

Connection Impact Assessment (CIA) Application



SUBMISSION INSTRUCTIONS

Distributed Energy Resource Connections, Capacity Planning and Grid Innovation | der@torontohydro.com | 416-542-3099

Please return the completed form and other required documents by mail or email to:

Email: der@torontohydro.com

Subject: Connection Impact Assessment Application

Mail: Toronto Hydro

500 Commissioners St. 3rd Floor
Toronto, ON M4M 3N7
Attention: Benson Lo, Distributed Energy Resource Connections, Capacity Planning and Grid Innovation

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 Generation Requirements," available at torontohydro.com/conditionsofservice.

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)	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-XXXXXX)

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 number (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 the Connection Cost Agreement and Distribution Connection Agreement) are only made between Toronto Hydro and the host customer. This section is strictly to gather contact information for 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) Note: PO boxes and rural routes will not be accepted

Work phone number

Mobile phone number

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) Note: PO boxes and rural routes will not be accepted

Work phone number

Mobile phone number

Fax number

Email address

Please enter the following information about the consultant:

Contact person

Company's legal name

Mailing address (including postal code) Note: PO boxes and rural routes will not be accepted

Work phone number

Mobile phone number

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 any 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)

Technology and fuel type (select all that apply)

Solar (PV)

Wind

Water

Natural Gas

Bio-Gas

Biomass

Diesel

Battery Energy Storage System

UPS

CHP/Co-Generation

Other (please specify):

DER type

Synchronous

Induction

Inverter-based

Other

Number of generating unit(s)

Manufacturer

Type and/or model number

Rated capacity of each unit

kW

kVA

Rated frequency (Hz)

Generator/DER phases

Single

Three

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

For inverter-based units

Min. power limit for stable operation (kW)

Direct axis sub-transient reactance, X''d (p.u.)

Inverter rating (kVA)

Direct axis sub-transient reactance, X''d (p.u.)

Direct axis transient reactance, X'd (p.u.)

Maximum continuous power output (kW)

Direct axis transient reactance, X'd (p.u.)

Total PF correction installed (kVAR)

—

Direct axis synchronous reactance, Xd (p.u.)

—

—

Zero sequence reactance, X0 (p.u.)

—

—

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)

Type of connection

Single-phase

Three-phase

Technology and fuel type (select all that apply)

Solar (PV)

Wind

Water

Natural Gas

Bio-Gas

Biomass

Diesel

Battery Energy Storage System

UPS

CHP/Co-Generation

Other (please specify):

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

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 for the location, populating the fields in Section G is optional for this application. Ensure selection below matches with this note (required or optional).

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 (i.e. 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.

Please provide a Single Line Diagram (SLD) of the Generator's facilities, including the PCC, transformer and connecting station, feeder and supply voltage.

SLD drawing or 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)

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

Generator fault contribution (with fault location at the PCC)

Single Line Diagram (SLD)

Provide an updated SLD of the generating facility that has been signed by a professional engineer and includes the interface point/point of common coupling 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, please show the existing and new electrical equipment.

SLD drawing number

Revision

Please check off any of the following items if they are included as part of your submission:

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 point with Toronto Hydro system	
Load break switches	
Fuses/circuit breakers	
Interface step-up transformer (intermediate transformer)	
Current transformers and 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	

Connection to Toronto Hydro's distribution system (from SLD)**Note: Please copy the above section if additional space is required to fill data**

	Cable/conductor type (i.e. Al, Cu) and number of wires	Cable/conductor size (i.e. #4 or 250 kcmil)	Length (metres)	Impedance	Comments
Demarcation point to generator interface transformer					
Intermediate transformer to generator					
Generator disconnect to generator					

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 and ES Agreements.

Section I: Energy storage or uninterrupted power supply (UPS)

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

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.

Number of units

Inverter unit size
(enter 0 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

Section J: Load displacement/peak shaving

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

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).

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)

Section K: DER characteristics

For facilities with multiple generators: If your generators have different characteristics, please use the “Add page” button in 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 unit(s)

Rated capacity of each unit

DER output voltage (in kV)

kW

kVA

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, p.u.)

Generator winding connection

Delta

Star

Neutral grounding method (for star winding connection only)

Impedance R (in ohms)

Impedance X (in ohms)

Solid

Ungrounded

Impedance

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 (p.u.)

Direct axis subtransient reactance, X_d'' (p.u.)

Direct axis transient reactance, X'_d (p.u.)

—

Direct axis synchronous reactance, X_d (p.u.)

—

Subtransient time, T_d'' (ms)

—

Zero sequence reactance, X_0 (p.u.)

—

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) p.u.

Impedance (X) p.u.

Impedance (Z%)

or

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 base (if different than ratings above)

kVA base

kV base

Impedance R (p.u.)

Impedance X (p.u.)

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 (in ohms)

Zero sequence impedance (Z0) X (in 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:

Item description	Check as applicable
Payment in full including applicable taxes (by cheque or other approved methods of payment to "Toronto Hydro")	
Completed Form B stamped by a professional engineer	
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:

Item description	Check as applicable	Amount
Applicable CIA Fee: Refer to Toronto Hydro's Distributed Energy Resource (DER) Application and Connection Guidelines for costs: torontohydro.com/connectionprocess . 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.		\$ + HST

Section Q: Attachments

Attached documents/drawings

Item	Description	Document number	Number of pages

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 if you need further details.

Section S.1: Expected monthly generation, consumption and output from the facility

	Total generation (a)		Total internal consumption (b)		Total output (to Toronto Hydro distribution system) (a - b)*	
	kWh	Peak kW	kWh	Peak kW	kWh	Peak kW
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

*This value would be negative when the DER are not in operation or when the internal consumption exceeds generation.

Section S.2: Motor load information

Please provide motor load details for any motors that are present onsite. If total motor load is greater than 1,000 horsepower (hp), please complete the following table:

Motor		Units
Type		—
Nominal hp rating (total)		hp
Nominal power		kW

All motors must be shown on the SLD with ratings. Provide motor and drives specifications.

Motor load

Not applicable

Nominal rating		Units
a.	Mechanical power	hp
b.	Rated power	kVA
c.	Rated voltage	kvLL
d.	Efficiency	%
e.	Power factor	p.u.
f.	Synchronous speed	RPM
g.	Number of poles	—

Motor impedances

	R	X	Units
h.	Subtransient		p.u.
i.	Steady state		p.u.
j.	Negative sequence		Ω
k.	Zero sequence, Z_0		p.u.
l.	Negative sequence, Z_2		p.u.

Grounding impedances

m.	Grounding, Z_g		Ω
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Note: Each motor rating requires a separate sheet. Please use the “Add page” button on the bottom right corner and provide the characteristics for each motor. Provide a total count for each motor size.

Section T: Toronto Hydro specific additional notes

Sections	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	No additional notes
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	Any material revisions to the design, planned equipment or plans for the embedded generation facility shall be filled with Toronto Hydro and a new CIA will be prepared as per the DER Connection Procedures. The new CIA will be performed at the customer's expense.

Section U: Toronto Hydro information

This section is to be filled out by Toronto Hydro representatives for internal use only.

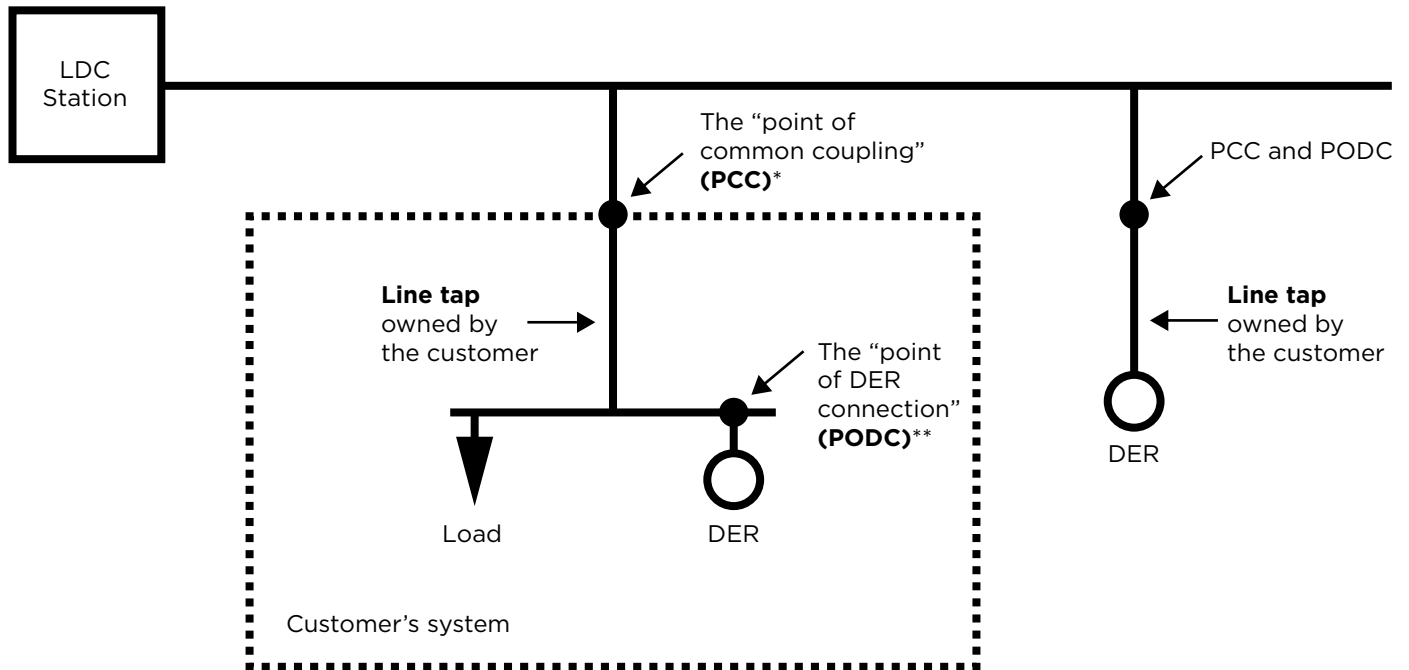
DER project reference number	Distributed generator number
------------------------------	------------------------------

Important notes

The information and, where applicable, personal information being collected via this form, is being collected by Toronto Hydro for the purposes of facilitating Distributed Energy Resources connections. By submitting this form, you are agreeing to Toronto Hydro collecting the information and, where applicable, the personal information on this form, and are consenting to its usage by Toronto Hydro for the aforementioned purposes. By opting to submit this form, you are acknowledging that you accept the risk of communications to and from Toronto Hydro not being encrypted or secure, and that the personal information contained in this form, where applicable, 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 losses and/or damages caused by unintended parties intercepting and/or reading this form and/or its contents.

For more information on how Toronto Hydro collects, uses and discloses personal information, please refer to Toronto Hydro's Privacy Policy at torontohydro.com/privacypolicy.

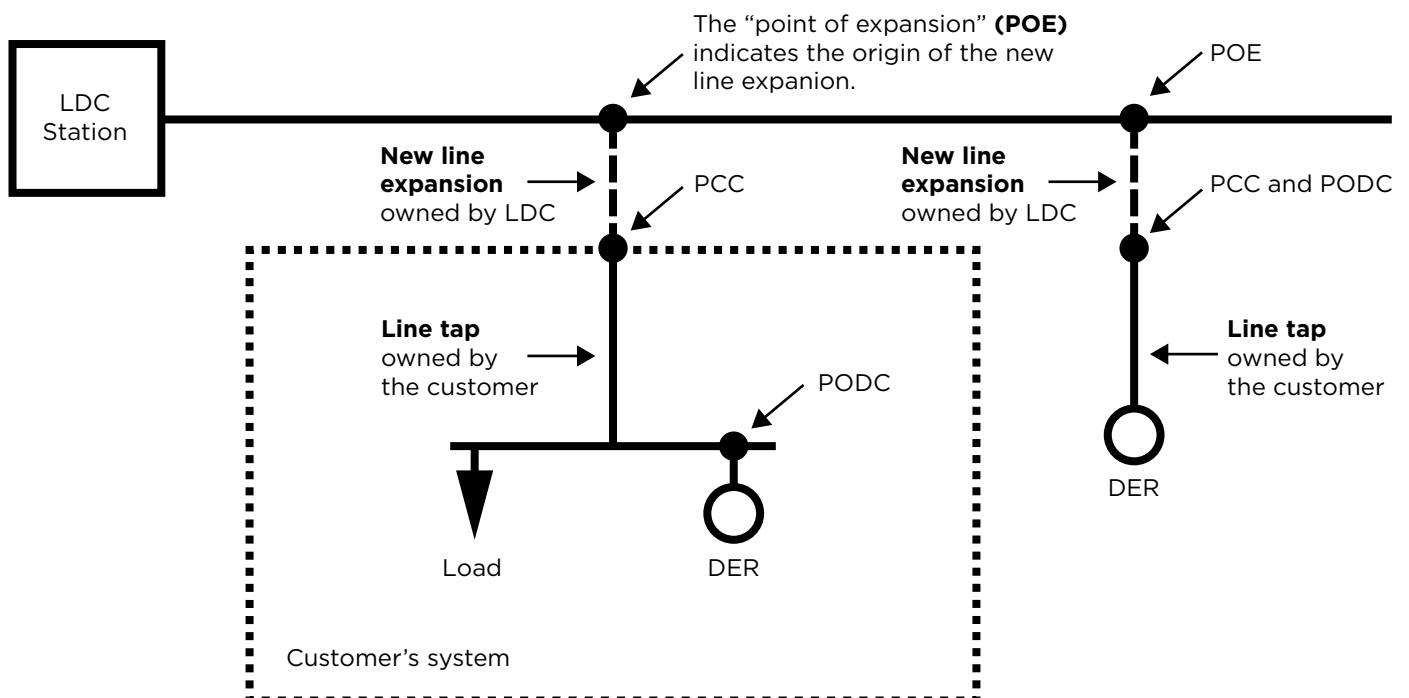
Figure A1: Where there is no new Toronto Hydro owned line expansion



*PCC: The point where the customer facility connects to the LDC owned system.

**PODC: The point where the DER unit(s) 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				

Important notes

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.