TORONTO HYDRO

DISTRIBUTED ENERGY RESOURCE REQUIREMENTS

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PREPARED BY: **BENSON LO, P.Eng**
MANAGER – CAPACITY PLANNING & GRID INNOVATION

REVIEWED BY: **KIRK HUNTLEY, P.Eng**
SENIOR MANAGER - CAPACITY PLANNING & GRID INNOVATION

CERTIFICATE OF APPROVAL

THIS TECHNICAL SPECIFICATION MEETS THE SAFETY REQUIREMENTS OF SECTION 4 OF ONTARIO REGULATION 22/04

BENSON LO, PROFESSIONAL ENGINEER	2024/01/01 **DATE**

PREFACE

Toronto Hydro's Conditions of Service requires the inclusion of terms and conditions of interconnecting distributed energy resource (DER) facilities to the Toronto Hydro distribution system. This reference document titled "Distributed Energy Resource Requirements" is to be read along with the Conditions of Service.

The purpose of this document is to provide information on various types of DER facilities interconnections available to the Customers, Consumers and Suppliers within Toronto Hydro's service area and how the interconnection will be facilitated to such Customers, Consumers and Suppliers. Further, this reference document will outline the processes of interconnection and settlement to the Customers, Consumers and Suppliers, whether IESO or Toronto Hydro managed program.

This reference document on DER does not yet include DER facilities owned and operated by Toronto Hydro.

Comments and inquiries can be e-mailed to: DER@torontohydro.com

Customers without e-mail access can submit through regular mail to:

DER Connections
Toronto Hydro-Electric System Limited
3rd Floor
500 Commissioners Street
Toronto, Ontario
M4M 3N7

Attn: DER Connections

To contact Toronto Hydro e-mail at: DER@torontohydro.com

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1. INTRODUCTION

1.1 Identification of Distributed Energy Resource and DER Operator

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.

Toronto Hydro may only connect DER facilities within its Licensed Territory as defined in Section 1.1 of the Conditions of Service.

1.2 Related Codes and Governing Laws

DER facilities owned by the Customer, Consumer or Supplier shall be subject to various laws, regulations, and codes as listed in Section 1.2 of the Conditions of Service.

1.3 Interpretations

The rules for interpretation of the Toronto Hydro DER Requirements adhere to the rules listed in Section 1.3 of the Conditions of Service.

1.4 Contact Information

Toronto Hydro can be contacted via e-mail at DER@torontohydro.com or such other e-mail addresses as Toronto Hydro may advise through its website or invoices.

The mailing address is

DER Connections
Toronto Hydro-Electric System Limited
3rd Floor
500 Commissioners Street
Toronto, Ontario
M4M 3N7

Attn: DER Connections

2. DISTRIBUTED ENERGY RESOURCE CONNECTION

2.1 Distributed Energy Resource Classification

DER classification set forth in the Distribution Energy Resources Connection Procedures (DERCP) are outlined in the table below:

Distributed Energy Resource Classification	Rating
Micro	≤ 10 kW
Small	(a) ≤ 500 kW connected on distribution system voltage < 15 kV (b) ≤ 1 MW connected on distribution system voltage ≥ 15 kV
Mid-Sized	(a) > 500 kW but ≤ 10 MW connected on distribution system voltage < 15 kV (b) > 1 MW but ≤ 10 MW connected on distribution system voltage ≥ 15 kV
Large	> 10 MW

2.2 Connection Process (Information Package) and Timing

Subject to all applicable laws, Toronto Hydro will make all reasonable efforts in accordance with the provisions of Section 6.2 of the Distribution System Code (DSC) to promptly connect to its distribution system a DER facility, which is the subject of an application for connection.

As per Section 6.2.1 of the DSC, the connection process (information package) and timing outlined in Section 2.2 of this reference document does not apply to the connection or operation of an Emergency Backup DER facility.

2.2.1 Preliminary Meeting

A DER operator who is considering applying for the connection of a DER facility to the Toronto Hydro distribution system may submit a Preliminary Consultation Information Request (PCIR) to Toronto Hydro. Toronto Hydro will provide a Preliminary Consultation Report (PCR) within 15 days of receiving a complete PCIR submission.

For PCIR, the customer must provide the following information:

i. The total name-plate rated capacity of the DER facility at the connection point;

ii. the DER type for the proposed DER facility;
iii. the resource technology to be used; and
iv. the location of the proposed DER facility including address and account number with the distributor where available.

A DER operator who is considering applying for the connection of a DER facility to the Toronto Hydro distribution system may request a preliminary meeting with Toronto Hydro prior to submitting PCIR. Toronto Hydro will provide a time when it is available to meet with the person within 15 days of the person requesting the meeting.

At the preliminary meeting, Toronto Hydro will discuss the basic feasibility of the proposed connection including discussing the location of its existing distribution facilities in relation to the proposed DER facility and can provide an estimate of the time and costs necessary to complete the connection if requested. Toronto Hydro will not charge for its preparation for and attendance at the preliminary meeting.

2.2.2 Capacity Allocation Process

Toronto Hydro will establish and maintain a capacity allocation process under which Toronto Hydro will process applications for the connection of embedded DER facilities, except for the applications of a micro-embedded DER facility, a capacity allocation exempt small embedded DER facility or a net metered DER facility.

2.2.2.1 Capacity Allocation

The capacity allocation will meet the following requirements:

(a) each application for connection, including an application to increase the output of an embedded DER facility, will be allocated capacity only upon completion of Toronto Hydro's Connection Impact Assessment (CIA), and any required review of Transformer Station (TS) supply capability for the embedded DER facility;
(b) a CIA will not be completed for a proposed connection that cannot be completed within the feeder and/or substation technical capacity limits of Toronto Hydro's distribution system or the supply TS and transmission system, including capacity additions contained in any OEB approved plans to increase the capacity of one or more of Toronto Hydro's distribution system, any host distributor's distribution system or the supply TS and transmission system;
Note: *CIA completed means completed with satisfactory results to connect as in the DSC.*
(c) a CIA will not be completed unless the embedded DER facility which is the subject of the application meets the following requirements at the time the application is made:
    i. demonstrated site control over the land on which the embedded DER facility is proposed to be located and any required adjacent or buffer lands in the form of property ownership (deed), long term lease (lease agreement) or an executed option to purchase or lease the land.
    ii. a proposed in-service date for the embedded DER facility which is no later than 5 years for water power projects or 3 years for all the other types of projects from the initial date of application for connection or in accordance with the timelines in an executed IESO contract.

Capacity Allocation Process does not apply to an application to connect a micro-embedded DER facility or an embedded generation facility that is not an embedded retail generation facility. Applications to connect to a DER which the capacity allocation process under Section 6.2.4.1 of the DSC do not apply, will be processed by Toronto Hydro in accordance with the DSC as and when received.

2.2.2.2 Removal of Capacity Allocation

An application shall have its capacity allocation removed if:

a) an OTC/CCA has not been signed in relation to the connection of the embedded DER facility within:
    i. Subject to 2 and 3 below, 6 months of the date on which the applicant received a capacity allocation for the proposed embedded DER facility;
    ii. Subject to 3 below, 9 months of the date on which the applicant received a capacity allocation for the proposed large embedded facility if a transmission system impact assessment is required; or
    iii. 17 months of the date on which the applicant received a capacity allocation for the proposed large embedded DER facility if transmission upgrades are required in order to connect the large embedded DER facility;
b) a new CIA is prepared for a proposed embedded DER facility, any material revisions to the design, planned equipment or plans for the proposed embedded DER facility and connection shall be filed with Toronto Hydro and Toronto Hydro prepares a new CIA within the relevant time period. If the new CIA differs in a material respect from the original CIA for the project, the project shall have its capacity allocation removed.
c) any required deposit payable to Toronto Hydro in accordance with OTC/CCA has not been received by the date specified by Toronto Hydro;
d) Toronto Hydro is informed by the IESO that the applicant has defaulted on an executed IESO contract; or
e) the applicant defaults on an executed OTC/CCA and fails to correct the default within 30 calendar days.

Toronto Hydro will provide the applicant with two (2) months' advance notice of the expiry of the applicable time period referred to in Section 2.2.2.2(a) prior to removing the capacity allocated to the applicant.

If any applicant has its capacity allocation removed in accordance with Section 2.2.2.2. (a)-(e) (Section 6.2.4.1. (e) in the DSC), the amount of any deposit paid pursuant to the OTC/CCA requirements shall be forfeited by the applicant and retained by Toronto Hydro in a deferral account for disposition by OEB. The amount of any unspent connection cost deposit will be returned to the applicant in accordance with the requirements of Section 6.2.18G in the DSC.

Toronto Hydro will, no later than 30 days after the applicant has its capacity allocation removed, refund to the applicant the amount of any remaining connection cost deposit provided by the applicant to Toronto Hydro pursuant to a OTC/CCA, provided that if Toronto Hydro has incurred costs associated with the connection of the applicant's embedded DER facility to Toronto Hydro's

distribution system in accordance with the relevant OTC/CCA, Toronto Hydro will subtract the amount of any such incurred costs from the total connection cost deposit amount provided by the applicant prior to remitting any refund to the applicant.

2.2.3 Connection Process

Refer to OEB's DERCP, Section 5.3.

2.2.4 Connection of Micro-Embedded DER Facilities

A DER operator who wishes to connect a micro-embedded DER facility to the Toronto Hydro distribution system shall submit an application to Toronto Hydro providing the following information:

i. name-plate rated capacity of each unit of the proposed DER facility and the total name-plate rated capacity of the proposed DER facility at the connection point;
ii. the DER type for the proposed DER facility;
iii. the resource technology to be used; and
iv. location of the proposed DER facility including address and account number where available; and

Where the proposed micro-embedded DER facility is:

i. located at an existing Customer connection and a site assessment is not required, Toronto Hydro shall, within 15 days of receiving a complete application, make a Connection Agreement (CA) or provide reasons for refusing to connect the proposed DER facility;
ii. located at an existing Customer connection and a site assessment is required, Toronto Hydro shall, within 30 days of receiving a complete application, make a CA or provide reasons for refusing to connect the proposed DER facility; or
iii. located other than at an existing Customer connection, Toronto Hydro shall, within 60 days of receiving a complete application, make a CA or provide reasons for refusing to connect the proposed DER facility.

Toronto Hydro's CA will include an estimate of the charges that the Customer can expect to pay for connection. The charges will include design, inspection, meter installation and administrative costs.

In all cases, Toronto Hydro shall give the Customer at least 30 days to accept the CA and Toronto Hydro shall not revoke the CA until this time period has expired.

If the connection of the micro-embedded DER facility will not require a site assessment, then Toronto Hydro shall not charge for the preparation of the CA.

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.

The connection deposit shall be provided in the form of cash, cheque, letter of credit from a bank as defined in the Bank Act, electronic fund transfer (EFT) or surety bond. Toronto Hydro shall

allow the Customer to select the form of the connection deposit.

If Toronto Hydro refuses to provide a CA for the micro-embedded DER facility due to technical limits or constraints, the connection deposit shall be refunded to the Customer. Toronto Hydro shall return the connection deposit to the Customer no later than 30 days after refusing to provide the CA.

If the Customer does not accept Toronto Hydro's CA for the micro-embedded DER facility, or if the Customer withdraws its application, then Toronto Hydro shall retain the connection deposit.

Toronto Hydro will make any necessary metering changes and connect the applicant's micro-embedded DER facility to its distribution system within 5 business days, or at such later date as agreed to by the applicant and Toronto Hydro, of the applicant completing the following:

i. informing Toronto Hydro that it has satisfied all applicable service conditions and received all necessary approvals;
ii. providing Toronto Hydro with a copy of Connection Authorization from the ESA;
iii. enter into a Connection Agreement with Toronto Hydro in the form set out in Schedule B1 of Appendix 2; and
iv. paying Toronto Hydro for the connection costs, including costs for any necessary new or modified metering.

2.2.5 Connection of Small, Mid-sized and Large DER Facilities

This section applies to the connection to the Toronto Hydro distribution system of a DER facility, which is not a micro-DER facility.

A DER operator that applies for the connection of a DER facility to the Toronto Hydro distribution system shall submit a completed application form in Appendix 3 to Toronto Hydro providing the following information:

i. name-plate rated capacity of each unit of the proposed DER facility and total name-plate rated capacity of the proposed DER facility at the connection point;
ii. fuel type of the proposed DER facility;
iii. type of technology to be used;
iv. location of the proposed DER facility including address and account number where available: and
v. single line diagram of the proposed DER facility and connection to the Toronto Hydro distribution system.

A DER operator will be required to pay the CIA cost, applicable to mid-sized and large DER facilities or small DER facilities, as per the price schedule set by Toronto Hydro and submit a completed request for impact assessment form in Appendix 3 providing the following information:

i. evidence that the requirements set out in Section 2.2.2.1(c) have been met;
ii. the proposed point of common coupling with Toronto Hydro distribution system;
iii. any of the "initial set of information" which has not yet been provided to Toronto Hydro;

iv. a single line diagram of the proposed DER facility and connection to the Toronto Hydro distribution system sealed and signed by a professional engineer licensed in Ontario;
v. a preliminary design of the proposed interface protection; and
vi. all necessary technical information required by Toronto Hydro to complete the CIA.
vii. a copy of the lease agreement between Developer and Landlord (if applicable)

Once the applicant has entered into an OTC/CCA with Toronto Hydro and has provided Toronto Hydro with engineering drawings with respect to the proposal, Toronto Hydro will conduct a design review to ensure that the detailed engineering plans are acceptable.

When the connection proposal is approved, assuming that capacity on the distribution system and transmission system is available, DER project will proceed to the next stage. The connection will be completed after a commissioning report is approved by Toronto Hydro and a final connection agreement is executed between the DER operator and Toronto Hydro.

2.2.6 Connection Impact Assessment (CIA)

For all small, mid-sized and large embedded DER facilities, Toronto Hydro will perform a CIA. Toronto Hydro will advise the Customer of the costs to conduct any required impact assessment.

The impact assessment will specify the impact of the proposed embedded DER facility on the Toronto Hydro distribution system and any of its Customers including, but not limited to:

i. any voltage impacts, impacts on current loading settings and impacts on fault currents;
ii. the connection feasibility;
iii. the need for any line or equipment upgrades;
iv. the need for transmission system protection control modifications;
v. any metering requirements;
vi. any Supervisory Control and Data Acquisition (SCADA) monitoring requirements; and
vii. operating schedule requirements;

The Customer shall submit any material revisions to the design, planned equipment or plans for the proposed embedded DER facility and connection with Toronto Hydro. Toronto Hydro will then prepare a new impact assessment within the relevant time period as set out below in Sections 2.2.6.1 and 2.2.6.2. If the new impact assessment differs in a material respect from the original CIA for the project, the project shall have its capacity allocation removed in accordance with Section 2.2.1.2 (b) of this document.

2.2.6.1 CIA for Small Embedded DER Facility

Toronto Hydro will provide an applicant proposing to connect a small embedded DER facility with its results of its impact assessment of the proposed embedded DER facility, a detailed cost estimate of the proposed connection, and an OTC within:

i. sixty (60) days of the receipt of the application where no distribution system reinforcement or expansion is required; and

ii. ninety (90) days of the receipt of the application where a distribution system reinforcement or expansion is required.

An OTC made to an applicant proposing to connect a small embedded DER facility may be revoked by Toronto Hydro if not accepted by the applicant within sixty (60) days.

2.2.6.2 CIA for Mid-sized and Large Distributed Energy Resource Facilities

Subject to Sections 2.2.1.1 (b) and (c), Toronto Hydro will provide the Customer with its impact assessment of the proposed DER facility within sixty (60) days of the receipt of the application of a mid-sized embedded DER facility and within ninety (90) days of the receipt of the application of a large embedded DER facility.

In the case of an application for the connection of a mid-sized or large embedded DER facility, after receiving from Toronto Hydro the connection impact assessment and payment made to Toronto Hydro for the cost for preparing a detailed cost estimate, Toronto Hydro will provide a detailed cost estimate based on an agreed upon project scope with the customer. Toronto Hydro will provide the applicant a detailed cost estimate and an OTC by the later of ninety (90) days after the receipt of payment from the applicant and thirty (30) days after the receipt of comments from a transmitter or other distributor that may have been advised under the Section 4.6.1.

2.3 Offer-to-Connect and Other Agreement

2.3.1 Offer to Connect

Toronto Hydro's Offer to Connect (OTC) is notice to the DER operator that the proposed DER will be considered for connection to the Toronto Hydro distribution system provided that the conditions and requirements set forth in the OTC are met by the applicant for connection.

The OTC will be attached as an appendix to and form part of the connection cost agreement referred to in Section 2.3.2 for small, mid-sized and large embedded DER facilities. For micro-embedded DER facilities, Toronto Hydro's OTC will be sent with the connection agreement.

2.3.2 Connection Cost Agreement

An applicant shall enter into a connection cost agreement (CCA) with Toronto Hydro in relation to any small, mid-sized or large embedded DER facility. The CCA will include the following:

i. a requirement of connection cost deposit equal to 100% of the total estimated allocated cost of connection at the time the CCA is executed;
ii. any requirements relating to the applicant's acceptance of Toronto Hydro's OTC and the connection costs;
iii. a requirement that the in-service date of the DER is no later than five (5) years for water power projects or three (3) years for all other types of projects from the initial date of application for connection or in accordance with the timelines in an executed IESO contract;
iv. a requirement that the applicant completes engineering design and provide detailed

electrical drawings to Toronto Hydro at least six (6) months prior to the specified in-service date or as reasonably required by Toronto Hydro; and

v. the timing of connection.

Where connection of a renewable energy generation facility requires distribution system expansion, the CCA will include a requirement for payment of the cost of the distribution system expansion in excess of $90,000/MW of the name-plate rated capacity of renewable energy generation facility that are not an expansion project as described in 3.2.5B of the DSC.

2.3.2.1 Payment, Refunds and Settlement

Any connection cost deposit, distribution system expansion cost deposit, required to be obtained by Toronto Hydro pursuant to the DSC shall be in the form of letter of credit from a bank as defined in the Bank Act, or surety bond.

The connection cost deposit will be used by Toronto Hydro to pay for costs allocated to the applicant and related to the connection of the embedded DER facility to the distribution system in accordance with the terms of the relevant CCA.

If, following the connection of an embedded DER facility to Toronto Hydro's distribution system, Toronto Hydro determines that the amount of the connection cost deposit provided by the applicant exceeded the costs allocated to the applicant and related to connecting the DER facility to Toronto Hydro's distribution system, Toronto Hydro will at the time of connection, refund to the applicant the amount by which the connection cost deposit exceeded the costs related to connecting the embedded DER facility.

Where any connection cost deposit is provided by an applicant to Toronto Hydro in the form of letter of credit and where Toronto Hydro refunds all or any portion of such connection cost deposit to the applicant in accordance with the DSC, the return of such deposit or deposits shall be in accordance with the following conditions:

i. interest shall accrue monthly on the deposit amounts commencing on the receipt of the deposit required by the distributor; and
ii. the interest rate shall be at the Prime Business Rate set by the Bank of Canada less two (2) percent.

2.3.3 Connection (Operating) Agreement

All Customers with an existing embedded DER facility shall enter into a Connection Agreement with Toronto Hydro. All Customers proposing to construct a new DER facility must also enter into a Connection Agreement with Toronto Hydro prior to the facility being connected to the distribution system.

DER Facilities	**Connection Agreement Form – Appendix 2**
Micro	Schedule B1

Small and mid-sized	Schedule B2
Large	Schedule B3

Where Toronto Hydro does not have a Connection Agreement with an existing Customer that has a DER facility connected to the Toronto Hydro distribution system, the Customer shall be deemed to have accepted and agreed to be bound by all of the Connection Agreement Terms and Conditions attached to this reference document as Schedules B1, B2 B3 in Appendix 2 (depending on the size of the DER facility) as well as the terms of any operating schedule delivered to the Customer from time to time by Toronto Hydro.

A Customer wishing to become a Wholesale Market Participant shall enter into a Connection Agreement in a form acceptable to Toronto Hydro prior to proceeding with IESO Registration. Until such time as an existing Wholesale Market Participant executes such a Connection Agreement with Toronto Hydro, the Wholesale Market Participant shall be deemed to have accepted and agreed to be bound by all of the Connection Agreement Terms and Conditions attached in Schedule C of Appendix 2 and the terms of any operating schedule delivered to it from time to time by Toronto Hydro.

If there is a conflict between the Connection Agreement with a DER operator or Wholesale Market Participant and the Conditions of Service, the Connection Agreement shall govern. An Operating Agreement may be used instead of Connection Agreement for complex DER projects involving multiple feeder operational scenarios.

2.4 Connection Cost and Meter Charges

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.

2.5 Metering

Metering requirements vary with the type and intent of the DER facility. Please consult the IESO Market Rules and Section 5.2 of the Distribution System Code (OEB) for details.

All DER facilities that are greater than 0.5 MVA (or 2 MW for renewables) shall have a four-quadrant interval meter installed at point(s) of DER supply for future standby charge purpose.

Metering provided and installed by Toronto Hydro for DER facility will be subject to the following Toronto Hydro metering requirements:

1) Metering Requirements for 13.8 kV & 27.6 kV Customer-Owned Substation
2) Metering Requirements 750 Volts or Less

2.6 Expansions, Renewable Improvements, Enhancements and Connection Assets

This section provides information on expansion and renewable enabling improvements with respect to DER of renewable energy sources.

2.6.1 Expansion

As described in Section 3.2.30 in the DSC, an expansion of the main distribution system includes:

i. building a new line to serve the connecting Customer;
ii. rebuilding a single-phase line to three-phase to serve the connecting Customer;
iii. rebuilding an existing line with a larger size conductor to serve the connecting Customer renewable energy generation facility;
iv. rebuilding or overbuilding an existing line to provide an additional circuit to serve the connecting Customer renewable energy generation facility;
v. converting a lower voltage line to operate at higher voltage;
vi. replacing a transformer to a larger MVA size;
vii. upgrading a voltage regulating station transformer or station to a larger MVA size; and
viii. adding or upgrading capacitor banks to accommodate the connection of the connecting Customer

2.6.1.1 Expansion Charges to DERs

Where an expansion is undertaken in response to a request for the connection of renewable energy generation facilities, Toronto Hydro will charge the requesting Customer as capital contribution any cost of expansion that exceeds renewable energy expansion cost cap. Renewable energy expansion cost cap is $90,000/MW of the total name-plate rated capacity of all renewable energy generation facilities proposed to be connected to the expansion. If the expansion is in an OEB approved plan filed with the OEB by Toronto Hydro pursuant to the deemed condition of the Toronto Hydro's licence referred to in paragraph 2 of subsection 70(2.1) of the *Ontario Energy Board Act, 1998*, then the full costs will be covered by Toronto Hydro.

When an expansion is undertaken in response to requests for the connection of renewable energy generation facilities by more than one DER operator, Toronto Hydro will apportion the amount of the capital contribution among the requesting DER operators on a pro-rata basis based on the total name-plate rated capacity of the renewable energy generation facility of each DER operator.

Toronto Hydro will not charge a DER operator to construct an expansion to connect a renewable energy generation facility,

(a) if the expansion is in a Board-approved plan filed with the Board by the distributor as in Section 3.2.5A of the DSC; or
(b) if costs of the expansion are at or below the renewable energy generation facility's renewable energy expansion cost cap as in Section 3.2.5B of the DSC.

Section 2.6.1.1(a) also applies to a request for the connection of more than one renewable energy generation facility. Section 2.6.1.1 (b) applies to any of the requesting DER operators to construct the expansion, when expansion costs are at or below the amount that results from adding the total name-plate rated capacity of each renewable energy generation facility in MW and then multiplying that number by $90,000.

2.6.1.2 Expansion Cost Share and Rebate

As per Section 3.2.27 in the DSC, unforecasted Customers that connect to the distribution system during the Customer connection horizon as defined in Appendix B of the DSC will benefit from the earlier expansion and should contribute their share. In such an event, the initial contributors shall be entitled to a rebate from the distributor.

When the unforecasted Customer is a renewable energy generation facility to which Section 2.6.1.1 (a) or Section 2.6.1.1 (b) applies and the Customer entitled to a rebate is a load Customer or a DER Customer to which neither Section 2.6.1.1 (a) nor Section 2.6.1.1 (b) applies, the initial contributors shall be entitled to a rebate. The amount of rebate is determined in accordance with Section 3.2.27 in the DSC. Toronto Hydro refunds or collects from the unforecasted Customers and pays an amount equal to the rebate to the initial contributor, depending on whether the expansion cost is at or below the expansion cap or else the unforecasted Customer is required to share the expansion cost respectively.

When an unforecasted renewable energy generation facility to which Section 2.6.1.1 (a) or Section 2.6.1.1 (b) applies (the "unforecasted renewable DER operator") connects to the distribution system during the Customer connection horizon as defined in Appendix B and benefits from an earlier expansion made on or after October 21, 2009 to connect another renewable energy generation facility to which Section 2.6.1.1 (a) or Section 2.6.1.1 (b) applies (the "initial renewable DER operator"), the initial renewable DER operator shall be entitled to a rebate. If the cost of the earlier expansion exceeded the initial renewable DER operator's renewable energy expansion cost cap, Toronto Hydro will pay to the initial renewable DER operator a rebate and collect a share from the unforecasted renewable DER operator. The calculation of rebate and share will be on pro-rata basis based on the total name-plate rated capacity of the renewable energy generation facility of each DER operator.

2.6.2 Renewable Improvements and Enhancements

As per Section 3.3.2 in the DSC, renewable enabling improvements to the main distribution system to accommodate the connection of renewable energy generation facilities are limited to the following:

i. modifications to, or the addition of, electrical protection equipment;
ii. modifications to, or the addition of, voltage regulating equipment transformer controls or station controls;
iii. the provision of protection against islanding (transfer trip or equivalent);
iv. bidirectional reclosers;
v. tap-changer controls or relays;

vi. replacing breaker protection relays;
vii. Supervisory Control and Data Acquisition (SCADA) system design, construction and connection;
viii. any other modifications or additions to allow for and accommodate 2-way electrical flows or reverse flows; and
ix. communication systems to facilitate the connection of renewable energy generation facilities.

Subject to Section 3.3.4 in the DSC, Toronto Hydro will bear the cost of constructing an enhancement for accommodating 2-way electrical flows in the existing electrical distribution system or making a renewable enabling improvement, and therefore will not charge:

i. a Customer a capital contribution to construct an enhancement; or
ii. a Customer that is connecting a renewable energy generation facility a capital contribution to make a renewable enabling improvement.

2.6.3 Distributed Energy Resource Facility Connection Assets

Bypass Compensation

Toronto Hydro shall require bypass compensation from a Customer, with a non-coincident peak demand that meets or exceeds 5 MW, if:

(a) the Customer disconnects its load facility from Toronto Hydro's distribution system and connects that facility to a generation facility (excluding embedded renewable generation) or to another load facility that is not owned by Toronto Hydro such that Toronto Hydro will no longer receive rate revenues in relation to that disconnected facility; or

(b) the Customer, while retaining its connection to Toronto Hydro's distribution system, also connects its load facility to a generation facility (excluding embedded renewable generation) or to another load facility that is not owned by Toronto Hydro such that the Customer reduces its load served directly by Toronto Hydro's distribution system, and Toronto Hydro's rate revenues in relation to that facility will be reduced.

Toronto Hydro shall calculate bypass compensation using the methodology set out in the DSC

3. TECHNICAL REQUIREMENTS

The Customer shall ensure that the connection of its DER facility to the distribution system does not materially and adversely affect the safety, reliability and efficiency of the Toronto Hydro distribution system.

New or significantly modified DER facilities shall meet the following technical requirements:

i. Technical requirements specified in DERCP of the DSC;
ii. Ontario Electrical Safety Code (OESC) and applicable Canadian Standards Association (CSA) and IEEE Standards;
iii. Toronto Hydro Parallel DER Requirements in Appendix 1 of this reference document; and
iv. Electrical Safety Authority (ESA) Electrical Guidelines for Inverter-Based Micro-DER facilities (10kW and smaller).

3.1 General Technical Requirements

In general, the connection agreement with a Customer for a DER facility connected to the Toronto Hydro distribution system shall include a requirement that the Customer shall have and provide upon request by Toronto Hydro a regular, scheduled maintenance plan that ensures that the DER's connection devices, protection systems and control systems are maintained in good working condition.

All equipment that is connected, operated, procured or ordered before May 1, 2002 is deemed to initially be in compliance with the technical requirements of the DSC.

Toronto Hydro may determine that equipment that was deemed to be in compliance with the technical requirements of the DSC as noted in the immediately preceding paragraph is not in **actual** compliance with the technical requirements due to any of the following conditions:

i. a material deterioration of the reliability of the distribution system resulting from the performance of the DER's equipment; or
ii. a material negative impact on the quality of power of an existing or a new Customer resulting from the performance of the DER's equipment; or
iii. a material increases in DER capacity at the site where the equipment deemed compliant is located.

In such a case, Toronto Hydro will provide the Customer with rules and procedures for requiring such equipment to be brought into actual compliance. The Customer shall then bring its equipment into actual compliance with the technical requirements and within a reasonable time period specified by Toronto Hydro.

When a Customer with an embedded DER facility is connected to the Toronto Hydro distribution system, the Customer shall provide an interface protection that is capable of automatically isolating the DER facility from the Toronto Hydro distribution system under the following situations:

i. internal faults within the DER

ii. external faults in the Toronto Hydro distribution system
iii. certain abnormal system conditions, such as over/under voltage, over/under frequency.

The Customer shall disconnect the embedded DER facility from the Toronto Hydro distribution system when:

i. a remote trip or transfer trip is included in the interface protection, and
ii. the Customer effects changes in the normal feeder arrangements other than those agreed upon in the operating agreement between Toronto Hydro and the Customer.

3.2 Emergency Backup DER Facility Technical Requirements

3.2.1 Commercial and Industrial Customers

Emergency backup DER is a DER facility installed by Customers for backup of load when utility power supply is not available. A Customer with portable or permanently connected emergency backup DER shall comply with all applicable criteria of the Ontario Electrical Safety Code (OESC) and in particular, shall ensure that its Emergency Backup DER Facility does not back feed into the LDC's system or back feed through the revenue meter.

A Customer with an Emergency Backup DER Facility in Open-Transition mode shall further ensure that its facility does not parallel with, nor adversely affect Toronto Hydro's distribution system.

Customers who consider installing a Closed-Transition switch shall notify Toronto Hydro and shall submit documentation that satisfies Toronto Hydro's technical requirements. Customers shall obtain written authorization from Toronto Hydro prior to commissioning the switch in Closed-Transition mode. Closed-Transition switches must not operate the DER in parallel with Toronto Hydro's distribution system for longer than 100ms. A backup timer shall monitor the parallel duration and automatically open the main or DER contacts within 500ms if the maximum parallel duration is exceeded. The backup timer shall also provide visual indication and lockout the transfer system.

Closed transition transfer of the emergency backup DER facility shall not cause a voltage fluctuation of more than 5% at the PCC. Closed transition transfer from utility to DER and retransfer shall take place only when the two sources have a maximum voltage difference of 5%, frequency difference of 0.2 Hz and phase angle difference of 5 electrical degrees. For emergency backup DER facilities with an aggregate capacity greater than 5 MVA, active synchronization shall be used.

In order to operate Closed-Transition switches of emergency backup-DERs, the Customer must also submit to Toronto Hydro:

i. an ESA Plan review report
ii. a Short Circuit Coordination Study
iii. a Sequence of operation in descriptive format
iv. a simplified one-line drawing of the power distribution at the proposed site; and
v. monitoring requirements as per section 3.4

Where multiple emergency backup DERs with Closed-Transition transfer are planned to be installed at a single location, the design and configuration shall minimize the impact to the

distribution grid including fault contribution by using techniques such as sequencing the Closed-Transition transfer and DER units, or using a high impedance design or other equivalent method.

The Customer shall notify Toronto Hydro a minimum of fifteen (15) working days in advance of scheduled commissioning tests to enable Toronto Hydro to witness the commissioning tests. Toronto Hydro may elect to accept a commissioning test report certified by a Professional Engineer. The commissioning verification report shall confirm the installation, configuration, upstream protection, co-ordination devices and sequence of operation as per submitted design requirements. The commissioning report shall be submitted for approval before the operation of the emergency backup DER facility.

customers with a permanently connected emergency backup DER facility operating in parallel shall notify Toronto Hydro regarding the presence of such equipment and shall enter into a connection agreement as required in Section 4 of this document. Contact information is as listed in Section 1.4.

3.2.2 Residential Customers

For customer with emergency backup DER that is operated in closed-transition, or installed with a meter base plug-in transfer device shall submit an application to Toronto Hydro. For portable emergency backup DER, residential Customers can install a Toronto Hydro approved meter base plug-in transfer device onto a 200 A, 4-jaw meter socket that is installed outdoors. All installations must meet Toronto Hydro approval requirements and will only be considered for residential Customers with 120/240 V, single-phase and up to a 200 A service. Customers must initially contact Toronto Hydro to begin the installation process for the meter base plug-in transfer device. Following a Toronto Hydro field visit at the Customer's residence to determine the feasibility of the installation, the Customer will be advised whether to proceed to make arrangements for the meter base plug-in transfer device installed by an electrical contractor that is licensed by the Electrical Safety Authority. In addition, during the time of installation or removal of the meter base plug-in transfer device, a service disconnection /reconnection and breaking/resealing of the revenue meter will be required and shall be performed by Toronto Hydro.

The installation of a meter base plug-in transfer device is not permitted where a Customer location has a DER installation (i.e. MicroFIT, FIT, Net Metering, Load Displacement, and RESOP).

3.3 Net Metered Distributed Energy Resource Technical Requirements

In order to participate in the Net Metering program, Customers will be required to meet all the parallel DER requirements for Connecting micro-DER facilities (10 kW or less) or other DER facilities (greater than 10 kW).

The Customer must have a bi-directional revenue meter that records energy flow in both directions.

3.4 Control and Monitoring

All DER facilities regardless of size will be required to have control and monitoring capability in place. For program specific requirements, please refer to Appendix 4(ii).

4. DISTRIBUTED ENERGY RESOURCE ACTIVITIES (GENERAL)

4.1 Design Review

After the applicant has entered into a CCA with Toronto Hydro and has provided the detailed engineering drawings with respect to the proposal, Toronto Hydro will conduct a design review to determine if the design engineering plans are acceptable.

4.2 Inspections before Connections

All DER facility installations shall be inspected by both the ESA and Toronto Hydro. The DER facility must be approved by the ESA and must also meet Toronto Hydro's requirements. Toronto Hydro requires notification from the Electrical Safety Authority of this approval prior to the DER facility connection and energizing. DER facilities that have been disconnected for a period of six months or longer must also be re-inspected and approved by the Electrical Safety Authority, prior to reconnection.

Provision for metering will be inspected and approved by Toronto Hydro prior to energizing

4.3 Commissioning and Testing

Toronto Hydro has the right to witness the commissioning and testing of the connection of DER facilities greater than 10kW to its distribution system. The Customer shall notify Toronto Hydro no later than fifteen working days prior to any commissioning tests to enable Toronto Hydro to witness the commissioning tests. Toronto Hydro may elect to accept a commissioning test report certified by a Professional Engineer.

Whether Toronto Hydro attends the testing or not, the Customer shall submit a commissioning verification report, as per Appendix 1 (ii), which will include, at a minimum:

i. confirmation of installation and configuration;
ii. a single line electrical drawing which identifies the as-built Connection Point (must be signed, dated and sealed by a Professional Engineer); and
iii. confirmation of posted warning signs on vault doors and switchgear.

In addition to requirements listed above, commissioning reports for solar photovoltaic (PV) DER facilities shall include:

i. confirmation that equipment and installation meet CSA and/or other applicable electrical safety standards (conducted by an Independent Professional Engineer);
ii. protection device co-ordination;
iii. inverter trip settings as per CSA 107.1 with grid interactive mode and anti-islanding protection; and
iv. PV string tests.

The commissioning report shall be submitted for approval before the operation of the DER facility.

Toronto Hydro will permit the operation of the DER facility in parallel to its distribution system in accordance with these conditions once:

i. the applicant has informed Toronto Hydro that it has received all necessary approvals;
ii. the applicant has provided Toronto Hydro with a copy of the Certificate of Acceptance from the ESA;
iii. the applicant has entered into the appropriate Connection Agreement;
iv. Toronto Hydro has received the Connection Authorization from ESA; and
v. Toronto Hydro has received a satisfactory commissioning report sealed by a P.Eng.

Subject to any delays in commissioning and testing of the DER facility, which may be beyond the control of Toronto Hydro, Toronto Hydro will permit the operation a proposed small embedded DER facility in parallel to its distribution system within:

i. Sixty (60) days of the applicant taking the steps set out above, where no distribution system reinforcement or expansion is required; and
ii. One hundred and eighty (180) days of the applicant taking the steps set out above, where a distribution system reinforcement or expansion is required.

Information on the process for connecting a DER facility to a distribution system is set out in the OEB's DERCP.

4.4 Settlement

Each DER program, other than emergency backup DER, is administered and settled by the respective organization based on the metered quantities.

4.5 Billing

Billing by Toronto Hydro for the applicable DER is performed with the regular cycle. Billing and Settlement is made with the owner of the DER facility. A new account will be opened, where the DER operator is not the load Customer of the service address. An OEB-approved monthly administration charge will also apply.

4.6 Mandatory Reporting Requirements

4.6.1 Notice to Transmitter and other Distributors

Toronto Hydro will, no later than five (5) days after the receipt of a complete application for connection of embedded DER facilities, provide notice in writing to the transmitter and/or distributor whose transmission and distribution systems are impacted by an application to connect an embedded DER to Toronto Hydro's distribution system.

Toronto Hydro will, within 10 days of initiating a CIA study, advise in writing any transmitter or distributor whose transmission or distribution system is directly connected to the specific feeder or substation to which the proposed embedded DER facility is proposing to connect. Toronto Hydro will include in the written communication, at a minimum, the proposed in-service date, the rated capacity and type of technology of the proposed embedded DER facility.

Toronto Hydro will file an application with a transmitter or host distributor to complete a Transformer Station (TS) review study or CIA where necessary. Toronto Hydro will also inform the transmitter and/or host distributor in writing on an ongoing basis of any change in status of the project including removal of capacity allocation of the project, material changes in the projected in-service date of the project or placing the project in service.

Where Toronto Hydro is preparing a detailed cost estimate in accordance with Section 4.4.4.2 with respect to a proposed mid-sized or large embedded DER facility, Toronto Hydro will advise any transmitter and/or distributor whose transmission or distribution system is directly connected to Toronto Hydro's distribution system that it is preparing an estimate, within 10 days of receiving payment from the applicant.

Where Toronto Hydro is preparing a detailed cost estimate in accordance with Section 4.4.4.1 with respect to a proposed small embedded DER facility, Toronto Hydro will advise any transmitter or distributor whose transmission or distribution system is directly connected to Toronto Hydro's distribution system that it is preparing an estimate, within 10 days of receiving payment from the applicant.

4.6.2 Information to be made Publicly Available

In accordance with the DSC, certain information of interest to DER operators must be made publicly available. Toronto Hydro will:

i. provide information about the capacity of Toronto Hydro's distribution system to accommodate renewable DER; and
ii. provide information about the take-up of that capacity by individual DERs.

Toronto Hydro will, at least on a quarterly basis, make publicly available:

i. the remaining available capacity on individual feeders to accommodate the connection of renewable DER,
ii. for all feeders directly connected to a transformer station; and
iii. for any feeder that is not directly connected to a transformer station for which an application to connect has been received.
iv. information about Toronto Hydro's feeder and substation technical capacity limits with respect to connecting DER; and
v. other related information about each feeder including, voltage level, minimum and maximum feeder loading and fault level.

A DER operator shall bear all costs of DER facility connection assets comprised of dedicated facilities to connect a DER facility to the existing distribution system and it is not expected to be shared by other users.

5. NET METERING PROGRAM

In order to encourage conservation, Toronto Hydro has established a Net Metering Policy for eligibility of Customers and Consumers who wish to participate in the Net Metering program. Eligible Customers and Consumers with renewable energy generation facilities may reduce their energy costs by exporting surplus generated energy back onto the utility distribution system for credit against the energy the Customer consumes from the distribution system.

In accordance with the Net Metering Regulation, Toronto Hydro has established a Net Metering Program for netting of surplus generated energy with energy consumed from the Toronto Hydro supply. The program information is posted on the Toronto Hydro website and can be downloaded from: https://www.torontohydro.com/grid-connections/net-metering

Eligibility for participation in the Net Metering Program is set out in Net Metering, O. Reg 541/05.

6. EMBEDDED MARKET PARTICIPATION

Under the Market Rules for the Ontario Electricity Market, Chapter 2, Section 1.2.1:

"No persons shall participate in the IESO-administered markets or cause or permit electricity to be conveyed into, through or out of IESO-controlled grid unless that person has been authorized by the IESO to do so".

All embedded market participants, including Wholesale Market Participants, within the service area of Toronto Hydro, once approved by the IESO, are required to inform Toronto Hydro of their approved status in writing, thirty (30) days prior to their participation in the Ontario electricity market.

7. EMBEDDED DISTRIBUTOR

Toronto Hydro will make reasonable efforts to respond promptly to an Embedded Distributor's written request for Connection to the Distribution System and will comply with the requirements of Connection identified in Section 6.3 of the Distribution System Code. On occasion, a Distributor may wish to connect to Toronto Hydro's distribution system for the purposes of obtaining additional transmission connection capacity. In such cases, Toronto Hydro will follow the approval process for such connections required by Section 3.1.8 of the DSC.

The Embedded Distributor is a Customer of Toronto Hydro. Metering at the supply point to the Embedded Distributor will comply with Toronto Hydro's requirements for a Customer in the applicable rate class. Toronto Hydro is not involved in metering the Customers of the Embedded Distributor

8. APPENDICES

8.1 Appendix 1 - Requirements

i. Toronto Hydro Parallel Distributed Energy Resource Requirements

ii. DER Commissioning Requirements and Reports

8.2 Appendix 2 – Agreements

i. Schedule B1:
   - Micro-Embedded DER Facility Connection Agreement

ii. Schedule B2:
   - Form of Connection Agreement for a Small Embedded DER Facility or a Mid-Sized Embedded DER Facility

iii. Schedule B3:
   - Connection Agreement for an Embedded DER Facility Larger than 10 MW

iv. Schedule C:
   - Wholesale Market Participant Connection Agreement Terms and Conditions

8.3 Appendix 3 – Application Forms

i. Distributed Energy Resource (DER) Application Form

ii. Mirco Distributed Energy Resource (DER) Application Form

iii. Pre-assessment Application Form

8.4 Appendix 4 - Charges, Standards, Sketches and Availability

i. Standard for Net Metering – Residential Service

ii. Distributed Energy Resource (DER) Monitoring and Control Requirements

Appendix 1(i) - Toronto Hydro Parallel Distributed Energy Resource Requirements

TORONTO HYDRO-ELECTRIC SYSTEM

PARALLEL DISTRIBUTED ENERGY RESOURCE REQUIREMENTS

FIRST EDITION: April 14, 2004

REVISION #1: February 10, 2006

REVISION #2: January 23, 2007

REVISION #3: January 1, 2024

SECTION 8 - REFERENCE #3

Table of Contents

Introduction

The technical requirements for parallel DER are in place to ensure public and employee safety, protect the integrity of Toronto Hydro's system, and guarantee reliable and quality service to Toronto Hydro customers. The technical requirements in this document are for the protection of Toronto Hydro's facilities, and the DER operator should satisfy itself as to any requirements for the protection of its own facilities.

The requirements below are primarily from Institute of Electrical and Electronics Engineers ("IEEE") Standard 1547, and CAN/CSA C22.2 No. 257-06. DER operators are encouraged to consult the listed references for more details about every item. In situations where modifications are required to the incoming supply arrangement, the DER facility shall also satisfy the following: "Toronto Hydro Requirements for Design and Construction of Customer-Owned Substation High Voltage Substations". It is the DER operator's responsibility to ensure that all requirements are met. Additional requirements may be necessary to address unique situations, and DER operators will be advised of any additional requirements at the appropriate assessment stage.

Toronto Hydro accepts no responsibility or liability for any of the information provided in this document, which has been provided for informational purposes only. Meeting these requirements does not necessarily constitute an acceptable facility design. Toronto Hydro reserves the right to amend any of these requirements at any time.

1 Connection Impact Assessment – Initial Review

Technical requirements for interconnection of the DER facility with Toronto Hydro are checked during the Impact Assessment stage. This initial review is intended to determine the viability of the DER operator's project and to provide the applicant an opportunity to evaluate the situation before making further investments.

1.1 Facility Design Overview

1.1.1 Single Line Diagram ("SLD")

For the initial review, a high-level single line diagram of the proposed facilities is required. Major equipment such as the transformer, disconnection device, and the DER and their respective ratings should be included. Please see the *Distributed Energy Resource (DER) Application Form* for information to be submitted.

A typical arrangement of a DER facility connected to the utility distribution system is shown below in Figure 1. Various configurations, however, are possible in accordance with design requirements and DER facility use.

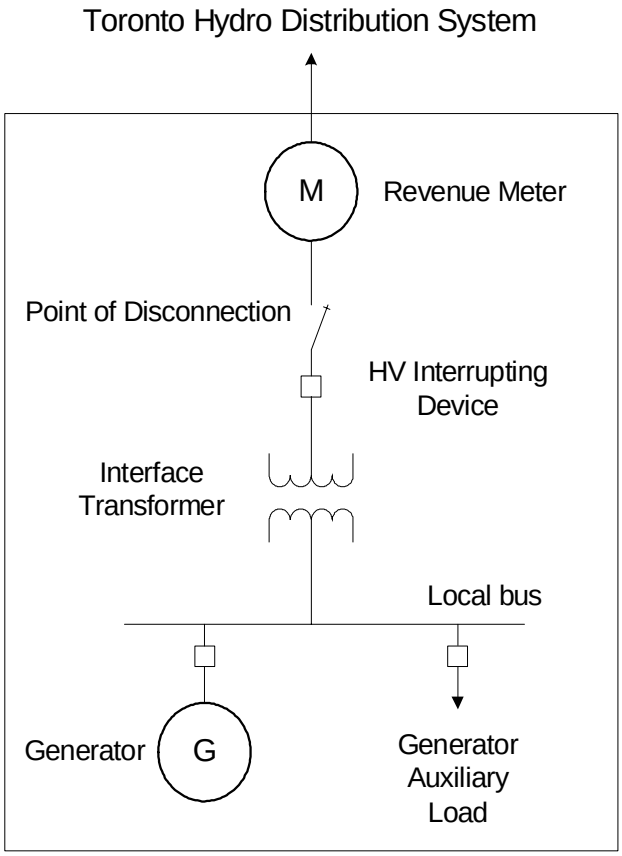


Figure 1 Typical Single Line Diagram Required at the Connection Impact Assessment Stage

1.1.2 Point of Disconnection - Safety

A point of disconnection is required to isolate the DER for the purpose of work protection of Toronto Hydro crews. Switching, lockout and tagging procedures shall be coordinated with Toronto Hydro.

For Micro-Embedded and Small Size DERs, the disconnecting device shall be lockable, have a visible break and accessible by Toronto Hydro personnel. If multiple DERs are on site, there shall be one main disconnect on site capable of disconnecting all DERs simultaneously.

For Mid-Size and Large DERs, the disconnecting device shall be lockable, have a visible break and 24 hours a day, 7 days a week access for Toronto Hydro personnel.

If Toronto Hydro locks are not practical, the customer shall provide Toronto Hydro the appropriate access keys or magnetic cards to enable entry from outside to the substation. Toronto Hydro shall supply and install a key box at a suitable location to safekeep the key(s), as required.

Two Lamicoid labels shall be mounted on the disconnect with the following text.

- **MAIN DG DISCONNECT**

- **WARNING**

  TWO POWER SOURCE

  PARALLEL SYSTEM

Reference codes and standards that apply to the disconnect or isolation device are as follows: Ontario Electrical Safety Code (“OESC”) rule 84-026, IEEE Standard 1547 Clause 4.1.7 and CAN/CSA-C22.2 No. 257-06 Clause 5.3.4 .

1.1.3 Preferred Interface Transformer Configuration and HV Interrupting Device

Preferred configurations for the DER facility interface transformer are outlined in Table 1. The interface transformer connection significantly affects the DER facility interaction with the distribution system under steady state and fault conditions. Careful selection and design are required to mitigate adverse effects.

Selecting an appropriate configuration is dependent on the local distribution system at the point of connection. The configurations suggested in table 1 are only general guidelines that are applicable for the majority of connections. Toronto Hydro will assess each connection individually to determine the required configuration based on the local conditions. In situations where DER neutral impedance or a grounding transformer may be required, effective grounding criteria of the distribution system shall be maintained. This will ensure the maximum overvoltage on the distribution system is within 125% of the nominal voltage. The suggested HV interrupting device is a breaker capable of withstanding 220% of the interconnection system rated voltage.

Table 1

System Voltage	Distribution System Grounding Impedance (Low , High)	Preferred Interface Transformer (HV:LV)
27.6, 13.8 kV	Low (effectively grounded)	Wye Ground / Delta
13.8 kV	High (downtown)	Delta / Wye Ground
27.6,13.8 kV, 4.16 kV	Low (effectively grounded)	Wye Ground / Wye Ground (DER < 1MW)

1.2 Equipment Rating and Requirements

Requirement	Reference
The DER facility interface equipment shall be compatible with Toronto Hydro equipment design and ratings under all operating conditions. During both on-line and off-line interconnection scenarios of the DER equipment, the distribution equipment shall be within its operating rating. Equipment ratings to be reviewed shall be as follows: - Equipment **thermal loading limits.** This equipment includes feeder conductor/cable, station breaker and transformer ratings. - Impact of DER facility **fault contribution** on equipment rating - If power is to be exported to the distribution system then all **metering devices** shall be suitable for ***bi-directional flow***.	Toronto Hydro Requirements

1.3 Voltage Regulation

Requirement	Reference
Voltage variations at the point of common coupling ("PCC") are limited to **+/- 6%** of the nominal voltage. The DER facility should not actively regulate the voltage at the PCC. During normal operation, the DER facilities must be **loaded and unloaded gradually** to allow adequate time for regulating devices to respond and avoid excessive voltage fluctuation. The DER facility shall not cause objectionable voltage and current **unbalance** conditions. The DER facility shall not cause voltage unbalance beyond 3% and current unbalance beyond 10% at the PCC.	CSA CAN3-C235 IEEE 1547 Clause 4.1.1 CAN CSA C22.2 No. 257-06 Section 5.2.3

1.4 Synchronization

<table>
<tr><th>Requirement</th><th>Reference</th></tr>
<tr><td>The DER facility shall parallel with the distribution system without causing a voltage fluctuation of more than 5% at the PCC.

Interconnection shall take place only when the differences in frequency, voltage and phase angle are within the limits shown below.

<u>Table 2</u>
<table>
<tr><th>Total DR System Capacity</th><th>Frequency Difference</th><th>Voltage Difference</th><th>Phase Angle Difference</th></tr>
<tr><td>0-500 kVA</td><td>0.3 Hz</td><td>10 %</td><td>20°</td></tr>
<tr><td>>500-1500 kVA</td><td>0.2 Hz</td><td>5 %</td><td>15°</td></tr>
<tr><td>> 1500 kVA</td><td>0.1 Hz</td><td>3 %</td><td>10°</td></tr>
</table>
</td><td>CAN CSA C22.2 No. 257-06 Section 5.3.21
IEEE 1547 Clauses 4.1.3, 5.1.2
OESC rule 84-006</td></tr>
</table>

1.5 Feeder Relay Directioning

Requirement	Reference
To prevent sympathetic tripping of the DER feeder due to faults on adjacent feeders, breaker protection may need a directional feature for reverse fault current conditions.	Toronto Hydro Requirements

1.6 Monitoring

Requirement	Reference
A DER facility with total capacity rated greater than 50 kVA, shall have at a minimum monitoring items a) to e) below. a) Connection status (Breaker or Contactor Status) b) Real power output c) Reactive power output (Typically on non-inverter DERs) d) Voltage at PCC or aggregate connection e) Current per phase For a generation facility with total capacity rated 2.5 MW or greater, items a) to d) shall be actively monitored. In this case, monitoring typically includes status of load interrupting switches, circuit breakers and interface protection annunciation. Communication media options will be mutually agreed upon.	IEEE 1547 Clause 4.1.6 CAN CSA C22.2 No. 257-06 Clause 5.3.22 Toronto Hydro Requirements

1.7 DER Voltage Ride-Through

Requirement	Reference
The DER shall comply with voltage ride-through on capabilities as per table below **Table 3**	CSA C22.3 No.9-20

Voltage range (% of nominal voltage)	Minimum ride-through time (s) (design criteria)	Maximum response time (s) (design criteria)	Response
V > 120	N/A*	0.16	Cease to energize
117.5 < V ≤ 120	0.2	N/A	Mandatory operation
115 < V ≤ 117.5	0.5	N/A	Mandatory operation
110 < V ≤ 115	1	N/A	Mandatory operation
88 ≤ V ≤ 110	infinite	N/A	Continuous operation
70 ≤ V < 88	Linear slope of 4 s/1p.u. voltage starting at 0.7 s @ 0.7 p.u.: $T_{VTR} = 0.7s + \frac{4s}{1p.u.}(V - 0.7\ p.u.)$	N/A	Mandatory operation
50 ≤ V < 70	0.16	N/A	Mandatory operation
V < 50	N/A*	0.16	Cease to energize

** Cessation of current of DER in not more than the maximum specified time and with no intentional delay. This does not necessarily imply disconnection, isolation, or a trip of the DER.*

1.8 DER Frequency Ride-Through

Requirement	Reference
The DER shall comply with frequency ride-through capabilities as per table below **Table 4**	CSA C22.3 No.9-20

Frequency range (Hz)	Minimum ride-through time (s) (design criteria)
f > 62.0	N/A
61.2 < f ≤ 62	299
58.8 ≤ f ≤ 61.2	infinite*
57.0 ≤ f < 58.8	299
f < 57.0	N/A

** Applicable only for a per-unit ratio of voltage/frequency limit of V/f ≤ 1.1.*

1.9 Minimum DER system reactive power capabilities

Requirement	Reference
The DER should be capable of reactive power sourcing and consumption as per table below. **Table 5** DER system interconnection Q capability grade / Sourcing (capacitive) capability as % of as nameplate apparent power, S (kVA) rating / Consumption (inductive) capability as % of as nameplate apparent power, S (kVA) rating baseline grade / 44% at PCC nominal voltage / 25% at PCC nominal voltage supplemental grade / 44% over +/- 5% of PCC nominal voltage range / 44% over +/- 5% of PCC nominal voltage range **Note:** *44% is equivalent to a power factor range of ± 0.9 (i.e., 0.9 lagging and leading) at rated output.*	CSA C22.3 No.9-20

1.10 Electromagnetic Interference (EMI)

Requirement	Reference
The protection, control, and communication functions of the interconnection system shall not fail, operate improperly, or provide misinformation as a result of EMI and shall comply with the following, where applicable: a) CAN/CSA-CEIKIEC 61000-4-3, using Level X, 35 Wm, in accordance with IEEE C37.90.2; or b) IEEE C37.90.2. The power producer shall provide documentation of compliance with Item a) or b).	CSA C22.3 No.9-20

1.11 Surge Withstand

Requirement	Reference
The protection, control, and communication functions of the interconnection system shall not fail, operate improperly, or provide misinformation as a result of voltage of current surges and comply with clause 7.4.15 of the CSA C22.3 No.9-20 standard.	CSA C22.3 No.9-20

1.12 Harmonics

Requirement	Reference
The DER harmonic levels should comply with table **Table 6** Harmonic order / Odd / Even 2nd through 10th: 4.00% / 1.00% 11th through 16th: 2.00% / 0.500% 17th through 22nd: 1.50% / 0.375% 23rd through 34th: 0.600% / 0.150% 35th through 40th: 0.300% / 0.075%	CSA C22.3 No.9-20

1.13 Power Factor

Requirement	Reference
The DER facility operation shall not adversely affect voltage at the PCC. The preferred power factor range of operation is ±0.9. This range may be narrower if required in some situations. Systems of 30 kW or less are generally not required to be capable of adjusting power factor. For large facilities that are IESO impactive, the DER units shall have sufficient reactive power compensation such that there is no material increase at the transmission system terminal station.	CAN CSA C22.2 No. 257-06 Clause 5.3.13

1.14 Maximum Power Transfer & Synchronous Stability

Requirement	Reference
To ensure distribution system stability and prevent adverse effects on the steady state voltage profile of the feeder, the maximum power export of a generating facility shall be limited so as to not exceed 10° phase shift between line ends. For typical distribution feeders on Toronto Hydro's system at 27.6 kV and 13.8 kV the limit is 50 MW and 20 MW, respectively. Other distribution constraints well below these limits however may govern the maximum power transfer such as feeder rated capacity.	Toronto Hydro Requirement

2 Design Review

The design review ensures detailed engineering is in compliance with Toronto Hydro requirements. It is recommended that this review be completed before proceeding with equipment purchase.

A sample single line diagram below provides the details required at this stage.

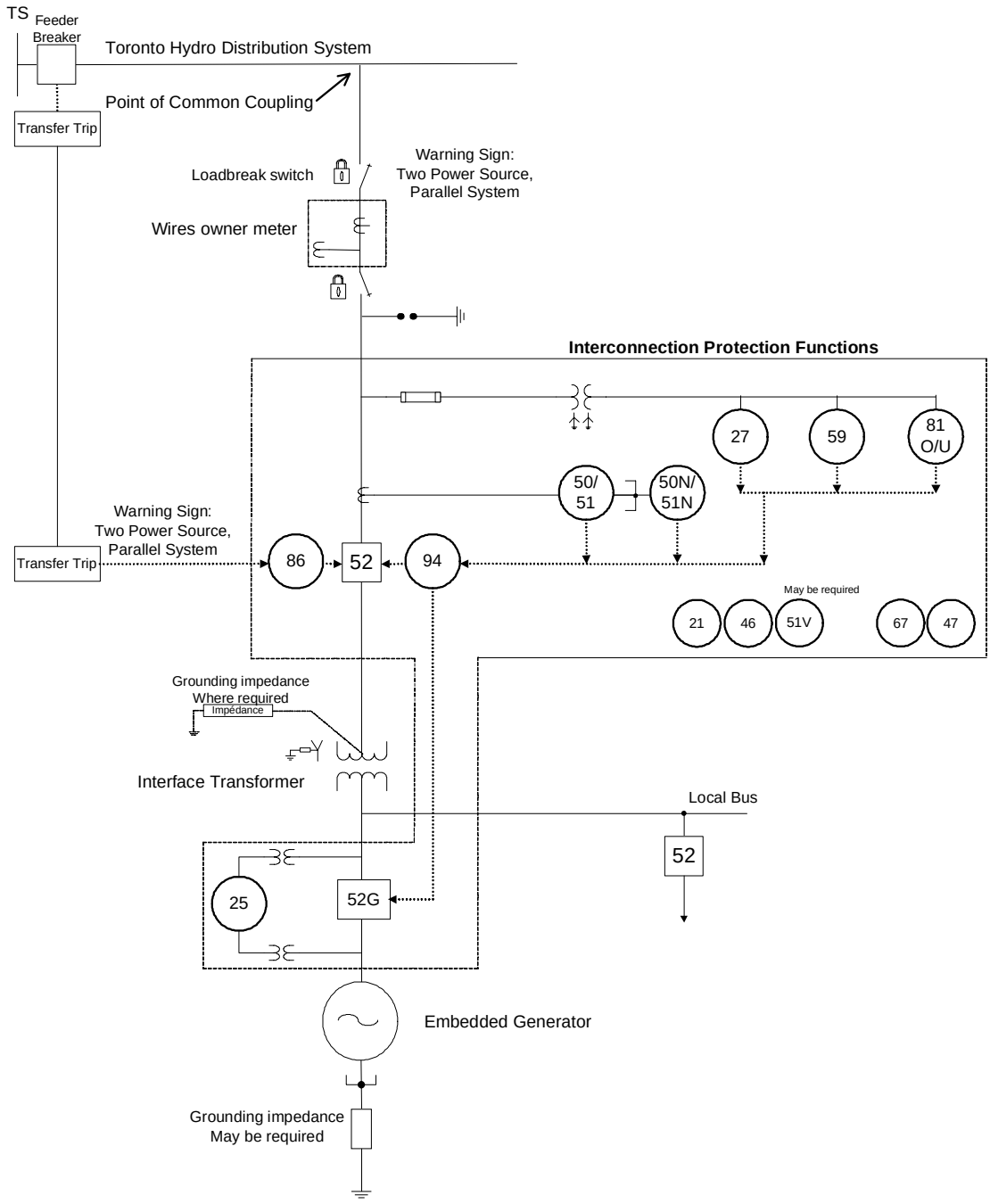


Figure 2 Typical Single-Line Diagram Required at the Design Review Stage

2.1 Case to Energize

<table>
<tr><th>Requirement</th><th>Reference</th></tr>
<tr><td>2.1.1 Distribution System Faults and Customer Facility Faults

Interface protection of the DER facility shall cease to energize Toronto Hydro's distribution system under the following conditions:

Internal Faults at the Customer's Facility.

External Faults on the Toronto Hydro Distribution System.

Equipment and Conductors energized from both directions shall have suitable protection from each supply source.</td><td>DSC Appendix F.2 Section 6.4
IEEE 1547 Clause 4.2.1
OESC 84-014

CAN CSA C22.2 No. 257-06
Clause 5.3.8</td></tr>
<tr><td>2.1.2 Feeder Breaker Reclosing Coordination

The DER facility shall cease to energize Toronto Hydro's feeder before automatic reclosing of the breaker takes place.

Toronto Hydro's 27.6 kV feeders incorporate an autoreclose operation typically half a second in duration. Underground 13.8 kV feeders in the downtown area do not have an automatic reclosing scheme.</td><td>IEEE 1547 Clause 4.2.2
DSC Appendix F.2 Section 6
CAN CSA C22.2 No. 257-06
Clause 5.2.9</td></tr>
<tr><td>2.1.3 Over-Voltage and Under-Voltage Protection

The typical range of protection settings shall comply with the following table:

Response to abnormal voltages
<table>
<tr><th>Voltage at PCC</th><th>Clearing Time Range</th></tr>
<tr><td>V<50%</td><td>Instantaneous to 0.16 s</td></tr>
<tr><td>50% ≤ V < 88%</td><td>Instantaneous to 2 s*</td></tr>
<tr><td>106% < V ≤ 110%</td><td>0.5 s to 2 minutes</td></tr>
<tr><td>110% < V ≤ 120%</td><td>Instantaneous to 2 minutes</td></tr>
<tr><td>120% < V < 137%</td><td>Instantaneous to 2 s*</td></tr>
<tr><td>137% ≤ V</td><td>Instantaneous</td></tr>
</table>
* To satisfy system requirements 2 over-voltage and under-voltage set points may be required.

The actual clearing times may vary within the above range due to distribution system conditions and DER facility protection design.</td><td>IEEE 1547 Clause 4.2.3

CAN CSA C22.2 No. 257-06
Clause 5.3.9

Toronto Hydro Requirement</td></tr>
</table>

<table>
<tr>
<td>2.1.4 Over-Frequency and Under-Frequency Protection

The DER facility shall cease to energize Toronto Hydro's distribution system at the frequency set points and clearing times outlined in the table below.

Response to abnormal frequency
<table>
<tr><th>Adjustable Set Point</th><th>Clearing Time</th></tr>
<tr><td>59.3 to 55.5 Hz</td><td>0.1 to 300 s</td></tr>
<tr><td>60.7 to 63.5 Hz</td><td>0.1 to 180 s</td></tr>
</table>
To satisfy system requirements 2 over-frequency and under-frequency set points may be required.</td>
<td>IEEE 1547 Clause 4.2.4

CAN CSA C22.2 No. 257-06
Clause 5.3.10

Toronto Hydro Requirement</td>
</tr>
<tr>
<td>2.1.5 Interface Protection System

The interface protection study shall include coordination of key interface protection elements, along with the proposed relays and settings to be used at the point of common coupling. The protection study submission shall include required AC & DC schematics and wiring diagram.</td>
<td>Toronto Hydro Requirement</td>
</tr>
</table>

2.2 Connection to Toronto Hydro System

Requirement	Reference
Connection to Toronto Hydro's System following a grid disturbance shall take place only when the voltage at the PCC is within 6% and frequency between 59.3 and 60.5 Hz. The DER facility shall reconnect no less than 5 minutes after the system has stabilized within the above voltage and frequency ranges. Where multiple units on the same feeder are involved, staggering the reconnection times may be required. For mid-sized generating facilities that incorporate transfer trip protection, a lockout relay (86) shall prevent resynchronization until enabled by Toronto Hydro System Control.	IEEE 1547 Clause 4.2.6 Toronto Hydro Requirement

2.3 Anti-Islanding Protection and Transfer Trip Requirements

Requirement	Reference
The DER facility shall disconnect from Toronto Hydro's System upon the loss of utility supply voltage in one or more phases. For mid-sized DER facilities with capacity greater than 50% of the minimum feeder load, the design shall include a Transfer Trip scheme to prevent islanding. In this case, Embedded Generator End Open (EGEO) logic is to be included to supervise the autoreclose operation of the feeder breaker.	IEEE 1547 Clause 4.4.1 OESC rule 84-008 CAN CSA C22.2 No. 257-06 Clause 5.3.11 Toronto Hydro Requirement

2.4 Grounding at the DER Facility

Requirement	Reference
The DER facility's grounding scheme shall not cause over voltages that exceed the rating of Toronto Hydro equipment. The distribution system primarily consists of effectively grounded feeders with surge arresters suitably rated. To meet these requirements at the point of connection the following criteria shall be met: $X0 / X1 \leq 3$, $R0/X1 \leq 1$. The DER facility shall not disrupt the coordination of ground fault protection on Toronto Hydro's distribution system. Wind DER facilities shall not connect to the distribution system neutral.	IEEE 1547 Clause 4.1.2 OESC rule 84-030 CAN CSA C22.2 No. 257-06 Clause 5.3.6 Toronto Hydro Requirement

3 Warning Signs and Diagrams

The following warning sign shall be posted on the point of disconnection, DER feeder cell and switch room door to warn people of the presence of DER:

WARNING
TWO POWER SOURCE
PARALLEL SYSTEM

As well, a single line, permanent and legible diagram of the switching arrangement shall be placed at the **Customer**'s control room and the switch room to indicate the position of the DERs and isolation points with their interlocking arrangements.

Operating designations will be assigned to the switching equipment of the DER system as required by Toronto Hydro. The **Customer** shall update the single line electrical diagram and operating diagram to include the assigned operating designations, and the switching equipment shall be identified by the operating designations as well.

4 Commissioning and Witnessing Requirements

The **Customer** shall apply for **ESA** electrical inspection and provide Toronto Hydro with the Certificate of Inspection once requirements are satisfied. Following this Toronto Hydro will also receive a copy of the Connection Authorization from ESA.

Prior to commencing with commissioning and placing DER facility in-service, Toronto Hydro shall be given an opportunity to review and confirm the proposed commissioning plan meets system requirements.

In addition, before the DER is brought into synchronization, as per the Conditions of Service 4.3 and the DSC 6.2.19, Toronto Hydro will require a utility representative to:

- Witness successful tests of the protection system as far as it affects the Interconnection of the DER to the Toronto Hydro distribution system.
- Verify interface equipment and test associated interlocking facilities.

The customer shall advise Toronto Hydro a minimum of fifteen working days in advance of scheduled commissioning tests, exclusive of Saturday, Sunday and Statutory Holidays, to enable Toronto Hydro to witness the commissioning tests. All testing shall be completed during Toronto Hydro's normal working hours with the Customer being responsible for all costs incurred for time spent beyond said hours.

Alternatively, Toronto Hydro may elect to accept a commissioning test report certified by a Professional Engineer. The commissioning verification report shall contain all interface protection settings and confirm key protective functions and interlocking requirements as previously agreed to by Toronto Hydro Policy & Standards Department. The commissioning report shall be submitted for approval before the operation of DER facility.

On small generating units (less than 500 kVA), Toronto Hydro may elect to forego witness testing. All results shall be documented and a copy forwarded to Toronto Hydro.

Appendix 1(ii) - DER Commissioning Requirements and Reports

Toronto Hydro - Electric System

DER Commissioning Requirements and Reports

Comments and inquiries can be e-mailed to: DER@torontohydro.com

Customers without e-mail access can submit through regular mail any comments and inquiries to:

DER Connection
Toronto Hydro-Electric System Limited
500 Commissioners Street, 3rd Floor
Toronto, Ontario
M4M 3N7

Attn: Benson Lo

To contact Toronto Hydro e-mail at: DER@torontohydro.com

TABLE OF CONTENTS

INTRODUCTION

The technical requirements for parallel DER are in place to ensure public and employee safety, protect the integrity of Toronto Hydro's system, and guarantee reliable and quality service to Toronto Hydro customers. The technical requirements in this document are for the protection of Toronto Hydro's facilities, and the DER operator should satisfy itself as to any requirements for the protection of its own facilities.

Toronto Hydro has the right to witness the commissioning and testing of the connection of DER facilities greater than 10kW to its distribution system. The Customer shall notify Toronto Hydro no later than fifteen working days prior to scheduled commissioning tests to enable Toronto Hydro to witness the commissioning tests.

Whether Toronto Hydro attends the testing or not, the Customer shall submit a ***DER Commissioning Report*** which will include:

a) all required items as outlined in this document;
b) single line electrical drawing which identifies the as-built Connection Point (must be signed, dated and sealed by a Professional Engineer)
c) letter of confirmation that equipment and installation meets CSA and/or other applicable electrical safety standards (conducted by an Independent P.Eng)
d) applicable ESA/CSA certificates and authorization forms
e) PV string tests

The commissioning report shall be submitted for approval before the operation of the DER facility.

The verification of the ***DER Commissioning Report*** must be signed and sealed by a 3rd Party Independent Engineer. This requirement does not disqualify the involvement of the design engineer from the commissioning tests. The design engineer retains the option of participating in the commissioning of the system.

The requirements below are primarily from the Distribution System Code's ("*DSC*"), Institute of Electrical and Electronics Engineers ("*IEEE*") Standard 1547, and *CAN/CSA C22.2 No. 257-06.* DER operators are encouraged to consult the listed references for more details about every item.

In situations where modifications are required to the incoming supply arrangement, the DER facility shall also satisfy the following: "*Toronto Hydro Requirements for Design and Construction of Customer-Owned Substation High Voltage Substations*".

It is the DER operator's responsibility to ensure that all requirements are met. Additional requirements may be necessary to address unique situations, and DER operators will be advised of any additional requirements at the appropriate assessment stage.

DER PROJECT COMMISSIONING SUMMARY

Project Details

DER Reference No.	
Project Address	
Project Name	
System Size (kW)	
Transformer Station and Bus	
Feeder Name	
Utility Transformer Size (kVA)	
Utility Transformer Voltage (HV/LV)	
Number of Strings	
Number of Inverters	
Inverter Manufacturer	

Inverter Serial Numbers

1.		2.		3.	
4.		5.		6.	
7.		8.		9.	
10.		11.		12.	
13.		14.		15.	
16.		17.		18.	
19.		20.		21.	
22.		23.		24.	

Contact Information

DER Operator		
DER Operator Contact		
		PEO File No.
Design Engineer		
Commissioning Engineer		
3rd Party Independent Engineer		
Toronto Hydro Representative		
Notes:		

Commissioning Information

Date of Commissioning	
General Weather Conditions	
Power Analyser	
Notes:	

Equipment Verification and Commissioning Testing Checklist

Results: ✓ = **Pass** ✗ = **Fail**

EQUIPMENT RATINGS and REQUIREMENTS

Commissioning Engineer to verify the following items by visual inspection, calculations, and ESA/CSA approvals.

Item to be Verified	Standards	Result	Notes
Generators/Inverters, circuit breakers and protective relays are functioning correctly	Toronto Hydro Requirement		
Generators/Inverters, circuit breakers and protective relays are within Thermal Loading Limits			
Fault withstanding rating of electrical equipment is higher than maximum fault current possible to flow through the equipment			
Regulating devices and metering devices are suitable for bi-directional flow			
All grounding is in accordance with the Ontario Electrical Safety Code	CSA C22.3 No 9-08		
Inverter and related equipment is UL1741, IEEE 1547, and CSA certified	Toronto Hydro Requirement		

ELECTRICAL SPECIFICATIONS

Procedure:

1. Prior to system start-up, the steady-state parameters listed in this section will be monitored, and recorded, for a minimum of 1 minute at Point A on Figure 1.
2. DER system will be turned on upon the completion of Step 1
3. Upon system start-up, the steady-state parameters listed in this section will be monitored, and recorded, during the inverter start up cycle
4. Once the inverter(s) begin to produce power, the steady-state parameters listed in this section will be monitored, and recorded, for a minimum of 5 minutes at Point A on Figure 1.

** Steady-state parameters will be monitored and recorded using an IEC 61000-4-30 Class A certified Power Analyser. Recording interval time must be ≤ 0.5sec. Power Analyzer must have waveform capture capability.

Item to be Verified	Standards	Result	Notes
Voltage variations at the point of common coupling are limited to +/- 6% of the nominal voltage	CSA C22.2 No. 257-06 Clause 5.2.3		
Confirm frequency is operating in the range of 59.3Hz to 60.5Hz	CSA C22.2 No. 257-06 Clause 5.3.21		
Maximum Harmonic Current Distortion is within limits (see Table 1)	CSA 22.2 No. 107.1		
Power Factor is within 0.9 and 1.1	CSA C22.2 No. 257-06 Clause 5.3.13		
Steady State Plots of 'Electrical Specifications' are provided in Appendix E	Toronto Hydro Requirement		

CEASE TO ENERGIZE

Commissioning Engineer to review Inverter Certificates and Inverter Manufacturer Production Test Reports in order to fulfill the following items. Documentation to be provided in Appendix D

Item to be Verified	Standards	Result	Notes
Interface protection of the DER facility ceases to energize under the following conditions: **Internal Faults** at the Customer's Facility **External Faults** on the Toronto Hydro Distribution system	IEEE 1547 Clause 4.2.1 CSA C22.2 No. 257-06 Clause 5.3.8		
Under Voltage Protection is functioning Over Voltage Protection is functioning	IEEE 1547 Clause 4.2.3 CSA C22.2 No. 257-06 Clause 5.3.9		
Under Frequency Protection is functioning Over Frequency Protection is functioning	IEEE 1547 Clause 4.2.4 CSA C22.2 No. 257-06 Clause 5.3.10		

CEASE TO ENERGIZE - ON SITE TESTING

Procedure:

1. During normal operation, the steady-state parameters (output power, voltage, current, frequency, harmonics and power factor) of the system will be monitored, and recorded, for a minimum of 1 minute at Point A on Figure 1.
2. After 1 minute has elapsed, the main exterior DER disconnect switch will be tripped open.
3. All inverter outputs will be tested to ensure that the inverters have ceased to energize during the simulated utility outage. DER disconnect switch must remain open for a minimum of 2 minutes.
4. Upon confirmation of Step 3, the main exterior DER disconnect switch shall be re-closed.
5. All inverter outputs will be monitored to ensure that the system has ceased to energize for 5 minutes, as per (CSA 22.3 107.1/UL1741)
6. After the inverters begin producing power, the steady-state parameters of the system will be monitored, and recorded, for a minimum of 5 minutes, as per step 1.

** Steady-state parameters will be monitored and recorded using an IEC 61000-4-30 Class A certified Power Analyser. Recording interval time must be ≤ 0.5sec. Power Analyzer must have waveform capture capability.

Item to be Verified	Standards	Result	Notes
Output of inverter(s) is within 'Electrical Specifications' limitations. (Step 1)	Toronto Hydro Requirement		
The DER facility disconnects from the Toronto Hydro system upon the loss of utility supply voltage in one or more phases. (Step 3)	IEEE 1547 Clause 4.4.1 CSA C22.2 No. 257-06 Clause 5.3.11		
System ceased to energize for 5 minutes, upon the re-closing of the main exterior DER disconnect switch (Step 5).			
Output of inverter(s) is within 'Electrical Specifications' limitations. (Step 6)	Toronto Hydro Requirement		
Plots of steady- state parameters are provided in Appendix F† 1. Output Power 2. Current 3. Voltage 4. Frequency 5. Harmonics - Frequency Plot 6. Power Factor † Plots are to be divided into 2 time frames: a) Step 1 to 5: Normal operation, tripping of switch and system re-activation b) Step 6: 5 min interval after anti-islanding test	Toronto Hydro Requirement		
Waveform captures of Step 2 are provided for each parameter (1 to 6) in Appendix G‡ ‡Waveforms captures must depict: a. minimum of 2 cycles before switch is pulled b. minimum of 5 cycles after switch is pulled	Toronto Hydro Requirement		

MONITORING and CONTROL			
Item to be Verified	**Standards**	**Result**	**Notes**
The DER Facility has provision for real time monitoring items:			
1. Analogue Quantities a) Apparent Power (KVA) output and Power Factor and direction for each unit or total for the DER Facility	Toronto Hydro Requirement		
b) Frequency (Hz)			
c) Phase to phase voltage (V)			
d) Three phase currents (A)			
2. Device Statuses a) Status of consolidated DER units			
3. Unsolicited response is sent to THESL when a) Voltage or frequency has reached +/-6% of nominal value			
b) Current or apparent power has reached 100% of max generation or -1% of max generation			
c) Power factor of the DER Facility has fallen below 0.9 or over 1.1			
d) Status of DER facility has changed			
The DER Facility has provision for real time control:			
the ability to remotely dispatch the DER facility (on/off)	Toronto Hydro Requirement		

DEFICIENCIES

Item	Deficiency	Resolution
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

SUPPLEMENTARY DOCUMENTATION

	Yes	No	Notes
Certificate of Inspection from the ESA **(Appendix C)**			
Authorization to Connect from ESA **(Appendix C)**			
Single line electrical drawing which identifies the as-built Connection Point (sealed by P.Eng) **(Appendix A)**			
Letter of confirmation that equipment and installation meets CSA and/or other applicable electrical safety standards (conducted by an Independent P.Eng) **(Appendix B)**			
PV string tests **(Appendix I)**			

VERIFICATION OF REPORT AND SIGNAURE BLOCK

DER Operator	
Name of DER Operator (Print)	
Signature of DER Operator	
Date (dd/mm/yyyy)	
Independent Engineer	
Name of Professional Engineer (Print)	
Signature of Professional Engineer	
Date (dd/mm/yyyy)	
Licensed Professional Engineer Province of Ontario - Seal	

Appendix 2(i) - Schedule B1:

Micro-Embedded DER Facility Connection Agreement

Schedule B1

Micro-Embedded Generation Facility Connection Agreement

See next 3 pages for terms and conditions

Work Description	Net Metering Final Connection Costs
Cost	**$-**
HST(13%)	**$-**
Total	**$-**
Project ID	
Project Size	
Project Address	
Customer Name	
Phone No.	
E-mail	
Requesting Department	DER Connections

Micro-Embedded Generation Facility Connection Agreement

In consideration of Toronto Hydro-Electric System Limited ("Toronto Hydro") agreeing to allow you to connect your 10 kW nameplate rated capacity or smaller generation facility to the Toronto Hydro distribution system, you hereby agree to the following terms and conditions.

1.0 Eligibility

1.1 You agree that your generation connection shall be subject to all applicable laws and bound by the terms and conditions of the Toronto Hydro Conditions of Service, which have been filed with the OEB and are available on request.

2.0 Technical Requirements

2.1 You represent and warrant that you have installed or will install prior to the connection of your generation facility to the Toronto Hydro distribution system, an isolation device satisfying Section 84 of the Ontario Electrical Safety Code and agree to allow Toronto Hydro staff access to and operation of this isolation device as required for the maintenance and repair of the Toronto Hydro distribution system.

2.2 You agree to perform regular scheduled maintenance to your generation facility as outlined by the manufacturer in order to assure that connection devices, protection systems, and control systems are maintained in good working order and in compliance with all applicable laws.

2.3 You agree that during a power outage on the Toronto Hydro system your generation facility will shut down, unless you have installed special transfer and isolating capabilities on your generation facility. You agree to the automatic disconnection of your generation facility from the Toronto Hydro distribution system, as per the generator protective relay settings set out in this Agreement, in the event of a power outage on the Toronto Hydro distribution system or any abnormal operation of the Toronto Hydro distribution system.

2.4 You covenant and agree that the design, installation, maintenance, and operation of your generation facility are conducted in a manner that ensures the safety and security of both the generation facility and the Toronto Hydro distribution system.

2.5 Due to Toronto Hydro's obligation to maintain the safety and reliability of its distribution system, you acknowledge and agree that in the event Toronto Hydro determines that your generation facility (i) causes damage to; and/or (ii) is producing adverse effects affecting other distribution system customers or the Toronto Hydro assets, you will disconnect your generation facility immediately from the Toronto Hydro distribution system upon direction from the Toronto Hydro distribution system and correct the problem at your own expense prior to reconnection.

3.0 Liabilities

3.1 You and Toronto Hydro will indemnify and save each other harmless for all damages and/or adverse effects resulting from either party's negligence or willful misconduct in the connection and operation of your generation facility or the Toronto Hydro distribution system.

3.2 Toronto Hydro and you shall not be liable to each other under any circumstances whatsoever for any loss of profits or revenues, business interruptions losses, loss of contract or loss of goodwill, or for any indirect, consequential, incidental or special damages, including but not limited to punitive or exemplary damages, whether any of the said liability, loss or damages arise in contract, tort or otherwise.

4.0 Compensation and Billing

4.1 If you are not an embedded retail generator, you agree that, subject to any applicable law:

a. Toronto Hydro will not pay you for any excess generation that results in a net delivery to the Toronto Hydro distribution system between meter reads; and

b. There will be no carryover of excess generation from one billing period to the next unless you are, at the relevant time, a net-metered generator (as defined in section 6.7.1 of the Distribution System Code).

4.2 If you are an embedded retail generator selling output from the embedded generation facility to the Independent Electricity System Operator under contract, you agree that Toronto Hydro will pay you for generation in accordance with the Retail Settlement Code.

4.3 If you are an embedded retail generator delivering and selling output to Toronto Hydro, you agree that Toronto Hydro will pay you for generation in accordance with the Retail Settlement Code.

5.0 Termination

5.1 You understand that you have the right to terminate this Agreement at any time, and that by doing so you are required to disconnect your generation facility and notify Toronto Hydro of such action.

6.0 Assignment

6.1 You may assign your rights and obligations under this Agreement with the consent of Toronto Hydro, which shall not withhold its consent unreasonably. Toronto Hydro shall have the right to assign its rights and obligations under this Agreement without your consent.

I understand, accept and agree to comply with and be bound by the above terms and conditions governing the connection of my generation facility to the Toronto Hydro distribution system.

The final connection cost is dependent on the location and the type of connection being made to the distribution grid.

Customer Address: Connection Cost: $- + HST

Customer Signature: _____ Date: _____

Print Name: _____ Your Hydro Account Number:

IMPORTANT NOTE

This Connection Agreement, which is to be signed by the Toronto Hydro load account holder, must be submitted with the final connection payment indicated in this agreement directly to:

Toronto Hydro-Electric System Limited
500 Commissioners Street, Toronto, ON M4M 3N7.
Attn: Accounts Receivable

This agreement and payment must be sent to Toronto Hydro via Canada Post, or courier, at the above address.

Only once the payment and all four pages of this document are received, fully filled out and in their original form, will the scope package be issued for this project to have the meter locate/ site visit scheduled by the Toronto Hydro Electrical Service Inspectors. Failure to meet these requirements will delay the processing of your application.

Nameplate rating of Generator: KW Total installed generation: KW
Type: Photovoltaic
Inverter utilised: ☒ Yes ☐ No

Generator Protective Relay Settings

Table 1 – Inverter Based Generation

The following relay settings shall be used for inverters built to the CSA standard:
Source: CSA C22.2 No. 107.1-01 Table 16

System Voltage Vn = V nominal **V (Volts)**	Frequency **F (Hertz)**	Maximum number of cycles to disconnect	
		Seconds	Cycle
V < 0.5 Vn	60	0.1	6
0.5 Vn • **V** < 0.88 Vn	60	2	120
1.10 Vn • **V** <1.37 Vn	60	2	120
V • 1.37 Vn	60	0.033	2
Vn	**F** < 59.5*	0.1	6
Vn	**F** > 60.5	0.1	6

* The UL1741 & IEEE P1547 Standards use F < rated-0.7 i.e. 59.3 Hz. To update if CSA C22.2 No. 107.1-01 is changed

Table 2 – Non – Inverter Generation

Toronto Hydro's minimum requirements, for other generation are as follows:

System Voltage Vn =V nominal **V (Volts)**	Frequency **F (Hertz)**	Maximum clearing time*	
		Seconds	Cycles
V < 0.5 Vn	60	0.16	9.6
0.5 Vn • **V** < 0.88 Vn	60	2	120
1.10 Vn • **V** <1.20 Vn	60	1	60
V • 1.20 Vn	60	0.16	9.6
Vn	**F** < 59.3	0.16	9.6
Vn	**F** > 60.5	0.16	9.6

*Clearing time is the time between the start of the abnormal condition and the generation ceasing to energize the Toronto Hydro distribution system

- If you are uncertain about your generation equipment's protective relay settings, please check with your generating equipment supplier.
- Automatic reconnect setting time for your generator is after 5 minutes of normal voltage and frequency on the Toronto Hydro distribution system.

Appendix 2(ii) - Schedule B2:

Form of Connection Agreement for a Small Embedded DER Facility or a Mid-Sized Embedded DER Facility

CONNECTION AGREEMENT
FOR A SMALL EMBEDDED GENERATION FACILITY

This Connection Agreement is made this < > day of (Month) , .

BETWEEN

Toronto Hydro-Electric System Limited, (the "Distributor")

AND

(Name of Customer) _____, (the "Customer")

(each a "Party" and collectively the "Parties")

RECITALS

WHEREAS the Distributor is the owner of the distribution system serving the service area described in electricity distribution licence number ED-2002-0497 (the "Licence") issued by the Ontario Energy Board (the "Board") (the "Distributor's distribution system").

AND WHEREAS the Customer owns or operates an embedded generation facility that is located in the Distributor's licensed service area (the "Facility").

AND WHEREAS the Customer has connected or wishes to connect its Facility to the Distributor's distribution system and the Distributor has connected or has agreed to connect the Facility to the Distributor's distribution system.

AND WHEREAS the Distributor has previously reviewed and accepted the Customer's application to connect and related materials (altogether, the "Application") that were submitted to the Distributor in accordance with the process set out in the Distribution System Code (the "Code"), and the Distributor's Conditions of Service and the Distributor and the Customer have signed a connection cost agreement (CCA/OTC), dated *(Month) (Date), (Year);*

AND WHEREAS due to the time elapsed between the execution of the CCA/OTC and the project's progress, Distributor and Customer agreed to change the In-Service Date referenced in the CCA/OTC to _____, *(Year)* to allow for appropriate time for completion and meeting of timelines as agreed in the extension letter (the "Letter") dated (Month) (Date), (Year);

AND WHEREAS in accordance with its Licence and the Code, the Distributor has agreed to offer, and the Customer has agreed to accept, distribution service in relation to the Facility.

NOW THEREFORE in consideration of the foregoing, and of the mutual covenants, agreements, terms and contained conditions herein, the Parties, intending to be legally bound, hereby agree as follows:

1. Definitions and Schedules

1.1 Words and phrases contained in this Agreement (whether capitalized or not) that are not defined in this Agreement have the meanings given to them in the *Electricity Act, 1998*, the *Ontario Energy Board Act, 1998*, any regulations made under either of those *Acts*, or the Code.

1.2 The following schedules form part of this Agreement:

Schedule A – Application and Connection Cost Agreement (recitals)

Schedule B – Single Line Diagram, Connection Point and Location of Facilities (section 2.3)

Schedule C – List of Other Contracts (section 3.4)

Schedule D – Technical and Operating Requirements (section 4.1(d))

Schedule E – Billing and Settlement Procedures (section 5.3)

Schedule F – Contacts for Notice (section 12.1)

Schedule G – Dispute Resolution (section 16.1)

Schedule H – Provisions Applicable if Facility Financed by a Lender (sections 19.3, 20.3 and 21.1)

Where a schedule is to be completed by the Parties, the Parties may not include in that schedule a provision that would be contrary to or inconsistent with the Code or the remainder of this Agreement.

2. Type of Facility and Customer

2.1 The Facility has a name-plate rated capacity of:

[Parties to check the applicable box below]

☐ more than 10 kW and:

(a) up to and including 500 kW, if the Facility is or will be connected to a less than 15 kV line; or

(b) up to and including 1 MW, if the Facility is or will be connected to a 15 kV or greater line

(in which case the Facility is a "Small Embedded Generation Facility")

☐ 10 MW or less and:

(a) more than 500 kW, if the Facility is or will be connected to a less than 15 kV line; or

(b) more than 1 MW, if the Facility is or will be connected to a 15 kV or greater line

(in which case the Facility is a "Mid-sized Embedded Generation Facility")

2.2 The Facility is or will be connected:

[Parties to check the applicable box (es) below]

☐ directly to the Distributor's distribution system

☒ on the load customer side of a connection point to the Distributor's distribution system

☒ the load customer is the same as the Customer

☐ the load customer is:

2.3 Schedule B sets out the following:

(a) a single line diagram of the Facility;
(b) a list of the facilities of one Party that are on the property of the other Party; and
(c) a diagram of the metering installations applicable to the Facility.

2.4 The Customer:

[Parties to check the applicable box(es) below]

☐ intends to:

☐ sell output from the Facility to the Independent Electricity System Operator and has entered into an agreement with the Independent Electricity System Operator for that purpose

☐ deliver and sell output from the Facility to the Distributor

(in which case the Customer is an "Embedded Retail Generator")

☒ does not intend to sell any of the output of the Facility to the Independent Electricity System Operator or the Distributor

3. Incorporation of Code and Application of Conditions of Service and Other Contracts

3.1 The Code, as it may be amended from time to time, is hereby incorporated in its entirety by reference into, and forms part of, this Agreement. Unless the context otherwise requires, all references to "this Agreement" include a reference to the Code.

3.2 The Distributor hereby agrees to be bound by and at all times to comply with the Code, and the Customer acknowledges and agrees that the Distributor is bound at all times to comply with the Code in addition to complying with the provisions of this Agreement.

3.3 In addition to this Agreement, the relationship between the Distributor and the Customer will be governed by the Distributor's Conditions of Service that are in effect at the relevant time. In the event of a conflict or an inconsistency between a provision of this Agreement and a provision of the Distributor's Conditions of Service, the provision of this Agreement shall govern.

3.4 The Distributor may require or may have already required the Customer to enter into one or more of the other contracts listed in Schedule C. In the event of a conflict or an inconsistency between a provision of the Code or this Agreement and a provision of such other contract, the provision of the Code or this Agreement shall govern.

4. Facility Standards

4.1 The Customer shall ensure that the Facility:

(a) meets all applicable requirements of the Electrical Safety Authority ("ESA");
(b) conforms to all applicable industry standards including, but not limited to, those of the Canadian Standards Association ("CSA"), the Institute of Electrical and Electronic Engineers, the American National Standards Institute and the International Electrotechnical Commission;
(c) is installed, constructed, operated and maintained in accordance with this Agreement, the Distributor's offer to connect, the requirements of the ESA, the connection cost agreement, all applicable reliability standards and good utility practice;
(d) meets the technical and operating requirements set out in Schedule D. These requirements shall not exceed any technical or operating requirements set out in the Code unless the Customer agrees; and

5. Charges, Settlement and Billing

5.1 The Customer shall pay the Distributor such charges as may be approved by the Board in relation to the connection of, and the provision of distribution service to, the Facility.

5.2 The Customer agrees to the following in relation to settlement for the output of the Facility:

[Parties to check the applicable box below]

☐ if the Customer is not an Embedded Retail Generator (see section 2.4)
the Distributor will not pay the Customer for any excess generation that results in a net delivery to the Distributor between meter reads and there will be no carryover of excess generation from one billing period to the next unless the Customer is at the relevant time a net metered generator

☐ if the Customer is an Embedded Retail Generator (see section 2.4)

the Distributor will settle all applicable payments and charges in accordance with the Retail Settlement Code

5.3 Billing and settlement activities will be conducted in accordance with the procedures set out in Schedule E.

6. Representations and Warranties

6.1 The Customer represents and warrants to the Distributor as follows, and acknowledges that the Distributor is relying on such representations and warranties without independent inquiry in entering into this Agreement:

(a) the Facility is fully and accurately described in the Application;
(b) all information in the Application is true and correct;
(c) the Facility is in compliance with all applicable technical requirements and laws;
(d) the Customer has been given warranty information and operation manuals for the Facility;
(e) the Customer has been adequately instructed in the operation and maintenance of the Facility and the Customer has developed and implemented an operation and maintenance plan based on those instructions;
(f) if the Customer is a corporation or other form of business entity, the Customer is duly incorporated, formed or registered (as applicable) under the laws of its jurisdiction of incorporation, formation or registration (as applicable);
(g) the Customer has all necessary power, authority and capacity to enter into this Agreement and to perform its obligations under this Agreement;
(h) this Agreement constitutes a legal and binding obligation on the Customer, enforceable against the Customer in accordance with its terms;
(i) the Customer holds all permits, licences and other authorizations that may be necessary to enable it to own and operate the Facility; and
(j) any individual signing this Agreement on behalf of the Customer has been duly authorized by the Customer to sign this Agreement and has the full power and authority to bind the Customer.

6.2 The Distributor represents and warrants to the Customer as follows, and acknowledges that the Customer is relying on such representations and warranties without independent inquiry in entering into this Agreement:

(a) the Distributor is duly incorporated under the laws of Ontario;
(b) the Distributor has all necessary power, authority and capacity to enter into this Agreement and to perform its obligations under this Agreement;
(c) this Agreement constitutes a legal and binding obligation on the Distributor, enforceable against the Distributor in accordance with its terms; and
(d) any individual signing this Agreement on behalf of the Distributor has been duly authorized by the Distributor to sign this Agreement and has the full power and authority to bind the Distributor.

7. Disconnection Device at the Point of Connection

7.1 The Customer shall furnish and install a disconnection switch at the point of connection for the Facility that opens, with a visual break, all ungrounded poles of the connection circuit. The disconnection switch at the point of connection shall be rated for the voltage and fault current requirements of the Facility, and shall meet all applicable CSA standards, ESA requirements, and all other applicable laws. The switch enclosure, if applicable, shall be properly grounded. The disconnection switch at the point of connection shall be accessible at all times, located for ease of access to the Distributor's personnel, and shall be capable of being locked in the open position. The Customer shall follow the Distributor's procedures for switching, clearance, tagging, and locking.

8. Modifications to the Facility

8.1 The Customer shall not modify its connection assets or the Facility except in accordance with this section. Where the modification will not increase the maximum electrical output of the Facility, the Customer shall give the Distributor no less than 15 working days' notice prior to the date on which the modification will be completed. Where the modification will increase the maximum electrical output of the Facility, the Customer shall submit a new application for connection to the Distributor. The Distributor shall process that application for connection in accordance with the Code. The Customer shall not commence such modification until that process has been completed.

9. Insurance

9.1 Throughout the term of this Agreement, the Customer shall carry commercial general liability insurance for third party bodily injury, personal injury, and property damage in an amount as follows:

[Parties to check the applicable box below]

☐ if the Facility is a Small Embedded Generation Facility (see section 2.1)

not less than $1,000,000 per occurrence and in the annual aggregate

☐ if the Facility is a Mid-sized Embedded Generation Facility (see section 2.1)

not less than $2,000,000 per occurrence and in the annual aggregate

Prior to execution of this Agreement, the Customer shall provide the Distributor with a valid certificate of insurance. The Customer shall provide the Distributor with prompt notice of any cancellation of the Customer's insurance by the insurer.

10. Liability and Force Majeure

10.1 The liability provisions of section 2.2 of the Code apply to this Agreement and are hereby incorporated by reference into, and form part of, this Agreement.

10.2 A Party shall have a duty to mitigate any losses relating to any claim for indemnification from the other Party that may be made in relation to that other Party. Nothing in this section shall require the mitigating Party to mitigate or alleviate the effects of any strike, lockout, restrictive work practice or other labour dispute.

10.3 A Party shall give prompt notice to the other Party of any claim with respect to which indemnification is being or may be sought under this Agreement.

10.4 The force majeure provisions of section 2.3 of the Code apply to this Agreement and are hereby incorporated by reference into, and form part of, this Agreement.

11. Facility Commissioning and Testing

11.1 The Customer shall give the Distributor at least fifteen days advance written notice of the date(s) and time(s) on which the Facility will be commissioned and tested prior to connection. The Customer shall give the Distributor the same notice in relation to the commissioning and testing of any material modification to the Customer's connection assets or Facility that occurs after connection.

11.2 The Distributor shall have the right to witness the commissioning and testing activities referred to in section 11.1.

12. Notice

12.1 Any notice, demand, consent, request or other communication required or permitted to be given or made under or in relation to this Agreement shall be given or made: by courier or other personal form of delivery; by registered mail; by facsimile; or by electronic mail. Notices shall be addressed to the applicable representative of the Party identified in Schedule F.

12.2 A notice, demand, consent, request or other communication referred to in section12.1 shall be deemed to have been made as follows:

(a) where given or made by courier or other form of personal delivery, on the date of receipt;
(b) where given or made by registered mail, on the sixth day following the date of mailing;
(c) where given or made by facsimile, on the day and at the time of transmission as indicated on the sender's facsimile transmission report; and
(d) where given or made by electronic mail, on the day and at the time when the notice, demand, consent, request or other communication is recorded by the sender=s electronic communications system as having been received at the electronic mail destination.

13. Access to Facility

13.1 Each Party shall ensure that its facilities are secured at all times.

13.2 The Customer shall permit and, if the land on which the Facility is located is not owned by Customer, cause such landowner to permit, the Distributor's employees and agents to enter the property on which the Facility is located at any reasonable time. Such access shall be provided for the purposes of inspecting and/or testing the Facility as and when permitted by this Agreement, the Code or the Distributor's Conditions of Service or as required to ensure the continued safe and satisfactory operation of the Facility, to ensure the accuracy of the Distributor's meters, to establish work protection, or to perform work.

13.3 Any inspecting and/or testing referred to in section 13.2 shall not relieve the Customer from its obligation to operate and maintain the Facility and any related equipment owned by the Customer in a safe and satisfactory operating condition and in accordance with this Agreement.

13.4 The Distributor shall have the right to witness any testing done by the Customer of the Facility and, to that end, the Customer shall provide the Distributor with at least fifteen working days' advance notice of the testing.

13.5 Notwithstanding section 10.1, where the Distributor causes damage to the Customer's property as part of this access, the Distributor shall pay to the Customer the Customer's reasonable costs of repairing such property or, if such property cannot be repaired, replacing such property.

13.6 Notwithstanding section 10.1, if the Customer has been given access to the Distributor's property, and if the Customer causes damage to the Distributor's property as part of that access, the Customer shall pay to the Distributor the Distributor's reasonable costs of repairing such property or, if such property cannot be repaired, replacing such property.

14. Disconnection of Facility to Permit Maintenance and Repairs

14.1 If the Customer requests it, the Distributor will provide the Customer with reasonable notice of any planned equipment outages in the Distributor's distribution system that occur on or after the date of the Customer's request which will impact the Facility or its connection.

14.2 The Distributor will make reasonable efforts to ensure that the outages referred to in section 14.1 will be of minimal duration and cause minimal inconvenience to the Customer.

14.3 In connection with any planned equipment outage, either Party may disconnect or isolate, or require the disconnection or isolation of, its Facility or system (as applicable) from the other Party's Facility or system (as applicable) so that the employees, contractors or agents of the Party may construct, maintain, repair, replace, remove, investigate or inspect its own Facility or system (as applicable) in accordance with the terms of this Agreement and good utility practice.

14.4 Where practical, the Customer shall notify the Distributor prior to temporarily isolating or disconnecting the Facility from the Distributor's distribution system.

15. Disconnection of Facility for Other Reasons

15.1 The Customer shall discontinue operation of the Facility and the Distributor may isolate or disconnect the Facility from the Distributor's distribution system, upon any of the following:

(a) termination of this Agreement in accordance with section 19;
(b) if the Customer's connection assets or the Facility are modified by the Customer in a manner contrary to section 8.1;
(c) during an emergency or where necessary to prevent or minimize the effects of an emergency;
(d) in accordance with section 31, 31.1 or 40(5) of the *Electricity Act, 1998*, other applicable law, the Code, the Distributor's Licence or the Distributor's Conditions of Service; or
(e) where required to comply with a decision or order of an arbitrator or court made or given under Schedule G.

15.2 In the event of disconnection under section 15.1(b), the Facility shall remain isolated or disconnected from the Distributor's distribution system until the connection process referred to in section 8.1 has been completed.

15.3 In the event of disconnection under section 15.1(c), the Distributor shall reconnect, or permit the reconnection of, the Facility to the Distributor's distribution system when it is reasonably satisfied that the emergency has ceased and that all other requirements of this Agreement are met.

15.4 In the event of disconnection under section 15.1(d) or 15.1(e), the Distributor shall reconnect, or permit the reconnection of, the Facility to the Distributor's distribution system when the Distributor is reasonably satisfied that the reason for the disconnection no longer exists, the Customer agrees to pay all Board-approved reconnection costs charged by the Distributor, and the Distributor is reasonably satisfied of the following, where applicable:

(a) the Customer has taken all necessary steps to prevent the circumstances that caused the disconnection from recurring and has delivered binding undertakings to the Distributor that such circumstances shall not recur; and
(b) any decision or order of a court or arbitrator made or given under Schedule G that requires a Party to take action to ensure that such circumstances shall not recur has been implemented and/or assurances have been given to the satisfaction of the affected Party that such decision or order will be implemented.

15.5 Where the Facility has been isolated or disconnected, each Party shall be entitled to decommission and remove its assets associated with the connection. Each Party shall, for that purpose, ensure that the other Party has all necessary access to its site at all reasonable times.

15.6 The Customer shall continue to pay for distribution services provided up to the time of isolation or disconnection of its Facility.

15.7 The Customer shall pay all reasonable costs including, but not limited to, the costs of removing any of the Distributor's equipment from the Customer's site, that are directly

attributable to the isolation or disconnection of the Facility and, where applicable, the subsequent decommissioning of the Facility. The Distributor shall not require the removal of the protection and control wiring on the Customer's site.

15.8. While the Facility is isolated or disconnected, the Distributor shall not be required to convey electricity to or from the Facility.

16. Dispute Resolution

16.1 Any dispute between the Customer and the Distributor arising under or in relation to this Agreement will be resolved in accordance with Schedule G. The Parties shall comply with the procedure set out in Schedule G before taking any civil or other proceeding in relation to the dispute, provided that nothing shall prevent a Party from seeking urgent or interlocutory relief from a court of competent jurisdiction in the Province of Ontario in relation to any dispute arising under or in relation to this Agreement.

17. Amendments

17.1. The parties may not amend this Agreement without leave of the Board except where and to the extent permitted by this Agreement.

17.2. The Parties may by mutual agreement amend this Agreement to reflect changes that may from time to time be made to the Code during the tern of this Agreement.

17.3 The Parties may by mutual agreement amend any portion of a schedule that was originally to be completed by the Parties.

17.4 No amendment made under section 17.2 or 17.3 shall be contrary to or inconsistent with the Code or the remainder of this Agreement.

17.5 The Parties shall amend this Agreement in such manner as may be required by the Board.

17.6 Any amendment to this Agreement shall be made in writing and duly executed by both Parties.

18. Waiver

18.1 A waiver of any default, breach or non-compliance under this Agreement is not effective unless in writing and signed by the Party to be bound by the waiver. The waiver by a Party of any default, breach or non-compliance under this Agreement shall not operate as a waiver of that Party's rights under this Agreement in respect of any continuing or subsequent default, breach or non-compliance, whether of the same or any other nature.

19. Term of Agreement and Termination

19.1 This Agreement shall become effective upon execution by the Parties, and shall continue in effect until terminated in accordance with section 19.2 or 19.3.

19.2 The Customer may, if it is not then in default under this Agreement, terminate this Agreement at any time by giving the Distributor thirty days prior written notice setting out the termination date.

19.3 Except as set out in Schedule H, the Distributor may terminate this Agreement upon any material breach of this Agreement by the Customer (a "Default"), if the Customer fails to remedy the Default within the applicable cure period referred to in section 19.4 after receipt of written notice of the Default from the Distributor.

19.4 The Customer shall cure a Default within the applicable cure period specified in the Code or the Distributor's Conditions of Service. If no such cure period is specified in relation to a given Default, the cure period shall be sixty working days.

19.5 Termination of this Agreement for any reason shall not affect:

(a) the liabilities of either Party that were incurred or arose under this Agreement prior to the time of termination; or
(b) the provisions that expressly apply in relation to disconnection of the Customer's facilities following termination of this Agreement.

19.6 Termination of this Agreement for any reason shall be without prejudice to the right of the terminating Party to pursue all legal and equitable remedies that may be available to it including, but not limited to, injunctive relief.

19.7 The rights and remedies set out in this Agreement are not intended to be exclusive but rather are cumulative and are in addition to any other right or remedy otherwise available to a Party at law or in equity. Nothing in this section 19.7 shall be interpreted as affecting the limitations of liability arising from section 10.1 or the obligation of a Party to comply with section 16 while this Agreement is in force.

19.8 Sections 19.5 to 19.7 shall survive termination of this Agreement.

20. Exchange and Confidentiality of Information

20.1 Confidential information in respect of a Party means (i) information disclosed by that Party to the other Party under this Agreement that is in its nature confidential, proprietary or commercially sensitive and (ii) information derived from the information referred to in (i), but excludes the following:

(a) information that is in the public domain; or
(b) information that is, at the time of the disclosure, in the possession of the receiving Party, provided that it was lawfully obtained from a person under no obligation of confidence in relation to the information.

20.2 Subject to section 20.3, each Party shall treat all confidential information disclosed to it by the other Party as confidential and shall not, without the written consent of that other Party:

(a) disclose that confidential information to any other person; or

(b) use that confidential information for any purpose other than the purpose for which it was disclosed or another applicable purpose contemplated in this Agreement.

Where a Party, with the written consent of the other Party, discloses confidential information of that other Party to another person, the Party shall take such steps as may be required to ensure that the other person complies with the confidentiality provisions of this Agreement.

20.3 Nothing in section 20.2 shall prevent the disclosure of confidential information:

(a) where required or permitted under this Agreement, the Code, the Market Rules or the Distributor's Licence;
(b) where required by law or regulatory requirements;
(c) where required by order of a government, government agency, regulatory body or regulatory agency having jurisdiction;
(d) if required in connection with legal proceedings, arbitration or any expert determination relating to the subject matter of this Agreement, or for the purpose of advising a Party in relation thereto;
(e) as may be required to enable the Distributor to fulfill its obligations to any reliability organization; or
(f) as may be required during an emergency or to prevent or minimize the effects of an emergency.

20.4 Notwithstanding section 10.1, a Party that breaches section 20.2 shall be liable to the other Party for any and all losses of the other Party arising out of such breach.

20.5 The Parties agree that the exchange of information, including, but not limited to, confidential information, under this Agreement is necessary for maintaining the reliable operation of the Distributor's distribution system. The Parties further agree that all information, including, but not limited to, confidential information, exchanged between them shall be prepared, given and used in good faith and shall be provided in a timely and cooperative manner.

20.6 Each Party shall provide the other with such information as the other may reasonably require to enable it to perform its obligations under this Agreement.

20.7 Each Party shall, as soon as practicable, notify the other Party upon becoming aware of a material change or error in any information previously disclosed to the other Party under this Agreement and, in the case of the Customer, in any information contained in its Application. The Party shall provide updated or corrected information as required to ensure that information provided to the other Party is up to date and correct.

21. Assignment, Successors and Assigns

21.1 Except as set out in Schedule H, the Customer shall not assign its rights or obligations under this Agreement in whole or in part without the prior written consent of the Distributor, which consent shall not be unreasonably withheld or unduly delayed. The Distributor may withhold its consent to any proposed assignment until the proposed assignee assumes, in writing, all of the Customer's obligations contained in this Agreement.

21.2 The Distributor shall have the right to assign this Agreement in whole upon written notification to the Customer.

21.3 This Agreement shall be binding upon and enure to the benefit of the Parties and their respective successors and permitted assigns.

22. Governing Law

22.1. This Agreement shall be governed by the laws of the Province of Ontario and the federal laws of Canada applicable therein.

23. Entire Agreement

23.1 Except as expressly provided herein, this Agreement constitutes the entire agreement between the Parties with respect to the subject-matter hereof and supersedes all prior oral or written representations and agreements of any kind whatsoever with respect to the subject-matter hereof.

IN WITNESS WHEREOF, the Parties hereto, intending to be legally bound, have caused this Agreement to be executed by their duly authorized representatives.

_____ _____
Customer Signature Date

_____
Name (Print)

_____
Title

I have the authority to bind the Customer.

_____ _____
Distributor Signature Date

HANI TAKI
Name (Print)

DIRECTOR, CAPACITY PLANNING & GRID INNOVATION
Title

I have the authority to bind the Distributor.

SCHEDULE A

Application and Connection Cost Agreement (recitals)

See the attached Application and connection cost agreement.

SCHEDULE B

Single Line Diagram, Connection Point and Location of Facilities (section 2.3)

B.1 Single Line Diagram and Connection Point

See attached Drawing No. _____ dated _____

B.2 List of Facilities on the Property of the Other Party

B.2.1 The following facilities of the Customer are located on the property of the Distributor:

There are no facilities of the Customer on the Distributor's property.

B.2.2 The following facilities of the Distributor are located in the property of the Customer:

SCADA Control and Monitoring Equipment, Metering Equipment.

B.3 Metering Installation Diagram

Metering is in accordance with the Distributor's Conditions of Service Section 6, Reference #6 Metering Requirements 750 Volts or Less, Revision #19.1, dated March 1, 2020, as amended from time to time.

SCHEDULE C

List of Other Contracts (section 3.4)

The following other contracts have been or will be entered into by the Parties:

There are no other contracts.

SCHEDULE D

Technical and Operating Requirements (section 4.1(d))

The following technical and operating requirements apply to the Facility:

The Technical and Operating Requirements are set out in Distributor's Distributed Energy Resource Requirements effective January 1, 2023 (Conditions of Service Section 6 - Reference #3), as amended from time to time.

SCHEDULE E

Billing and Settlement Procedures (section 5.3)

The following provisions apply in relation to billing and settlement in relation to the Facility:

Billing and settlement will be on a monthly basis whenever there is direct communication with the meter. In the event there is no communication with the meter, manual readings will be obtained for settlement and billed on a monthly basis based on the Distributor's billing schedule.

SCHEDULE F

Contacts for Notice (section 12.1)

During normal business hours, and anytime after hours, or on weekends & holidays,

Contact:

For the Customer:

For the Distributor:

Benson Lo
Manager – DER Connections
Capacity Planning & Grid Innovation
Toronto Hydro-Electric System Limited
500 Commissioners Street, 3rd Floor
Toronto, Ontario M4M 3N7
Telephone: (416) 542-3100 × 42233
Blo2@torontohydro.com

SCHEDULE G

Dispute Resolution (section 16.1)

G.1 The Party claiming a dispute will provide written notice to the other Party. The Parties will make reasonable efforts through or by their respective senior executives to resolve any dispute within sixty days of receipt of such notice.

G.2 If a dispute is settled by the senior executives of the Parties, the Parties shall prepare and execute minutes setting forth the terms of the settlement. Such terms shall bind the Parties. The subject-matter of the dispute shall not thereafter be the subject of any civil or other proceeding, other than in relation to the enforcement of the terms of the settlement. If a Party fails to comply with the terms of settlement, the other Party may submit the matter to arbitration under section G.3. A copy of the minutes referred to in this section from which all confidential information has been expunged shall be made available to the public by the Distributor upon request.

G.3 If the senior executives of the Parties cannot resolve the dispute within the time period set out in section G.1 or such longer or shorter period as the Parties may agree, either Party may submit the dispute to binding arbitration under sections G.4 to G.8 by notice to the other Party.

G.4 The Parties shall use good faith efforts to appoint a single arbitrator for purposes of the arbitration of the dispute. If the Parties fail to agree upon a single arbitrator within ten (10) working days of the date of the notice referred to in section G.3, each Party shall within five working days thereafter choose one arbitrator. The two arbitrators so chosen shall within fifteen working days select a third arbitrator.

G.5 Where a Party has failed to choose an arbitrator under section G.4 within the time allowed, the other Party may apply to a court to appoint a single arbitrator to resolve the dispute.

G.6 A person may be appointed as an arbitrator if that person:

(a) is independent of the Parties;
(b) has no current or past substantial business or financial relationship with either Party, except for prior arbitration; and
(c) is qualified by education or experience to resolve the dispute.

G.7 The arbitrator(s) shall provide each of the Parties with an opportunity to be heard orally and/or in writing, as may be appropriate to the nature of the dispute.

G.8 The *Arbitration Act, 1991* (Ontario) shall apply to an arbitration conducted under this Schedule G.

G.9 The decision of the arbitrator(s) shall be final and binding on the Parties and may be enforced in accordance with the provisions of the *Arbitration Act, 1991* (Ontario). The Party against which the decision is enforced shall bear all costs and expenses reasonably incurred by the other Party in enforcing the decision.

G.10 A copy of the decision of the arbitrator(s) from which any confidential information has been expunged shall be made available to the public by the Distributor upon request.

G.11 Subject to section G.12, each Party shall be responsible for its own costs and expenses incurred in the arbitration of a dispute and for the costs and expenses of the arbitrator(s) if appointed to resolve the dispute.

G.12 The arbitrator(s) may, if the arbitrator(s) consider it just and reasonable to do so, make an award of costs against or in favour of a Party to the dispute. Such an award of costs may relate to either or both the costs and expenses of the arbitrator(s) and the costs and expenses of the Parties to the dispute.

G.13 If a dispute is settled by the Parties during the course of an arbitration, the Parties shall prepare and execute minutes setting forth the terms of the settlement. Such terms shall bind the Parties, and either Party may request that the arbitrator(s) record the settlement in the form of an award under section 36 of the *Arbitration Act, 1991* (Ontario). The subject-matter of the dispute shall not thereafter be the subject of any civil or other proceeding, other than in relation to the enforcement of the terms of the settlement.

G.14 If a Party fails to comply with the terms of settlement referred to in section G.13, the other Party may submit the matter to arbitration under section G.3 if the settlement has not been recorded in the form of an award under section 36 of the *Arbitration Act, 1991* (Ontario).

G.15. A copy of the minutes referred to in section G.13 from which all confidential information has been expunged shall be made available to the public by the Distributor upon request.

G.16 The Parties may not, by means of the settlement of a dispute under section G.2 or section G.13, agree to terms or conditions that are inconsistent with or contrary to the Code or this Agreement.

SCHEDULE H

Provisions Applicable if Facility Financed by a Lender (sections 19.3, 20.3 and 21.1)

H.1 For the purposes of this Schedule, "lender" means a bank or other entity whose principal business in that of a financial institution and that is financing or refinancing the Facility.

H.2 Where notice of a Default has been served on the Customer under section 19.3, an agent or trustee for and on behalf of a lender ("Security Trustee") or a receiver appointed by the Security Trustee ("Receiver") shall upon notice to the Distributor be entitled (but not obligated) to exercise all of the rights and obligations of the Customer under this Agreement and shall be entitled to remedy the Default specified in the notice within the applicable cure period referred to in section 19.4. The Distributor shall accept performance of the Customer's obligations under this Agreement by the Security Trustee or Receiver in lieu of the Customer's performance of such obligations, and will not exercise any right to terminate this Agreement under section 19.3 due to a Default if the Security Trustee, its nominee or transferee, or the Receiver acknowledges its intention to be bound by the terms of this Agreement and such acknowledgment is received within 30 days of the date of receipt by the Customer of the notice of Default.

H.3 The Customer may, without the prior written consent of the Distributor, assign by way of security only all or any part of its rights or obligations under this Agreement to a lender. The Customer shall promptly notify the Distributor upon making any such assignment.

H.4 The Customer may disclose confidential information of the Distributor to a lender or a prospective lender.

Appendix 2(iii) - Schedule B3:

Connection Agreement for an Embedded DER Facility Larger than 10 MW

SCHEDULE D

Operating and Technical Requirements

for

a Parallel Generation and Interconnection Agreement

made between:

xxxx Company

and

Toronto Hydro-Electric System Limited (THESL)

March 16, 20--

Table of Contents

1. FACILITY OWNERSHIP

1.1. THESL owns:

1.1.1. The incoming _____ feeder cables from _____ feeder up to the Point of Connection at the Customer-owned loadbreak switch ___, on the main Customer-owned pole.

1.1.2. The transfer-trip protection equipment at THESL Facility.

1.2. The Customer owns:

1.2.1. All other switches, breakers, transformers and associated Apparatus at substation ___ and downstream from above mentioned Customer-owned loadbreak switches ___.

1.2.2. The Embedded Generation Facility, which includes devices and relays to protect both the THESL Distribution System and Embedded Generation Facility from faults.

1.2.3. The transfer-trip protection equipment at the Embedded Generation Facility.

2. CONTROL AUTHORITIES

2.1. The Customer is responsible for the operation of all of the Customer's Apparatus at the Embedded Generation Facility.

2.2. The Customer shall designate their own Controlling Authorities for their Embedded Generation Facility. The Customer Controlling Authorities are set out in Appendix D2 to this Operating Schedule. The Customer may change its designates by giving notice to THESL in accordance with this Operating Schedule.

2.3. The THESL Controlling Authorities for all THESL Apparatus at the Embedded Generation Facility shall be designated by THESL. The THESL Controlling Authorities are set out in Appendix D2 to this Operating Schedule. THESL may change its designates by giving notice to the Customer in accordance with this Operating Schedule.

2.4. The THESL Controlling Authorities are responsible for the operation of the feeders supplying the Customer. In addition, THESL may operate switchgear and/or disconnect switches with visible isolation and lockable provision at the Embedded Generation Facility as required for planned or Emergency work.

2.5. The THESL Controlling Authorities may unilaterally force the Customer's Apparatus out of service, de-rate, or impose Customer's Apparatus limitations. THESL will provide reasons to the Customer for such action. When THESL, in its sole discretion, determines that an Emergency exists, THESL may provide the Customer with the reasons for taking such action following the Emergency.

3. OPERATING REQUIREMENTS

3.1. The Customer shall operate the Embedded Generation Facility as an Embedded Generator. Upon the loss of THESL feeder supply, the protective devices shall operate to disconnect the Embedded Generation Facility from the THESL Distribution System as outlined in Section 5 of this Operating Schedule.

3.2. The Customer shall connect the Embedded Generation Facility to THESL's Distribution System only when the transfer-trip protection is in-service on the specific supply feeder being connected.

3.3. The Customer shall operate the Embedded Generation Facility as outlined in Appendix D8. Upon occurrence of a grid disturbance, the interface protection will open the Generator Isolation Breakers ___ to disconnect the Embedded Generation Facility from the THESL Distribution System.

3.4. The Customer shall connect the Embedded Generation Facility to the THESL Distribution System only when the Embedded Generation Facility is in-service at synchronous voltage and frequency and only in accordance with the terms of this Operating Schedule. The Customer shall not energize the Point of Connection if the THESL Distribution System has been de-energized for any reason, except in accordance with this Operating Schedule.

3.5. The Customer shall operate its Embedded Generation Facility so as to avoid unacceptable harmonics (as set forth in Section 3.11 of this Operating Schedule), voltage flicker or voltage levels on the ____ kV distribution system (collectively, "Adverse Conditions). If THESL determines that the Customer's equipment or the Embedded Generation Facility are causing any such Adverse Conditions, the Customer shall correct such Adverse Conditions in a timely manner in accordance with the terms of this Operating Schedule.

3.6. The Customer shall install and maintain readily identifiable warning signs at: (i) the main incoming ___kV switchgear, and all other _____kV switchgears, (ii) the Embedded Generation Facility step-up transformers, (iii) the primary loadbreak switch location, main breaker, and both Embedded Generation Facility breakers, and (iv) the Embedded Generation Facility location. The warning signs shall identify operation of the Embedded Generation Facility and the location of the visible-open-disconnect switch. A single-line diagram shall also be posted at the above locations clearly identifying the Embedded Generation Facility. Warning sign requirements shall be as per Conditions of Service, Section 6, Ref #3, Appendix 6.1, 1(i), Section 3, as amended from time to time.

3.7. If THESL determines that the Customer is not operating in compliance with the terms of this Operating Schedule and attached Appendices, THESL may then, by notice in writing at any time ("Notice of Non-Compliance"), require the Customer to correct any instances of non-compliance, and the Customer shall, upon receipt of said notice, correct such instances of non-compliance in a timely manner. THESL shall determine, in its sole discretion if it is necessary to disconnect the Customer until the correction is made. Notice of any disconnection will be set out in the Notice of Non-Compliance. Notice of disconnection may be given to the Customer following the disconnection where the disconnection was made as a result of an Emergency, as determined in the sole discretion of THESL.

3.8. The transfer-trip signal shall trip and lockout both Generator Isolation Breakers ___ during operation of supply feeder ___ . The Customer must ensure that the transfer-trip protection and monitoring equipment are continually in service and functioning. If a failure of any of these occurs, the Customer shall notify the THESL Controlling Authorities immediately.

3.9. In the event that an abnormal operation of the Embedded Generation Facility occurs, including but not limited to, over or under voltage, over or under frequency or voltage unbalance, and the Customer cannot contact the THESL Controlling Authorities, then the Customer shall immediately disable the Embedded Generation Facility from operating in Parallel Mode.

3.10. The operation of the Embedded Generation Facility and Customer Apparatus shall meet or exceed the level of standards, procedures and instructions set by THESL from time to time.

3.11. The Customer must ensure that the interface protection is in service and functioning. This includes the following protective functions: under/over voltage, under/over frequency, distance protection, DC station services. If a failure of any of these should occur, the Customer must not operate the Embedded Generation Facility in Parallel Mode with the THESL Distribution System and the Customer must notify the THESL Controlling Authorities immediately. The Customer shall take necessary corrective action to re-enable the interface protection.

3.12. Restoration of the Embedded Generation Facility from Islanded Mode to Parallel Mode after a failure of power supply to the Customer should only be initiated with the prior approval of the THESL System Controller by resetting of the 86 lockout relay.

3.13. Each party must ensure that the other party is aware of local or trade specific procedures that may have an impact on the overall operation and maintenance of the Embedded Generation Facility.

4. EMERGENCY OPERATIONS

4.1. During Emergencies, each party shall take, and is hereby authorized to perform, whatever immediate action it deems necessary to safeguard public safety, life and property. Any actions taken shall be reported to the other party's Controlling Authorities as soon as possible after conditions have stabilized.

4.2. During an Emergency, THESL may, in its sole discretion, require the Customer to disconnect the Embedded Generation Facility from Parallel Mode in order to protect the stability of the THESL Distribution System, by opening the Generator Isolation Breakers identified in Appendix D8 and this may be done without prior notice to the Customer.

4.3. Information on automatic or Emergency operations affecting the Embedded Generation Facility or the ___ kV supply feeders will be exchanged between the Customer and THESL. Restoration of the supply feeders and the reconnection of the Embedded Generation Facility to Parallel Mode shall be in accordance with instructions from THESL.

4.4. At the request of the THESL Controlling Authorities, the Customer Controlling Authorities Competent Person(s) shall provide isolation of Customer's Apparatus, as required by THESL and in accordance with the timeframe provided by THESL, for Emergency switching.

5. PROTECTION AND CONTROL

5.1. The interface protection settings shall include over/under voltage (59/27), over/under frequency (81 O/U) and distance function (21). The THESL-approved settings of the interface protection relays shall be as specified in Appendix D3. The Customer must, as specified in Section 8 the Connection Agreement, obtain the prior written consent of THESL to any Modifications to the interface protection relaying, control facilities and settings. The Customer must submit to THESL for review drawings, revised interface protection settings related to the proposed Modifications and any other information as THESL may request.

5.2. The Embedded Generation Facility shall be disconnected immediately from operating in Parallel Mode where there is a loss of the interface protection functionality.

5.3. The Embedded Generation Facility may continue to operate in Parallel Mode if there is a temporary loss of transfer-trip protection at the sole discretion of Toronto Hydro System Controller.

5.4. If the DC station service for the Customer's substation fails (under voltage), the affected Embedded Generation Facility shall be immediately disconnected from operating in Parallel Mode with the applicable feeder.

5.5. The Customer shall ensure that the closing of the Embedded Generation Facility onto the THESL feeders is synchronized.

5.6. Interface protection at the Embedded Generation Facility, and all control systems, shall be re-verified in accordance with Appendix D9 of this Operating Schedule.

6. WORK PROTECTION

6.1. All work on THESL Apparatus will be carried out in accordance with THESL Work Protection practices. THESL and local safety rules must be followed at all times.

6.2. All work on Customer Apparatus will be carried out in accordance with the Customer's practices which shall be consistent with Good Utility Practice or, where applicable, the procedures outlined in the Occupational Health and Safety Act (Ontario) and the regulations related thereto.

6.3. When the Customer's Embedded Generation Facility requires Isolation from THESL sources of energy or Isolation of a Device under THESL control, the Customer Controlling Authorities shall request the THESL Controlling Authorities to provide a Condition Guarantee. The Customer shall then establish its own Work Protection practices. These practices shall be consistent with Good Utility Practice or, where applicable, the procedures outlined in the Occupational Health and Safety Act (Ontario) and the regulations related thereto.

6.4. When THESL requires Isolation from Customer sources or Isolation of a Device under the Customer's control, the THESL Controlling Authorities shall request the Customer Controlling Authorities to provide a Condition Guarantee. THESL will then establish its own Work Protection Condition in accordance with its practices for establishing a Work Protection Condition.

7. COMMUNICATION

7.1. Communication between the parties' Controlling Authorities must be available on a 24-hour basis. A 24-hour contact list is provided in Appendix D2 to this Operating Schedule.

7.2. All communications by the Controlling Authorities regarding Apparatus shall reference the operating designations and nomenclature as identified on the operating diagram in Appendix D4 to this Operating Schedule.

7.3. Operating orders and messages shall be confirmed by the receiving authority.

7.4. The Customer shall advise THESL as soon as practicable, of all Embedded Generation Facility related events, including but not limited to:

7.4.1. time of connection or disconnection of the Embedded Generation Facility.

7.4.2. time of Embedded Generation Facility' breaker trip.

7.5. The Customer will provide THESL with all necessary instructions for Emergency responses including reporting procedures and site Emergency co-ordinators. Each party will provide the other party with all necessary instructions.

8. INFORMATION REQUIREMENT AND EXCHANGE

8.1. THESL and the Customer will use reasonable efforts to keep each other informed of conditions and events within their respective control that may affect the connection assets and the performance of obligations under this Operating Schedule.

8.2. The parties shall each provide the other with updates in the event of any changes to the positions and telephone numbers listed in Appendix D2 to this Operating Schedule.

8.3. Operating data and information affecting the connection assets of each party and operation of this Operating Schedule shall be conveyed to the other party to ensure safe and efficient operation and maintenance of both parties' facilities.

8.4. If a Scheduled/Planned Outages or Forced Outages on any Apparatus would provide an opportunity for maintenance activities, the parties will provide advance notice to the other party of such opportunity, where possible.

8.5. By December 31st of each year, the Customer shall provide THESL with an annual 5-year load demand (by transformer, station, bus) for planning purposes.

8.6. The Customer shall maintain a daily operation log which shall include:

8.6.1. information on the Embedded Generation Facility;

8.6.2. scheduled Maintenance and Forced Outages; circuit breaker trip operations that require manual reset;

8.6.3. switching operations that are requested by THESL;

8.6.4. any significant events related to the operation of the Embedded Generation Facility;

8.6.5. Customer loading; and

8.6.6. time of connection and disconnection of the Embedded Generation Facility.

8.7. The Customer shall retain the records contained in the operations log for a minimum of the previous five (5) years, and upon request, shall provide information from the operation logs to THESL .

8.8. Operating orders and messages from the Customer or THESL must refer to nomenclature as identified on the standard operating diagram attached as Appendix D4 to this Operating Schedule, and must be confirmed by the receiving authority.

9. ACCESS AND SECURITY

9.1. The Customer hereby grants to THESL a right of access at any time, without notice, to the Embedded Generation Facility and any property of the Customer required to access the Embedded Generation Facility on a 24-hour basis. If the land on which the Embedded Generation Facility is located is not owned by the Customer, the Customer shall require the landowner to permit THESL the right to enter the property on which the Facility is located at any time.

10. MAINTENANCE AGREEMENT

10.1. Each party is solely responsible for routine and emergency maintenance on all Apparatus under their respective Ownership. The Customer must have a regular, scheduled maintenance plan to ensure that the Embedded Generation Facility is in good working order.

10.2. Each party is solely responsible for upgrades and rehabilitation on all Apparatus under its Ownership to ensure there is no degradation in Apparatus performance that would lead to unacceptable increases in Apparatus failure rates that could impact the other party's operation.

10.3. The standards of, procedures for, performance of, and maintenance on the Customer's Apparatus shall meet or exceed the level of standards, procedures and instructions set by THESL from time to time.

10.4. Each party is responsible for ensuring that its own assets are secure at all times. Where a fence is provided for the purpose of restricting access to any enclosed facilities, the owner of the fence must maintain the integrity of the fence.

10.5. THESL and the Customer may elect to repair/maintain their respective equipment during normal working hours even though this may prevent the Embedded Generation Facility from operating in Parallel Mode. At the request of the Customer, and upon payment of any increased costs (as specified by THESL), THESL may perform any required maintenance

outside normal working hours. Normal working hours of THESL repair personnel are from 7:00 A.M. to 3:30 P.M., Monday to Friday (excluding statutory holidays in Ontario).

10.6. The Customer is responsible for maintaining its interface protection.

11. ENVIRONMENTAL

11.1. If the Customer causes a spill that could impact THESL's Distribution System, the Customer shall clean up the spill as soon as possible and at the Customer's sole expense. The Customer shall immediately notify THESL of any spills. The Customer shall comply with all applicable environmental laws and regulations when cleaning up a spill and the Customer will notify the required parties for any reportable spill.

11.2. If THESL causes a spill, THESL shall clean up such spill as soon as possible and at THESL's sole expense. THESL shall comply with all applicable environmental laws and regulations when cleaning up a spill and THESL will notify the required parties of any reportable spill.

11.3. Storage and handling of regulated wastes shall be in accordance with Applicable Laws.

12. TRAINING AND QUALIFICATIONS

12.1. Operation, inspection and maintenance of all Apparatus covered by this Operating Schedule must be performed by Competent Persons.

13. REVISIONS TO THIS OPERATING SCHEDULE

13.1. The parties agree that this Operating Schedule shall be revised and updated every two (2) years from the date of execution (each, an "Update") to ensure that information provided herein is up to date and correct. Each Update shall be in accordance with Section 17 of the Agreement. The Customer shall submit any updated information to this Operating Schedule to the THESL System Operations Department within sixty (60) days prior of each Update and THESL will revise the Operating Schedule according, along with any additional updates required.

APPENDIX D1 - DEFINITIONS

Definitions

Words and phrases defined in the Connection Agreement shall have the same meaning when used in this Operating Schedule and, also, the words and phrases shall have the meanings set forth below. If there is any conflict between a definition contained in this Operating Schedule and a definition in the body of the Connection Agreement, the definition in the body of the Connection Agreement shall prevail.

Apparatus	Equipment pertaining to the generation, distribution and use of power.
Applicable Laws	All federal, provincial and municipal statutes, regulations, codes, by-laws, orders in council, directives, rules, guidelines and ordinances applicable to the Agreement and Operating Schedule, including without limitation all applicable Ontario Energy Board codes, rules or guidelines.
Approved Work Practices	Procedures approved for use by THESL.
Competent Person	One qualified by knowledge, training and experience to perform the assigned work.
Condition Guarantee	A guarantee issued in support of Work Protection certifying that an Isolated or de-energized condition exists at points under the control of the issuer of the Condition Guarantee.
Connection Agreement	The Connection Agreement for Embedded Generation Facility dated March 16, 2016 between THESL and the Customer.
Customer Apparatus	All Apparatus Owned by the Customer.
Customer Controlling Authorities	Competent Persons who have the responsibility and authority of operating control over the Customer's Apparatus.
Customer Loading	The amount of power being consumed by the customer facility, measured in kW, regardless of the source.

Device	A mechanism that can be operated to stop, start or control the flow or release of energy such as fuse, cut-out, live line clamp, mid span opener, air break switch, open point.
Embedded Generation Facility	A generation facility which is not directly connected to the IESO-controlled grid but instead is connected to a distribution system, and has the extended meaning given to it in Section 1.9, Distribution System Code (DSC).
Emergency	A condition or situation which, in the judgement of THESL or the Customer, will affect THESL or the Customer's ability to meet its obligations to maintain safe, adequate and continuous electric service or to avoid damage to property or persons.
Forced Outage	The removal from service of the availability of the Embedded Generation Facility for Emergency reasons; or the unavailability of the Embedded Generation Facility due to an unanticipated failure of those Embedded Generation Facility or other facilities. Only the Controlling Authorities may force Apparatus out of service, de-rate or impose Apparatus limitations.
Generator Isolation Breakers	The generator breaker that is as shown in Appendix D4 (breaker 52-G), which may be opened to isolate the downstream generators.
Good Utility Practice	The practices, methods and acts engaged in or approved by a significant portion of the electric utility industry in North America during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method or act to the exclusion of all others, but rather to be acceptable practices, methods or acts generally accepted in North America.
Guaranteed Device	An isolated Device tagged with a Work Protection tag.

Hazard	Any condition which has the potential for loss to people, property or process.
Islanded Mode	The portion of the Customer's Apparatus that is energized by the Embedded Generation Facility downstream from their PCC while that portion is separated electrically from the rest of the distribution system.
Isolated	Physically disconnected or separated from sources of energy by approved Devices or procedures.
Main Supply Breaker	The breakers located in the main substation as shown in Appendix D4 (breakers 52-U), which are upstream from the customer-owned high voltage transformers.
Maintenance	Routine maintenance, troubleshooting, repairs, approved changes and modifications as required for safe and efficient operation of the Apparatus.
Modification	Additions, improvements or other changes to the Embedded Generation Facility as required for economical, safe and reliable operation.
Ownership/Owned	Having the design authority and the replacement responsibility of the thing owned.
Point of Common Coupling (PCC)	The point on the distribution system that is electrically closest to the power producer's facility, where other customers are connected or can be connected.
Point of Connection	Line side of the primary ___ kV Customer-owned loadbreak switch CO-OSL86183 at xxxCompany substation(THESL location number: CO-ST947-1) which connects to the ___ feeder.
Parallel	The simultaneous energization of a PCC by the distribution system and the Embedded Generation Facility.
Parallel Mode	The generator is connected in parallel with the THESL Distribution System.

Scheduled/Planned Outage	An outage that results when a component is deliberately taken out of service at a pre-selected time, usually for the purpose of construction, preventive maintenance or repair.
Surrender	The relinquishing of a Condition Guarantee by the appropriate Controlling Authorities.
THESL	Toronto Hydro-Electric System Limited.
THESL Apparatus	All Apparatus Owned by THESL.
THESL Controlling Authorities	Competent Persons who have the responsibility and authority of operating control over all THESL Apparatus that could affect the distribution of power under its control.
THESL Distribution System	The distribution system serving the service area described in electricity distribution licence number ED-2002-0497 issued by the Ontario Energy Board.
THESL System Controller	Competent Persons who have the responsibility and authority of operating control over the THESL's Apparatus.
Work Protection	A guarantee that an Isolated, or Isolated and de-energized condition has been established for work, and will continue to exist, except for authorized tests, until Surrendered.

APPENDIX D2 - TELEPHONE CONTACTS

Telephone Contacts

Either party has the right to change the below listed position designations and telephone numbers at any time by notice in accordance with the Operating Schedule. All emergency numbers may only be changed by giving notice pursuant to Section 2 of the main body of the Operating Schedule.

xxxxa

Service Address: 60 xxx Street, Toronto, ON M8V 2B8

during normal business hours, and anytime after hours, or on weekends & holidays,

Name: Power Service Operation (1st Call)

Telephone: 416-251-1117, x8285 Fax: (416) 253-8692

THESL

Control Authority

System Operations

Toronto Hydro

Telephone: (416) 542-3540

System Operations Supervisor

System Operations

Telephone: (416) 542-3552

APPENDIX D3.1 - FACILITIES INFORMATION

Facilities Information

Single Line Diagram:	
Metering Facilities Diagram:	
Protection and Control (Transfer-Trip):	See attached report
Operating Diagram:	See attached overview
Protection Settings:	See attached report
Interface Protection Relays and Settings:	Upon occurrence of a THESL failure while the generator is operating in parallel, the interface protection will separate the generator from the THESL feeder by opening the corresponding interface breaker. The interface relays in operation and their respective settings follow:
Islanding Protection:	See attached report
Ground Backup Protection:	See attached report
Phase Backup Protection:	See attached report

APPENDIX D3.2 - PROTECTION STUDY

APPENDIX D4 - SINGLE LINE DIAGRAM

APPENDIX D5 - MONITORING & CONTROL OVERVIEW

APPENDIX D6 - DISTRIBUTION SYSTEM DIAGRAM

APPENDIX D7.1 - SUBSTATION OPERATING DIAGRAM SCENARIO 1

APPENDIX D7.2 - SUBSTATION OPERATING DIAGRAM SCENARIO 2

APPENDIX D8 - GENERAL MODE OF OPERATION

APPENDIX D9 - PROTECTION & CONTROL RE-VERIFICATION

Protection and Control Re-verification Schedule

1. Transfer-trip protection and interface protection at the Embedded Generation Facility as well as control systems that may affect the THESL or Hydro One shall be re-verified every 5 years.

2. The Customer shall advise THESL by giving at least ten (10) working days' notice of intention to conduct a re-verification test, so that THESL Protection and Control staff and System Planning & Performance staff (if necessary) can witness the testing of the following:

   2.1. relay re-calibration;

   2.2. test tripping of associated breakers; and

   2.3. measurement and analysis of secondary AC voltages and currents to confirm integrity of protection system.

3. Specific protection to be observed:

   3.1. all station protection which trip and open the interface breakers;

   3.2. transfer-trip protection and interface protection;

   3.3. confirm that the initial settings of the Embedded Generation Facility submitted and approved by THESL continue to apply to the interface protection relays in Appendix D3.1.

4. Upon request from THESL, Customer shall provide, in a timely manner, a copy of the most recent Protection and Control testing/maintenance report to THESL Protection and Control staff and/or System Planning & Performance staff.

Appendix 2(iv) - Schedule C:

Wholesale Market Participant Connection Agreement Terms and Conditions

WHOLESALE MARKET PARTICIPANT CONNECTION AGREEMENT

TERMS AND CONDITIONS

ARTICLE 1: CONNECTION

1.1 The Facility shall be connected to the THESL Distribution System and remain Energized at the Points of Connection from the Connection Date for the duration of the Term on the terms and subject to the conditions set out in this Agreement.

ARTICLE 2: POINTS OF CONNECTION AND JURISDICTION

2.1 The points of delivery and connection for the Facility shall be where the THESL supply feeders connect to the high-voltage disconnect switches (the "Points of Connection") or such other points as may be designated by THESL.

2.2 THESL shall have jurisdiction and control over the area between the point of entry of THESL supply feeders onto the Customer's property at the Site and the load side of the Customer-owned switchgear, including;

(i) the electrical interlocks for the close operations of the circuit breakers to ensure the non-paralleling of the supply feeders; and
(ii) THESL's revenue billing metering equipment;

or such areas as may be designated by THESL.

ARTICLE 3: COVENANTS OF THE CUSTOMER

3.1 The Facility, when inter-connected to the THESL system, shall not adversely affect or damage:

a. the health and safety of THESL or any of its Representatives or the general public;
b. the Apparatus owned or operated by THESL;
c. the THESL Distribution System;
d. the security, safety, or reliability of the THESL Distribution System;
e. in a material manner, the efficiency of the THESL Distribution System; or
f. in a material manner, the quality of the electrical power supply provided by THESL to the Customer or other THESL customers.

3.2 The Customer shall, at its expense, maintain any and all permits, licenses and approvals required by law for the operation and maintenance of the Facility ("Required Approvals") throughout the Term.

3.3 The Customer shall (i) pay THESL for all electricity distribution services provided by THESL to the Site during the Term at such rates as may be approved by the Ontario Energy Board ("OEB") from time to time for the appropriate class rating to which the services apply; (ii) make such payments in accordance with THESL's billing cycle as notified to the Customer from time to time; and (iii) pay late payment and other charges and pay such deposits as may be required by THESL from time to time as part of the OEB-approved rate structure. The Customer shall also pay to THESL such other charges as THESL may be required by applicable law to bill and/or collect for third parties including electricity retailers, the Independent Market Operator, Ontario Energy Board and any transmission company.

3.4 The Customer shall not, in installing, operating or maintaining the Facility:

a. violate, or cause THESL to violate, any provision of its Distribution License;

b. contravene any laws of the Province of Ontario or any laws of Canada having force and effect in the Province of Ontario; or

c. violate any provision contained in the Conditions of Service.

3.5 The Customer shall comply as soon as possible with any reasonable directive received from THESL that THESL makes for the purpose of meeting any of its obligations under its Distribution License.

3.6 In addition to the obligations set forth in this Agreement, the Customer shall be bound by, and shall comply with, all provisions of THESL's Conditions of Service.

3.7 The Customer shall maintain all parts of the Facility, including, connection Devices, protection and control systems in good working order in accordance with the Distribution System Code and the Conditions of Service and otherwise in a manner consistent with Good Utility Practice.

3.8 The Customer shall limit the effects of harmonic voltages and currents on the THESL Distribution System caused by the Facility in accordance with the IEEE specification 519-1992 titled "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems". In the event THESL, in its discretion, deems it necessary for modifications to be made to the Facility to achieve acceptable power quality, the Customer shall make such modifications, at its own cost, within such time period as is specified by THESL ("Modification Period"), acting reasonably; provided that if the modifications are not completed within 14 days of receipt of a notice of non-performance delivered after the expiry of the Modification Period, THESL shall be entitled to disconnect the Facility from the THESL Distribution System without any further notice.

3.9 THESL shall be entitled to access to the property of the Customer at all reasonable times, to inspect, maintain, repair, alter, remove, replace or disconnect wires or other parts of the Facility, or to install, inspect, read, calibrate, maintain, repair, alter, remove or replace a meter, which are located on the property and to take any actions necessary to maintain the safe and reliable operation of the THESL Distribution System. The Customer shall also provide THESL with such other access as may be specified in the Conditions of Service, Operating Schedule or by law. In accessing the property of the Customer, THESL shall comply with the Customer's reasonable security practices and procedures to the extent it is made aware of such practices and procedures.

The Customer agrees to provide suitable space for THESL's existing meters, wires, poles, cables, transformers and other appliances and equipment (collectively "Metering Equipment") at the Site and for any Metering Equipment which THESL may be required by law to install at any time after the date of this Agreement and further agrees that, without to prior written consent of THESL (not to be unreasonably withheld) it shall not permit any one who is not an agent of THESL to remove, inspect or tamper with same, including moving, inspecting or tampering with the seals. The Customer agrees that Representatives of THESL shall have reasonable access to the Site and Facility for the purposes of reading, examining, preparing or removing its meters, wires, poles, cables, transformers and other appliances, materials and equipment and for the purpose of inspecting the Customer's appliances, equipment and wiring.

3.10 The Customer shall have no rights of access to THESL Apparatus or lands or property owned by THESL.

3.11 If, as a consequence of the connection of the Facility to the THESL Distribution System or the Tests performed hereunder, damage occurs to the Apparatus owned or operated by THESL ("THESL Apparatus") or the THESL Distribution System, the Customer shall, within 10 days of receipt of an invoice therefore, pay the amount of any such damage to THESL.

3.12 If so required by Hydro One, THESL or any regulatory authority as determined in accordance with applicable laws, at any future date, the Customer shall, as its expense, install performance metering equipment.

3.13 If the Customer installs performance metering equipment in accordance with Section 3.12, the Customer shall allow THESL to receive output from the performance metering equipment, and the Customer shall install and maintain any equipment necessary to allow THESL to do so, at no cost to THESL.

Section 6 – REFERENCES

Standard Toronto Hydro Connection Agreements and Terms of Conditions

Schedule C

ARTICLE 4: TERM AND TERMINATION

4.1 Unless terminated earlier in accordance with the terms of this Agreement, this Agreement shall be effective as of the date first written above and shall continue in full force and effect until either party gives no less than 365 days written notice to the other party of its intention to terminate this Agreement (the "Term"). Any such notice of termination shall specify the effective date of termination; provided that notwithstanding the delivery of a notice of termination under this Section 4.1, THESL shall have the right to terminate this Agreement prior to the specified effective date of termination pursuant to Section 4.2.

4.2 The occurrence of any of the following shall constitute an event of default ("Event of Default") on the part of the defaulting party:

a. failure to pay any sum, due and owing hereunder including any sum owing pursuant to Section 3.3, within 5 days of receipt of a notice of failure to pay from the non-defaulting party;

b. failure to comply with any other material covenant or obligation set forth in this Agreement within 14 days of receipt of notice of default from the non-defaulting party; or

c. the occurrence of a material breach or default under any other agreement between the parties.

4.3 a Upon the occurrence of an Event of Default, where the Customer is the defaulting party ("Customer Event of Default") THESL shall have the right to:

(i) give notice of termination to the Customer whereupon the Agreement shall terminate as at the effective date of termination specified in the notice; and

(ii) disconnect the Facility from the THESL Distribution System in accordance with Section 5.1 below.

b Upon the occurrence of an Event of Default where THESL is the defaulting party ("THESL Event of Default"), the Customer shall have the right to give notice of termination to THESL whereupon the Agreement shall terminate as at the effective date of termination specified in the notice.

4.4 Upon termination of the Agreement by THESL in accordance with its provisions, without prejudice to any other rights THESL may have:

a. all amounts outstanding pursuant to this Agreement shall immediately become due and payable by the Customer;

b. THESL shall be entitled to enter onto the Customer's property to remove, at the Customer's expense, any THESL Apparatus as soon as reasonably practicable;

c. the relevant provisions of this Agreement shall continue in effect after expiry or termination to the extent necessary to provide for any billings, adjustments and payments related to the period prior to the termination and for the payment of any monies due and owing pursuant to 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 and shall not affect any continuing obligations of either party under this Agreement, which are intended to continue after termination of such Agreement, including, without limitation, Article 7; Article 8; and Sections 4.4, 4.5 and 10.3;

e. THESL shall have no liability whatsoever to the Customer arising from such termination; and

f. THESL may, if it has not already done so pursuant to Section 4.3 hereof, disconnect the Facility from the THESL Distribution System.

4.5 Upon termination of the Agreement by Customer in accordance with its provisions, without prejudice to any other rights Customer may have:

a. all amounts outstanding pursuant to this Agreement shall immediately become due and payable by THESL;

b. the relevant provisions of this Agreement shall continue in effect after expiry or termination to the extent necessary to provide for any billings, adjustments and payments related to the period prior to the termination and for the payment of any monies due and owing pursuant to this Agreement;

c. 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 and shall not affect any continuing obligations of either party under this Agreement, which are intended to continue after termination of such Agreement, including, without limitation, Article 7; Article 8 and Sections 4.4, 4.5 and 10.3;

d. Customer shall have no liability whatsoever to the THESL arising from such termination; and

e. THESL shall, if it has not already done so, disconnect the Facility from the THESL Distribution System.

ARTICLE 5: DISCONNECTION

5.1 Notwithstanding anything else contained in this Agreement, THESL may disconnect the Facility from the THESL Distribution System:

a. if an Event of Default occurs, upon reasonable prior notice to the Customer; provided that:

(i) THESL may, if it, in its sole discretion, acting reasonably, deems it necessary for any reason whatsoever, disconnect the Facility from the THESL Distribution System immediately without any notice to the Customer; and

(ii) if the disconnection is as a result of non-payment of monies due and owing hereunder, THESL shall provide no less than 7 days notice of such disconnection.

b. immediately without notice, if THESL, in its sole discretion, determines it is necessary:

(i) to protect the health or safety of THESL personnel, its contractors or any third parties;

(ii) to prevent damage to the THESL Distribution System or any other property;

(iii) to preserve the security, safety, or reliability of the THESL Distribution System or services delivered thereunder;

(iv) to prevent a material adverse effect on the efficiency of the THESL Distribution System or quality of electrical power supply provided by THESL to the Customer or other THESL customers;

(v) as a result of any other circumstances which THESL in its sole discretion, determines to be an Emergency; or

(vi) the Customer has failed to comply with the Ontario Electrical Safety Code;

c. upon reasonable prior notice to the Customer to perform any unplanned inspection or maintenance;

d. upon termination this Agreement pursuant to Section 4.1 or 4.3;

e. immediately without notice, upon issuance of an order or directive requiring disconnection by any court or regulatory authority having jurisdiction to issue such an order or directive; or

f. for any other reason specified in this Agreement or in the Conditions of Service.

5.2 a. If THESL exercises any rights to disconnect the Facility pursuant to this Agreement for an Customer Event of Default or any other reason attributable to the action or inaction of the Customer, or any cause related to or connected with the Customer, or the Customer requests THESL to disconnect the Facility, and the Customer requests that the Facility be reconnected, for any reason, the Customer shall pay the reasonable costs of such reconnection as set out in the Conditions of Service or where not specified in the Conditions of Service as determined by THESL in its sole discretion, acting reasonably and in either case, including any monies which may be due and owing to THESL under this Agreement including pursuant the Section 3.3. Such costs shall be paid in full prior to the reconnection of the Facility.

b. Upon request of THESL, the Customer shall comply with the following conditions prior to reconnection:

1. Testing

(i) THESL shall provide prior written notice to the Customer of the Tests which it reasonably determines must be performed prior to reconnection;

(ii) the Customer shall obtain prior written approval from THESL for the contractor who will perform the Tests; provided that if a contractor is on the most recent list of approved contractors published by THESL from time to time no written approval shall be required; and

(iii) after completion of the Tests, the Customer shall deliver the results of the Tests to THESL.

The Facility shall not be reconnected until THESL is satisfied the results of the Tests show the security, safety, efficiency, and reliability of the THESL Distribution System will not be adversely affected by the reconnection.

2. ESA Approval

The Customer shall, at its expense, have the Facility inspected and approved by the ESA and obtain a written certificate from the ESA certifying that the ESA has inspected the electrical installations of the Facility to allow for the performance of the Tests, and in-service operation of the Facility and deliver, or have delivered, to THESL such written certificate from the ESA. THESL will not allow the Facility to be connected to the THESL Distribution System for the purpose of performing the Tests hereunder until THESL receives a written connection authorization from the ESA for the Facility and all other requirements of THESL for the connection of the Facility, if requested by THESL, to the THESL Distribution System are met.

5.3 Upon receipt of a disconnection request from the Customer, THESL will disconnect and/or remove THESL's Apparatus at the Customer's reasonable cost as outlined in the Conditions of Service.

ARTICLE 6: COMPLIANCE WITH LAWS

6.1 The Customer and its Representatives shall comply with all applicable federal, provincial and municipal laws, regulations, by-laws, codes, and orders with respect to the Customer's obligations under this Agreement, including, without limitation, the *Occupational Health and Safety Act* (Ontario), the *Electrical Safety Code* (Ontario), and the *Workplace Safety and Insurance Act* (Ontario).

ARTICLE 7: LIABILITY

7.1 The Customer shall have the risk and all liability in respect of:

a. all loss, damage or injury to property owned by THESL, or to property for which THESL has jurisdiction under this Agreement, or is at law responsible for, located on the lands and premises owned by the Customer, unless due to a negligent act or omission of THESL or any of its Representatives; and

b. all loss, damage or injury to:

(i) property of the Customer, or property of a third person, on the lands and premises owned by the Customer; and

(ii) any person or persons (including loss of life), whether on the lands or premises owned by the Customer, or owned or used by THESL, or otherwise, resulting from any of the Tests or operation of the Facility, whether in accordance with this Agreement or otherwise,

except to the extent that such loss, damage or injury is the result of the negligent action or omission of THESL or any of its Representatives.

7.2 Notwithstanding any other provision in this Agreement, or any applicable statutory provision:

a. neither THESL nor any of its Representatives shall be liable to the other party for any losses, damages, claims, liabilities, costs or expenses arising from any breach of this Agreement or any tortious act, other than for losses, damages, claims, liabilities, costs or expenses directly resulting from the negligence or wilful misconduct of THESL or any of its Representatives; and;

b. neither THESL nor any of its Representatives shall be liable to the other party under any circumstances for any indirect, incidental, or special or consequential damages, whether punitive or exemplary, including damages for loss of use or profits or revenues, business interruption losses, loss of contract or loss of goodwill, or other economic benefits, arising directly or indirectly from any breach of this Agreement, fundamental or otherwise, or from any tortious acts, including negligence or gross negligence or wilful misconduct or omissions, of THESL or any of its Representatives.

ARTICLE 8: INDEMNIFICATION

8.1 Except to the extent such obligations are modified by applicable law, the Customer shall indemnify and save harmless THESL and all of its Representatives against all claims, losses, expenses, damages, costs, actions or proceedings incurred by, or instituted against, them which relate to, arise out of, or are attributable in any way to the connecting or operating the Facility regardless of whether such connecting or operating were in accordance with this Agreement and whether the Customer has been negligent in the performance of its operation of the Facility, or which relate to, arise out of, or are attributable to a breach of, or default under this, Agreement by, or the negligence or willful misconduct of, the Customer or any of its Representatives.

8.2 "Force Majeure" means in relation to either party ("Non-Performing Party"), any event or circumstance which (i) is beyond the reasonable control of such party, including without limitation severe weather, strikes, riots, civil disturbances, sabotage or acts of a public enemy, war, insurrection, earthquake, explosion, or order, regulation, or restriction imposed by any authorities, having authority to issue such orders, regulations or restrictions (ii) could not have been avoided through the use of Good Utility Practice (provided that a party shall have the right to determine and settle in its sole discretion any labor dispute in which that party may be involved), (iii) does not result from the negligence or fault of that party or any of its Representatives and (iv) results in or causes the inability of the party to perform any of its obligations under the Agreement (other than for payment of monies due hereunder) or whereby electricity cannot flow from the THESL

Distribution System to the Facility or which causes the THESL Distribution System to be incapable of being operated lawfully, safely or at all; provided however that lack of funds shall not be interpreted as a cause beyond the reasonable control of either party.

8.3 If because of the occurrence of an event of Force Majeure either the Customer or THESL is unable to carry out any of its obligations under this Agreement, the obligations of the Non-Performing Party and the corresponding obligations of the other party shall be suspended to the extent necessary by and during the continuance of such Force Majeure; provided however, that Non-Performing Party shall only be entitled to claim Force Majeure if the following conditions have been met:

a. the Non-Performing Party has promptly given the other party written notice of the event of Force Majeure together with an estimate in good faith of the effect that the event will have on its ability to perform each of its obligations;

b. the Non-Performing Party shall only be entitled to suspend performance of its obligations as a consequence of the event of Force Majeure to the extent and for such period of time as the event of Force Majeure requires it to do so;

c. the Non-Performing Party has used its best efforts to mitigate the effects of the event of Force Majeure, remedy its inability to perform and resume full performance of its obligations hereunder;

d. the Non-Performing Party has continually informed the other party of its efforts taken in compliance with Section 8.3(c) above; and

e. the Non-Performing Party has provided written notice to the other party upon resuming performance of any obligation affected by the event of Force Majeure.

8.4 The Customer may not materially increase the load at the Points of Connection without the prior written approval of THESL, which approval may not be unreasonably withheld. The Customer shall provide THESL with all information requested by it to reasonably consider the application for approval. If any material increase in load is made in contravention of this Section 8.4, it shall be an Event of Default, THESL shall have the right to terminate this Agreement pursuant to Section 4.3 and the provisions of Section 4.4 shall apply to such termination. In addition to any other indemnity contained herein, the Customer shall be liable to THESL for, and shall indemnify THESL against, any damages to the THESL Distribution System resulting from of any unapproved increase in the load.

ARTICLE 9: RELATIONSHIPS OF PARTIES

9.1 Nothing in this Agreement shall be deemed to constitute either party hereto as partner, agent or representative of the other party or to create any fiduciary relationship between the parties.

ARTICLE 10 MISCELLANEOUS PROVISIONS

10.1 From time to time certain improvements, additions or other changes ("Modification") to the Facility may be required for their economical, reliable and safe operation. The Customer may not make any material Modification without prior written consent of THESL, which consent may not be unreasonably withheld. The Customer shall provide THESL with all information requested by it to reasonably consider the application for consent. Any consent given by THESL shall be deemed to contain the conditions that the Modification shall be made (i) in accordance with the Conditions of Service of THESL in effect at the time the Modification is made and (ii) at the Customer's expense. In the event that the Customer disagrees with THESL refusal to give any such consent, it may elect to terminate this Agreement upon thirty (30) days prior written notice. If any material Modification is made in contravention of this Section 10.1, THESL shall have the right to terminate this Agreement pursuant to Section4.3 and the provisions of Section 4.4 shall apply to such termination.

10.2 Any waiver of any right under this Agreement shall be in writing and any failure by either party to exercise any right or to enforce any remedy under this Agreement shall not be deemed to be a waiver of any other right or remedy or affect the validity of this Agreement.

10.3 In the event of any dispute arising out of this Agreement, THESL and the Customer agree as follows:

a. to attempt, in good faith, to negotiate a settlement of the dispute between themselves within 45 days from the date the dispute arose;

b. in the event that the parties cannot settle the dispute between themselves, either party may, following the passage of at least 45 days from the date the dispute arose (as evidenced by writing between the parties) either party may submit the dispute for arbitration by a single arbitrator in accordance with the *Arbitration Act, 1991 (Ontario)*; provided that, in the event the dispute relates solely to the payment of money under this Agreement, the submitting of the dispute for arbitration shall operate as a stay in respect of the payment of monies to the extent of the amount in dispute until such time as the decision of the arbitrator is rendered; and

c. the decision of the arbitrator will be final and binding with no right of appeal.

10.4 Any amount to be paid under this Agreement unless otherwise specified, shall become due and owing and be paid by the Customer to THESL 10 days after receipt of an invoice for such amount from THESL.

10.5 Any amount required to be paid under this Agreement, which is not paid on the due date therefore, shall bear interest at the rate of 1.5 percent calculated and compounded monthly (19.56 percent per annum) at and from the due date up to and including the date of payment in full of such amount, together with all interest accrued to the date of payment.

10.6 The Customer agrees that THESL shall have the right to revise any provision in this Agreement, or insert any provision into this Agreement, that it determines, in its sole discretion, is required, for any reason, (a) to protect the security, efficiency, reliability and safety of the THESL Distribution System or safety of THESL personnel or any other property or persons; provided however that such change shall not result in a disconnection upon less than 48 hours notice or resulting in Customer being required to pay unreasonable costs; or (b) to make the provisions of this Agreement consistent with a change in applicable laws or in the Conditions of Service; provided that, THESL shall provide no less than 30 days prior notice of such change to the Customer and the Customer shall have the right to terminate the Agreement within 10 days of receipt of such notice. The provisions of Section 4.4 shall apply to any such termination.

10.7 Telephone communication between the Customer and THESL is required at all times when the Tests are being performed and such communications shall be made to the telephone and fax numbers provided from time to time by each party.

ARTICLE 11: DEFINITIONS

11.1 In this Agreement, the following terms shall have the meanings set forth below:

a. "Agreement" means the agreement of THESL to connect the Facilities to the THESL Distribution System upon these terms and conditions and the Customer's deemed agreement pursuant to the Conditions of Service to be bound by these terms and conditions, as amended from time to time.

b. "Apparatus" means structures, equipment or apparatus pertaining to the generation, transmission, distribution or use of power.

c. "Business Day" shall mean any day on which The Royal Bank of Canada is open for business in Toronto, Ontario;

d. "Competent Person" means one qualified by knowledge, training and experience to perform assigned work.

e. "Conditions of Service" means the document developed by THESL in accordance with subsection 2.4 of the Distribution System Code that describes the operating practices and connection rules for THESL as amended from time to time.

f. "Connection Date" means the date of connection of the Facility to the THESL Distribution System.

g. "Distribution License" means any license to distribute electricity issued to THESL by the Ontario Energy Board.

h. "Distribution System Code" means the code, approved by the Ontario Energy Board, and in effect at the relevant time, which, among other things, establishes the obligations of THESL and other distribution systems with respect to the services and terms of service to be offered to customers and retailers and provides minimum technical operating standards for THESL and other distribution systems.

i. "Emergency" means a condition or situation which in the judgement of THESL as will affect THESL's ability to meet its obligations to maintain safe, adequate and continuous electric service or to avoid damage to any property or persons.

j. "Energized" means the joining of the Facility to the THESL Distribution System by means of Approved Work Practices either initially or following a disconnection for whatever reason so that Customer may make or receive a supply of electricity to or from THESL Distribution System at the Points of Connection.

k. "ESA" means the person or body designated under the *Electricity Act, 1998*, S.O. 1998, c.15, Schedule A as the Electrical Safety Authority.

l. "Facility" means the system identified in the Toronto Hydro single-line diagram for a property connection to the THESL Distribution System.

m. "Good Utility Practice" means any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry in North America during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method or act to the exclusion of all others, but rather to be acceptable practices, methods or acts generally accepted in North America.

n. "Points of Connection" shall have the meaning set out in Section 2.1 hereto.

o. "Representatives" means the respective directors, officers, employees, contractors or agents of either party hereto, as applicable.

p. "Site" means the physical location of the Facility.

q. "Term" has the meaning set out in Section 4.1 hereto.

r. "Tests" means the tests performed on the Facility to ensure that the Facility is designed and acceptable to be connected to the THESL Distribution System.

s. "THESL Distribution System" means the system used by THESL for distributing electricity and includes any structures, equipment or other things used for that purpose.

Appendix 3(i) - Distributed Energy Resource (DER) Application Form

Connection Impact Assessment (CIA) Application

System Studies & Distributed Energy Resource Connections, Investment Planning | der@torontohydro.com | 416-542-3099

Validate Form
Clear Form

ABOUT THIS FORM

This Connection Impact Assessment (CIA) application is to be completed by any proponent interested in connecting Distributed Energy Resources (DER) with a project size over 10 kilowatts (kW) to Toronto Hydro. This includes DER applying for a new CIA or for revision(s) to their original CIA. This form expresses an intent to enter into an agreement between Toronto Hydro and the customer (or host customer* for load displacement projects) for completion of a CIA associated with connecting a DER to the Toronto Hydro distribution grid. The CIA Application shall be part of the required servicing (electrical installation, maintenance and operating) agreements between Toronto Hydro and the proponent. Through this process, Toronto Hydro will be the proponent's contact with the transmission system provider (e.g. Hydro One Networks Inc.) and, if necessary, the provincial market operator, namely, the Independent Electricity System Operator (IESO).

*For Load Displacement projects, the term "host customer" refers to the owner of the load facility. The term "DER owner" refers to the owner of the DER facility.

For the emergency backup generator application form, please email der@torontohydro.com

TECHNICAL REQUIREMENTS

For technical requirements of Toronto Hydro's DER projects, refer to "Reference 3. Distributed Energy Resource Requirements," available at: torontohydro.com/conditionsofservice

SUBMISSION INSTRUCTIONS

Please return the completed form, fees and other required documents by mail to:

Toronto Hydro
Attn: DER Connections, Capacity Planning & Grid Innovation
500 Commissioners Street, 3rd Floor
Toronto, ON M4M 1N7

IMPORTANT NOTES

- An engineering stamp and all red box fields (on electronic version of form) are mandatory. Incomplete applications may be returned by Toronto Hydro and will result in delays in processing your application. Click the "Validate Form" button on the top right corner of this page to ensure all required information is completed. If any of the required fields are not applicable to your project, type "N/A" in any required text field or "0" in any required numerical field
- Toronto Hydro specific requirements and notes are found in Sections S and T, respectively
- Applicants are cautioned NOT to incur major expenses until Toronto Hydro approves to connect the proposed DER facility
- All technical submissions (CIA Application, Single Line Diagrams, etc.) must be signed, dated and sealed by a licensed Ontario Professional Engineer (P.Eng.)
- The proponent will pay for the CIA according to the Toronto Hydro CIA Fee Schedule

- The siting restrictions in O. Reg. 274/18, which were administered by electricity distributors such as Toronto Hydro, have been replaced by amendments to the *Planning Act* (Ontario) that puts siting and planning requirements for renewable DER facilities under municipal oversight. It is recommended that you discuss municipal permitting and approvals requirements with the planning department in the municipality where your DER project is located before you proceed.

SECTION A: APPLICATION INFORMATION

Engineering Stamp

Application Type *choose one*: New CIA Application

Date *mm/dd/yyyy*

Program Type/Purpose *choose one*

Program Type (additional details)

Project Name

IESO Contract Number *F-XXXXXX-XXX-XXX-XXX*

IESO Reference Number *FIT-XXXXXXX*

Ontario Corporate Number or Business Identification Number

Proposed In Service Date *mm/dd/yyyy*

If this project is a subdivision project, please complete the following fields:

Subdivision Project Name

Number of Lots

For certain application type selections, please complete the required fields:

Original CIA Project ID # *XX,XXX*

Revised Fields *list the fields that have changed from your previous application*

SECTION B: PROJECT LOCATION

Address

City / Town / Township

Postal Code

Lot Number(s)

Concession Number(s)

SECTION C: CONTACT INFORMATION

CIA will be issued in the name of the host customer (load facility owner). All agreements (including CCA and DCA) are only made between Toronto Hydro and the host customer. This section is strictly to gather contact information of some of the key contacts that are involved with the project.

Who is the single point of contact for this project?

◯ Host Customer ◯ DER Owner (if different from host customer) ◯ Consultant

*Please enter the following information about the **host customer** (load facility owner):*

Contact Person

Company's Legal Name

Mailing Address *including postal code, P.O. Boxes and Rural Routes will not be accepted*

Work Phone

Mobile Phone

Fax Number

Email Address

*Please enter the following information about the **DER owner** (if different from host customer):*

Contact Person

Company's Legal Name

Mailing Address *including postal code, P.O. Boxes and Rural Routes will not be accepted*

Work Phone

Mobile Phone

Fax Number

Email Address

*Please enter the following information about the **consultant**:*

Contact Person

Company's Legal Name

Mailing Address *including postal code (P.O. Boxes and Rural Routes will not be accepted)*

Work Phone

Mobile Phone

Fax Number

Email Address

SECTION D: CUSTOMER STATUS

Is there an existing Toronto Hydro account at the project location?

◯ Yes ◯ No

Is the account holder aware of this application?

◯ Yes ◯ No

Does your account fall within a residential rate classification?

◯ Yes ◯ No ◯ Do not know

Existing Account Number

Account Holder Name

Does the account holder have an HST registration number?

◯ Yes ◯ No

HST Number

SECTION E: EXISTING DER

Are there existing DER at the point of common coupling (PCC)?

◯ Yes ◯ No

Existing Project Number

Existing Project Size (kW)

Program Type for Existing DER *choose one*

DER type: ◯ Synchronous ◯ Induction ◯ Inverter-Based ◯ Other

For Synchronous Units	For Induction Units	For Inverter-Based Units
Min. power limit for stable operation *kW*	Direct axis sub-transient reactance, X''d *pu*	Inverter rating *kVA*
Direct axis sub-transient reactance, X''d *pu*	Direct axis transient reactance, X'd *pu*	Maximum continuous power output *kW*
Direct axis transient reactance, X'd *pu*	Total PF correction installed *kVAR*	
Direct axis synchronous reactance, Xd *pu*		
Zero sequence reactance, X0 *pu*		

SECTION F: PROJECT INFORMATION

Station Name *optional to leave blank for behind the meter projects*

Feeder *optional to leave blank for behind the meter projects*

Feeder Voltage (kV) *optional to leave blank for behind the meter projects*

Project Size (kW) *total maximum output capacity*

Equipment Capacity (kVA) *total equipment nameplate rating*

Fuel/Energy Type *select all that apply*

- ☐ Solar (PV)
- ☐ Wind
- ☐ Water
- ☐ Natural Gas
- ☐ Bio-Gas
- ☐ Biomass
- ☐ Diesel
- ☐ Battery Energy Storage System
- ☐ UPS
- ☐ CHP/Co-Generation
- ☐ Other (specify below)

Type of Connection

○ Single Phase ○ Three Phase

If this is a solar project, please answer the following questions:

Mounting Type *select one*

If this is a water project, please answer the following questions:

Is your generation facility located on provincial Crown or federally regulated lands?

○ Yes ○ No

Is water your primary energy source?

○ Yes ○ No

SECTION G: STATION SERVICE LOAD INFORMATION

The host customer's station service load details

If there is an existing account at the project location, populating the fields in Section G is required for Toronto Hydro. Ensure selection below matches with this note.

○ Required ○ Optional

Maximum Demand of Station Service Load of DER *kW*

Average Monthly Consumption *kWh*

SECTION H: CONNECTION INFORMATION

On the cut-out from the Toronto Hydro site plan, provide the location of the generation facility with proposed line routings for connection to Toronto Hydro's distribution system. It should identify the Point of Expansion (POE), the Point of Common Coupling (PCC), the location of the generation facility, and (if applicable) the route of the new line between the generation facility and the POE (ie. on private property or public road/right-of-way). This is not required for existing load customers that are connecting a load displacement generation, net metering generation or energy storage system behind their existing metered connection point. Please see "Appendix A" for a visual representation of POE and PCC.

Drawing/Sketch Number

Site Plan Revision Number

Please provide an SLD of the Generator's facilities, including the PCC, transformer and connecting station, feeder and supply voltage.

SLD Drawing/Sketch Number

SLD Revision Number

POE Latitude *degree decimal format*

POE Longitude *degree decimal format*

PCC Latitude *degree decimal format*

PCC Longitude *degree decimal format*

Generation Facility Latitude *degree decimal format*

Generation Facility Longitude *degree decimal format*

Length of Line from POE to PCC *km*

Length of Line from PCC to Generation Facility *km*

Important: The line between the PCC and the Generation Facility must NOT be shared with any other DER owner (refer to Appendix A).

Conductor Type/Size *for the line between the PCC and the Generation Facility*

Generator Fault Contribution *with fault location at the PCC*

IMPORTANT NOTES:

If this project requires line expansion work between the POE and PCC, Toronto Hydro will provide a cost estimate to construct any line located on public road right-of-way. The cost estimate will include a breakdown of uncontestable work (i.e. overbuild to existing line) that can only be performed by Toronto Hydro, as well as contestable work (i.e. new construction/green-field) that may be performed by the Generator, their contractor or Toronto Hydro. The design of uncontestable and contestable work shall conform to Toronto Hydro specifications). For Generator-owned line, the Generator may apply to construct the line on existing Toronto Hydro- owned poles. This is known as an application for Joint Use (JU) of poles. If the application is accepted, Toronto Hydro will provide the Generator with information on initial connection costs, annual pole-space rental and emergency service (ES) fees and required JU & ES Agreements.

SECTION I: ENERGY STORAGE OR UPS

Please complete the following section if your project includes energy storage.

Number of Units

Inverter Unit Size *enter zero if inverter is shared with generation unit(s)*

Energy Storage Unit Size *kWh*

Total Energy Storage Size *kWh*

Energy Storage Facility Control Strategy

- ○ Peak Shaving
- ○ Dynamic VAR Support
- ○ Frequency Support
- ○ Other

Please submit a detailed description of the control strategy according to the templates in Appendix B. Toronto Hydro reserves the right to modify the control strategy as part of its Detailed Technical Connection Assessment.

SECTION J: LOAD DISPLACEMENT/PEAK SHAVING

Please complete the following section if this is a load displacement or peak shaving project.

Operating Mode

○ Parallel ○ Non-Parallel

Transition Type

○ Closed *"make before break"* ○ Open *"break before make"*

Time that generator remains parallel to grid *closed transition only, ms*

For non-parallel load displacement, SCADA monitoring and Gross Load Billing (GLB) may apply. For load displacement generation facilities, please attach a schedule of the forecasted maximum generation output (as a function of loading of the facility). At a minimum, include the forecasted generation output information (i.e. Watts and VARs) during the minimum and maximum of the load facility to which the load displacement generator is connecting (see Appendix C for template).

SECTION K: DER CHARACTERISTICS (1 / 1)

For facilities with multiple generators: If your generators have different characteristics, please use the "Add Page" button on the bottom right corner and provide the characteristics for each generator on the additional pages.

DER type: ◯ Synchronous ◯ Induction ◯ Inverter-Based ◯ Other

Number of Generating Units

Rated Capacity of Each Unit kW kVA

DER Output Voltage *in kV*

Manufacturer

Type or Model Number

If Power Conversion Type is "Other," please provide values equivalent to a Synchronous or Induction type generator.

Maximum Starting In-Rush Current *multiple of full load current, pu*

Generator Winding Connection ◯ Delta ◯ Star

Neutral Grounding Method *for star winding connection only* ◯ Solid ◯ Ungrounded ◯ Impedance

Impedance R *in ohms*

Impedance X *in ohms*

Limits of range of reactive power at the machine output:

Lagging *over-excited, kVAR*

Lagging Power Factor

Leading *under-excited, kVAR*

Leading Power Factor

Limits of range of reactive power at the PCC:

Lagging *over-excited, kVAR*

Lagging Power Factor

Leading *under-excited, kVAR*

Leading Power Factor

For Synchronous Units	For Induction Units
Nominal Machine Voltage *kV (LL)*	Nominal Machine Voltage *kV (LL)*
Unsaturated Reactance *kVA Base*	Unsaturated Reactance *kVA Base*
Unsaturated Reactance *kV Base*	Unsaturated Reactance *kV Base*
Direct Axis Subtransient Reactance, X''d *pu*	Direct Axis Subtransient Reactance, Xd'' *pu*
Direct Axis Transient Reactance, X'd *pu*	
Direct Axis Synchronous Reactance, Xd *pu*	
Subtransient Time, Td'' *ms*	
Zero Sequence Reactance, X0 *pu*	

Add Page

SECTION L: INTERFACE TRANSFORMER

The transformer connecting to the Toronto Hydro distribution system

Transformer Ownership

◯ Customer ◯ Toronto Hydro

Transformer Rating *kVA*

Transformer Type

◯ Single Phase ◯ Three Phase

Nominal Voltage of High Voltage Winding *kV*

Nominal Voltage of Low Voltage Winding *kV*

Impedance Base (if different than ratings above)

kVA Base kV Base

Impedance (R) *pu* Impedance (X) *pu* OR Impedance (Z%) *%*

High Voltage Winding Connection

◯ Delta ◯ Star

High Voltage Grounding Method *for star winding connection only*

◯ Solid ◯ Ungrounded ◯ Impedance

Star Impedance R *in ohms* Star Impedance X *in ohms*

Low Voltage Winding Connection

◯ Delta ◯ Star

Low Voltage Grounding Method *for star winding connection only*

◯ Solid ◯ Ungrounded ◯ Impedance

Star Impedance R *in ohms* Star Impedance X *in ohms*

IMPORTANT NOTES:

The term "High Voltage" refers to the connection voltage to Toronto Hydro's distribution system and "Low Voltage" refers to the generation or any other intermediate voltage.

Providing a photo of transformer equipment, along with this application, may help expedite your application.

SECTION M: INTERMEDIATE TRANSFORMER

Transformer between the interface transformer and DER

Please complete the following section if your project includes an intermediate transformer:

Do you intend to install an intermediate transformer?

◯ Yes ◯ No

Transformer Rating *KVA*

Transformer Type

◯ Single Phase ◯ Three Phase

Nominal Voltage of High Voltage Winding *kV*

Nominal Voltage of Low Voltage Winding *kV*

Impedance

kVA Base

kV Base

Impedance R *pu*

Impedance X *pu*

High Voltage Winding Connection

◯ Delta ◯ Star

High Voltage Grounding Method *for star winding connection only*

◯ Solid ◯ Ungrounded ◯ Impedance

Star Impedance R *in ohms*

Star Impedance X *in ohms*

Low Voltage Winding Connection

◯ Delta ◯ Star

Low Voltage Grounding Method *for star winding connection only*

◯ Solid ◯ Ungrounded ◯ Impedance

Star Impedance R *in ohms*

Star Impedance X *in ohms*

IMPORTANT NOTES:

The term "High Voltage" refers to the connection voltage to Toronto Hydro's distribution system and "Low Voltage" refers to the generation or any other intermediate voltage.

SECTION N: HIGH-VOLTAGE GROUNDING TRANSFORMER

Please complete the following section if your project includes a high-voltage grounding transformer. Do you have a high-voltage grounding transformer?

◯ Yes ◯ No

Transformer Type *select one*

◯ Zig-Zag ◯ Star-Delta

Zero Sequence Impedance (Z0) R *ohms*

Zero Sequence Impedance (Z0) X *ohms*

SECTION O: SUBMISSION CHECKLIST

Please ensure the following items are completed prior to submission. Your application may not be processed if any part is omitted or incomplete:

- ☐ Payment in full including applicable taxes (by cheque payable to "Toronto Hydro")
- ☐ Completed Form B stamped by a Professional Engineer
- ☐ Signed Study Agreement (original signature is required)
- ☐ Single Line Diagram (SLD) of the Generator's facilities, must be stamped by a Professional Engineer
- ☐ Protection Philosophy
- ☐ Distribution Operating Map (DOM) and/or Site Plan *(not required for existing load customers that are connecting a load displacement generation, net metering generation or energy storage system behind their existing metered connection point)*
- ☐ Load Displacement Generation Facility's load and generation schedules (if applicable)
- ☐ Load Displacement Generation Facility's mode of operation (if applicable)
- ☐ Energy Storage Facility operating strategy description and parameters (if applicable)
- ☐ Emergency Backup Generation Facility's mode of operation (if applicable)

SECTION P: CIA APPLICATION FEE CHECKLIST

Please ensure the following items are completed prior to submission. Your application will not be processed if any part is omitted or incomplete. Check all that apply:

- ☐ Applicable CIA Fee
  See the Connection Impact Assesment Fee Schedule on our website for costs. Please enter the amount from the fee schedule.
  $ _____ +HST

- ☐ Transmission Customer Impact Assessment (TxCIA) Fee (if applicable)
  A TxCIA is also required if the total nameplate generation of the project is greater than 10 MW.
  $ _____ +HST

- ☐ IESO System Impact Assessment (SIA) Fee (if applicable)
  An SIA deposit is required if the total nameplate generation of the project is greater than 10 MW. The total cost of the SIA will be Trued Up/Down upon the receipt of the SIA from the IESO. See the IESO's SIA Application for costs.
  $ _____

SECTION Q: ATTACHMENTS

Attached Documents/Drawings

Item #	Description	Document #	# of Pages
1			
2			
3			
4			
5			
6			

SECTION R: NOTES

SECTION S: Toronto Hydro Specific Required Fields

This section contains specific information that is required by Toronto Hydro . Please read Section T notes regarding this section if you need further details.

What is the barcode of the nearest pole serving the project location?

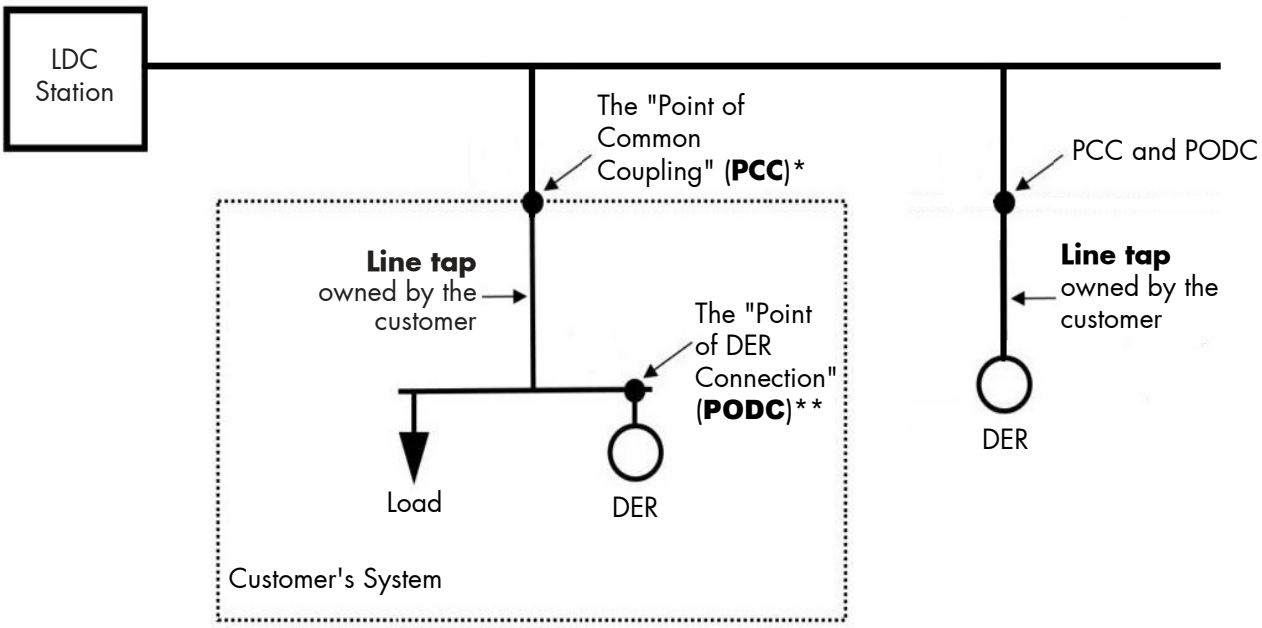
Toronto Hydro Account Number *if transformer is owned by Toronto Hydro*

SECTION T: Toronto Hydro Specific Additional Notes

Section A: No additional notes
Section B: No additional notes
Section C: No additional notes
Section D: No additional notes
Section E: No additional notes
Section F: No additional notes
Section G: No additional notes
Section H: No additional notes
Section I: No additional notes
Section J: No additional notes
Section K: No additional notes
Section L: At the Generator's expense, and if requested, Toronto Hydro may provide transformation up to a maximum of 500 kVA three-phase, as described in the Toronto Hydro Conditions of Service (Section 3.5 item C.4).
Section M: No additional notes
Section N: No additional notes
Section O: For a new DER site, Distribution Operating Map (DOM) is required by Toronto Hydro in addition to Site Plan
Section P: When there is an upstream LDC, an additional fee will be required for costs associated with this LDC's CIA
Section Q: No additional notes
Section R: No additional notes
Section S:
- For question: "What is the barcode of the nearest pole serving the project location?", this is only applicable if you choose "No" to question: "Is there an existing Toronto Hydro account at the project location?" in Section D
- For question: "Toronto Hydro Account Number (if transformer is owned by Toronto Hydro)", this is only applicable if you answer "Toronto Hydro" to question: "Transformer Ownership" in Section L

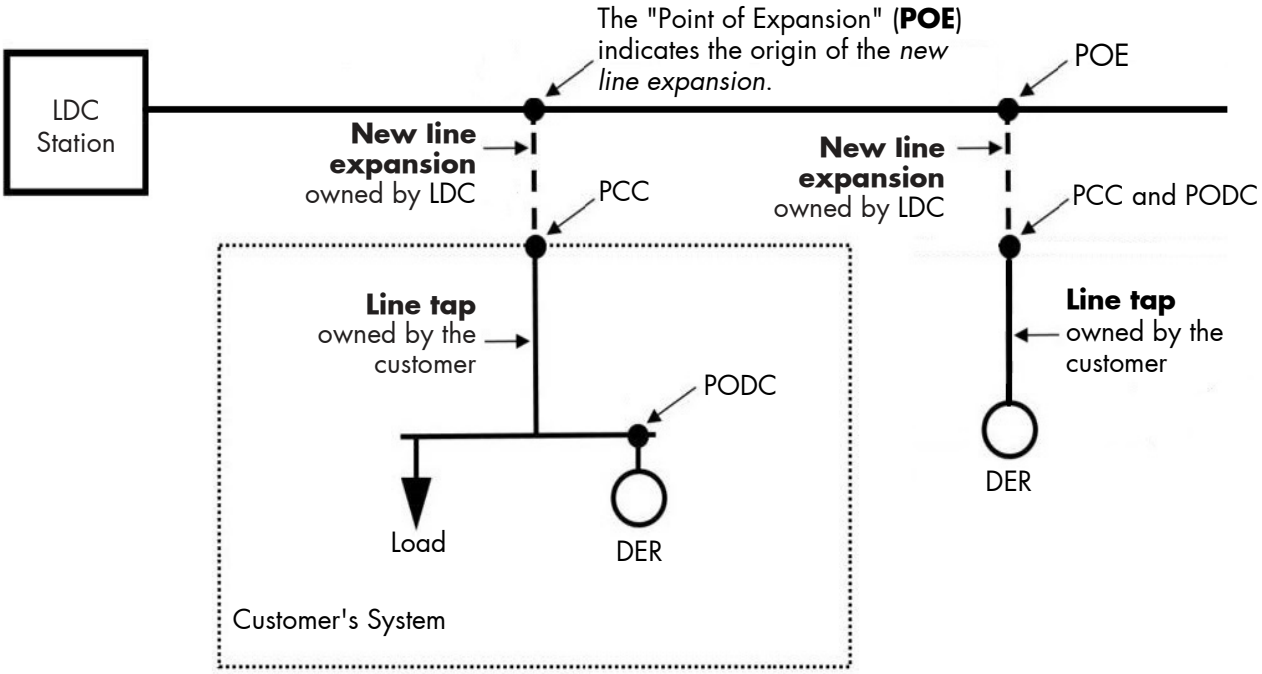
APPENDIX A - FIGURES & DIAGRAMS

Figure A1: Where There is No New Toronto Hydro Owned Line Expansion



*PCC: The point where the customer facility connects to the LDC owned system
**PODC: The point where the DER unit(s)'s interconnection system connects the DER unit(s) to the DER facility

Figure A2: Where There is a New Toronto Hydro Owned Line Expansion



APPENDIX B - MINIMUM CONTROL STRATEGY INFORMATION FOR ENERGY STORAGE FACILITIES OR OTHER TECHNOLOGIES

Figure B1: Peak Shaving

Peak Shaving			
Description of Control Strategy			
When Operating as a Load			
Switch In Time	Switch Out Time	Load kW (peak)	Load kVAR (peak, leading/lagging)
When Operating as a Generator			
Switch In Time	Switch Out Time	Generation kW (peak)	Generation kVAR (peak, leading/lagging)

Figure B2: Dynamic VAR Support

Dynamic VAR Support			
Description of Control Strategy			
Switch In Condition	Switch Out Condition	Generation kW (peak)	Generation kVAR (peak, leading/lagging)

Figure B3: Frequency Support

Frequency Support			
Description of Control Strategy			
Switch In Condition	Switch Out Condition	Generation kW (peak)	Generation kVAR (peak, leading/lagging)

Figure B4: Other Control Strategies

Other	
Description of Control Strategy and Relevant Operating Parameters	

APPENDIX C - LOAD DISPLACEMENT FIGURES

Figure C1: Example Schedule With Minimum Information Required for Load Displacement Projects

	Load of Facility (kW)	Load of Facility (kVAR, lead or lag)	Generation Output (kW)	Generation Output (kVAR, lead or lag)
Minimum Load				
Maximum Load				

By opting to submit this form via email, you are acknowledging that you accept the risk of email communications to and from Toronto Hydro not being encrypted or secure, and that the personal information contained in this form (including but not limited to name, service address, phone number, email address and Toronto Hydro account number) could be intercepted and/or read by unintended parties. Toronto Hydro accepts no liability for any loss and/or damages caused by unintended parties intercepting and/or reading email communications contained in this form.

Appendix 3(ii) - Micro Distributed Energer Resource(DER) Application Form

DER Connections,
Capacity Planning and Grid Innovations,
Toronto Hydro
500 Commissioners Street, 3rd Floor
Toronto, ON M4M 3N7

Micro-Embedded Generation Facility Application

This application is for micro-embedded generation facilities, including net metering, that are ≤ 10 kW.

Section A - Administrative Information

Program *(choose one)*	☐ FIT ☐ Net Metering ☐ Load Displacement ☐ Energy Storage ☐ Large Renewable Procurement (LRP) ☐ Closed Transition ☒ Other, please specify:
Existing Distributed Energy Resource (DER) on the property	☒ Yes ☐ No IESO Contract # for existing generator(s) if applicable:

If existing DER(s) on property, select resource technology below

☐ Solar Photovoltaic (PV) ☐ Renewable Biomass ☐ Wind ☐ Bio-Gas ☐ Co-Generation/Combined Heat and Power (CHP)
☐ Energy Storage Type (please specify):
☐ Other (please specify):

Section B - Contact Information

	Toronto Hydro Service Location (site of project)	**Distributed Energy Resource Owner** (owner of project)	**Engineering Consultant** (electrical/developer)
Company/ Person			
Street Address			
City			
Postal Code			
Contact Name			
Telephone			
Cell			
Email			

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Section C - Billing Contact

☉ Toronto Hydro Customer ○ DER Owner ○ Engineering Consultant
○ Other (please specify): _____

_____

_____

Section D - Project Description

Dates	Proposed Start of Construction (dd/mm/yyyy)				
	Proposed In-Service (dd/mm/yyyy)				
Account	If you are an HST registrant, provide your HST number	- RT			
	Toronto Hydro Account Number				
Generator/ Storage *(if applicable)*	DER	☐ Synchronous ☐ Induction ☐ Inverter ☐ Other, please specify:			
	Resource Technology *(select all that apply)*	☐ Solar PV ☐ Renewable Biomass ☐ Wind ☐ Bio-Gas ☐ Co-Generation/CHP ☐ Other, please specify:			
		Generator		**Storage**	
	Manufacturer				
	Model Number				
	Power Factor (p.u)				
	[A]: Number of Units				
	[B]: Rating of Each Unit	kW	kVA	kWh	kVA
	Proposed Total Capacity: = **[A] × [B]**	kW	kVA	kWh	kVA
	Number of Phases:	○ one	☉ three		
	Output Voltage (V)				
	Connection Configuration	○ delta	☉ star		

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Toronto, ON M4M 3N7

Mode of Operation	Load Displacement?	☐ Yes, existing load new load ☐ No	kW kW
	Power Export?	☐ Yes ☐ No	kW
	Peak Period Only?	☐ Yes ☐ No	kW

Please be advised that the nameplate capacity for Solar PV systems is determined by taking the lesser of:

i. The sum of the manufacturer's capacity ratings (in kW) for normal operation (e.g., continuous output ratings) of the installed solar modules (i.e. panels) of the Facility; or,

ii. The sum of the manufacturer's capacity ratings (in kW) for normal operation (e.g., continuous output ratings) of the installed inverters of the Facility.

Section E - Single Line Diagram (SLD)

Provide an updated SLD of the Generating Facility, signed by a Professional Engineer, which includes the Interface Point/Point of Common Coupling (PCC) to Toronto Hydro's distribution system.

The SLD shall contain details on the following:

- Electrical equipment at the embedded generation facility, principal ratings, impedances, winding configurations, neutral grounding methods, etc.
- Protective relaying, synchronizing and revenue metering arrangements. The device numbers should be in accordance with IEEE Standard Electrical Power System Device Function Numbers (ANSI/IEEE C37.2)
- Only dual winding transformers are acceptable for connection to the Toronto Hydro system.
- Provide the details at the connection point. Toronto Hydro Transformer Station, Toronto Hydro Feeder ID, Transformer Location number and ratings

Note: If the project includes upgrades to existing Embedded Generation facilities, show the existing and new electrical equipment.

SLD Drawing Number: _____ Revision: _____

Single Line Diagram Checklist

Item description	Check as applicable
Toronto Hydro transformer station, feeder ID, transformer location number and ratings (obtained from Pre-Assessment)	☐
Disconnecting device at the interface (PCC) point with Toronto Hydro system	☐
Load break switches	☐
Fuses / circuit breakers	☐

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Interface step-up transformer (intermediate transformer)	☐
Current transformers / voltage transformers (quantity, location, connection, ratio)	☐
Power cables (length, type, impedance)	☐
Power factor correction capacitors and their switching arrangements (particularly for induction units)	☐
Generators (rotating/static) / Motors / PV inverter system	☐
Surge arresters	☐
Other information	☐
Drawing attached / mailed separately	☐

Section F - Location and Site Plan

Provide a site plan outlining existing facilities and proposed embedded generator location. The site plan should include approximate line route for connection to Toronto Hydro, as well as roads, lot numbers and nearby power lines.

Provide meter room layout showing locations of all equipment and approximate clearances.

Drawing Number: _____ Revision: __

Section G - Protection Philosophy

Provide a document describing the protection philosophy for detecting and clearing:

- Internal faults within the Embedded Generation facility
- External phase and ground faults (in Toronto Hydro's distribution system)
- Certain abnormal system conditions such as; over- / under-voltage, over- / under-frequency, open phase(s)
- Islanding
- Tripping matrix

Drawing Number: _____ Revision: __

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Toronto Hydro
500 Commissioners Street, 3rd Floor
Toronto, ON M4M 3N7

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Customer Name (Print): _____

Customer Signature: _____ **Date:** _____

Appendix 3(iii) - Preliminary Consultation Information Request for DER Connections

Preliminary Consultation Information Request for Distributed Energy Resource (DER) Connections

This application is for customers applying for a Distribution Energy Resource (DER) pre-assessment. Email your completed application to **der@torontohydro.com**. If you have any questions, you can contact us at the same email address.

Project information

Project address: _____ Postal code: _____

Project account number: _____ Date: _____
(if applicable)

Please complete one or more of the following sections as they relate to your project:

Customer contact

Note: *The customer is the individual registered as the Toronto Hydro account holder and is responsible for signing the DER connection agreement.*

Customer name/company: _____

Contact name: _____

Telephone: _____ Email: _____

Address: _____ Postal code: _____

DER owner/project owner

Note: *Only complete this section if the owner is different from the customer.*

Company/person: _____

Contact name: _____

Telephone: _____ Email: _____

Address: _____ Postal code: _____

Engineering consultant (electrical consultant/contractor)

Note: *If there is no consultant/developer, you don't need to complete this section.*

Company/person: _____

Contact name: _____

Telephone: _____ Email: _____

Address: _____ Postal code: _____

Project description

Program

Please select one of the following options:

☐ Net metering ☐ Other (please specify): _____

DER application/purpose

Please select one of the following options:

☐ Combined Heat & Power (CHP) ☐ Demand response ☐ Inject energy to the grid

☐ Load displacement ☐ Emergency backup (closed transition)

Size

Proposed generation capacity: _____ kW Proposed storage capacity: _____ kW

Project type

DER type

Please select one of the following options:

☐ Synchronous ☐ Induction ☐ Inverter

☐ Other (please specify): _____

Resource technology

Please select one or more of the following options:

☐ Solar (photovoltaic) ☐ Other

If you indicated "Other," please select one or more of the following options (optional):

☐ Wind turbine
☐ Gas turbine *- natural gas*
☐ Micro turbine *- natural gas*
☐ Energy storage *- battery*
☐ Energy storage *- underwater compressed air*
☐ Turbo expander *- steam*
☐ Reciprocating engine *- diesel*
☐ Reciprocating engine *- natural gas*
☐ Turbo expander *- reservoir*
☐ Reciprocating engine *- bio-gas*
☐ Reciprocating engine *- bi-fuel (natural gas & diesel)*
☐ Uninterruptible power supply
☐ Other (please specify): _____

Project details

Please complete the following information:

Number of units (optional): _____

Rating of each unit (optional): _____ kW _____ kVA

Proposed total capacity*: _____ kW _____ kVA

Number of phases: ☐ One ☐ Three

**The proposed total capacity is the number of units multiplied by the rating of each unit.*

Single line diagram (optional)

Please attach a single line diagram of the project to this application form. In the diagram, mark the proposed point of generator connection.

Expected monthly generation, consumption and output from the facility (optional)

Total generation (optional)

Month	kWh	Peak kW
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

Total internal consumption (optional)

Month	kWh	Peak kW
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

Total output to Toronto Hydro's distribution system (optional)

Note: The total output is the total generation minus the total internal consumption. This value would be negative when the generators are not in operation or when the internal consumption exceeds generation.

Month	kWh	Peak kW
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

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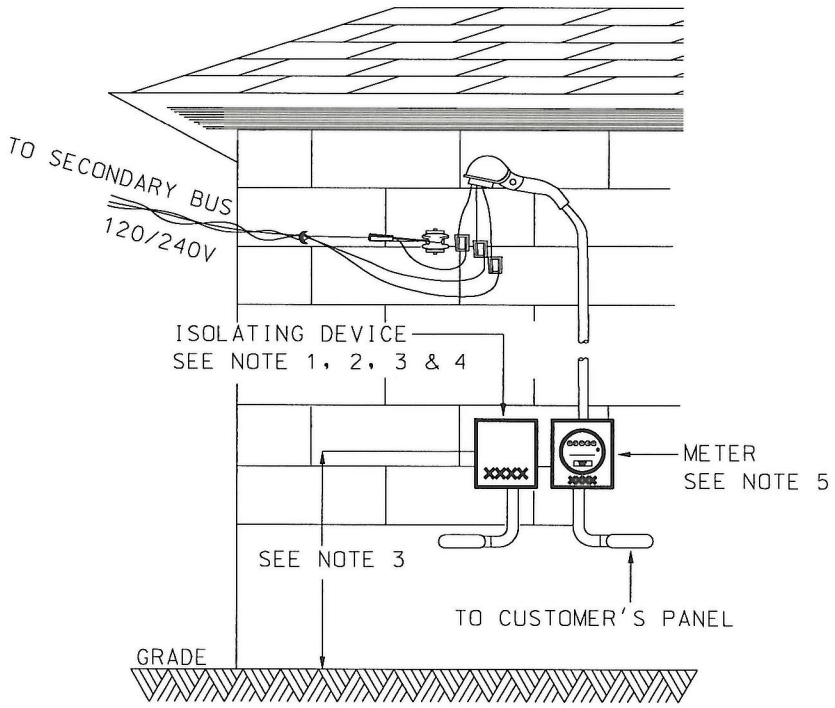
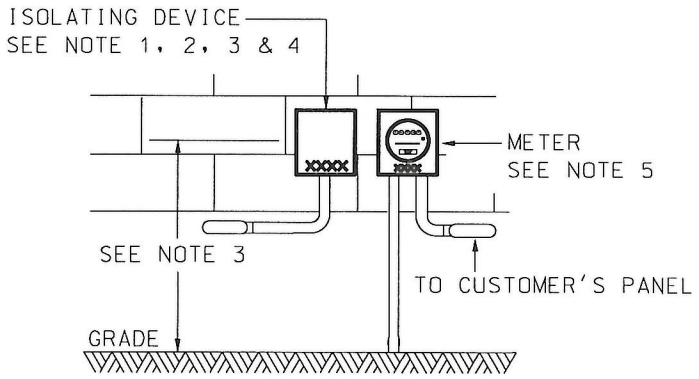
Customer signature

Customer name (print)	**Customer signature**	**Date**

Appendix 4(i) - Standard for Net Metering – Residential Service



③ DEVICE ISOLATION / OVERHEAD SUPPLY – METER AND ISOLATING DEVICE LOCATION



FOR REFERENCE

③ DEVICE ISOLATION / UNDERGROUND SUPPLY – METER AND ISOLATING DEVICE LOCATION

NOTES:

1) THE ISOLATING DEVICE, E.G. FUSED DISCONNECT SWITCH IS SUPPLIED FOR USE BY TORONTO HYDRO PERSONNEL AND SHALL BE VISIBLE, ACCESSIBLE AND LOCKABLE. OUTDOOR INSTALLATION SHALL BE WEATHERPROOF (MINIMUM NEMA 3R RATING).
2) THE ISOLATING DEVICE SHALL BE WITHIN 1000 mm (3'-4") OF THE METER.
3) MOUNTING HEIGHT OF ISOLATING DEVICE SHALL BE BETWEEN 1220 mm (4'-0") AND 1700 mm (5'-7").
4) CUSTOMER SHALL SUPPLY AND INSTALL A 75 mm X 19 mm (3" X 3/4") LAMACOID PLATE, COMES WITH MINIMUM 1/4" HIGH WHITE LETTERS "DG SYSTEM DISCONNECT" ON BLACK BACKGROUND TO BE FASTENED PERMANENTLY TO METER BASE AS SHOWN.
5) CUSTOMER SHALL SUPPLY AND INSTALL A 75 mm X 25 mm (3" X 1") LAMACOID PLATE, COMES WITH MINIMUM 6 mm (1/4") HIGH WHITE LETTERS "WARNING-TWO POWER SOURCE PARALLEL SYSTEM" ON BLACK BACKGROUND TO BE FASTENED PERMANENTLY TO METER BASE AS SHOWN.

DISTRIBUTION CONSTRUCTION STANDARD Revenue Metering			NET METERING RESIDENTIAL SERVICE MOUNTING LOCATION				
TORONTO HYDRO	Approved By:						
	Drafted By:	Designed By:	Original Issue:	Scale: N.T.S.	Rev:	17-9500	1/1

Appendix 4(ii) - Distributed Energy Resource (DER) Monitoring and Control Requirements

DER Connections
Toronto Hydro-Electric System Limited
500 Commissioners Street, 3rd Floor
Toronto, Ontario, M4M 3N7

MONITORING AND CONTROL REQUIREMENTS FOR DISTRIBUTED ENERGY RESOURCE (DER) FACILITIES

1. Introduction

Real time monitoring and control is necessary to ensure public and employee safety and to protect the integrity and reliability of the Toronto Hydro distribution system. Feeder management for bi-directional distribution grid flows via communications with Toronto Hydro's supervisory control and data acquisition (SCADA) system is also essential. This includes dispatch, monitoring, communication, data analysis and forecasting systems.

At this current time, all DER Facilities ≥ 50kW will be required to have Monitoring and Control installed and operational prior to connection to the grid.

2. Overview

2.1 THESL SCADA System

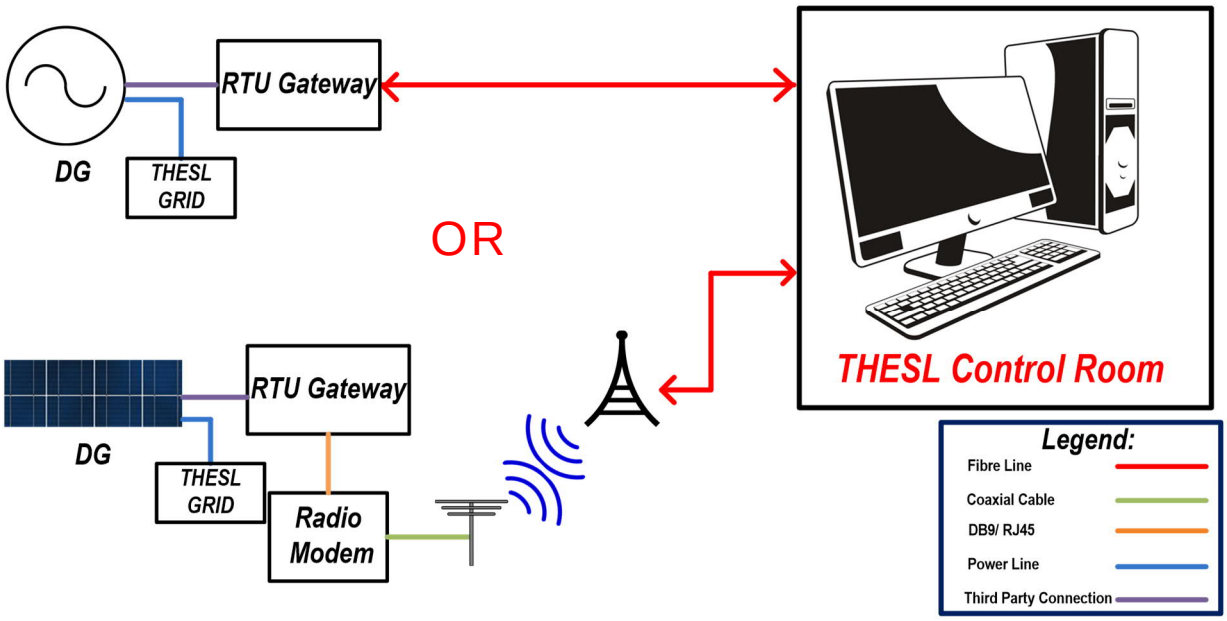
Real time monitoring and control provides the Toronto Hydro Control Room with the necessary information and control to:

a. ensure public and employee safety
b. protect the integrity and reliability of Toronto Hydro distribution system
c. feeder management for bi-directional distribution grid flows
d. data analysis and
e. forecasting systems

The DER Monitoring and Control system is comprised of a Remote Terminal Unit (RTU) Gateway device which:

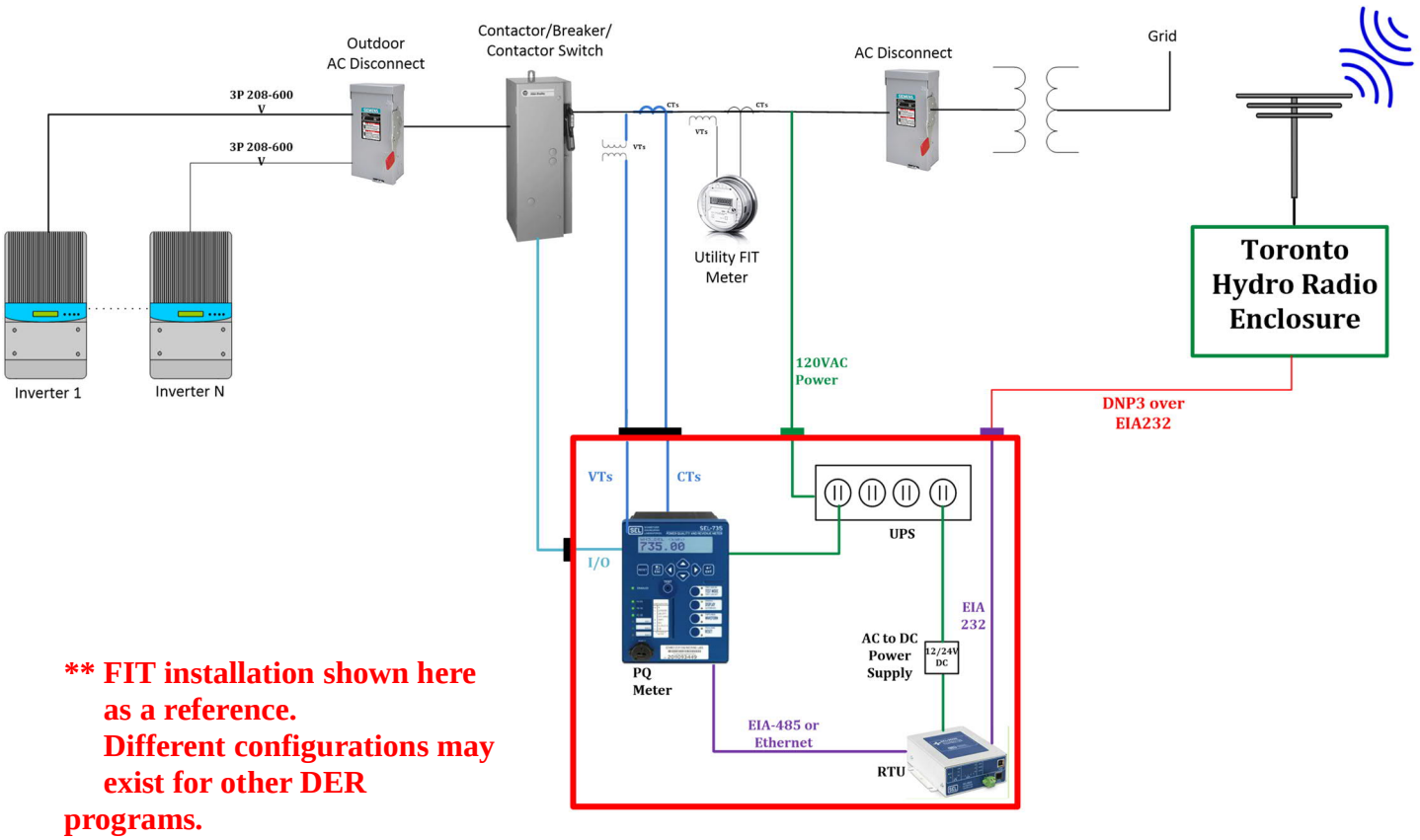
i. polls the DER for the necessary analogue quantities;
ii. interfaces with Toronto Hydro's communications network via a fibre or radio link.

The diagram below demonstrates an overview of Toronto Hydro's SCADA system.



2.2 DER Site

The following schematic further illustrates the Monitoring and Control system at the DER site.



**** FIT installation shown here as a reference. Different configurations may exist for other DER programs.**

3. Requirements (**full requirements to be provided in Connection Impact Assessment)

3.1 Control Requirements (not applicable for Closed-Transition Transfer Generation)

All DER Facilities connected to Toronto Hydro's distribution system are required to provision for remote real time control to Toronto Hydro. Provision will include, but is not limited to, the following:

1. The ability to remotely dispatch the DER Facility (on/off)

   Option A: Trip Command is sent from RTU to the generator(s) communication board
   Option B: Dry Contact is sent from RTU to generator(s) auxiliary contact
   Option C: Dry Contact is sent from RTU to a separate disconnecting means (ie. contactor, circuit breaker, contactor switch, etc.)

	Available Option		
No. of Generators	**A**	**B**	**C**
1	☒	☒	☒
2	☒	☒	☒
≥ 3†			☒

† Daisy chaining of inverters is not allowed.

3.2 Monitoring Requirements

3.2.1 Monitoring

All DER Facilities connected to Toronto Hydro's distribution system are required to provision for remote real time monitoring to Toronto Hydro. Provision will include, but is not limited to, the following:

1. Analogue Quantities which include the following:
   a) Apparent Power (KVA) and Reactive Power (VAR) output;
   b) Power Factor and direction for each unit or total for the DER Facility;
   c) Frequency (Hz);
   d) Phase to phase voltage (V); and
   e) Three phase currents (A).
2. Device Statuses:
   a) Status of consolidated DER units;
   b) Status of protective relays; and
3. Unsolicited response will be sent to Toronto Hydro when:
   a) Current values change by 20% of maximum allowable value
   b) Voltage values changes by 15% of nominal value.
   c) Status of DER Facility has changed

3.2.2 Telemetry Requirements

The telemetry Reporting Rates shall be:

Function	Performance
Data measurements	Less than 10 seconds from change in field monitored quantity
Equipment status change	Less than 10 seconds from field status change
Scan period for data measurements	Minimum 4s
Scan period for equipment status	Minimum 4s

3.2.3 Options

Depending on the number of generators at the DER Facility, there are two options to satisfy the monitoring requirements:

Option A: Monitoring quantities are obtained directly from the generator(s).
Option B: Monitoring quantities are obtained from a Power Quality (PQ) meter$^{\Psi}$.

	Available Option	
No. of Generators	**A**	**B**
1	☒	☒
2	☒	☒
≥ 3†		☒

† Daisy chaining of inverters is not allowed.

Ψ The PQ meter will, at a minimum, meet the following specifications:

- Accuracy:
  - PQ meter accuracy must be ANSI C12.20 Class 0.2
  - CT and PT accuracy must be Class 1.0 (1% accuracy)
- Power Quality:
  - IEC 61000-4-30 power quality accuracy for voltage, current, power
- Harmonic Metering:
  - Individual voltage and current up to 15th order
  - THD
- Display: LCD display showing all parameters.

3.3 Reliability

1. The delivery of real-time data at the communication demarcation point shall have a:
    a) MTBF (Mean Time between Failure) of four (4) years; and
    b) MTTR (Mean Time to Repair) of seven (7) days.
2. The DER operator may be required to disconnect the DER Facility until problems are corrected if the failure rates or repair time performance in item 1) above fails to achieve their targets by the following significant amounts:
    a) less than 2 years MTBF; or
    b) MTTR greater than 7 days.
3. If the DER Facility is involved in a Special Protection System (SPS) or automated dispatch, the Telecommunication Mean Time to Repair (MTTR) requirement shall be 24 hours.
4. Upon loss of telecommunications, the DER operator is required to immediately report the failure cause and estimated repair time to Toronto Hydro.
5. Mean Time to Repair time shall start from the time when the communications was lost and not from when it was discovered.
6. The DER operator shall coordinate any planned interruption to the delivery of real time data with Toronto Hydro.

3.4 Communication Point

1. Toronto Hydro will connect with only one point for communication per Toronto Hydro supply point.
2. The communication and control point shall be located at the same location in close proximity to the revenue metering for the DER Facility.
3. RTU would connect to the THESL radio modem through its RJ45 serial COM port over an RS-232 interface. Pinout Configuration below

4. Surge protection and backup power will be provided for the RTU and other miscellaneous equipment.

3.5 Medium and Protocol

1. The DER Facility shall provide real-time operating information to Toronto Hydro as specified in Section 3.2 directly from the station(s) as described below in item (2).
2. Real time operating information provided to Toronto Hydro may be from a RTU device at the DER Facility's station to Toronto Hydro's control centre using Distributed Network Protocol (DNP 3.0 protocol).
3. Further provision to accommodate IEC 61850 is also required.
4. Toronto Hydro will notify the DER operator of which communication medium (fibre/radio/Bell line) and protocol (Ethernet DNP/Serial DNP) will be used for the proposed DER Facility in the Connection Impact Assessment (CIA).
5. DNP3 (or IEC61850) protocol is required between DER protection relay(s) and RTU Gateway for engineered systems using a breaker transfer scheme. This includes Closed Transition transfer via breaker auxiliary contacts

3.6 RTU Specifications

1. RTU must be equipped with a fibre Ethernet port (single mode, LC connector).
2. Upon recovery from an interruption, the RTU must continue to operate in the same configuration and setting prior to the loss of main power.
3. Enclosure containing RTU will be pad locked by THESL in order to prevent non-THESL access upon successful commissioning of the system.
4. TCP/IP connections to the RTU will not be permitted.
5. Only one (1) Serial DB9-232 or DB9-485 connection to the RTU is allowed for DER operator use. Access will be ***Read-Only over Modbus protocol***. No other connections to the RTU will be permitted for the DER operator.
6. Unused ports on the RTU must be disabled.

3.7 Uninterruptible Power Supply (UPS) Requirements

An Uninterruptible Power Supply (UPS) is required to power the RTU and other miscellaneous equipment during a utility outage. UPS must be supplied by a 120V GFCI outlet/receptacle.

3.7.1 UPS Specifications

The UPS shall:

a. Have adequate capacity to ensure that all protection functions operate when the main source of power fails.
b. Remain operational for a minimum of 10 minutes (600s) after the main source of power fails, in order for the protection functions to operate properly and disconnect the DER Facility from Toronto Hydro's distribution system.
c. Be capable of sustaining continuous telemetry about the DER connection status.
d. Be equipped with two (2) 120V outlets for Toronto Hydro use.

DER Connections
Toronto Hydro-Electric System Limited
500 Commissioners Street, 3rd Floor
Toronto, Ontario, M4M 3N7

Appendix A -
SCADA RTU Configuration for Inverter Based DER

A.1 Setup

1. The SCADA RTU Gateway shall act as a Serial DNP Server
2. The SCADA RTU Gateway shall be configured as follows

Server DNP Address	*
Client DNP Address	*
Serial Communications Port Type	EIA232
Baud Rate	9600
Data Bits	8
Parity Bit	None
Stop Bit	1
Full Duplex	FALSE
Allow Unsolicited Messages	TRUE
Unsolicited Messaging Retries	3
UTC Offset	0
DST Enabled	FALSE

* To be provided in the CIA

A.2 SCADA Mapping

1. The SCADA points shall be, but is not limited to, mapped as follows

Monitoring (Analog Input)	
From RTU	**Definition**
0	Voltage AB
1	Voltage BC
2	Voltage CA
3	Current I_a
4	Current I_b
5	Current I_c
6	Apparent Power
7	Power Factor
8	Frequency

Monitoring (Digital Input)	
From RTU	**Definition**
0	On/Off Status
1	Test Point

Control (Digital Output)	
From SCADA	**Definition**
0	On/Off Command
1	Test Point

2. The configuration of these SCADA points shall be, but is not limited to, as follows:

Definition	Unit	Scale	Deadband	Zero Deadband	Max Value	Min Value
Voltage AB	V	1	3% of nominal	10	+6% of Nominal	-6% of Nominal
Voltage BC	V	1	3% of nominal	10	+6% of Nominal	-6% of Nominal
Voltage CA	V	1	3% of nominal	10	+6% of Nominal	-6% of Nominal
Current I_a	A	1	5% of max	1% of Max	105% of Max	-1% of Max
Current I_b	A	1	5% of max	1% of Max	105% of Max	-1% of Max
Current I_c	A	1	5% of max	1% of Max	105% of Max	-1% of Max
Apparent Power	KVA	1	5% of max	1% of Max	100% of Max	-1% of Max
Power Factor		0.01	5		110	-110
Frequency	Hz	1	1.8	10	63.6	56.4

3. Alternatives may be considered upon submission of proposals.

4. The **Digital Output** to control the RTU shall be
    i. latch off to disconnect; and
    ii. latch on to connect.

5. The **Digital Input** On/Off status of the DER from the RTU shall be
    i. **0** or **FALSE** for Off Status; and
    ii. **1** or **TRUE** for On Status.

At this current time, all DER facilities ≥50kW <u>will be required</u> to have Monitoring and Control installed and operational prior to connection to the grid.

Appendix B -
Sample SCADA RTU Configuration for Synchronous Based DER

B.1 Serial DNP (RS232) Setup

1. The SCADA RTU Gateway shall act as a Serial DNP Server
2. The SCADA RTU Gateway shall be configured as follows

Server DNP Address	*
Client DNP Address	*
Serial Communications Port Type	EIA232
Baud Rate	9600*
Data Bits	8
Parity Bit	None
Stop Bit	1
Full Duplex	FALSE
Allow Unsolicited Messages	TRUE
Unsolicited Messaging Retries	3
UTC Offset	0
DST Enabled	FALSE

* To be provided in the CIA

B.2 Ethernet DNP Setup

1. The SCADA RTU Gateway shall act as a Ethernet DNP Server
2. The SCADA RTU Gateway shall be configured as follows

Server DNP Address	*
Client DNP Address	*
Allow Anonymous DNP IP Clients	FALSE
Client IP Addresses	*
Server IP Port	*
Allow Unsolicited Messages	TRUE
Unsolicited Messaging Retries	3
UTC Offset	0
DST Enabled	FALSE
Transport Protocol	TCP

* To be provided in the CIA

B.3 Sample SCADA Mapping

1. The SCADA points shall be, but is not limited to, mapped as follows

Monitoring (Analog Input)			
From RTU	**Definition**	**From RTU**	**Definition**
0	Gen #1 Power Factor	**30**	Gen Tie #1 Bus Ref Voltage
1	Gen #1 Phase A Amps	**31**	Gen Tie #1 KiloWatts
2	Gen #1 Phase B Amps	**32**	Gen Tie #1 KVAR
3	Gen #1 Phase C Amps	**33**	Gen Tie #1 HZ
4	Gen #1 A-B volts	**34**	Utility #1 Phase A RMS Current
5	Gen #1 B-C volts	**35**	Utility #1 Phase B RMS Current
6	Gen #1 C-A Volts	**36**	Utility #1 Phase C RMS Current
7	Gen #1 KiloWatts	**37**	Utility #1 A-B RMS Voltage
8	Gen #1 KVAR	**38**	Utility #1 B-C RMS Voltage
9	Gen #1 KVA	**39**	Utility #1 C-A RMS Voltage
10	Gen #1 HZ	**40**	Utility #1 Average Current
11	Gen #2 Power Factor	**41**	Utility #1 Average Line Voltage
12	Gen #2 Phase A Amps	**42**	Utility #1 3 Phase Real Power
13	Gen #2 Phase B Amps	**43**	Utility #1 3 Phase Reactive Power
14	Gen #2 Phase C Amps	**44**	Utility #1 3 Phase Apparent Power
15	Gen #2 Phase B Amps	**45**	Utility #1 System Frequency
16	Gen #2 A-B volts	**46**	Utility Tie #1 Ph A RMS Current
17	Gen #2 B-C volts	**47**	Utility Tie #1 Ph B RMS Current
18	Gen #2 C-A Volts	**48**	Utility Tie #1 Ph C RMS Current
19	Gen #2 KiloWatts	**49**	Utility Tie #1 A-B RMS Voltage
20	Gen #2 KVAR	**50**	Utility Tie #1 B-C RMS Voltage
21	Gen #2 KVA	**51**	Utility Tie #1 C-A RMS Voltage
22	Gen #2 HZ	**52**	Utility Tie #1 Average Current
23	Gen Tie #1 Power Factor	**53**	Utility Tie #1 Average Line Voltage
24	Gen Tie #1 Phase A Amps	**54**	Utility Tie #1 3 Phase Real Power
25	Gen Tie #1 Phase B Amps	**55**	Utility Tie #1 3 Phase Reactive Power
26	Gen Tie #1 Phase C Amps		
27	Gen Tie #1 A-B Volts		
28	Gen Tie #1 B-C Volts		
29	Gen Tie #1 C-A Volts		

Monitoring (Digital Input)	
From RTU	**Definition**
0	Generator 1 CB Closed
1	Generator 1 CB Open
2	Generator 1 Alarm
3	Generator 1 Running
4	Generator 2 CB Closed
5	Generator 2 CB Open
6	Generator 2 Alarm
7	Generator 2 Running
8*	Generator Tie #1 CB Closed
9*	Generator Tie #1 CB Open
10*	Utility Tie #1 CB Closed
11*	Utility Tie #1 CB Open
12	Utility Tie #1 Alarm
13*	Utility #1 Main CB Closed
14*	Utility #1 Main CB Open
15	Utility #1 Main CB Alarm
16*	Transfer Switch Closed
17*	Transfer Switch Open
18*	Transfer Switch Alarm

Control (Digital Output)	
From SCADA	**Definition**
0	Emergency Trip
1	Test Point

***Status must be time stamped**

Note 1: Any additional Generators will require a replica of points appended to the end.
Note 2: Any additional Generator Ties will require a replica of points appended to the end.
Note 3: Any additional Utility Ties will require a replica of points appended to the end.

2. Alternatives may be considered upon submission of proposals.

3. The **Digital Output** to control the RTU shall be
    i. latch off to disconnect; and
    ii. latch on to connect.

4. The **Digital Input** On/Off status of the DER from the RTU shall be
    i. **0** or **FALSE** for Off Status; and
    ii. **1** or **TRUE** for On Status.

At this current time, all DER facilities ≥50kW <u>will be required</u> to have Monitoring and Control installed and operational prior to connection to the grid.