unless there is a strong value proposition for doing so.

QUESTION (B):

b) Please elaborate how external stakeholders will be involved in the execution and evaluation phases of the pilot projects selected.
i. Please confirm whether the steering committee members mentioned in reference 3 will involve external stakeholders, and the proposed composition of the committee of external to internal stakeholders.

RESPONSE (B):

Please see Toronto Hydro's responses to interrogatories 1B-CCC-46 part (a) and 1B-DRC-06 part (i).

QUESTION (C) :

c) Please discuss any quantifiable goals and outcomes Toronto Hydro can establish for the pilot projects.

RESPONSE (C):

As stated in the Innovation Fund evidence, "*a key component of the design phase is to maximize Toronto Hydro's ability to learn and develop new distribution capabilities*." To do this, pilot project owners set outcomes, which include learning objectives for each pilot project independently. The evidence further states that these may include (a) developing an understanding of the business case, (b) defining and testing a "theory of operation", and (c) further exploring use cases with a focus on ratepayer benefit. In addition to these qualitative objectives, pilot project owners may set outcomes using quantitative measures if suitable for a given pilot project. For more information see Exhibit 1B, Tab 4, Schedule 2.

QUESTION (D):

d) Please discuss any evidence demonstrating the utility's current limitations in funding and executing innovative pilot projects without the establishment of the Innovation Fund.

RESPONSE (D):

Please see the Innovation Fund evidence in Exhibit 1B, Tab 4, Schedule at page 4, lines 6 to 26.

QUESTION (E):

e) Please explain why the total balance for disposition is presented as $19,380,781 in Reference 4 where other references indicate a proposal for a $16 million fund.

RESPONSE (E):

Toronto Hydro has reviewed and modified its proposal based on the approach outlined above in part (a). For clarity, Toronto Hydro no longer proposes to apply carrying charges to the rate rider. Rather, the rate rider will be set based on the proposed/approved funding amount ($16 million), and carrying charges will be applied as actual amounts are booked in the account year over year.

QUESTION (F) :

f) Please provide reference(s) whereby a utility established a variance account that: had a balance at inception, costs were not yet incurred, and there was no forecast provided of expected costs.

RESPONSE (F):

Toronto Hydro has clarified its proposal with respect to the Innovation Fund Rate Rider and variance account in the responses to parts (a) and (e) above. With these clarifications provided, the question is no longer relevant as: 1) there is no balance in the IFVA at inception; 2) any balances that will be tracked in the IFVA would be based on the actual costs incurred; and 3) the forecast of expected cost is the proposed/approved $16 million Innovation Fund allotment.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-343

References: Exhibit 9, Tab 1, Schedule 1, Pages 40-41
Exhibit 1B, Tab 4, Schedule 2
Exhibit 9, Tab 1, Schedule 1, Pages 28-29

Preamble**:**

Toronto Hydro seeks approval to establish a new symmetrical variance account for demand related variances related to structural unknowns in forecasted costs and revenues. Subject to OEB approval, Account 1508 - Demand-Related Variance Account (DRVA) would record:

(i) the demand-driven revenue requirement impacts arising from variances in actual versus forecast capital and operational expenditures for certain demand-based programs; and

(ii) (ii) the revenue impacts arising from variances in (1) forecast versus (2) actual weather normalized billing determinants (customer count, kWh and kVA) over the rate period.

To that end, the account would consist of two subaccounts:

1. The Expenditure Variance subaccount would record the symmetrical revenue requirement impacts, including PILs, arising from the variance between the forecast expenditures for the 2025-2029 period and actual expenditures related to the following capital and operations programs: Customer Connections, Customer Operations, Stations Expansion, Load Demand, Non-Wires Solution, Generation Protection Monitoring and Control and Externally-Initiated Plant Relocations & Expansions (collectively “Demand-Related Investments”).

2. The Revenue Variance subaccount would record the revenue impacts resulting from weather-normalized variances in billing determinants (e.g. customer count and billed demand).

QUESTION (A):

a) Please discuss in detail what information is missing currently to allow THESL to build a reasonably accurate forecast related to demand for the 2025-2029 period.

RESPONSE (A):

Toronto Hydro stands behind the accurate reasonability of its forecasts as presented in this application. The purpose of the DRVA is protect customers and the utility from structural forecasting risks in a time of unprecedented uncertainty with respect to future demand. Please refer to Exhibit 1B, Tab 2, Schedule 1 at pages 35-47 for detailed evidence supporting the basis for DRVA.

RESPONSE (B):

b) Considering Toronto Hydro's statement in reference 4, "Toronto Hydro proposes to discontinue [the CRRRVA] account in the 2025-2029 rate period as it has proven over the last two custom rate periods (i.e. 2015-2019 and 2020-2024) its ability to deliver multi-year capital programs within very reasonable margins of variance." Please discuss how the basis for discontinuing the CRRRVA is not contradictory to establishing the DRVA.

RESPONSE (B):

The CRRRVA was established in the first Custom IR application (EB-2014-0116) to address concerns about underspending related to the utility's ability to execute the five-year capital work program funded through rates.[1] The CRRRVA was not established to address variability in demand-related investments. As such, the basis for discontinuation of the CRRRVA is distinct from the basis for establishment of the DRVA, which is discussed above in the response to part (a) and the pre-filed evidence cited therein.

QUESTION (C):

c) Please discuss in detail how Toronto Hydro intends to support the prudency of the expenditures in this account.

[1] EB-2014-0116, Decision and Order (December 29, 2015) at pages 52-53.

RESPONSE (C):

The prudency of expenditures in this account will be supported by detailed evidence, which will be filed in the 2030 rebasing application. The specific evidence to be brought forward to support prudency will be assessed on the basis of the facts and circumstances surrounding the nature of variances in expenditures that are booked in this account.

Throughout the rate term, Toronto Hydro will leverage its Investment Planning and Portfolio Reporting (IPPR) process and supporting financial, legal and regulatory oversight management systems noted in the evidence at Exhibit 2B and Exhibit 4, Tab 2, Schedules 16 and 18 to manage the prudence of investment decisions with respect to the capital and operational program budgets that would be tracked in this account over the 2025-2029 rate term.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-344

Reference: Exhibit 9, Tab 1, Schedule 1, Pages 34-35

EB-2018-0165, Decision and Order, Pages 190-193

Preamble:

In the Decision and Order for EB-2018-0165, the OEB agreed that the ESM methodology applied by THESL only reflected changes in non-capital related revenue requirement (OM&A and revenue offsets). The OEB accepted the submission by intervenors in that proceeding that changes in both costs and revenues (including changes in load relative to forecast amounts) should be added to the ESM definition.

QUESTION (A):

a) In reference 1, Toronto Hydro provided Table 18 with the 2019 ESM calculation that included OM&A and revenue offsets. Please update the ESM calculations for 2019 through 2022 to include changes in revenue and provide supporting schedules.

RESPONSE (A):

Please see the table below and supporting calculations for the 2019 ESM calculation that includes revenue.

Toronto Hydro notes that the 2020-2022 ESM calculation is identical to what was provided in the referenced pre-filed evidence at Table 17, as the methodology for 2020-2024 ESM was modified in EB-2018-0165 to include revenues.

Table 1: 2019 ESM Calculation using ESM Methodology Approved in EB-2018-0165

2019 RRR 2.1.5.6 ROE (updated methodology)		**($ Millions)**
Regulatory net income from RRR	P	154.0
Adjustments in OM&A and revenue offsets included in rates	**Q= D+E**	**0.5**
Other adjustments to income not related to OM&A and revenue offsets:		
Interest Expense adjustments to deemed interest expense	S	(23.8)
Deduct other out-of-period (revenue) / expense	T	(0.4)
Payments-in-lieu of taxes adjustments	U	17.5
Subtotal	**V (S+T+U)**	**(6.7)**
Total Adjustment to RRR net Income	**W=Q+V**	**(6.2)**
2.1.5.6 Adjusted Net Income	X=P+W	147.8
2.1.5.6 Adjusted Deemed Equity	M	1,751.8
2.1.5.6 ROE	**Y=X/M**	**8.44%**
ROE Approved	Z	9.30%
ROE Over (Under)	**Y Compared to Z**	**(0.86%)**

QUESTION (B):

b) Please discuss any differences with Toronto Hydro's filings of RRR 2.1.5.6 for 2019-2022.

RESPONSE (B):

There are no differences with Toronto Hydro's filings of RRR 2.1.5.6 for 2020-2022 as the RRR has been reported consistently with the methodology approved in EB-2018-0165.

The 2019 ESM calculation in response to part (a) is not comparable to what was in RRR for that period because the methodology for the 2015-2029 ESM (approved in EB-2014-0116) is not the same as the methodology in part (a).

QUESTION (C):

c) Please provide the actual 2023 ESM and ROE.

RESPONSE (C):

The preliminary 2023 ROE was 6.80 percent (cumulative ROE for 2020 – 2023 was 6.82 percent) and the ESM was (1.70 percent) under the approved ROE of 8.52 percent. This will be finalized and filed for the 2023 reporting year on April 30, 2024 per the RRR Filing Guide.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-345

References: Exhibit 9, Tab 1, Schedule 1, 37

Exhibit 9, Tab 3, Schedule 1, Rate Rider Table

QUESTION (A):

a) OEB staff notes that the renewal generation connection funding adder deferral account of ($7.4M) is missing from the rate rider table in reference 2. Please confirm that Toronto Hydro seeks disposition of this account and the disposition to each class by updating the evidence.

RESPONSE (A):

Toronto Hydro notes that that variance of $7.4 million forecasted within account 1533 Renewable Generation Connection Funding Adder represents the difference between payments received from the IESO based on approved revenue requirement[1] and actual revenue requirement. These amounts were not included in rates as they are provincially funded. Toronto Hydro intends to clear the balances directly with the IESO similar to how the balances associated with 2015-2019, which were payable to the IESO, were cleared in May 2020.

[1] EB-2019-0279, EB-2020-0238, EB-2021-0303, EB-2022-0270, and EB-2023-0267.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-346

References: OEB Accounting Procedures Handbook Guidance issued on March 2015 APH_Guidance_March2015 (oeb.ca), Question 10, Pages 10-13
Exhibit 9, Tab 2, Schedule 1, THESL_9_T02_S01-Continuity_Schedule_20231117, Tab 2b Continuity Schedule

Preamble:

On page 11, Reference 1 states "The following is the account description for Account 1533 Renewable Generation Connection Funding Adder Deferral Account.

This account is used to record the Provincial Rate Protection payments under O. Reg. 330/09 at the end of each fiscal year. The account will include the net of
I. The annual revenue requirement impact on an actual basis applicable to in-service capital assets, depreciation, and incurred OM&A expenses, eligible for Provincial Rate Protection, AND
II. Provincial Rate Protection payments, as approved by the Board, and received from the IESO in that year."

On page 12 Paragraph (A), Reference 1 states:
"No carrying charges are to be recorded on the balance in Account 1533, Sub-account Provincial Rate Protection Payment Variances".

QUESTION (A)

a) Please confirm that Toronto Hydro has complied with the March 2015 Accounting Guidance on Account 1533, specifically:
    i. If the transaction debits/(credits) recorded in the Account 1533 continuity schedules represent the net of annual revenue requirement on the actual basis and the IESO payments for the year. If the transaction debts/(credits) recorded

in the Account 1533 does not represent the net difference as referred in the March 2015 Accounting Guidance, please explain in detail what the transaction debits/(credits) represent.

RESPONSE (A):

Toronto Hydro confirms the transaction debits/(credits) recorded in the Account 1533 continuity schedule represent the net of annual revenue requirement on the actual basis and the IESO payments for the year.

QUESTION (B):

b) Please confirm that there is no interest recorded in all continuity schedules of Account 1533.

ii. If not, please write off the interest recorded in all continuity schedules of Account 1533, given the direction in the March 2015 Accounting Guidance.

RESPONSE (B):

Toronto Hydro confirms that there is no interest recorded for Account 1533 in the continuity schedule

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-347

Reference: THESL_9_T02_S01-Continuity_Schedule_20231117.xls

QUESTION (A):

a) OEB staff notes closing interest amounts in Exhibit 9, Tab 2b Continuity Schedule for 2023, in BV48 of ($115,161,484), BV70 of ($115,161,484) and BV72 of ($42,159) which appear to be hard coded into the schedule in error. Please confirm and update the evidence accordingly.

RESPONSE (A):

These were hard coded into the schedule in error. Refer to the response to 9-Staff-349 for the updated Continuity Schedule for 2023.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-348

References: Exhibit 9, Tab 1, Schedule 1, Updated December 19, 2023, Page 19
Exhibit 9, Tab 2, Schedule 1, Excel Model - THESL_9_T02_S01
Continuity_Schedule_20231117, Tab 2b Continuity Schedule

Preamble:

Table 11 in reference 1 shows the approved revenue requirement amounts for Renewable Enabling investments from 2020 to 2024. OEB staff uses this information to produce a table below comparing the approved revenue requirement amounts from Table 11 and the OEB's previously approved RGCRP funding amounts for Toronto Hydro shown below.

	Table 11 (Ref 1) ($ Millions)	OEB Decisions ($)	EB#
May 1 – Dec 31, 2026	-	$1,173,258	EB-2016-0170
2017	-	$1,514,587	EB-2017-0004
2018	-	$2,068,451	EB-2017-0370
2019	-	2,627,506	EB-2018-0295
2020	1.5	1,448,698	EB-2019-0279
2021	2.2	2,311,021	EB-2020-0238
2022	2.6	2,673,671	EB-2021-0303
2023	3.0	2,998,066	EB-2022-0270
2024	3.3	3,247,440	EB-2023-0267

OEB staff notes that there are some discrepancies between the approved revenue requirement amounts in Table 11 and the OEB's previously approved decisions from 2020 to 2024.

QUESTION (A):

a) Please explain the discrepancies.

RESPONSE (A):

The discrepancies are due to rounding errors. Please see the table below with the updated figures.

Table 1: OEB Table for Comparing the Approved Revenue Requirement Amounts from Table 11 and the OEB's Previously Approved RGCRP Funding Amounts

	Table 11 (Ref 1) ($ Millions)	OEB Decisions ($)	EB#
May 1 – Dec 31, 2026	-	$1,173,258	EB-2016-0170
2017	-	$1,514,587	EB-2017-0004
2018	-	$2,068,451	EB-2017-0370
2019	-	$2,627,506	EB-2018-0295
2020	$1,448,698	$1,448,698	EB-2019-0279
2021	$2,311,021	$2,311,021	EB-2020-0238
2022	$2,673,671	$2,673,671	EB-2021-0303
2023	$2,998,066	$2,998,066	EB-2022-0270
2024	$3,247,441	$3,247,440	EB-2023-0267

QUESTION (B):

b) Please revise the evidence (e.g. the amounts recorded in Account 1533 in reference 2) to reflect the OEB's approved revenue requirement amounts as needed.

RESPONSE (B):

Please see updated Table 11 below with the rounding corrected. Toronto Hydro notes that approved revenue requirement amounts included in Account 1533 are based on actual payments received from the IESO, which are on a one-month lag based on timing of issuance of the respective OEB decisions listed in the preamble.

Table 11: REI Variance Account ($ Millions)

	Actual				Forecast	Total
	2020	**2021**	**2022**	**2023**	**2024**	
Approved Revenue Requirement	1.4	2.3	2.7	3.0	3.2	**12.7**
Actual/Forecast Revenue Requirement	0.8	1.3	1.3	1.3	0.9	**5.6**
Variance Account Balance	**(0.7)**	**(1.0)**	**(1.4)**	**(1.7)**	**(2.4)**	**(7.1)**

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-349

References: Exhibit 9, Tab 1, Schedule 1, Pages 24, 28
DVA Continuity Schedule, November 17, 2023
Global Adjustment (GA) Analysis Workform, November 17, 2023.

Preamble:

Toronto Hydro is seeking OEB approval to dispose the 2022 balances in Accounts 1588 and 1589 in the current proceeding, that were not disposed in its 2024 Custom IR Update proceeding.

Toronto Hydro stated that through the discovery phase of this proceeding, it intends to update the evidence that pertain to Group 1 balances accumulated during the 2023 calendar year.

OEB staff notes that the DVA Continuity Schedule included in the pre-filed evidence has many blank tabs that need to be completed. Also, the GA Analysis Workform needs to be updated with 2023 balances.

QUESTION:

Please update all evidence that pertains to actual Group 1 and Group 2 balances accumulated during the 2023 calendar year, as well as Accounts 1588 and 1589 balances accumulated during the 2022 calendar year.

RESPONSE:

An updated DVA Continuity Schedule is attached to this interrogatory response. Toronto Hydro notes that the GA Analysis Workform Tab GA 2023 cannot be updated at this time because the 2023 data has not yet been filed for RRR.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-350

References: Exhibit 9, Tab 1, Schedule 1, Page 28
EB-2020-0057, 2021 Custom IR Update, Decision and Rate Order, December 10, 2020, Pages 15 and 16
Filing Requirements for Electricity Distribution Rate Applications - 2023 Edition for 2024 Rate Applications, Chapter 2 Cost of Service, December 15, 2022, Page 62

Preamble:

Toronto Hydro stated that it is not proposing to dispose any residual balances in Account 1595. Toronto Hydro stated that it does not have any sub-accounts that have not already been approved for disposition and no sub-account will meet the two-year requirement for 2025 disposition.

However, OEB staff notes that DVA balances were cleared in Toronto Hydro's 2021 Custom IR Update decision and Account 1595 (2021) would be eligible for disposition in the current proceeding, consistent with the OEB's filing requirements. Toronto Hydro's rate riders were to be in effect over a one-year period from January 1 to December 31, 2021, relating to its 2021 Custom IR Update decision.

The OEB's filing requirements state that distributors become eligible to seek disposition of residual balances two years after the expiry of the rate rider.

Consistent with the filing requirements, if the 2021 rate riders expired on December 31, 2021, the balance of sub-account 1595 (2021) is eligible to be disposed after the account balance as at December 31, 2023 has been audited. Therefore, sub-account 1595 (2021) would be eligible for disposition in the 2025 rate year, as the respective balance has been audited.

QUESTION (A)

a) Please update all evidence that relates to the disposition of Account 1595 (2021).

RESPONSE (A):

This subaccount does not meet the 2-year requirement for 2025 disposition as there are other approved balances related to Group 2 accounts transferred to sub-account 1595 (2021). The last rate rider will end in December 2024. Please see Exhibit 9, Tab 1, Schedule 1 (updated on December 15, 2023) at page 2, Table 1 for sub-account 1595 (2021) and Toronto Hydro's Draft Rate Update in the 2020-2024 Custom Incentive Rate-setting Application (EB-2018-165) dated February 12, 2020 at page 13.[1]

	Clearance Start Date	Clearance End Date	Clearance Amount as at March 1, 2020 ($ Millions)	Carrying Charges from March 1, 2020 to Clearance Start Date	Total Balance at Clearance ($ Millions)
Group 2 Accounts					
Impact for USGAAP Deferral	1-Mar-2020	31-Dec-2020	6.4	-	6.4
CRRRVA	1-Jan-2023	31-Dec-2024	(77.2)	(4.6)	(81.8)
Externally Driven Capital	1-Mar-2020	31-Dec-2020	(3.2)	-	(3.2)
Derecognition	1-Jan-2022	31-Dec-2022	(32.9)	(1.3)	(34.2)
Wireless Attachments	1-Jan-2021	31-Dec-2024	(0.7)	(0.0)	(0.7)
Monthly Billing	1-Mar-2020	31-Dec-2022	11.4	-	11.4
OCCP	1-Mar-2020	31-Dec-2021	(73.7)	-	(73.7)
OPEB Cash vs Accrual	1-Mar-2020	31-Dec-2020	7.1	-	7.1
Stranded Meter Costs	1-Jan-2021	31-Dec-2024	(1.4)	(0.0)	(1.4)
IFRS-USGAAP Transitional PP&E Amounts	1-Mar-2020	31-Dec-2020	(1.6)	-	(1.6)
PILs and Tax Variances – CCA Changes	1-Jan-2023	31-Dec-2024	(10.9)	(0.6)	(11.6)
Other Amounts					
Excess Expansion Deposits	1-Jan-2021	31-Dec-2024	(10.9)	(0.2)	(11.1)
Gain on Sale 50/60 Eglinton Avenue	1-Mar-2020	31-Dec-2021	(11.8)	-	(11.8)
Accounts Receivable Credits	1-Jan-2021	31-Dec-2024	(3.4)	(0.1)	(3.5)
Foregone Revenue					
2020 Foregone Revenue	1-Mar-2020	31-Dec-2021	(4.0)	-	(4.0)

[1] https://www.rds.oeb.ca/CMWebDrawer/Record/667697/File/document

QUESTION (B):

b) If there is a material residual balance being proposed for disposition, please provide a detailed explanation, including quantifying any significant drivers of the residual balance.

RESPONSE (B):

Please refer to section a) above.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-351

References: **EB-2023-0054, 2024 Custom IR Update, Decision and Rate Order, December 14, 2023, pp. 10, 11**
Exhibit 9, Tab 1, Schedule 1, December 19, 2023, Pages 25, 26
OEB Letter, Adjustments to Correct for Errors in Electricity Distributor "Pass-Through" Variance Accounts After Disposition, October 31, 2019
Filing Requirements for Electricity Distribution Rate Applications – 2023 Edition for 2024 Rate Applications – Chapter 3, Incentive Rate-Setting Applications, June 15, 2023, Section 3.2.6

In the 2024 Custom IR Update decision, the following was noted in the background of this decision:

- Toronto Hydro proposed not to dispose of the 2022 balances within Accounts 1588 and 1589, due to the need to further analyze a 2021 principal adjustment of a credit of $5.7 million that was approved for disposition as part of the Account 1588 balance in its 2023 Custom IR Update proceeding.
- Such a credit would usually be reversed as a debit in the 2024 Custom IR Update proceeding, but Toronto Hydro proposed instead to examine this $5.7 million amount further.
- This principal adjustment is associated with reporting enhancements, specifically an enhanced model for customer billings.
- Toronto Hydro proposed instead to defer the review and disposition of Accounts 1588 and 1589 to this current proceeding.

In the 2024 Custom IR update decision, the OEB approved Toronto Hydro's request to defer the review and disposition of Accounts 1588 and 1589 to the current proceeding. The OEB's expectation was that Toronto Hydro, amongst other items, will address the requirements of the OEB's October 31, 2019 letter and section 3.2.6 of the filing requirements. This documentation outlines required documentation to be filed in a proceeding, including any adjustments made to

DVA balances that were previously approved by the OEB on a final basis.

In the current proceeding, Toronto Hydro stated that its request regarding the $5.7 million amount does not represent a correction of an error (per the OEB's October 31, 2019 letter). Toronto Hydro stated that it relates to an enhancement of a model, rather than an error in the utility's accounting records. Similarly, Toronto Hydro noted that its proposal does not represent an adjustment to an account balance that was previously approved by the OEB on a final basis.

OEB staff notes that the OEB's October 31, 2019 letter and section 3.2.6 of the filing requirements relate to any adjustments made to DVA balances that were previously approved by the OEB on a final basis.

QUESTION (A) AND (B):

a) Given that the OEB's October 31, 2019 letter and section 3.2.6 of the filing requirements relate to any adjustments made to DVA balances that were previously approved by the OEB on a final basis, as well as the OEB's expectations set out in the 2024 Custom IR Update decision, please address both the OEB letter and the filing requirements.
b) Please explain Toronto Hydro's statement that its $5.7 million debit principal adjustment relates to "an enhancement of a model, rather than an error", in the context of the OEB's requirements which relate to any adjustments made to DVA balances. Please also elaborate on what aspects of the model were enhanced and how the enhancement impacted the DVA balances as of 2021-year end that were cleared in Toronto Hydro's 2023 Custom IR proceeding.

RESPONSE TO (A) AND (B):

As shown in the excerpt below, the October 31, 2019 letter clearly states that the guidance applies to errors:

Where an accounting or other error is discovered after the balance in one of the above listed variance accounts has been cleared by a final order of the OEB, the OEB will determine on a case-by-case basis whether to make a retroactive adjustment based on the particular circumstances of each case, including factors such as:

- *whether the error was within the control of the distributor*
- *the frequency with which the distributor has made the same error*
- *failure to follow guidance provided by the OEB*
- *the degree to which other distributors are making similar errors.*

Toronto Hydro stands by its assessment that the proposed adjustment is not the result of an error as there was no mistake in the prior methodology/data used – the former approach was the best information that was available at the time, and the enhanced approach provided data that enabled more precision. Toronto Hydro enhanced its Electricity Revenue Application system in late 2022 to improve the calculation of unbilled revenue by using actual meter reads (instead of bill estimates) and to improve the logic used in the model validate larger rate classes. Prior to this enhancement, Toronto Hydro calculated unbilled revenue on the basis of bill estimates, which was the best available information available at the time.

This enhancement also enabled Toronto Hydro more precisely account for actual billings and allocate usage to the billing period based on actual meter reads. For a description of the aspects of the model which were enhanced, please refer to Exhibit 9, Tab 1, Schedule 1 at pages 24-25. Overall, the improvements to the model are reasonable and justified, and therefore the outcome of making these improvements does not constitute an error.

Additionally, Toronto Hydro does not agree that its request for clearance of Account 1588 and Account 1589 constitutes an adjustment to DVA balances that were previously approved by the OEB on a final basis. This is evident from the fact that the opening 2022 principal and interest amounts for Account 1588 and Account 1589, shown in the continuity schedule, reconcile with the previously

approved 2021 closing balances. Toronto Hydro does not propose to adjust the 2021 Account 1588 balance cleared on a final basis in the 2023 Custom IR update proceeding.[1] Rather, Toronto Hydro proposes to reverse the full 2021 Principal Adjustment of $7.5 million which includes the $5.7 million that relates to the model enhancement as per standard requirement in the Global Adjustment Analysis Workform ("GA Workform"), and seek clearance for the Accounts 1588 and 1589 2022 year-end balances. This approach complies with the Chapter 3 Filing Requirements for Electricity Distributors whereby '*the opening principal amounts as well as the opening interest amounts for Group 1 balances, shown in the continuity schedule, must reconcile with the last applicable approved closing balances'* and *'the OEB expects that distributors will not adjust any DVA balances that were previously approved by the OEB on a final basis.'*

DVA balances prior to 2021 are not impacted by the above principal adjustment reversal since each respective year's principal adjustments have been reversed year-over-year in the GA Workform and are not included in the GL (since the utility's GL balances hold the actual customer billings and estimated accruals). By reversing this $5.7 million, Toronto Hydro ensures that it remains consistent with the year-over-year reversals required in the GA Workform. In so doing, *"customers ultimately pay no more and no less than what their distributor paid, and that costs are tracked for recovery on the appropriate basis*", as per OEB's October 31, 2019 letter.

Even if the OEB is inclined to consider this adjustment an error, which Toronto Hydro does not agree with for the reasons noted above, the utility notes that: (i) none of the factors listed in the October 19, 2019 letter are present in this situation, (ii) the proposal is appropriate to ensure consistency with DVA continuities and the GA workform (see 9-Staff-352), and (iii) this adjustment does not cause any harm ratepayers since it reflects a more accurate assessment of the delta between what customer paid and the distributor paid. Thus, to ensure consistency and preserve fairness, the OEB should allow the adjustment to be made.

[1] For more information on Toronto Hydro's proposed approach to clearance, please refer to the response to interrogatory 9-Staff-352(c).

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-352

Reference: Exhibit 9, Tab 1, Schedule 1, December 19, 2023, Pages 25, 26
GA Analysis Workform, November 17, 2023

Preamble**:**

In the current proceeding, Toronto Hydro proposes to reverse the Account 1588 $5.7 million credit cleared in the 2023 Custom IR Update proceeding, as a debit in the current proceeding. This is demonstrated on the GA Analysis Workform.

OEB staff notes that there could be a permanent disconnect between the Account 1588 balance in the DVA continuity schedule and the Reporting and Record Keeping Requirements (RRR) 2.1.7 balance. This disconnect could occur if the OEB does not approve Toronto Hydro's request to recover the overstated credit of $5.7 million in Account 1588 through a debit adjustment in the current proceeding.

Instead, OEB staff notes that Account 1588 could be debited by $5.7 million and Account 1595 (2025) could be credited by $5.7 million. This would ensure that there would be no permanent disconnect in Account 1588, as noted above, while at the same time ensuring that the extra refund to ratepayers of $5.7 million made in the 2023 Custom IR update proceeding would not be clawed back.

QUESTION (A):

a) If the OEB decides not to approve the $5.7 million debit to Account 1588 in the current proceeding, please explain whether the following approach would be appropriate. To eliminate any permanent disconnect between the Account 1588 balance in the DVA continuity schedule and the RRR 2.1.7 balance, Account 1588 could be debited by $5.7 million and Account 1595 (2025) could be credited by $5.7 million.

b) If Toronto Hydro does not agree with the approach outlined in part a) of this interrogatory, please explain.

RESPONSE (A) AND (B)

A decision not to approve the reversal of the $5.7 million overstated Principal Adjustment amount in question would create a permanent difference between the Account 1588 balance and the DVA continuity schedule. Toronto Hydro agrees with the proposal put forth by the OEB, however would recommend that Account 1588 be credited and Account 1595 be debited by $5.7 million in order to eliminate the disconnect between the Account 1588 balance and the DVA continuity schedule.

QUESTION (C) :

c) Please explain how the $5.7 million adjustments (credit and debit) were reflected in the following Toronto Hydro documentation and the associated period(s):
   i. General ledger
   ii. "Transactions Debit / (Credit)" columns of the DVA Continuity Schedule
   iii. "Principal Adjustments" columns of the DVA Continuity Schedule
   iv. Tabs of the GA Analysis Workform

RESPONSE (C):

i) No adjustment was recorded in the General ledger for $5.7M. Account 1588 reflects the disposition of the amounts approved in the OEB Decision and Rate Order (EB-2022-0065).

ii) No adjustment has been reflected in "Transactions Debit / (Credit)" columns of the DVA continuity Schedule.

iii) Please refer to Table 1 below for a summary of the "Principal Adjustments" column of the DVA Continuity Schedule for the respective years ended December 31, 2021 and 2022.

Table 1: Summary of Principal Adjustments Column

Summary of the Principal Adjustments columns for:	**2021**	**2022**
Recognize the current year principal adjustments:		
IESO cost true-up based on actuals	*834,880*	*4,720,029*
Unbilled to actual revenue true up	*3,769,180*	*7,252,076*
Enhanced model adjustment	*(5,705,292)*	-
Total current year principal adjustments	(1,101,232)	11,972,105
Reversal of the prior year principal adjustments:		
Reversal of IESO cost true-up true-up based on actuals	*(3,358,709)*	*(834,880)*
Reversal of the unbilled to actual revenue accrual	*(3,022,358)*	*(3,769,180)*
Reversal of the enhanced model adjustment	-	*5,705,292*
Total reversal of prior year principal adjustments	(6,381,067)	1,101,232
Total principal adjustments in the DVA Continuity Schedule	**(7,482,299)**	**13,073,337**

If this $5.7 million is not reversed as part of the 2022 Principal Adjustments, this will result in the balance in Account 1588 being incorrect. Please refer to response in interrogatory 9-Staff-351.

iv) In the GA Workform "Principal adjustment" tab for 2022, the $5.7 million has been included in the reversal of the prior year adjustments, pending the outcome of this decision.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-353

References: EB-2023-0054, 2024 Custom IR Update, Decision and Rate Order, December 14, 2023, Pages 10, 11
GA Analysis Workform, November 17, 2023
EB-2022-0065, 2023 Custom IR Update, Reply Submission, November 22, 2022, Page 5

Preamble:

In its 2024 Custom IR Update decision, the OEB approved Toronto Hydro's request to defer the review and disposition of Accounts 1588 and 1589 (pertaining to balances accumulated during the 2022 calendar year) to the current proceeding.

OEB staff notes that an Account 1589 2022 principal adjustment of a credit of $3,461,257 was shown in the Tab Principal Adjustments of the GA Analysis Workform, but this amount was not shown in Tab GA 2022.

In Toronto Hydro's 2023 Custom IR Update reply submission, it explained that certain principal adjustments on the Principal Adjustments tab of the GA Analysis Workform do not need to be shown on other tabs of the GA Analysis Workform (e.g., Tab GA 2021). Toronto Hydro stated that this is because its general ledger balance and the expected balance calculated in the GA Analysis Workform are both determined based on estimated unbilled consumption. Toronto Hydro concluded that it is not appropriate for the unbilled to actual true-up to be presented as a difference (i.e., reconciling item) on Tab GA 2021.

QUESTION (A):

a) Please confirm that the Account 1589 2022 principal adjustment of a credit of $3,461,257 shown in the Tab Principal Adjustments of the GA Analysis Workform does not need be

shown in Tab GA 2022 for the same reasons indicated by Toronto Hydro in its 2023 Custom IR Update reply submission (see preamble above).

RESPONSE (A):

Confirmed - Account 1589 2022 principal adjustment of a credit of $3,461,257 shown in the Tab Principal Adjustments of the GA Analysis Workform does not need be shown in Tab GA 2022, for the same reasons indicated by Toronto Hydro in its 2023 Custom IR Update reply submission.

QUESTION (B):

b) If this is not the case, please clarify which is the correct balance to use as a 2022 principal adjustment for Account 1589 and update the evidence, including the DVA Continuity Schedule.

RESPONSE (B):

Refer to a) above.

QUESTION (C):

c) If this is not the case, after addressing part b) of this interrogatory, if cell C93 (i.e., Unresolved Difference as % of Expected GA Payments to IESO) of Tab GA 2022 is greater than the threshold of +/- 1%, please explain.

RESPONSE (C):

Refer to a) above.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-354

References: Exhibit 9, Tab 2, Schedule 3, Pages 1 and 2

Exhibit 9, Tab 2, Schedule 3, Appendix A

Preamble:

Toronto Hydro has requested approval to dispose of the balances in its LRAMVA which has a total debit balance of $5.6 million and are in relation to new savings from CDM programs delivered between 2020 and 2022, and lost revenues from persisting savings in 2020-2022 from CDM programs delivered from 2018-2021. To help mitigate rate impacts, Toronto Hydro has requested to recover this amount over a 60-month period, beginning January 1, 2025.

QUESTION (A):

a) Please confirm that Toronto Hydro's LRAMVA balance includes all outstanding lost revenues from past and current CDM programs. If any there are any amounts that remain from current CDM programs, please provide details of the amounts, including CDM program, year, and amount and when, if at all, Toronto Hydro will request disposition.

RESPONSE (A):

Based on the LRAMVA framework, Toronto Hydro anticipates it will be eligible to seek additional recovery for 2023-2024 lost revenues related to programs from the 2022 and prior period. The utility is currently working on the update and will provide the required information in advance of the Technical Conference.

QUESTION (B):

b) Please confirm that there are no LRAMVA balances related to the IESO's wind-down of the CFF nor from the Interim CDM Framework that remain outstanding. If there are, please discuss why these amounts have not been requested for disposition.

RESPONSE (B):

Please refer to part a of the response.

QUESTION (C):

c) Please discuss why there are no LRAMVA balances for 2023 or 2024 being proposed, including persisting CDM savings in 2023 and 2024.

RESPONSE (C):

Please refer to part a of the response.

QUESTION (D):

d) Please confirm that Toronto Hydro is not requesting approval of any prospective LRAMVA balances and that the LRAMVA will have a balance of zero if all requested amounts are approved.

RESPONSE (D):

Please refer to part a of the response.

QUESTION (E):

e) Please indicate if Toronto Hydro is seeking to maintain access to the LRAMVA for the possibility of future entries, either for distribution-rate funded CDM activities or partnership with the IESO for a Local Initiative Program.

RESPONSE (E):

The DRVA (revenue variance subaccount) proposed by Toronto Hydro would have the effect of capturing the effects of CDM, eliminating the necessity of the LRAMVA. In the event that the OEB does not approve the DRVA (revenue variance subaccount) as proposed, Toronto Hydro would request that the LRAMVA be continued for both distribution-rate funded CDM activities and CDM through engagements with the IESO.

QUESTION (F):

f) Please provide a table that clearly identifies what source was used to inform the savings totals in Tab 5 of the LRAMVA workform for the 2019, 2020 and 2021 program years (Tables 5-e, 5-f and 5-g, respectively). As part of your response, provide any additional discussion on how the Net Energy Savings (Column D) and New Demand Savings (column R) values were sourced/developed.
Additionally, please provide the IESO CDM persistence reports that support the data included in Tab 7 of the LRAMVA workform.

RESPONSE (F):

Toronto Hydro relied on information as outlined on Exhibit 9, Tab 2, Schedule 3, Section 2. Please refer to Appendix B for a table that identifies the appendices used to inform the savings totals in Tab 5 of the LRAMVA workform for the 2019, 2020 and 2021 program years.

Toronto Hydro relied on 2017 net-to-gross ratios ("NTGs") from IESO's 2017 Final Verified Annual LDC CDM Program Results Report to calculate the Net Energy Savings (Column D) and New Demand Savings (column R). Please refer to Exhibit 9, Tab 2, Schedule 3, Appendix A for the NTGs.
To calculate the savings persistence, Toronto Hydro used the savings persistence from the 2017 Final Verified Annual CDM Program results to develop persistence rates and applied those rates to the 2019, 2020, 2021 savings. Please refer to Appendix A for the 2017 persistence rates by program.

QUESTION (G):

g) Please confirm if Toronto Hydro is requesting the continuation of the LRAMVA during the 2025 to 2029 period.

RESPONSE (G):

Please see response to part (e) above.

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 9-STAFF-355

References: Exhibit 9, Tab 2, Schedule 3, Pages 3-7

Exhibit 9, Tab 2, Schedule 3, Appendix A

Preamble:

Toronto Hydro has requested approval of a modified LRAMVA threshold. Toronto Hydro indicates that it has modified the LRAMVA threshold excludes forecast CDM savings from programs that were transferred to the IESO.

QUESTION (A):

a) Please confirm that the LRAMVA balances included in the LRAMVA workform have been calculated using the proposed modified LRAMVA thresholds.

RESPONSE (A):

Toronto Hydro confirms the LRAMVA balances included in the LRAMVA workform have been calculated using the proposed modified LRAMVA thresholds.

QUESTION (B):

b) Please provide a live MS Excel spreadsheet that includes all calculations Toronto Hydro undertook in developing its modified LRAMVA threshold amount. In particular, please include all CDM programs, the forecast savings at the time of the 2018 rate application, calculations performed to remove programs transferred to the IESO, calculations performed to estimate Toronto Hydro's savings portion of transferred programs, calculations performed to estimate Toronto Hydro's portion of the IESO's Interim Framework programs, and any other calculations conducted to determine the modified LRAMVA threshold amounts.

RESPONSE (B):

Please refer to the following 9-Staff-355 Appendices:

- Appendix A:
  - Tab 1 - Toronto Hydro's calculations performed to determine Toronto Hydro's portion of the IESO's Interim Framework programs that are removed from its LRAMVA threshold.
  - Tab 2 - Toronto Hydro's calculations performed to remove programs transferred to the IESO.
- Appendix B – The IESO's 2019-2020 Interim Framework CDM Plan
- Appendix C – Toronto Hydro's CDM plan under the Conservation First Framework ("CFF")
- Appendix D – Reconciliation for Original to Modified LRAMVA Thresholds

QUESTION (C):

c) Please discuss how Toronto Hydro's 2018 LRAMVA threshold was used in relation to the CDM adjustment made to its approved 2018 load forecast, if at all, with relevant references and supporting documentation.

RESPONSE (C):

Toronto Hydro's 2018 LRAMVA threshold was not used in relation to the CDM adjustment made to its approved 2018 load forecast.

QUESTION (D):

d) Please provide a sample calculation of the LRAMVA balances using the LRAMVA threshold as approved by the OEB in EB-2018-0165. Please provide a comparison table to the LRAMVA balance that uses the modified LRAMVA threshold.

RESPONSE (D):

Please see Table 1 below for the results of sample calculations using the LRAMVA threshold as approved in EB-2018-0165 and the modified LRAMVA threshold.

Table 1: LRAMVA balances using the Original and Modified LRAMVA thresholds

	Residential	CSMUR	GS<50kW	GS 50-999kW	GS 1000-4999kW	Large User
	$M	$M	$M	$M	$M	$M
Original	-0.0	-0.0	-3.4	-5.6	-1.3	-1.2
Modified	-0.1	-0.0	-1.3	3.4	0.9	2.7

As outlined in Exhibit 9, Tab 2, Schedule 3, Section 1.1, the OEB approved Toronto Hydro's most recent load forecast and the related CDM forecast for rate-making purposes during the period when the CFF was revoked and the future direction on LRAMVA was still unknown. The sample Original LRAMVA as presented in Table 1 above is based on LRAMVA thresholds which include all of the Toronto Hydro CDM programs under the CFF plan, while the actuals to be used for the LRAMVA calculations include only those programs that the utility continued to manage post CFF as contractually obligated under the CFF wind-down. While the original LRAMVA threshold is consistent with what was previously approved, Toronto Hydro believes that this approach using mismatched versions of CDM values is not aligned with the intent of the LRAMVA as described in Conservation and Demand Management Guidelines for Electricity Distributors[1].

QUESTION (E):

e) For the MWh and MW amounts shown in Table 2: LRAMVA Threshold, please confirm:
   i. That the Original row is inclusive of all of Toronto Hydro's CDM programs under the CFF.
   ii. That the Modified row includes only Toronto Hydro's programs that actually proceeded after the cancellation of the CFF.

[1] EB-2021-0106, Conservation and Demand Management Guidelines for Electricity Distributors, Section 8, at page 26.

RESPONSE (E):

Toronto Hydro confirms that i) the figures in the Original row on page 3 of Exhibit 9, Tab 2, Schedule 3 is inclusive of all CDM programs planned under the CFF prior to the wind-down and includes programs that were later transferred to the IESO. ii) the Modified row includes programs that were fully discontinued, and those which the utility was contractually obligated to complete as part of the CFF wind-down.

QUESTION (F):

f) Please discuss why the LRAMVA threshold is higher in the Modified row than the Original row.

RESPONSE (F):

The LRAMVA threshold is higher in the Modified row as it includes 2018 CDM persistence that was not included in the original LRAMVA threshold. As described in Exhibit 9, Tab 2, Schedule 3, Section 1.2, Toronto Hydro proposes to include 2018 CDM persistence in the modified threshold for calculating the 2020-2022 LRAMVA as this information was not included in the threshold that the OEB approved in EB-2018-0165, due to the uncertainty related to CFF.[2] Please see Appendix D for reconciliation of including 2018 CDM persistence.

QUESTION (G):

g) Please provide an updated Table 2: LRAMVA Threshold that includes additional rows showing all programs and their corresponding LRAMVA threshold energy or demand savings under both the Original and Modified headings.

[2] This proposal aligns with VECC's position in EB-2018-0165, VECC Submission (August 28, 2019).

RESPONSE (G):

In the calculations for its Modified threshold, Toronto Hydro only removed programs that were transferred to the IESO. Please refer to Appendices A to D for Toronto Hydro's calculations performed to remove programs transferred to the IESO.

Energy Efficiency Interim Framework Program Plan

June 2019

Toronto Hydro-Electric System Limited
EB-2023-0195
9-Staff-355
Appendix B
FILED: March 11, 2024
(2 Pages)

The Interim Framework Program Plan is an overview of energy-efficiency programs IESO is offering in Ontario from April 2019 to December 2020. It sets out forecast budgets and, where applicable, targets and expected cost-effectiveness for Save on Energy programs. Details about incentives and how to apply for programs are available at www.SaveonEnergy.ca.

The IESO will report on the progress of the Interim Framework on a quarterly and annual basis.

Budget and Targets:

The plan, which is subject to changes and revisions over time, allocates the Interim Framework budget of $353 million over the suite of programs to create a cost-effective portfolio that is expected to achieve 1.4 TWh of electricity savings, and 189 MW of demand savings at a Levelized Unit Energy Cost (LUEC) of two cents per kWh. This budget represents a savings of up to $442 million from the previous Conservation First Framework.

Cost Effectiveness:

Program cost-effectiveness under the Interim Framework is assessed using forecasted program participation and supply side avoided costs – which estimate the cost of supplying that same amount of energy from the current electricity generation mix. An updated cost-effectiveness tool reflecting updated projections of avoided costs for 2019-2040 is available on the IESO website.

Reporting:

As part of its responsibilities, the IESO will publish the results of its Evaluation, Measurement, and Verification (EM&V) of the activities of the Interim Framework, as well as costs related to audits, capability building and training. The IESO will publish verified results on a yearly basis, as well as quarterly program updates, to inform the sector on the progress to meet the targets over the Interim Framework.

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Interim Framework Summary	2019-2020			Cost-Effectiveness Tests		
	Budget ($M)	Energy Savings (TWh)	Demand Savings (MW)	Total Resource Cost Test (TRC)	Program Administrator Cost Test (PAC)	Levelized Unit Energy Cost ($/kWh)
Business Programs						
Retrofit	141	0.925	144	1.28	2.99	0.02
Small Business Lighting	16	0.066	8.3	1.74	1.39	0.03
Energy Managers	17	0.151	7.6	1.18	2.21	0.02
Process and Systems Upgrades	52	0.210	21.1	1.45	2.68	0.02
Energy Performance Program	6	0.024	2.8	1.20	1.09	0.02
Total Business Programs	***232***	***1.35***	***184***	***1.22***	***2.36***	***0.02***
Low Income and Indigenous programs						
Home Assistance	50	0.035	3.6			
Indigenous Programs	16	0.014	1.4			
Total Low Income & Indigenous Programs	***66***	***0.05***	***5***	-	-	-
LDC Local Program Fund	27					
IESO Central Services Costs	28					
Total Interim Framework	**353**	**1.4**	**189**	-	-	-

The "-" symbol signifies that those programs are not required to be cost effective as per the directive.

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 9-CCC-64

Reference: Exhibit 9, Tab 1. Schedule 1, Page 8

Please explain why Toronto Hydro is seeking to recover $.6 million from customers as recorded in the Customer Choice Initiative Costs/ Account 1508 subaccount as the amount is not material.

RESPONSE:

Toronto Hydro recorded the revenue requirement impacts resulting from the Customer Choice Initiative in accordance with OEB requirements, namely (i) section 2.9.1.8 of the Chapter 2 Filing Requirements for Electricity Distributors and (ii) the Accounting Order for the Establishment of a Deferral Account to Record Impacts Arising from Implementing the Customer Choice Initiative OEB (EB-2020-0152).[1] This initiative was incremental to the 2020-2024 plan and provided value to customers and government stakeholders in terms of enabling greater customer choice in response to changing circumstances brought on by the COVID-19 pandemic.[2]

[1] EB-2020-0152 - Accounting Order for the Establishment of a Deferral Account to Record Impacts Arising from Implementing the Customer Choice Initiative (September 16, 2020)
[2] News Release, *Ontario Supports Those Struggling with Electricity Bills during COVID-19* (June 1, 2020)

RESPONSES TO CONSUMERS COUNCIL OF CANADA INTERROGATORIES

INTERROGATORY 9-CCC-65

Reference: Exhibit 9, Tab 1, Schedule 1, Page 22

Please explain why Toronto Hydro is seeking to recover $.1 million from customers as recorded in the Ultra-low Overnight Rate Costs/ Account 1508 subaccount as the amount is not material.

RESPONSE:

Toronto Hydro recorded the revenue requirement impacts resulting from the Ultra-low Overnight Rate initiative in accordance with OEB requirements, namely (i) section 2.9.1.8 of the Chapter 2 Filing Requirements for Electricity Distributors and (ii) the Accounting Order (001-2023) for the Establishment of a Deferral Account to Record Impacts Arising from Implementing the Ultra-Low Overnight (ULO) Regulated Price Plan (EB-2022-0160).[1] This initiative was incremental to the 2020-2024 plan and provided value to customers and government stakeholders in terms of enabling greater customer choice in response to changing circumstances brought on by electrification of transportation.[2]

[1] EB-2022-0160 - Accounting Order (001-2023) for the Establishment of a Deferral Account to Record Impacts Arising from Implementing the Ultra-Low Overnight (ULO) Regulated Price Plan Option (March 2, 2023)
[2] News Release, *Ontario Launches New Ultra-Low Overnight Electricity Price Plan* (April 11, 2023)

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 9-EP-36

Reference: Exhibit 9, Tab 1, Schedule 1, Page 27, Account 1508 - subaccount - Getting Ontario Connected Act ("GOCA") Variance Account

Preamble:

"On October 31, 2023, the OEB established a generic, industry-wide variance account to record incremental costs of locates resulting from the implementation of Bill 93 (Getting Ontario Connected Act, 2022), with an effective date of April 1, 2023. As this decision was released just weeks before Toronto Hydro submitted its application to the OEB, the utility intends to file supplemental evidence to forecast the balances that it expects in this account over the current rate period."

QUESTION:

Has this supplemental evidence been filed? If the answer is yes, please provide the link to the filing. If the answer is no, please file it or indicate when it will be filed.

RESPONSE:

Please see Toronto Hydro's response to 4-Staff-296(e).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 9-PP-50

References: General information on the Innovation Fund in Exhibit 9, plus Exhibit 1B, Tab 2, Schedule 1, Page 33

"The proposed Innovation Fund is an important part of Toronto Hydro's 2025-2029 Custom Rate Framework because it addresses needs that are not adequately met by existing funding mechanisms which favour investment where the beneficial outcomes are proven or certain."

QUESTION (A):

a) Please provide any documentation that defines the criteria and boundaries of spending under the proposed Innovation Fund. Please explain how this would be different from other Capital or OM&A spending and how the results would be tracked.

RESPONSE (A):

The criteria and boundaries of spending under the proposed Innovation Fund, as well as the planned approach to tracking results, are set out in the referenced evidence. The expenditures to be incurred under the proposed Innovation Fund would be tracked and accounted for in a manner similar to other Capital and OM&A programs.

QUESTION (B):

b) Please provide (or explain if documents do not exist) the governance structure intended to be used for the Innovation Fund, including which external stakeholders would be part of the advisory committee (or equivalent).

RESPONSE (B):

A detailed discussion of the governance framework for the proposed Innovation Fund is provided in Section 4.1 of the referenced evidence. The Innovation Fund evidence lists the following external

stakeholder groups that can potentially participate in the Innovation Fund (Exhibit 1B, Tab 4, Schedule 2 at page 11):

- provincial bodies such as the OEB and IESO, in particular their innovation teams;
- energy services companies and clean technology vendors and suppliers;
- government agencies such as Natural Resources Canada; and
- other regulated entities such as Ontario distributors and energy companies in other jurisdictions that have relevant experience with innovation projects.

For a description on the role of the internal steering committee that would oversee the Innovation Fund, please refer to Toronto Hydro's response to interrogatory 1B-DRC-06 part i). As described in Toronto Hydro's response to interrogatory 1B-CCC-46 part a), the role of external stakeholder participated is scoped to provide input and feedback to inform the pilot selection phase.

QUESTION (C):

c) The OEB, IESO and others have had programs to enable LDC and industry innovation, including ones that THESL already leverages. Please explain what THESL has done to maximized use of those tools and why a separate Innovation fund just for THESL is required.

RESPONSE (C):

Toronto Hydro has been an active participant in Innovation programs led by the industry. In the 2020-2024 rate period, Toronto Hydro launched an innovation pilot project called "Benefit Stacking Transmission and Distribution System Non-Wires Alternatives Pilot Project" (also known as "Etobicoke Demand Response Pilot"), with funding from IESO's Grid Innovation Fund and support from OEB's Innovation Sandbox. The evidence in Exhibit 1B, Tab 3, Schedule 1 provides a full list of strategies and initiatives that Toronto Hydro has undertaken in the 2020-2024 rate period to maximize innovation within the current business structure and based on available tools. A detailed discussion of differentiators for the Innovation Fund is available in the response to 1B-Staff-99 (d).

QUESTION (D):

Please explain the process THESL will use to leverage results from the proposed Innovation Fund more broadly to benefit other LDCs and stakeholders in Ontario.

RESPONSE (D):

Please see Toronto Hydro's response to interrogatory 1B-SEC-29 part (a).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 9-PP-51

Please explain what the 'asymmetrical' Earning Sharing Mechanism means in comparison to the existing 'symmetrical' ESM.

RESPONSE:

See Exhibit 9, Tab 1, Schedule 1, pages 33-35 for a description of Toronto Hydro's currently approved asymmetrical Earnings Sharing Mechanism ("ESM"). The ESM is asymmetrical in that it operates only to share overearnings in excess of 100 basis points over the approved return on equity ("ROE"), shared 50:50 with ratepayers compared to a symmetrical ESM which would provide protection to both the utility and the rate payer for both overearnings and underearnings in excess of 100 basis points of the approved ROE.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 9-SEC-126

Reference: Exhibit 9, Tab 1, Schedule 1, Page 2

Please provide a revised version of Table 1 that shows balanced as of December 31, 2023.

RESPONSE:

Please refer to the updated continuity schedules filed in response to interrogatory 9-Staff-349.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 9-SEC-127

Reference: Exhibit 9, Tab 1, Schedule 1, Page 15

With respect to the Account 1592 - PILs and Tax Variances – CCA Changes Sub-Account

a. For each year between 2020 and 2024, please provide the amount credited (or forecast to be credited) to the sub-account related to the changes in capital cost allowance rules included in Bill C-97.
b. For the years Toronto Hydro seeks to dispose of (2020 to 2022), please provide supporting calculations.

RESPONSE:

For each year between 2020 and 2024, there are no amounts credited (or forecast to be credited) to the sub-account related to the changes in capital cost allowance rules included in Bill C-97. For more information, please refer to integratory 6-Staff-322.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 9-SEC-128

References: Exhibit 9, Tab 1, Schedule 1, Page 26

With respect to Account 1508 – Getting Ontario Connected Act Variance Account:

QUESTION (A) :

What is the balance of the account as of December 31, 2023? Please provide details including a breakdown of costs.

RESPONSE (A):

Please refer to Toronto Hydro's response to 4-Staff-296(e).

QUESTION (B) :

Please provide the locate costs for each year between 2025 and 2029 that the account would capture variance from.

RESPONSE (B):

Please refer to pages 29-30 of Exhibit 4, Tab 2, Schedule 8, where Table 6 provides the forecast costs for 2025-2029 that the account would capture variance from.

QUESTION (C) :

On November 22,2023, the Government of Ontario introduced Bill 153, Building Infrastructure Safely Act, 2023 which SEC understands addresses some issues raised by distributors in the Getting Ontario Connect Act. Please provide Toronto Hydro's view on how the bill, if passed, would impact locate costs.

RESPONSE (C):

If passed, Bill 153 may help reduce the magnitude of the potential cost increases by: (i) extending timelines for project locates, which would allow more effective management of locate resources; and (ii) creating a better balance of financial risk between excavators and infrastructure owners.[1] However, Bill 153 as drafted would not address other significant drivers of incremental costs that arose from the enactment of Bill 93 in 2022, which notably include:

- Requirements to complete locates on time 100% of the time;
- No performance requirement allowance for extreme weather events, force majeure situations, or peak volume periods; and
- Other circumstances outside of the utility's control, such as potential locate ticket supply or system disruptions at Ontario One Call, fee increases from Ontario One Call;
- Specific requirements and accelerated timelines for supporting dedicated locator requests;
- New and improved systems to support increased compliance requirements including new requirements in Bill-93 for written confirmation of all appointment scheduling changes (previously verbal appointment scheduling changes were permitted).

Further, a key aspect of Bill 153 is to shift from a predominantly legislative framework to a predominantly regulatory framework through enactment of detailed regulations. Thus, the impact of Bill 153 on locate cost increases is contingent on regulations that have not yet been developed by the Government and its agency, Ontario One Call.

In summary, while changes proposed in Bill 153 may change the cost of locates, the direction and magnitude of those changes remains highly uncertain over the remainder of 2024 and well into (and potentially beyond) 2025.

[1] E.g. by repealing a current provision under the *Ontario Underground Infrastructure Notification System Act, 2012* that requires infrastructure owners to compensate excavators for late locates.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 9-SEC-129

Reference: Exhibit 9, Tab 1, Schedule 1, p.40

QUESTION :

If the OEB were to approve a modified proposed Demand Related Variance Account – Expenditure Sub-Account that would not capture all revenue requirement impacts from expenditures for demand related programs, but limited to the revenue requirement impact of expenditures in demand programs solely related to the variance in forecast of customer connections and customer demand (as opposed for example to variances costs to connect customers etc.), how would Toronto Hydro propose the account would work?

RESPONSE:

Toronto Hydro interprets this question as asking whether it is possible to isolate the demand from other drivers which may yield variances in the programs that form part of the Demand Related Variance Account – Expenditure Sub-Account. This approach is not supported by the evidence presented in Exhibit 1B, Tab 2, Schedule 1 at pages 35-46, and Toronto Hydro would be concerned if the OEB were to approve the modified DRVA as inferred by the question. The concern emanates from the fact that it would be very complex, cumbersome, and in the case of Customer Connections[1], impossible to administer the account as SEC suggests. As a result, this approach to the DRVA would unnecessarily constrain Toronto Hydro's ability to maintain responsiveness to customer requirements for new connections or service upgrades, as well as emerging and existing policy priorities, including: *Building Transit Faster Act,2020*[2] *More Homes Built Faster Act*[3] and the OEB's

[1] The Customer Connections forecast is a trend-based forecast that is impacted by a myriad of factors as outlined in Exhibit 2B, Section E5.1 at pages 19-23. It would not be possible to disentangle demand from other drivers within the forecast and the actuals.
[2] SO 2020, Ch 12.
[3] SO 2022, Ch 21.

Framework For Energy Innovation: Setting A Path Forward For DER Integration (January 2023) and the *Filing Guidelines for Incentives for Electricity Distributors to Use Third-Party DERs as Non-Wires Alternatives* (March 28, 2023).

In addition to the complexity of differentiating cost variances between customer demand and costs to connect, Toronto Hydro also notes that variances in revenue requirement as a result of prudent and necessary changes in the timing of in-service additions due to execution-related considerations, would not be captured in the sub-account under the modified approach set out in the preamble. For large projects such as Stations Expansions, this could result in prejudice to ratepayers.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 9-SEC-130

Reference: Exhibit 9, Tab 1, Schedule 1, Page 40

Please explain Toronto Hydro's expectations regarding how any balance in the two Demand-Related Variance Account sub-accounts would be allocated between customer classes.

RESPONSE:

The balance in both the Demand-Related Variance Account (Expenditure Variance sub-Account) and the Demand-Related Variance Account (Revenue Variance sub-Account) will be allocated among the rate classes proportionately based on actual distribution revenue recovered from each class for the latest year available at the time of clearance.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 9-SEC-131

Reference: Exhibit 9, Tab 1, Schedule 1, Appendix A, Pages 1-3

Using 2020 as an illustrative example, please provide the entries that would have been made into the Demand-Related Variance Account, including all supporting calculations, if it had been in place at the time.

RESPONSE:

Please refer to Toronto Hydro's response to 1B-SEC-16 b) for the Approved and Actual Revenue that would have been tracked in the Demand-Related Variance Account, if it had been in place at the time.

Please see Table 1 below for the Approved and Actual Revenue Requirement that would have tracked in the Demand-Related Variance Account, if it had been in place at the time.

Table 1: Approved vs. Actual/Bridge Revenue Requirement that would have been subject to the DRVA sub-account

	Approved	Actual/Bridge	Variance
ROE	1.3	1.2	(0.2)
Deemed Interest	0.9	0.7	(0.1)
Depreciation	3.5	2.6	(0.9)
OM&A	4.0	4.1	0.1
PILS	(1.8)	(1.5)	0.3
Revenue Requirement	**7.9**	**7.1**	**(0.8)**

Please see below entries that would have been made to the Demand-Related Variance account in 2020, if it had been in place at the time.

/C

1	*Demand-Related Revenue Variance subaccount*		
2	**DR 1508 Subaccount Demand-Related Revenue Variance Account**	**$29.3M**	
3	CR 4080 Distribution Services Revenue	$29.3M	
4			/C
5	*Demand-Related Expenditure Variance subaccount*		
6	**DR 4080 Distribution Services Revenue**	**$0.8M**	
7	CR 1508 Subaccount Demand-Related Expenditure Variance Account	$0.8M	

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 9-VECC-97

References: Exhibit 9, Tab 2, Schedule 1, Table 1

QUESTION:

Please update Table 1 to show the DVA balances as of December 31, 2023. In the updated table please also include the account number for each Group 1 and 2 account.

RESPONSE:

Please refer to the updated continuity schedules filed in response to interrogatory 9-Staff-349.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 9-VECC-98

Reference: Exhibit 1B, Tab 1, Schedule 3, Page 13

"The total net DVA balances proposed for clearance are $163.7 million (credit/refund) to customers beginning January 1, 2025."

QUESTION (A) :

a) We are unable to reconcile this statement with the evidence at Exhibit 9. Please clarify.

RESPONSE (A):

The table below reconciles the DVA balances with the rate riders.

	($ Millions)
DVA balance as per Rate Rider calculation[1]	($163.7)
Proposed Innovation Fund rate rider is not included in the DVA balance Rate Rider [2]	($19.4)
Variance account "Renewable Generation Connection Funding Adder Deferral Account – Provincial Rate Protection Payment Variances"[3]	($7.4)
Proposed Dispositions – Group 2 Accounts[4]	**($190.5)**

[1] Exhibit 9, Tab 3, Schedule 1.
[2] Exhibit 9, Tab 3, Schedule 1. This amount has been updated to $16.0 million to exclude carrying charges in response to interrogatory 9-Staff-342.
[3] Exhibit 9, Tab 1, Schedule 1, page 37.
[4] Exhibit 9, Tab 1, Schedule 1, pages 36-37.

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 9 -VECC -99

Reference: Exhibit 9, Tab 1, Schedule 1, Page 15

QUESTION (A):

a) We are unable to locate the calculation showing the derivation of Account 1592 - CCA Changes. Please provide a reference for this calculation. If the detailed calculation has not been provided please prove tables showing the AIIP additions, the CCA with and without acceleration and the other annual calculations that support the proposed disposition balance.

RESPONSE (A):

Please refer to Exhibit 9 Tab 1 Schedule 1 (Updated December 19, 2023) at page 15 and the response to interrogatory 6-Staff-322 (c).

RESPONSES TO VULNERABLE ENERGY CONSUMERS COALITION INTERROGATORIES

INTERROGATORY 9-VECC-100

Reference: Exhibit 9, Tab 1, Schedule 1, Tables 19 and 20, Pages 36-

"As this decision (EB-2023-0143) was released just weeks before Toronto Hydro submitted its application to the OEB, the utility intends to file supplemental evidence to forecast the balances that it expects in this account over the current rate period.

QUESTION (A):

a) We are unable to locate the referenced supplemental evidence. Please clarify whether this evidence has been filed.

RESPONSE (A):

Please refer to Toronto Hydro's response to 4-Staff-296(e).

QUESTION (B):

b) The Board approved account is to " track the incremental costs of locates in 2023 and future years arising from the implementation of Bill 93." (page 2). This requires that THESL have an amount from which Bill 93 related locate costs are incremental from. What is "normal" annual locate costs from which Bill 93 incremental costs are to vary from.

RESPONSE (B):

"Normal" annual costs will be based on prevailing locate costs prior to the enactment of Bill 93. Please see also Toronto Hydro's responses to 4-Staff-296(b) and (e) for additional details.