



# Toronto Hydro Distributed Generation Requirements

**ISSUED:** January 1, 2011  
**REVISION #1:** December 8, 2011  
**REVISION #2:** August 15, 2012  
**REVISION #3:** November 28, 2013  
**REVISION #4:** October 23, 2014  
**REVISION #5:** October 30, 2015  
**REVISION #6:** October 4, 2017

**PREPARED BY:**

  
GARY THOMPSON, SUPERVISOR-ENGINEER, GENERATION PLANNING  
& SYSTEM STUDIES

**REVIEWED BY:**

  
JACK SIMPSON, DIRECTOR, GENERATION & CAPACITY PLANNING

## CERTIFICATE OF APPROVAL

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

  
GARY THOMPSON,  
PROFESSIONAL ENGINEER

DATE

  
10/04/17

# Preface

## PREFACE

*The Conditions of Service of Toronto Hydro requires to include terms and conditions of interconnecting generation facilities to the Toronto Hydro distribution system. This reference document titled “Toronto Hydro Distributed Generation Requirements” is to be read along with the Conditions of Service.*

*The purpose of this document is to provide information on various types of generation 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, it 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 Distributed Generation does not yet include generation facilities owned and operated by Toronto Hydro.*

Comments and inquiries can be e-mailed to: [DER@torontohydro.com](mailto:DER@torontohydro.com)

Customers without e-mail access can fax comments and inquiries to 416.542.2630, Attn: Gary Thompson, or submit through regular mail to:

Generation Planning & System Studies  
Toronto Hydro-Electric System Limited  
3rd Floor  
500 Commissioners Street  
Toronto, Ontario  
M4M 3N7

Attn: Gary Thompson

To contact Toronto Hydro call (416) 542-3099 or e-mail at: [DER@torontohydro.com](mailto:DER@torontohydro.com)

# Table of Contents

## Table of Contents

PREFACE.....	2
1. INTRODUCTION.....	6
1.1 Identification of Distributed Generation and Distributed Generator .....	6
1.2 Related Codes and Governing Laws .....	6
1.3 Interpretations.....	6
1.4 Contact Information .....	6
2. DISTRIBUTED GENERATION FACILITIES .....	7
2.1 Types of Distributed Generation Facilities .....	7
2.2 Energy Sources .....	7
2.2.1 Renewable Energy sources.....	7
2.2.2 Clean Energy sources.....	7
2.3 Distributed Generation Classification .....	8
2.4 Generators .....	8
2.4.1 Embedded Retail Generator .....	8
2.4.2 Net Metered Generator.....	8
2.4.3 Retail Generator.....	9
2.5 Distributed Generation Programs .....	9
2.6 Outline of Distributed Generation Programs .....	9
2.6.1 Emergency Backup Generation .....	10
2.6.2 Net Metering Program .....	10
2.6.3 Feed-in Tariff Program .....	10
2.6.4 Renewable Energy Standard Offer Program (RESOP) .....	12
2.6.5 Demand Response .....	12
2.6.6 Wholesale Market Participant.....	13
2.6.7 Settlement at Hourly Ontario Energy Price (HOEP) .....	13
2.7 Distributed Generation Connections and Metering .....	13
2.7.1 Embedded Retail Generation Connection and Metering.....	14
2.7.2 Net Metering.....	14
2.7.3 Demand Response .....	15
2.7.4 Settlement at HOEP.....	15
2.7.5 Wholesale Market Participant.....	15
2.7.6 General.....	15
2.8 Damages .....	15
2.9 Warning Signs and Labels .....	15
3. TECHNICAL REQUIREMENTS.....	16
3.1 General Technical Requirements .....	16
3.2 Emergency Backup Generation Technical Requirements .....	17

# Table of Contents

3.2.1	<i>Commercial and Industrial Customers</i> .....	17
3.2.2	<i>Residential Customers</i> .....	18
3.3	<i>Net Metered Generation Technical Requirements</i> .....	19
3.4	<i>FIT Program Technical Requirements</i> .....	19
3.4.1	<i>MicroFIT</i> .....	20
3.4.2	<i>Capacity Allocation Exempt</i> .....	20
3.4.3	<i>Capacity Allocation</i> .....	20
3.5	<i>Control and Monitoring</i> .....	21
3.5.1	<i>Control Requirements</i> .....	21
3.5.2	<i>Monitoring Requirements</i> .....	21
3.5.3	<i>Real Time Control and Monitoring</i> .....	22
4.	<b>DISTRIBUTED GENERATION ACTIVITIES (GENERAL)</b> .....	24
4.1	<i>Preliminary Meeting</i> .....	24
4.2	<i>Information to Generator</i> .....	24
4.3	<i>Offer to Connect and other Agreements</i> .....	25
4.3.1	<i>Offer to Connect</i> .....	25
4.3.2	<i>Connection Cost Agreement</i> .....	25
4.3.3	<i>Connection Agreement</i> .....	27
4.4	<i>Connection Process and Timing</i> .....	27
4.4.1	<i>Capacity Allocation Process</i> .....	28
4.4.2	<i>Connection Process</i> .....	30
4.4.3	<i>Connection of Small, Mid-Sized and Large Generation Facilities</i> .....	32
4.4.4	<i>Connection Impact Assessment (CIA)</i> .....	33
4.5	<i>Mandatory Reporting Requirements</i> .....	34
4.5.1	<i>Notice to Transmitter and other Distributors</i> .....	34
4.5.2	<i>Information to be made Publicly Available</i> .....	35
4.6	<i>Expansion, Renewable Enabling Improvements, Enhancement and Connection Assets</i> .....	35
4.6.1	<i>Expansion</i> .....	35
4.6.2	<i>Renewable Enabling Improvements and Enhancement</i> .....	37
4.6.3	<i>Generation Facility Connection Assets</i> .....	37
4.7	<i>Miscellaneous Distributed Generation Activities</i> .....	38
4.7.1	<i>Design Review</i> .....	38
4.7.2	<i>Inspections before Connections</i> .....	38
4.7.3	<i>Metering</i> .....	38
4.7.4	<i>Commissioning and Testing</i> .....	39
4.7.5	<i>Settlement</i> .....	40
4.7.6	<i>Billing</i> .....	40
4.8	<i>Connection Costs and Meter Charges</i> .....	40



# Table of Contents

5.	GLOSSARY OF TERMS.....	41
6.	APPENDICES .....	44
6.1	<i>Appendix 1 - Requirements .....</i>	
6.2	<i>Appendix 2 – Agreements.....</i>	
6.3	<i>Appendix 3 – Application Forms.....</i>	
6.4	<i>Appendix 4 - Charges, Standards, Sketches and Availability.....</i>	

# Section 1 – Introduction

## 1. INTRODUCTION

### ***1.1 Identification of Distributed Generation and Distributed Generator***

Distributed Generation (DG) is any generation facility that is connected to the distribution grid of a Local Distribution Company (LDC) that distributes electrical power to Customers and Consumers. A Distributed Generator 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 distributed generation facilities within its Licensed Territory as defined in Section 1.1 of the Conditions of Service.

### ***1.2 Related Codes and Governing Laws***

Distributed Generation 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 Distributed Generation Requirements adhere to the rules listed in Section 1.3 of the Conditions of Service.

### ***1.4 Contact Information***

Toronto Hydro can be contacted regarding distributed generation connection during business hours, Monday to Friday between 8:30 a.m. and 4:30 p.m., at 416-542-3099 or such other numbers as Toronto Hydro may advise through its website or invoices.

Toronto Hydro can also be contacted via e-mail at [DER@torontohydro.com](mailto:DER@torontohydro.com) or such other e-mail addresses as Toronto Hydro may advise through its website or invoices.

The mailing address is Generation Planning Section, 500 Commissioners Street, Toronto Ontario M4M 3N7.

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## Section 2 – Distributed Generation Facilities

### 2. DISTRIBUTED GENERATION FACILITIES

#### ***2.1 Types of Distributed Generation Facilities***

Distributed Generation facilities are interconnected to the Toronto Hydro distribution system for various purposes as follows:

- Standby / Emergency backup
- Load displacement
- Export of power to the distribution grid

Such interconnected distributed generation can be an Emergency Backup Generation Facility, an Embedded Retail Generation Facility or a Wholesale Market Participant generator as described in Section 1.2: Definitions of the Distribution System Code (DSC). The owner or operator of any of the above mentioned generation facilities, is a generator.

#### ***2.2 Energy Sources***

Energy sources for Distributed Generation facilities will be renewable energy or clean energy, except for emergency backup.

##### ***2.2.1 Renewable Energy sources***

- solar
- wind
- water
- renewable or agricultural bio-mass
- bio-gas, including landfill gas and
- bio-fuel

##### ***2.2.2 Clean Energy sources***

- natural gas

## Section 2 – Distributed Generation Facilities

### 2.3 Distributed Generation Classification

Distributed Generation Classification set forth in the Distribution System Code are outlined in the table below:

Distributed Generation Classification	Rating
Micro	$\leq 10$ kW
Small	(a) $\leq 500$ kW connected on distribution system voltage $< 15$ kV (b) $\leq 1$ MW connected on distribution system voltage $\geq 15$ kV
Mid-Sized	(a) $> 500$ kW but $\leq 10$ MW connected on distribution system voltage $< 15$ kV (b) $> 1$ MW but $\leq 10$ MW connected on distribution system voltage $\geq 15$ kV
Large	$> 10$ MW

### 2.4 Generators

#### 2.4.1 Embedded Retail Generator

Embedded Retail Generator means Customers which owns or operates an embedded generation facility, other than an Emergency Backup Generation Facility, but is neither a wholesale market participant, nor a net metered generator. An Embedded Retail Generator's generation facility is connected to the distribution system, and the generator generates more electricity than consumption. Therefore, an Embedded Retail Generator sells output from the embedded generation facility to either the Independent Electricity System Operator under a contract or to Toronto Hydro at the Hourly Ontario Energy Price (HOEP).

#### 2.4.2 Net Metered Generator

As described in the DSC Section 6.7.1, a Customer of a distributor that meets the criteria set out in Section 7 (1) of the Net Metering Regulation is an "eligible generator" in respect of a distributor and to whom net metering shall be made available as "net metered generator" by the distributor.

## Section 2 – Distributed Generation Facilities

### 2.4.3 Retail Generator

In accordance with Retail Settlement Code, a distributor will purchase energy from a retail generator within its service area, where such generator has indicated that it intends to generate electricity for sale directly to such distributor and has obtained all required licences from the Board for generating and exporting electricity.

The generator must also have an executed Connection Agreement with Toronto Hydro. The Connection Agreement will specify that the generator must meet the technical and metering requirements set out in the Distribution System Code. The price at which all energy sales will be settled will be the Hourly Ontario Energy Price as described in Appendix “A” of the Retail Settlement Code.

### 2.5 Distributed Generation Programs

Apart from emergency backup as standby generation facilities operated for load displacement when utility power supply is not available, Distributed Generation facilities will be connected as Embedded Generation Facilities under different programs, depending on the type and source of energy. Such programs are as follows:

- i. Micro Feed-in Tariff (MicroFIT)
- ii. Feed-in Tariff (FIT)
- iii. Standard Offer Program (SOP) – no new connections offered
- iv. Demand Response (DR)
- v. Net Metering
- vi. Wholesale Market Participant
- vii. Retail Settlement at Hourly Ontario Energy Price (HOEP)

The programs are managed by different stakeholders and settled accordingly. Generators of programs (i) – (iv) are Embedded Retail Generators as described in Section 2.4.1 and program (v) is Net Metered Generator as in Section 2.4.2.

Program (vii) is Toronto Hydro administered and settled program as described in the Retail Settlement Code. A Customer, which is not eligible to be a Net Metered Generator for the non-renewable fuel type or who generates more than it consumes, will settle with Toronto Hydro, at the Hourly Ontario Energy Price as described in Appendix “A” of the Retail Settlement Code.

### 2.6 Outline of Distributed Generation Programs

An outline of each program of distributed generation that is presently in effect with Toronto Hydro is provided below. Technical requirements for connecting such distributed generation are provided in Section 3.

## Section 2 – Distributed Generation Facilities

### **2.6.1 Emergency Backup Generation**

Emergency backup generation is installed by Customers for backup of load when utility power supply is not available.

Customers with a permanently connected Emergency Backup Generation Facility operating in parallel shall notify Toronto Hydro regarding the presence of such equipment and shall enter into a connection agreement as described in Section 4 of this document. Contact information is as listed in Section 1.4.

The requirement does not apply to Open-Transition Emergency Backup Generation Facility.

For portable emergency backup generation, 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. Further information regarding portable emergency backup generation is provided in Section 3.2.2 of this document.

### **2.6.2 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:

<http://www.torontohydro.com/sites/electricsystem/business/yourmeter/Pages/NetMeteringforBusiness.aspx>

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

### **2.6.3 Feed-in Tariff Program**

The Feed-in Tariff (FIT) Program was enabled by the *Green Energy and Green Economy Act, 2009* which was passed into law on May 14, 2009. The Independent Electricity System Operator (IESO) is responsible for implementing the program.

The FIT Program is a guaranteed pricing structure or tariff for renewable electricity production and it offers stable prices under long-term contracts for energy generated from renewable sources, such as solar photovoltaic (PV), wind, water power, biomass, biogas and landfill gas.

For information on the Feed-in Tariff program, refer to <http://fit.powerauthority.on.ca/>

## Section 2 – Distributed Generation Facilities

Owners of these projects will be paid a fixed price for the electricity that they produce under a tariff system.

Projects eligible for the FIT program will receive from the IESO:

- (a) a long-term contract for the payment of electricity produced from the renewable energy project; and
- (b) a fixed price for the full term of the contract.

A Customer, Consumer or Supplier eligible to connect a FIT project to the Toronto Hydro distribution system will have:

- (a) a connection agreement signed with Toronto Hydro;
- (b) settlement made by Toronto Hydro on the pre-scheduled billing cycle; and
- (c) a settlement based on the contract offered by IESO to the Customer, Consumer or Supplier.

There are two types of processes under the FIT Program: MicroFIT and FIT.

### ***2.6.3.1 Micro Feed-in Tariff (MicroFIT)***

MicroFIT is a stream of IESO's FIT program. This program is for "micro scale" renewable energy projects, generating 10kW or less. MicroFIT is "Micro" generation under the distributed generation classification.

For the IESO's MicroFIT rules, process, tariff or price schedule and other details, refer to <http://fit.powerauthority.on.ca/>

MicroFIT has a simpler process than FIT, and will be eligible for connection meeting the minimum conditions for connections, as described in Sections 2.7, 3.4.1 and 4.4.2.1.

### ***2.6.3.2 Feed-in Tariff (FIT)***

FIT is another stream of IESO's FIT program. This program is for small, medium and large renewable energy projects, generating more than 10kW.

For the IESO's FIT rules, process, tariff or price schedule, contract and other details refer to <http://fit.powerauthority.on.ca/>

FIT connections are classified into Capacity Allocation Exempt and Capacity Allocation projects. A Capacity Allocation Exempt FIT project is a project which is not a MicroFIT project and which has a name plate rated capacity of:

- (a) 250kW or less connected to less than 15kV distribution system and,
- (b) 500kW or less connected to greater than 15kV distribution system.

Capacity Allocation Exempt (CAE) FIT is the subset of lower sizes of "small" generation under the distributed generation classification.

## Section 2 – Distributed Generation Facilities

A Capacity Allocation FIT project is a project which is neither a MicroFIT nor a Capacity Allocation Exempt FIT project. Capacity Allocation (CA) FIT is the subset of higher sizes of “small” generation under the distributed generation classification and medium and large generation under the distributed generation classification.

### **2.6.4 Renewable Energy Standard Offer Program (RESOP)**

***Important Notes:*** No new connections are provided under the Renewable Energy Standard Offer Program (RESOP). Customers and Consumers may rescind the existing RESOP contract less than 10kW, also referred as SOP, with the IESO and apply for MicroFIT.

***No new applications will be received under the RESOP program for DGs larger than 10kW. Any applicant that has initiated a Connection Impact Assessment (CIA) with Toronto Hydro is required to rescind the CIA and reapply to IESO under the FIT program.***

The IESO, in conjunction with LDCs, established the Renewable Energy Standard Offer Program (RESOP) to encourage and promote greater use of renewable energy sources such as wind, solar, photovoltaic (PV), renewable biomass, bio-gas, bio-fuel, landfill gas, or drop in water elevation for generating electricity. Renewable energy electricity generation projects with a capacity of 10 MW or less that met the program’s requirements were connected to Toronto Hydro distribution system in order to export electricity.

Generation facilities that participated in the RESOP were connected to the Toronto Hydro distribution system at a voltage of 27.6 kV or less. Output from the generation facility is metered as follows:

- (a) for generation facilities of 10 kW or less and connected to the line side of the load meter, bi-directional kWh meters are installed to measure energy consumed and energy exported; and
- (b) for all other generation facilities, interval meters are installed.

The Customer or Consumer was solely responsible for any costs associated with the connection to the Toronto Hydro distribution system and any required metering installation.

### **2.6.5 Demand Response**

Demand Response DR is a program that is overseen by Independent Electricity System Operator (IESO). DR was developed by the IESO together with DR1, DR2, DR3 and other demand reduction programs developed from time to time, and all those constitute the DR Program. For DR rules, contract and other details refer to:

<https://saveonenergy.ca/Business/Program-Overviews/Demand-Response.aspx>

A demand response program with contractual obligations is used to reduce load during certain periods of the year. DR load reduction program is for Direct Participants and Aggregators who are capable of providing a curtailment of load of at least 5.0 MW and 25.0 MW, respectively. IESO has designated several blocks of hours that a participant can select from to be available to Curtail.



## Section 2 – Distributed Generation Facilities

Participants make themselves available during scheduled hours for potential notices to reduce load up to 100 or 200 hours per year.

The DR Program makes both availability (capacity) and energy payments. Failure to comply with the contract requirements of the DR Program can result in set-offs against potential revenue.

The program rules, prices, schedules, participation zones, and other specific elements of the DR Program are subject to change as required to meet Ontario's energy conservation goals. DR will be operated and managed by the IESO.

### ***2.6.6 Wholesale Market Participant***

A Wholesale Market Participant sells or purchases electricity or ancillary services through the IESO-administered markets. 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, within the service jurisdiction of Toronto Hydro, once approved by the IESO are required to inform Toronto Hydro of their approved status in writing, 30 days prior to their participation in the Ontario Electricity market.

### ***2.6.7 Settlement at Hourly Ontario Energy Price (HOEP)***

Settlement is done at the Hourly Ontario Energy Price (HOEP) for an embedded generator, which is a retail generator or a wholesale market participant generator, whose facility is not connected to the IESO-controlled grid but is connected to the Toronto Hydro distribution system.

Retail Settlement at HOEP is managed and settled by Toronto Hydro. Wholesale Settlement at HOEP is managed and settled by the IESO.

## ***2.7 Distributed Generation Connections and Metering***

Distributed Generation facilities have different types of connections and metering depending on the size of generation and program. Generation facilities participating in any program are connected to the Toronto Hydro distribution system at a voltage of 27.6 kV or less.

As per the definition in Section 1.2 of the DSC, with respect to an embedded generation facility, “point of supply” means the connection point where electricity produced by the generation facility is injected into the distribution system. Output from the generation facility is metered as follows:

- (a) for generation facilities of 10 kW or less and connected to the line side of the load meter, by installing a bi-directional kWh meter to measure energy consumed and energy exported;

## Section 2 – Distributed Generation Facilities

- (b) for generation facilities with continuous parallel mode operation and with a nameplate generation capacity equal to or greater than 500 kVA, a bi-directional interval meter on the generator output shall be used to measure the energy produced;
- (c) for generators connected to the load side of the load meter, and who do not enroll in the Net Metering program, shall have a standard interval meter; and
- (d) for all other generation facilities, by installing a bi-directional interval type meter to measure energy consumed and energy exported at set intervals.

### ***2.7.1 Embedded Retail Generation Connection and Metering***

Embedded retail generators have two metering connection options as follows:

- i. Direct
- ii. Indirect Parallel

#### ***2.7.1.1 Direct Connection***

For a direct connection, the generation facility is connected to the same connection point of load service to the Toronto Hydro distribution system via a meter. A bi-directional meter is required to meter the generation output and any electricity consumption by the generation facility. The separate service incurs a fixed monthly Customer charge similar to the service connection for distribution services.

#### ***2.7.1.2 Indirect Parallel Connection***

An indirect parallel connection permits the generation facility and its bi-directional meter to be installed in parallel with the load service meter of the Customer. The point of parallel connection is upstream of both meters, but before the connection to the Toronto Hydro distribution system. As this is a separate service, the generator requires a bi-directional meter and it incurs a monthly Customer charge of the rate set by OEB.

When the load service requires transformation, the generation facility connected in parallel will also be connected through the same transformer. Therefore, secondary metering is applied to both load and generation. Further, transformer loss adjustment as prescribed in the Retail Settlement Code is applied in generation settlement where applicable.

### ***2.7.2 Net Metering***

In Net Metering, the existing load service remains the same, but the meter will be replaced with a bi-directional revenue meter that records energy flow in both directions.

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## Section 2 – Distributed Generation Facilities

### ***2.7.3 Demand Response***

DR participants shall be connected and metered in the manner required by the program. DR generation facilities must be equipped with meter(s) as specified by IESO.

### ***2.7.4 Settlement at HOEP***

A bi-directional interval meter is used to measure the load consumption, and the power generated and exported to the grid at the point of common coupling (PCC). Settlement is performed on the metered consumption and power exported.

### ***2.7.5 Wholesale Market Participant***

The connection and metering of a Wholesale Market Participant generation will be similar to Wholesale Market Participant loads. Connections and metering requirements will vary from project to project but shall be in accordance with the terms of this document and the Conditions of Service.

### ***2.7.6 General***

The generator will be solely responsible for any costs associated with the connection to the Toronto Hydro distribution system and any required metering installation not included in the basic connection.

The cost of metering varies depending on specific site conditions. Toronto Hydro will provide Customers with meter cost information. Design drawings and a single line diagram of the generation facility shall be submitted and approved by Toronto Hydro; prior to the CIA and Offer to Connect/Connection Cost Agreement (OTC/CCA) being provided to the Customer.

## ***2.8 Damages***

A Customer with an embedded generation facility connected to the Toronto Hydro distribution system (other than a micro-embedded generation facility) shall reimburse Toronto Hydro for any damage to the distribution system or increased operating costs that may result from the connection of a generation facility.

## ***2.9 Warning Signs and Labels***

The generator will be solely responsible for supplying and installing all appropriate warning signs and labels for embedded and emergency backup generation facilities. Warning signs and labels shall be posted on the point of disconnection, generator feeder cell and/or switch room door to warn people of the presence of the generation facility.

Warning sign requirements for Closed-Transition emergency backup generation are provided in Section 3.2.1. For all other generation facilities, the generator shall contact Toronto Hydro for up-to-date standards and requirements for warning signs and labels. Contact information is as listed in Section 1.4.

## Section 3 – Technical Requirements

### 3. TECHNICAL REQUIREMENTS

The Customer shall ensure that the connection of its generation 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 generation facilities shall meet the following technical requirements:

- (a) Technical requirements specified in Appendix F.2 of the DSC;
- (b) Ontario Electrical Safety Code (OESC) and applicable CSA and IEEE Standards;
- (c) Toronto Hydro Parallel Generation Requirements in Appendix 1 of this reference document; and
- (d) ESA Electrical Guidelines for Inverter-Based Micro-Generation facilities (10kW and smaller).

#### 3.1 General Technical Requirements

In general, the connection agreement with a Customer for a generation 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 generator'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:

- (a) a material deterioration of the reliability of the distribution system resulting from the performance of the generator's equipment; or
- (b) a material negative impact on the quality of power of an existing or a new Customer resulting from the performance of the generator's equipment; or
- (c) a material increase in generator 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 generation facility is connected to the Toronto Hydro distribution system, the Customer shall provide an interface protection that is capable of

## Section 3 – Technical Requirements

automatically isolating the generation facility from the Toronto Hydro distribution system under the following situations:

- (a) internal faults within the generator
- (b) external faults in the Toronto Hydro distribution system
- (c) certain abnormal system conditions, such as over/under voltage, over/under frequency.

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

- (a) a remote trip or transfer trip is included in the interface protection, and
- (b) 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 Generation Technical Requirements***

#### ***3.2.1 Commercial and Industrial Customers***

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

A Customer with an Emergency Backup Generation 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 generator in parallel with Toronto Hydro's distribution system for longer than 100 ms. A backup timer shall monitor the parallel duration and automatically open the main or generator contacts within 500 ms 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 generation facility shall not cause a voltage fluctuation of more than 5% at the PCC. Closed transition transfer from utility to generator 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 backup generation facilities with an aggregate capacity greater than 5 MVA, active synchronization shall be used.

In order to operate Closed-Transition switches of emergency-standby-generators, 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

## Section 3 – Technical Requirements

- iv. a simplified one-line drawing of the power distribution at the proposed site
- v. monitoring requirements as per section 3.5

Where multiple emergency backup generators 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 generator units, or using a high impedance design or other equivalent method.

The Customer shall notify Toronto Hydro a minimum of fifteen 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 Generation Facility.

The main incoming feeder supply load break switch and/or main breaker will have lamacoid signage with the following message:

### **WARNING**

**TWO POWER SOURCES**

**MOMENTARY PARALLEL SYSTEMS**

**(CLOSED-TRANSITION TRANSFER SWITCHES IN USE)**

The signage shall be 250 mm x 150 mm (10" x 6") Lamacoid plate c/w aluminium 15 mm (3/5") high black letters on yellow background to be fastened permanently to the respective item. A laminated simplified single line diagram will also be placed on the main incoming feeder supply load break switch and/or main breaker. The label shall be, at minimum, 250 mm x 150 mm (10" x 6"). All labels shall be supplied and installed by the Customer.

Customers with a permanently connected Emergency Backup Generation 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 portable emergency backup generation, 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

## Section 3 – Technical Requirements

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 to have 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 Customer shall enter into a connection agreement and pay for associated Toronto Hydro costs.

The installation of a meter base plug-in transfer device is not permitted where a Customer location has a distributed generation installation (i.e. Micro Feed-in Tariff, Feed-in Tariff, Net Metering, Load Displacement, and Renewable Energy Standard Offer Program).

### ***3.3 Net Metered Generation Technical Requirements***

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

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

### ***3.4 FIT Program Technical Requirements***

All Projects under the FIT program are eligible to be connected through any one of the two options, Direct and Indirect Parallel, listed in Section 2.7.1. Connection of distributed generation shall be such that any operation and maintenance of the DG does not interrupt the existing load service and emergency services, such as a fire pump. Similarly any operation and maintenance of load service or emergency service shall not interrupt generation of power from the DG and exporting power to the distribution grid. This requires the connection of DG on the line side of existing load and emergency services with necessary disconnect switches. Such requirements are outlined in Appendix 4 - Charges, Standards, Sketches and Availability to this document.

Metering of distributed generation shall be independent of metering load services and emergency services. Therefore, indirect parallel connection of DG requires to be connected as follows:

- (i) on the line side of the meter, if only one meter is available for load service metering;
- (ii) on the line side of the main disconnect switch, if more than one meter is available, for load service metering;
- (iii) on the secondary side of the transformer, where transformation is involved and the existing primary metering of load service is changed to secondary meter as well.

Direct connection of DG will be to the existing point of connection of the load service, if any. Metering shall be on the secondary side of the transformer, if transformation is involved, and

## Section 3 – Technical Requirements

transformation loss will be applied in accordance with Retail Settlement Code for settlement of generation.

### **3.4.1 MicroFIT**

A MicroFIT generator is a renewable energy generation facility less than 10 kW. Indirect parallel connection requires a double meter base for load service metering and generation bi-directional metering. Such provision allows for DG connection on the line side of load service. Refer to Electrical Distribution and Construction Standard No: 17-9610 in Appendix 4. Direct connection requires a separate bi-directional metering.

### **3.4.2 Capacity Allocation Exempt**

Capacity Allocation Exempt generation for FIT projects is a generation facility that is 250kW or less which is connected to 15 kV or less distribution system, or 500kW or less which is connected to greater than 15kV distribution system. In order to be eligible for connection to the existing distribution system, through either of the two options listed in Section 2.7.1 the project shall meet the following requirements:

- Transformer station bus available capacity
- Short circuit and thermal capacity
- Feeder available capacity

Toronto Hydro shall determine whether the requirements have been met.

The transformer station bus minimum loading requirement must be met to avoid reverse power flow at station transformers in order to meet thermal requirements. Also, the station bus short circuit capacity and transmission system short circuit capacity levels must be satisfied to enable connectivity.

The distributed generation project will be considered for connection if it does not have a material adverse impact on the Toronto Hydro distribution system, as per the requirements and recommendations listed in Appendix 4 (vi).

A CIA of the project, performed by Toronto Hydro, must satisfy Toronto Hydro that the project can be connected to the distribution system without any issues or concerns. The Customer shall pay the cost of the CIA in accordance with the Toronto Hydro fee schedule prior to Toronto Hydro performing the CIA.

### **3.4.3 Capacity Allocation**

Capacity Allocation projects must pass both a Transmission Availability Test (TAT) and a Distribution Availability Test (DAT).



## Section 3 – Technical Requirements

Any Capacity Allocation project connection request that does not have connection resources available or does not pass both the TAT and DAT will be required to complete a Capacity Allocation process involving multiple steps as per IESO FIT Rules.

Any Capacity Allocation project connection request that has passed the DAT and has a specified connection point, but does not have connection resources available before the Commercial Operation Date (COD), will have to follow a process that involves certain additional steps until suitable connection resources become available as per IESO FIT Rules.

### **3.5 Control and Monitoring**

All DG facilities regardless of size will be required to have control and monitoring capability in place. For program specific requirements, please refer to Appendix 4(viii). The following is a list of basic monitoring and control provisions required for each distributed generation program.

#### **3.5.1 Control Requirements**

All DG facilities connected on the Toronto Hydro Distribution System are required to provision for real time control to Toronto Hydro. Provision will include, but is not limited to, the following:

1. The ability to remotely dispatch the DG facility (on/off).

#### **3.5.2 Monitoring Requirements**

All DG facilities connected on the Toronto Hydro Distribution System are required to provision for real time monitoring to Toronto Hydro. Provision will include, but is not limited to, the following:

1. Analogue Quantities which include the following:
  - a) Net active power (MW) output and reactive power (MVAR) flow and direction for each unit or total for the DG facility;
  - b) Phase to phase (preferred) or phase to neutral voltages; and
  - c) Three phase currents.
2. Device Statuses:
  - a) Consolidated Connection Status at the PCC (HVI/LVI);
  - b) Status of individual DG units; and
  - c) All generation rejection selections.
3. Alarms:
  - a) Where facilities exist to provide independent monitoring of the interface protection fail provision shall be made for an alarm signal to be generated and transmitted to Toronto Hydro;
  - b) A separate alarm shall be provided for each circuit supplying the DG facility;

## Section 3 – Technical Requirements

- c) The alarms shall identify the name of the DG facility and the designation of the affected circuit; and
- d) Toronto Hydro shall determine requirements based on controlling authority and equipment ownership.

The telemetry Reporting Rates shall be:

Function	Performance
Data measurements	Less than 10s from change in field monitored quantity
Equipment status change	Less than 10s from field status change
Scan period for data measurements	Minimum 4s
Scan period for equipment status	Minimum 4s

### 3.5.3 Real Time Control and Monitoring

#### 3.5.3.1 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 DG Owner may be required to disconnect the DG 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 DG 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 DG Owner 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 DG Owner shall coordinate any planned interruption to the delivery of real time data with Toronto Hydro.

## Section 3 – Technical Requirements

### ***3.5.3.2 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 DG.

### ***3.5.3.3 Medium and Protocol***

1. The DG facility shall provide real-time operating information to Toronto Hydro as specified in Section 3.5.2 directly from the station(s) as described below in item (2).
2. Real time operating information provided to Toronto Hydro may be from an Intelligent Electronic Device (IED) at the DG 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 Customer of which communication medium will be used for the proposed project in the CIA.

## Section 4 – Distributed Generation Activities (General)

### 4. DISTRIBUTED GENERATION ACTIVITIES (GENERAL)

#### 4.1 *Preliminary Meeting*

A generator who is considering applying for the connection of a generation facility to the Toronto Hydro distribution system must request a preliminary meeting with Toronto Hydro and provide the required information described below. Toronto Hydro will provide a time when it is available to meet with the person within 15 days of the person requesting the meeting. For the purposes of this section, the following is the required information:

- (a) the name-plate rated capacity of each unit of the proposed generation facility and the total name-plate rated capacity of the generation facility at the connection point;
- (b) the fuel type of the proposed generation facility;
- (c) the type of technology to be used; and
- (d) the location of the proposed generation facility including address and account number with the distributor where available.

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 generation facility and will provide an estimate of the time and costs necessary to complete the connection. Toronto Hydro will not charge for its preparation for and attendance at the preliminary meeting.

#### 4.2 *Information to Generator*

Upon request by the generator, Toronto Hydro will provide the following to the person who requested the meeting as stated above:

- (a) a description of the portion of Toronto Hydro's distribution system relevant to the generator's proposed embedded generation facility, including the corresponding portions of an up-to-date system schematic map showing, at a minimum, the following:
  - major distribution and sub-transmission lines;
  - transformer and distribution stations;
  - the voltage levels used for distribution;
  - sufficient geographic references to enable the generator to correlate all of the above features with municipal road map; and
  - other information as the OEB may, from time to time, determine;
- (b) subject to Section 6.2.9.4 of the DSC, information on voltage level, fault level and minimum/maximum feeder loadings for up to three locations in Toronto Hydro's service area; and

## Section 4 – Distributed Generation Activities (General)

- (c) for each of the proposed locations included in the request, information about the proposed additional generation, above and beyond what is already connected and what capacity has already been allocated:
  - (i) with Toronto Hydro's feeder and/or substation technical capacity limits;
  - (ii) within any host distributor's and/or substation technical capacity limits;
  - (iii) within the transmitter's TS technical capacity limits; and
  - (iv) without exceeding the IESO's requirement for a System Impact Assessment (SIA).

### ***4.3 Offer to Connect and other Agreements***

#### ***4.3.1 Offer to Connect***

Toronto Hydro's Offer to Connect (OTC) is notice to the generator that the proposed generation 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 Offer to Connect will be attached as an appendix to and form part of the connection cost agreement referred to in Section 4.3.2 for small, mid-sized and large embedded generation facilities. For micro-embedded generation facilities, Toronto Hydro's Offer to Connect will be sent with the connection agreement.

#### ***4.3.2 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 generation facility. The connection cost agreement will include the following:

- (a) a requirement of connection cost deposit equal to 100% of the total estimated allocated cost of connection at the time the connection cost agreement is executed;
- (b) any requirements relating to the applicant's acceptance of Toronto Hydro's offer to connect and the connection costs;
- (c) a requirement that the in-service date of the generator is no later than 5 years for water power projects or 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;
- (d) a requirement that the applicant completes engineering design and provide detailed electrical drawings to Toronto Hydro at least 6 months prior to the specified in-service date or as reasonably required by Toronto Hydro; and
- (e) the timing of connection.

## Section 4 – Distributed Generation Activities (General)

In addition, where connection of a generation facility requires distribution system expansion, the connection cost agreement 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 referred to in Section 6.2.9 (a) in the DSC.

The connection cost agreement will also include a requirement for a capacity allocation deposit equal to \$20,000 per MW of capacity of the embedded generation facility referred to in Section 6.2.18 (b) and (c) in the DSC.

### ***4.3.2.1 Payment, Refunds and Settlement***

Any connection cost deposit, distribution system expansion cost deposit, capacity allocation deposit or additional capacity allocation deposit required to be obtained by Toronto Hydro pursuant to the DSC shall be in the form of cash, 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 generation facility to the distribution system in accordance with the terms of the relevant connection cost agreement.

If, following the connection of an embedded generation 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 generation 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 generation facility.

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

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

## Section 4 – Distributed Generation Activities (General)

### ***4.3.3 Connection Agreement***

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

For micro-embedded generation facility, the Connection Agreement shall be in the form set out in Schedule B1 in Appendix 2, for small and mid-sized embedded generation facilities, the Connection Agreement shall be in the form set out in Schedule B2 in Appendix 2, and for large embedded generation facilities in the form set out in Schedule B3 in Appendix 2.

Where Toronto Hydro does not have a Connection Agreement with an existing Customer that has a generation 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 generation 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 Generator or Wholesale Market Participant and the Conditions of Service, the Connection Agreement shall govern.

### ***4.4 Connection Process and Timing***

Toronto Hydro's "Embedded Generation Connection Overview" and "FIT Connection Overview" are attached in Appendix 1, which contain information referred to in Section 6.2.3 of the DSC.

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

As per Section 6.2.1 of the DSC, the connection process and timing outlined in Section 4.4 of this reference document does not apply to the connection or operation of an Emergency Backup Generation Facility or an embedded generation facility that is used exclusively for load displacement purposes at all times.

## Section 4 – Distributed Generation Activities (General)

### 4.4.1 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 generation facilities, except for the applications of a micro-embedded generation facility, a capacity allocation exempt small embedded generation facility or a net metered generation facility.

#### 4.4.1.1 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 generation facility, will be allocated capacity only upon completion of Toronto Hydro's CIA, and any required review of Transformer Station (TS) supply capability for the embedded generation 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 generation 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 generation 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 generation 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.
- (d) Toronto Hydro will notify the applicant when its capacity allocation is granted.

If the applicant does not have an executed IESO contract which includes requirement for security deposits or similar payments, the following will be required from the applicant:

- (a) a capacity allocation deposit equal to \$20,000 per MW of capacity of the embedded generation facility at the time the connection cost agreement is executed; and



## Section 4 – Distributed Generation Activities (General)

- (b) an additional capacity allocation deposit equal to \$20,000 per MW of capacity of the embedded generation facility on the first day of the sixteenth (16<sup>th</sup>) calendar month following the execution of the connection cost agreement, if after fifteen (15) calendar months following the execution of the connection cost agreement the embedded generation facility is still not connected to the Toronto Hydro's distribution system.

Toronto Hydro will refund to the applicant the amount of any capacity allocation deposit or additional capacity allocation deposit provided by the applicant to Toronto Hydro no later than 30 calendar days after the applicant connects to Toronto Hydro's distribution system.

### ***4.4.1.2 Removal of Capacity Allocation***

An application shall have its capacity allocation removed if:

- (a) a connection cost agreement has not been signed in relation to the connection of the embedded generation facility within:
  1. Subject to 2 and 3 below, 6 months of the date on which the applicant received a capacity allocation for the proposed embedded generation facility;
  2. 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
  3. 17 months of the date on which the applicant received a capacity allocation for the proposed large embedded generation facility if transmission upgrades are required in order to connect the large embedded generation facility;
- (b) a new CIA is prepared for a proposed embedded generation facility, any material revisions to the design, planned equipment or plans for the proposed embedded generation 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 connection cost agreement 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 connection cost agreement and fails to correct the default within 30 calendar days.

Toronto Hydro will provide the applicant with two months advance notice of the expiry of the applicable time period referred to in Section 4.4.1.2(a) prior to removing the capacity allocated to the applicant.

If any applicant has its capacity allocation removed in accordance with Section 4.4.1.2. (a)-(e) (Section 6.2.4.1.(e) in the DSC), the amount of any capacity allocation deposit and or additional

## Section 4 – Distributed Generation Activities (General)

capacity allocation deposit paid pursuant to the connection cost agreement 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 connection cost agreement, provided that if Toronto Hydro has incurred costs associated with the connection of the applicant's embedded generation facility to Toronto Hydro's distribution system in accordance with the relevant connection cost agreement, 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.

### ***4.4.1.3 Capacity Allocation Exempt***

Section 4.4.1.1 Capacity Allocation Process does not apply to an application to connect a micro-embedded generation facility or capacity allocation exempt small embedded generation facility. Applications to connect to which the capacity allocation process does not apply, will be processed by Toronto Hydro in accordance with the DSC as and when received.

### ***4.4.2 Connection Process***

#### ***4.4.2.1 Connection of Micro-Generation Facilities***

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

- (a) name-plate rated capacity of each unit of the proposed generation facility and the total name-plate rated capacity of the proposed generation facility at the connection point;
- (b) fuel type of the proposed generation facility;
- (c) type of technology to be used;
- (d) location of the proposed generation facility including address and account number where available; and
- (e) single line diagram of the proposed generation facility and connection to the Toronto Hydro distribution system.

Where the proposed micro-embedded generation facility is:

- a) located at an existing Customer connection and a site assessment is not required, Toronto Hydro shall, within 15 days of receiving the application, make an offer to connect or provide reasons for refusing to connect the proposed generation facility;
- b) located at an existing Customer connection and a site assessment is required, Toronto Hydro shall, within 30 days of receiving the application, make an offer to

## Section 4 – Distributed Generation Activities (General)

- connect or provide reasons for refusing to connect the proposed generation facility;  
or
- c) located other than at an existing Customer connection, Toronto Hydro shall, within 60 days of receiving the application, make an offer to connect or provide reasons for refusing to connect the proposed generation facility.

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

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

If the connection of the micro-embedded generation facility will not require a site assessment, then Toronto Hydro cannot charge for the preparation of the offer to connect.

If the connection of the micro-embedded generation facility will require a site assessment, then Toronto Hydro may collect a connection deposit for the preparation of the offer to connect. The connection deposit shall not be more than \$500 per offer to connect.

The connection deposit shall be provided in the form of cash, cheque, letter of credit from a bank as defined in the Bank Act, or surety bond. Toronto Hydro shall allow the Customer to select the form of the connection deposit.

If Toronto Hydro refuses to provide an offer to connect the micro-embedded generation 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 offer to connect.

If the Customer does not accept Toronto Hydro's offer to connect the micro-embedded generation 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 generation 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:

- (a) informing Toronto Hydro that it has satisfied all applicable service conditions and received all necessary approvals;
- (b) providing Toronto Hydro with a copy of the authorization to connect from the ESA;
- (c) enter into a Connection Agreement with Toronto Hydro in the form set out in Schedule B1 of Appendix 2; and
- (d) paying Toronto Hydro for the connection costs, including costs for any necessary new or modified metering.

## Section 4 – Distributed Generation Activities (General)

### ***4.4.3 Connection of Small, Mid-Sized and Large Generation Facilities***

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

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

- (a) name-plate rated capacity of each unit of the proposed generation facility and total name-plate rated capacity of the proposed generation facility at the connection point;
- (b) fuel type of the proposed generation facility;
- (c) type of technology to be used;
- (d) location of the proposed generation facility including address and account number where available; and
- (e) single line diagram of the proposed generation facility and connection to the Toronto Hydro distribution system.

A Generator will be required to pay the Connection Impact Assessment cost, applicable to mid-sized and large generation facilities or small generation 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:

- (a) evidence that the requirements set out in Section 4.4.1.1(c) have been met;
- (b) the proposed point of common coupling with Toronto Hydro distribution system;
- (c) any of the “initial set of information” which has not yet been provided to Toronto Hydro;
- (d) a single line diagram of the proposed generation facility and connection to the Toronto Hydro distribution system sealed and signed by a professional engineer licensed in Ontario;
- (e) a preliminary design of the proposed interface protection; and
- (f) all necessary technical information required by Toronto Hydro to complete the connection impact assessment.
- (g) a copy of the lease agreement between Developer and Landlord (if applicable)

Once the applicant has entered into a connection cost agreement 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, capacity allocation exempt small generation facilities will be connected. Capacity allocation for small, mid-sized and large generation facilities will be connected when the DAT and the TAT are passed for FIT projects, subject to capacity availability on the distribution system and transmission system. The connection will be completed after a final connection agreement is executed between the generator and Toronto Hydro.

## Section 4 – Distributed Generation Activities (General)

### ***4.4.4 Connection Impact Assessment (CIA)***

For all small, mid-sized and large embedded generation facilities, Toronto Hydro will perform a Connection Impact Assessment. 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 generation facility on the Toronto Hydro distribution system and any of its Customers including, but not limited to:

- (a) any voltage impacts, impacts on current loading settings and impacts on fault currents;
- (b) the connection feasibility;
- (c) the need for any line or equipment upgrades;
- (d) the need for transmission system protection control modifications;
- (e) any metering requirements;
- (f) any SCADA monitoring requirements; and
- (g) operating schedule requirements;

The Customer shall submit any material revisions to the design, planned equipment or plans for the proposed embedded generation 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 4.4.4.1 and 4.4.4.2. If the new impact assessment differs in a material respect from the original connection impact assessment for the project, the project shall have its capacity allocation removed in accordance with Section 4.4.1.2 (b) of this document.

#### ***4.4.4.1 CIA for Small Embedded Generation Facility***

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

- (a) 60 days of the receipt of the application where no distribution system reinforcement or expansion is required; and
- (b) 90 days of the receipt of the application where a distribution system reinforcement or expansion is required.

An offer to connect made to an applicant proposing to connect a small embedded generation facility may be revoked by Toronto Hydro if not accepted by the applicant within 60 days.

#### ***4.4.4.2 CIA for Mid-sized and Large Generation Facilities***

Subject to Sections 4.4.1.1 (b) and (c), Toronto Hydro will provide the Customer with its impact assessment of the proposed generation facility within 60 days of the receipt of the application of a mid-sized embedded generation facility and within 90 days of the receipt of the application of a large embedded generation facility.

## Section 4 – Distributed Generation Activities (General)

In the case of an application for the connection of a mid-sized or large embedded generation facility, after receiving from Toronto Hydro the impact assessment the applicant shall pay to Toronto Hydro the cost for preparing a detailed cost estimate of the proposed connection and enter into an agreement with Toronto Hydro on the scope of the project. Toronto Hydro will then provide the applicant with a detailed cost estimate and an offer to connect by the later of 90 days after the receipt of payment from the applicant and 30 days after the receipt of comments from a transmitter or other distributor that may have been advised under the Section 4.5.1.

### ***4.5 Mandatory Reporting Requirements***

#### ***4.5.1 Notice to Transmitter and other Distributors***

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

Toronto Hydro will, within 10 days of initiating a connection impact assessment 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 generation 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 generation facility.

Toronto Hydro will file an application with a transmitter or host distributor to complete a Transformer Station (TS) review study or Connection Impact Assessment 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 generation 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 generation 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.

## Section 4 – Distributed Generation Activities (General)

### ***4.5.2 Information to be made Publicly Available***

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

- (a) provide information about the capacity of Toronto Hydro's distribution system to accommodate renewable generation; and
- (b) provide information about the take-up of that capacity by individual generators.

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 generation,
  - for all feeders directly connected to a transformer station; and
  - for any feeder that is not directly connected to a transformer station for which an application to connect has been received.
- (ii) information about Toronto Hydro's feeder and substation technical capacity limits with respect to connecting generation; and
- (iii) other related information about each feeder including, voltage level, minimum and maximum feeder loading and fault level.

### ***4.6 Expansion, Renewable Enabling Improvements, Enhancement and Connection Assets***

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

#### ***4.6.1 Expansion***

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

- (a) building a new line to serve the connecting Customer;
- (b) rebuilding a single-phase line to three-phase to serve the connecting Customer;
- (c) rebuilding an existing line with a larger size conductor to serve the connecting Customer renewable energy generation facility;
- (d) rebuilding or overbuilding an existing line to provide an additional circuit to serve the connecting Customer renewable energy generation facility;
- (e) converting a lower voltage line to operate at higher voltage;
- (f) replacing a transformer to a larger MVA size;
- (g) upgrading a voltage regulating station transformer or station to a larger MVA size; and
- (h) adding or upgrading capacitor banks to accommodate the connection of the connecting Customer

##### ***4.6.1.1 Expansion Charges to Generators***

Where an expansion is undertaken in response to a request for the connection of a renewable energy generation facilities, Toronto Hydro will charge the requesting Customer as capital

## Section 4 – Distributed Generation Activities (General)

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 connection to the expansion.

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

Toronto Hydro will not charge a generator 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 4.6.1.1(a) also applies to a request for the connection of more than one renewable energy generation facility. Section 4.6.1.1 (b) applies to any of the requesting generators 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.

### ***4.6.1.2 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 4.6.1.1 (a) or Section 4.6.1.1 (b) applies and the Customer entitled to a rebate is a load Customer or a generation Customer to which neither Section 4.6.1.1 (a) nor Section 4.6.1.1 (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 cap or else the unforecasted Customer is required to share the expansion cost respectively.

When an unforecasted renewable energy generation facility to which Section 4.6.1.1 (a) or Section 4.6.1.1 (b) applies (the “unforecasted renewable generator”) 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 4.6.1.1 (a) or Section 4.6.1.1 (b) applies (the “initial renewable generator”), the initial renewable generator shall be entitled to a rebate. If the cost of the earlier



## Section 4 – Distributed Generation Activities (General)

expansion exceeded the initial renewable generator's renewable energy expansion cost cap, Toronto Hydro will pay to the initial renewable generator a rebate and collect a share from the unforecasted renewable generator. 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 generator.

Examples of expansion cost share and rebate calculations are presented by OEB in EB-2009-0077.

### ***4.6.2 Renewable Enabling Improvements and Enhancement***

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:

- (a) modifications to, or the addition of, electrical protection equipment;
- (b) modifications to, or the addition of, voltage regulating equipment transformer controls or station controls;
- (c) the provision of protection against islanding (transfer trip or equivalent);
- (d) bidirectional reclosers;
- (e) tap-changer controls or relays;
- (f) replacing breaker protection relays;
- (g) Supervisory Control and Data Acquisition (SCADA) system design, construction and connection;
- (h) any other modifications or additions to allow for and accommodate 2-way electrical flows or reverse flows; and
- (i) 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:

- (a) a Customer a capital contribution to construct an enhancement; or
- (b) a Customer that is connecting a renewable energy generation facility a capital contribution to make a renewable enabling improvement.

### ***4.6.3 Generation Facility Connection Assets***

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

## Section 4 – Distributed Generation Activities (General)

### **4.7 *Miscellaneous Distributed Generation Activities***

#### **4.7.1 *Design Review***

After the applicant has entered into a connection cost agreement 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.

#### **4.7.2 *Inspections before Connections***

All distributed generation facilities installations shall be inspected by both the Electrical Safety Authority (ESA) and Toronto Hydro. The generation facility must be approved by the Electrical Safety Authority and must also meet Toronto Hydro's requirements. Toronto Hydro requires notification from the Electrical Safety Authority of this approval prior to the generation facility connection and energizing. Generation 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.

#### **4.7.3 *Metering***

An Ontario Energy Board-licensed generator connected to the Toronto Hydro distribution system that sells energy and settles through the Toronto Hydro retail settlement process must have a four-quadrant interval meter installed.

All generation facilities that are greater than 0.5 MVA (or 2 MW for renewables) shall have a four quadrant interval meter installed.

A Customer with an embedded generation facility connected to the Toronto Hydro distribution system is responsible for providing the metering, including micro-embedded generation facilities in accordance with the Toronto Hydro metering requirements. The Customer shall obtain written approval from Toronto Hydro with respect to technical details of the metering installation. Alternatively, a Customer may request Toronto Hydro to provide an estimate to install the required meter and have the meters installed by Toronto Hydro.

Metering for an embedded generation facility shall be installed at the point of supply. If it is not practical to install the meter at the point of supply, Toronto Hydro will apply loss factors to the generation output in accordance with the loss factors applied for retail settlements and billing.

Where an embedded generation facility metering installation does not conform to Measurement Canada standards or the Customer cannot confirm accuracy class of its instrument transformers, the Customer shall have the metering installation, including instrument transformers, tested and provide satisfactory test results to Toronto Hydro. Toronto Hydro will apply a Measurement Canada correction factor to meter readings until such time as standards conformance is achieved.

## Section 4 – Distributed Generation Activities (General)

Metered Market Participants in the Independent Electricity Market Operator (“IESO”) administered wholesale market must meet or exceed all IESO metering requirements. All Embedded Generation Facilities of 10 MW or larger must meet or exceed all IESO metering requirements.

### ***4.7.4 Commissioning and Testing***

Toronto Hydro has the right to witness the commissioning and testing of the connection of generation 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 4 (vi), which will include, at a minimum:

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

In addition to requirements listed above, commissioning reports for solar photovoltaic generation facilities shall include:

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

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

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

- (a) the applicant has informed Toronto Hydro that it has received all necessary approvals;
- (b) the applicant has provided Toronto Hydro with a copy of the Certificate of Inspection from the ESA;
- (c) the applicant has entered into the appropriate Connection Agreement;
- (d) Toronto Hydro has received the Authorization to Connect from ESA; and
- (e) Toronto Hydro has received a satisfactory commissioning report.

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## Section 4 – Distributed Generation Activities (General)

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

- (a) 60 days of the applicant taking the steps set out above, where no distribution system reinforcement or expansion is required; and
- (b) 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 generation facility to a distribution system is set out in Appendix F.1 of the DSC.

### ***4.7.5 Settlement***

As described in Section 2.6, each distributed generation program, other than emergency backup generation, is administered and settled by the respective organization based on the metered quantities.

### ***4.7.6 Billing***

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

### ***4.8 Connection Costs 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 distribution generation facility.

## Section 5 – Glossary of Terms

### 5. GLOSSARY OF TERMS

***In addition to the Glossary of Term in the Conditions of Service document, this reference document contains a variety of terms that are defined in the context of distributed generation. Some terms are duplicated.***

Sources for definitions:

A	Electricity Act, 1998, Schedule A, Section 2, Definitions
MR	Market Rules for the Ontario Electricity Market, Chapter 11, Definitions
DSC	Distribution System Code Definitions
RSC	Retail Settlement Code Definitions

“business day” means any day that is not a Saturday, a Sunday, or a legal holiday in the Province of Ontario; (DSC)

“capacity allocation exempt small embedded generation facility” means an embedded generation facility which is not a micro-embedded generation facility and which has a name-plate rated capacity of 250 kW or less in the case of a facility connected to a less than 15 kV line and 500 kW or less in the case of a facility connected to a 15 kV or greater line; (DSC)

“closed-transition” means transferring load from the distribution system to the DG momentarily and then operating in stand-alone (emergency) mode or transferring load from the DG back to the distribution system momentarily. A closed-transition transfer is also referred to as a make-before-break transfer. The momentary interconnection of a DG system to the distribution system for 100 ms or less provided both sources are synchronized.

“day” means a calendar day unless specifically stated otherwise; (DSC)

“distributed generation facility” means an embedded generation facility (DSC)

“embedded distributor” means a distributor who is not a wholesale market participant and that is provided electricity by a host distributor; (RSC, DSC)

“embedded generation facility” means 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; (DSC)

“embedded wholesale consumer” means a Consumer who is a wholesale market participant whose facility is not directly connected to the IESO-controlled grid but is connected to a distribution system; (DSC)

“Emergency Backup Generation Facility” means a generation facility that has a transfer switch that isolates it from a distribution system; (DSC)

## Section 5 – Glossary of Terms

“enhancement” means a modification to the main distribution system that is made to improve system operating characteristics such as reliability or power quality or to relieve system capacity constraints resulting, for example, from general load growth, but does not include a renewable enabling improvement; (DSC)

“expansion” means a modification or addition to the main distribution system in response to one or more requests for one or more additional Customer connections that otherwise could not be made, for example, by increasing the length of the main distribution system, and includes the modifications or additions to the main distribution system identified in Section 3.2.30 but in respect of a renewable energy generation facility excludes a renewable enabling improvement; (DSC)

“generator” means a person who owns or operates a generation facility; (A, MR, DSC)

“generation facility” means a facility for generating electricity or providing ancillary services, other than ancillary services provided by a transmitter or distributor through the operation of a transmission or distribution system, and includes any structures, equipment or other things used for that purpose; (A, MR, DSC)

“large embedded generation facility” means an embedded generation facility with a name-plate rated capacity of more than 10 MW; (DSC)

“load displacement” means, in relation to a generation facility that is connected on the Customer side of a connection point, that the output of the generation facility is used or intended to be used exclusively for the Customer’s own consumption; (DSC)

“micro-embedded generation facility” means an embedded generation facility with a nameplate rated capacity of 10 kW or less; (DSC)

“MicroFIT Generator” means an electricity generation facility contracted under the Independent Electricity System Operator’s MicroFIT program and connected to the distributor’s distribution system.

“mid-sized embedded generation facility” means an embedded generation facility with a name-plate rated capacity of 10 MW or less and:

- (a) more than 500 kW in the case of a facility connected to a less than 15 kV line; and
- (b) more than 1 MW in the case of a facility connected to a 15 kV or greater line; (DSC)

“renewable enabling improvement” means a modification or addition to the main distribution system identified in Section 3.3.2 that is made to enable the main distribution system to accommodate generation from renewable energy generation facilities; (DSC)

“open transition” means an open transition transfer maintains isolation from utility power before it makes contact with generation facility power. An open transition transfer is also called a break-

## Section 5 – Glossary of Terms

before-make transfer. A break-before-make transfer breaks contact with one source of power before it makes contact with another.

“renewable energy expansion cost cap” means, in relation to a renewable energy generation facility, the dollar amount determined by multiplying the total name-plate rated capacity of the renewable energy generation facility referred to in Section 6.2.9(a) (in MW) by \$90,000, reduced where applicable in accordance with Section 3.2.27A; (DSC)

“renewable energy generation facility” has the meaning given to it in the Ontario Energy Board Act.

“renewable energy source” has the meaning given to it in the Ontario Energy Board Act.

“small embedded generation facility” means an embedded generation facility which is not a micro-embedded generation facility with a name-plate rated capacity of 500 kW or less in the case of a facility connected to a less than 15 kV line and 1MW or less in the case of a facility connected to a 15 kV or greater line; (DSC)

“wholesale market participant”, means a person that sells or purchases electricity or ancillary services through the IESO- administered markets; (RSC, DSC)

## Section 6 – Appendices

### 6. APPENDICES

#### 6.1 *Appendix 1 - Requirements*

- (i) Toronto Hydro Parallel Generation Requirements
- (ii) Embedded Generation Overview
- (iii) Feed-in Tariff Distributed Generation Connection Overview

#### 6.2 *Appendix 2 – Agreements*

- (i) Schedule B1:
  - Micro-Embedded Generation Facility Connection Agreement
- (ii) Connection Cost Agreement – Offer to Connect, Small Generation – Capacity Allocation Exempt
- (iii) Schedule B2:
  - Form of Connection Agreement for a Small Embedded Generation Facility or a Mid-Sized Embedded Generation Facility
- (iv) Schedule B3:
  - Connection Agreement for an Embedded Generation Facility Larger than 10 MW
- (v) Schedule C:
  - Wholesale Market Participant Connection Agreement Terms and Conditions



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## Section 6 – Appendices

### **6.3    *Appendix 3 – Application Forms***

- (i)    Distributed Energy Resource (DER) Application Form
- (ii)   Connection Impact Assessment Generator Form
- (iii)   MicroFIT Connection Application Guidelines and Form
- (iv)   FIT Connection Application Guidelines
- (v)    Net Metering Connection Application Guidelines

### **6.4    *Appendix 4 - Charges, Standards, Sketches and Availability***

- (i)    MicroFIT or FIT Capacity Allocation Exempt Summary of Connections and Charges
- (ii)   Standard for Net Metering – Residential Service
- (iii)   Standards for MicroFIT Program Residential Service
- (iv)   Sketch of Commercial Feed-in Tariff Parallel Connection Outline
- (v)    Sketches for Feed-in Tariff Program
- (vi)   Toronto Hydro Requirements and Recommendations for FIT Projects
- (vii)   Distribution Availability Test (DAT) Information
- (viii) Distributed Generation Monitoring and Control Requirements

## **Section 6 - APPENDICES**

## **6.1 Appendix 1 - Requirements**

- (i) Toronto Hydro Parallel Generation Requirements
- (ii) Embedded Generation Overview
- (iii) Feed-in Tariff Distributed Generation Connection

## **Appendix 1(i) - Toronto Hydro Parallel Generation Requirements**



**TORONTO HYDRO-ELECTRIC SYSTEM**

**PARALLEL GENERATION REQUIREMENTS**

**FIRST EDITION: April 14, 2004**

**REVISION #1: February 10, 2006**

**REVISION #2: January 23, 2007**

**SECTION 6 - REFERENCE #3**

## Table of Contents

Introduction .....	1
1 Connection Impact Assessment – Initial Review .....	2
1.1 Facility Design Overview .....	2
1.1.1 Single Line Diagram (“SLD”) .....	2
1.1.2 Point of Disconnection - Safety .....	3
1.1.3 Preferred Interface Transformer Configuration and HV Interrupting Device.....	3
1.2 Equipment Rating and Requirements.....	3
1.3 Voltage Regulation .....	4
1.4 Synchronization .....	4
1.5 Feeder Relay Directioning .....	4
1.6 Monitoring .....	4
1.7 Power Factor.....	5
1.8 Maximum Power Transfer & Synchronous Stability .....	5
2 Design Review .....	6
2.1 Cease to Energize .....	7
2.1.1 Distribution System Faults and Customer Facility Faults .....	7
2.1.2 Feeder Breaker Reclosing Coordination .....	7
2.1.3 Over-Voltage and Under-Voltage Protection.....	7
2.1.4 Over-Frequency and Under-Frequency Protection .....	7
2.1.5 Interface Protection System .....	8
2.2 Connection to Toronto Hydro System.....	8
2.3 Anti-Islanding Protection and Transfer Trip Requirements.....	8
2.4 Grounding at the Generation Facility .....	8
3 Warning Signs and Diagrams .....	9
4 Commissioning and Witnessing Requirements .....	9

## ***Introduction***

The technical requirements for parallel generation 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 Generator should satisfy itself as to any requirements for the protection of its own facilities.

The requirements below are primarily from Appendix F.2 of the Distribution System Code's ("DSC"), Institute of Electrical and Electronics Engineers ("IEEE") Standard 1547, and CAN/CSA C22.2 No. 257-06. Generators 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 Generation facility shall also satisfy the following: "Toronto Hydro Requirements for Design and Construction of Customer-Owned Substation High Voltage Substations". It is the Generator's responsibility to ensure that all requirements are met. Additional requirements may be necessary to address unique situations, and Generators 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

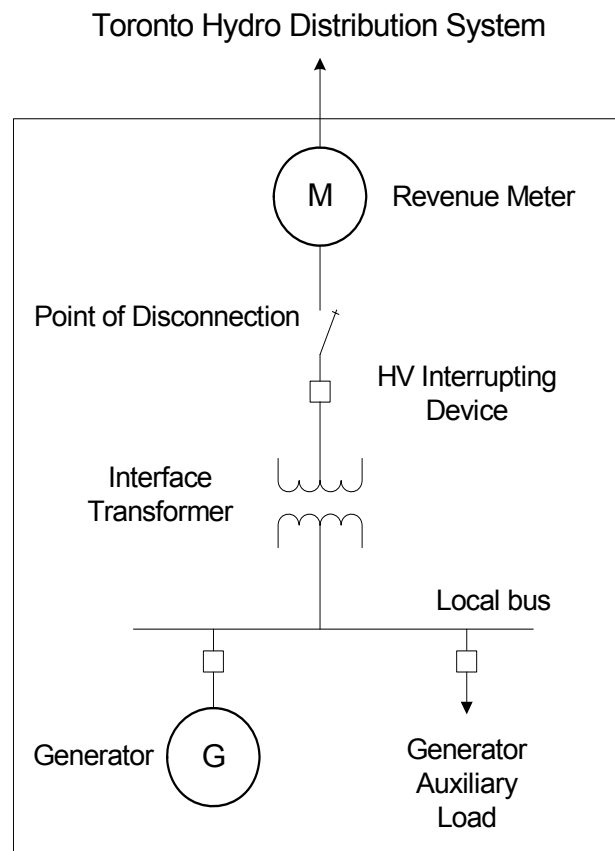
Technical requirements for interconnection of the Generator with Toronto Hydro are checked during the Impact Assessment stage. This initial review is intended to determine the viability of the Generator's project and to provide the applicant an opportunity to evaluate the situation before making further 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 generator and their respective ratings should be included. Please see the *Embedded Generation Connection Application Form* for information to be submitted.

A typical arrangement of a generation facility connected to the utility distribution system is shown below in Figure 1. Various configurations, however, are possible in accordance with design requirements and generation 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 embedded generator for the purpose of work protection of Toronto Hydro crews. Switching, lockout and tagging procedures shall be coordinated with Toronto Hydro.

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, CAN/CSA-C22.2 No. 257-06 Clause 5.3.4 and DSC Appendix F.2 Section 1.

### 1.1.3 Preferred Interface Transformer Configuration and HV Interrupting Device

Preferred configurations for the Generation facility interface transformer are outlined in Table 1. The interface transformer connection significantly affects the generator 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 generator 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 (Generation < 1MW)

1.2 Equipment Rating and Requirements	Reference
<p>The generation 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 generation equipment, the distribution equipment shall be within its operating rating. Equipment ratings to be reviewed shall be as follows:</p> <ul style="list-style-type: none"><li>- Equipment <b>thermal loading limits</b>. This equipment includes feeder conductor/cable, station breaker and transformer ratings.</li><li>- Impact of generation facility <b>fault contribution</b> on equipment rating</li><li>- If power is to be exported to the distribution system then all <b>metering devices</b> shall be suitable for <i>bi-directional flow</i>.</li></ul>	DSC Appendix F.2 Section 5

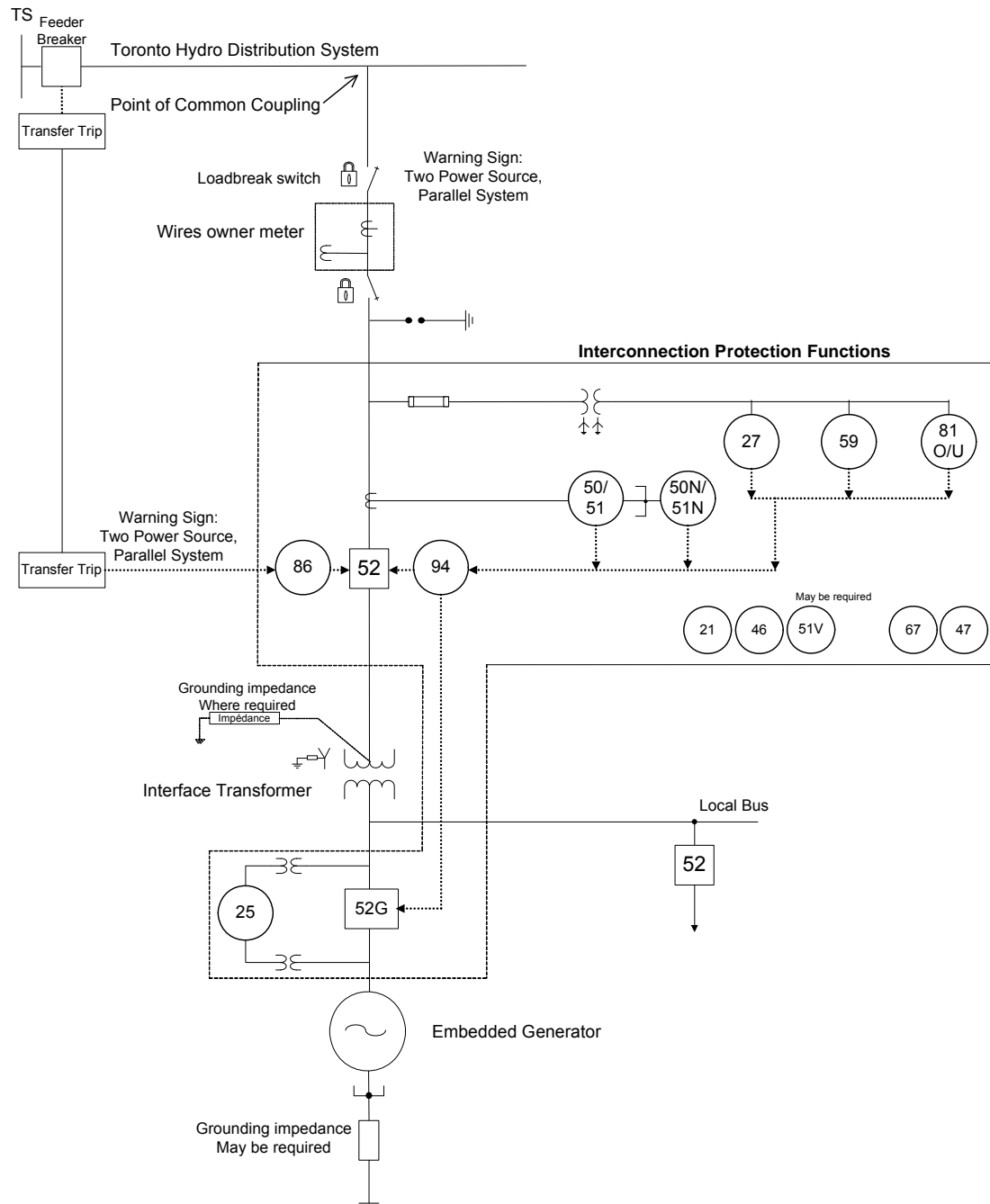
1.3 Voltage Regulation	Reference																
<p>Voltage variations at the point of common coupling (“PCC”) are limited to <b>+/- 6%</b> of the nominal voltage.</p> <p>The generation facility should not actively regulate the voltage at the PCC.</p> <p>During normal operation, the generation facilities must be <b>loaded and unloaded gradually</b> to allow adequate time for regulating devices to respond and avoid excessive voltage fluctuation.</p> <p>The generation facility shall not cause objectionable voltage and current <b>unbalance</b> conditions. The generation facility shall not cause voltage unbalance beyond 3% and current unbalance beyond 10% at the PCC.</p>	<p>CSA CAN3-C235 IEEE 1547 Clause 4.1.1</p> <p>DSC Appendix F.2 Section 3 CAN CSA C22.2 No. 257-06 Section 5.2.3</p>																
1.4 Synchronization	Reference																
<p>The generation facility shall parallel with the distribution system without causing a <b>voltage fluctuation</b> of more than 5% at the PCC.</p> <p>Interconnection shall take place only when the differences in <b>frequency, voltage and phase angle</b> are within the limits shown below.</p> <p><b>Table 2</b></p> <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>&gt;500-1500 kVA</td><td>0.2 Hz</td><td>5 %</td><td>15°</td></tr><tr><td>&gt; 1500 kVA</td><td>0.1 Hz</td><td>3 %</td><td>10°</td></tr></table>	Total DR System Capacity	Frequency Difference	Voltage Difference	Phase Angle Difference	0-500 kVA	0.3 Hz	10 %	20°	>500-1500 kVA	0.2 Hz	5 %	15°	> 1500 kVA	0.1 Hz	3 %	10°	<p>CAN CSA C22.2 No. 257-06 Section 5.3.21 IEEE 1547 Clauses 4.1.3, 5.1.2 DSC Appendix F.2 Section 3.2 OESC rule 84-006</p>
Total DR System Capacity	Frequency Difference	Voltage Difference	Phase Angle Difference														
0-500 kVA	0.3 Hz	10 %	20°														
>500-1500 kVA	0.2 Hz	5 %	15°														
> 1500 kVA	0.1 Hz	3 %	10°														
1.5 Feeder Relay Directioning	Reference																
<p>To prevent sympathetic tripping of the generator feeder due to faults on adjacent feeders, breaker protection may need a directional feature for reverse fault current conditions.</p>	<p>DSC Appendix F.2 Section 8</p>																
1.6 Monitoring	Reference																
<p>A generation facility with total capacity rated <b>greater than 250 kVA</b> at the PCC, shall have <b>provision</b> for monitoring items a) to d) below. If monitoring data is not required at the time of connection, the design shall include provisions for future installation.</p> <p>a) Connection status</p> <p>b) Real power output</p> <p>c) Reactive power output</p> <p>d) Voltage at PCC or aggregate connection</p> <p>For a generation facility with total capacity rated <b>2.5 MW or greater</b>, items a) to d) shall be <b>actively monitored</b>. 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.</p>	<p>DSC Appendix F.2 Section 9</p> <p>IEEE 1547 Clause 4.1.6</p> <p>CAN CSA C22.2 No. 257-06 Clause 5.3.22</p>																

1.7 Power Factor	Reference
<p>The generation facility operation shall not adversely affect voltage at the PCC. The preferred power factor range of operation is <math>\pm 0.9</math>. 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.</p> <p>For large facilities that are IESO impactful, the generator units shall have sufficient reactive power compensation such that there is no material increase at the transmission system terminal station.</p>	<p>DSC Appendix F.2 Section 4</p> <p>CAN CSA C22.2 No. 257-06 Clause 5.3.13</p>
1.8 Maximum Power Transfer & Synchronous Stability	Reference
<p>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.</p> <p>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.</p>	<p>Toronto Hydro Requirement</p>

## 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 Cease to Energize	Reference														
<p>2.1.1 <u>Distribution System Faults and Customer Facility Faults</u></p> <p>Interface protection of the generation facility shall <b>cease to energize</b> Toronto Hydro's distribution system under the following conditions:</p> <p><b>Internal Faults</b> at the Customer's Facility.</p> <p><b>External Faults</b> on the Toronto Hydro Distribution System.</p> <p>Equipment and Conductors energized from both directions shall have suitable protection from each supply source.</p>	<p>DSC Appendix F.2 Section 6.4 IEEE 1547 Clause 4.2.1 OESC 84-014</p> <p>CAN CSA C22.2 No. 257-06 Clause 5.3.8</p>														
<p>2.1.2 <u>Feeder Breaker Reclosing Coordination</u></p> <p>The generation facility shall cease to energize Toronto Hydro's feeder before automatic reclosing of the breaker takes place.</p> <p>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.</p>	<p>IEEE 1547 Clause 4.2.2 DSC Appendix F.2 Section 6 CAN CSA C22.2 No. 257-06 Clause 5.2.9</p>														
<p>2.1.3 <u>Over-Voltage and Under-Voltage Protection</u></p> <p>The typical range of protection settings shall comply with the following table:</p> <p><b>Response to abnormal voltages</b></p> <table border="1"> <thead> <tr> <th>Voltage at PCC</th><th>Clearing Time Range</th></tr> </thead> <tbody> <tr> <td><math>V &lt; 50\%</math></td><td>Instantaneous to 0.16 s</td></tr> <tr> <td><math>50\% \leq V &lt; 88\%</math></td><td>Instantaneous to 2 s*</td></tr> <tr> <td><math>106\% &lt; V \leq 110\%</math></td><td>0.5 s to 2 minutes</td></tr> <tr> <td><math>110\% &lt; V \leq 120\%</math></td><td>Instantaneous to 2 minutes</td></tr> <tr> <td><math>120\% &lt; V &lt; 137\%</math></td><td>Instantaneous to 2 s*</td></tr> <tr> <td><math>137\% \leq V</math></td><td>Instantaneous</td></tr> </tbody> </table> <p>* To satisfy system requirements 2 over-voltage and under-voltage set points may be required.</p> <p>The actual clearing times may vary within the above range due to distribution system conditions and generation facility protection design.</p>	Voltage at PCC	Clearing Time Range	$V < 50\%$	Instantaneous to 0.16 s	$50\% \leq V < 88\%$	Instantaneous to 2 s*	$106\% < V \leq 110\%$	0.5 s to 2 minutes	$110\% < V \leq 120\%$	Instantaneous to 2 minutes	$120\% < V < 137\%$	Instantaneous to 2 s*	$137\% \leq V$	Instantaneous	<p>IEEE 1547 Clause 4.2.3 DSC Appendix F.2 Section 6.5</p> <p>CAN CSA C22.2 No. 257-06 Clause 5.3.9</p> <p>Toronto Hydro Requirement</p>
Voltage at PCC	Clearing Time Range														
$V < 50\%$	Instantaneous to 0.16 s														
$50\% \leq V < 88\%$	Instantaneous to 2 s*														
$106\% < V \leq 110\%$	0.5 s to 2 minutes														
$110\% < V \leq 120\%$	Instantaneous to 2 minutes														
$120\% < V < 137\%$	Instantaneous to 2 s*														
$137\% \leq V$	Instantaneous														
<p>2.1.4 <u>Over-Frequency and Under-Frequency Protection</u></p> <p>The generation facility shall cease to energize Toronto Hydro's distribution system at the frequency set points and clearing times outlined in the table below.</p> <p><b>Response to abnormal frequency</b></p> <table border="1"> <thead> <tr> <th>Adjustable Set Point</th><th>Clearing Time</th></tr> </thead> <tbody> <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> </tbody> </table> <p>To satisfy system requirements 2 over-frequency and under-frequency set points may be required.</p>	Adjustable Set Point	Clearing Time	59.3 to 55.5 Hz	0.1 to 300 s	60.7 to 63.5 Hz	0.1 to 180 s	<p>IEEE 1547 Clause 4.2.4 DSC Appendix F.2 Section 6.5</p> <p>CAN CSA C22.2 No. 257-06 Clause 5.3.10</p> <p>Toronto Hydro Requirement</p>								
Adjustable Set Point	Clearing Time														
59.3 to 55.5 Hz	0.1 to 300 s														
60.7 to 63.5 Hz	0.1 to 180 s														

<p><b>2.1.5 Interface Protection System</b></p> <p>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 &amp; DC schematics and wiring diagram.</p>	<p>DSC Appendix F.2 Section 6 Toronto Hydro Requirement</p>
<p><b>2.2 Connection to Toronto Hydro System</b></p>	<p><b>Reference</b></p>
<p>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.</p> <p>The generation 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.</p> <p>For mid-sized generating facilities that incorporate transfer trip protection, a lockout relay (86) shall prevent resynchronization until enabled by Toronto Hydro System Control.</p>	<p>DSC Appendix F.2 Section 6 IEEE 1547 Clause 4.2.6  Toronto Hydro Requirement</p>
<p><b>2.3 Anti-Islanding Protection and Transfer Trip Requirements</b></p>	<p><b>Reference</b></p>
<p>The generation facility shall disconnect from Toronto Hydro's System upon the loss of utility supply voltage in one or more phases.</p> <p>For mid-sized generating 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.</p>	<p>DSC Appendix F.2 Section 6.1.2 IEEE 1547 Clause 4.4.1 OESC rule 84-008 CAN CSA C22.2 No. 257-06 Clause 5.3.11 Toronto Hydro Requirement</p>
<p><b>2.4 Grounding at the Generation Facility</b></p>	<p><b>Reference</b></p>
<p>The generation 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:</p> <p><math>X_0 / X_1 \leq 3</math>, <math>R_0/X_1 \leq 1</math>.</p> <p>The generation facility shall not disrupt the coordination of ground fault protection on Toronto Hydro's distribution system.</p> <p>Wind generation facilities shall not connect to the distribution system neutral.</p>	<p>DSC Appendix F.2 Section 2 IEEE 1547 Clause 4.1.2 OESC rule 84-030 CAN CSA C22.2 No. 257-06 Clause 5.3.6 Toronto Hydro Requirement</p>

### ***3 Warning Signs and Diagrams***

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

**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 embedded generators and isolation points with their interlocking arrangements.

Operating designations will be assigned to the switching equipment of the generation 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 Authorization to Connect from ESA.

Prior to commencing with commissioning and placing embedded generation 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 embedded generator is brought into synchronization, as per the Conditions of Service 4.5.4 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 embedded generator 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 embedded generation 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) - Embedded Generation Overview**



## ***Embedded Generation*** ***(An Overview of Processes, Requirements and Approvals)***

This overview provides a comprehensive set of references that are intended to familiarize the customer about the overall process, requirements, and approvals that may apply to connections of embedded generators to the Toronto Hydro distribution system.

### **Connection of Embedded Generation Facilities**

Building a generation facility and connecting it to the Toronto Hydro distribution system requires attention to safety, adherence to technical standards, all in compliance with regulatory requirements. Connection of an embedded generator involves several steps and both parties have distinct responsibilities.

#### **What is Toronto Hydro responsible for?**

- The safety, reliability, and efficiency of its distribution system, and ensuring that the new generation connection does not adversely affect the distribution system or existing customers
- Ensuring that the Distribution System Code and applicable standards are followed

#### **What is the Generator responsible for?**

- The safety, design, construction, operation, metering, protection and control, and maintenance of the generating facility
- Contacting the various agencies involved well before finalizing plans
- Ensuring all necessary submissions and agreements are completed and required payments made
- Considering using a consultant to assist with the connection requirements, process, and approvals

#### **What is the process for connecting an embedded generation facility?**

Customers interested in connecting an embedded generation facility to the Toronto Hydro distribution system will follow the process established by the Ontario Energy Board for one of the four Generator classifications.

<b>Generation Classification</b>	<b>Rating</b>
<b>Micro</b>	$\leq 10$ kW, for customer's own use
<b>Small</b>	(a) $\leq 500$ kW connected on distribution system voltage $< 15$ kV (b) $\leq 1$ MW connected on distribution system voltage $\geq 15$ kV
<b>Mid-Sized</b>	(a) $< 10$ MW but $> 500$ kW connected on distribution system voltage $< 15$ kV (b) $> 1$ MW but $< 10$ MW connected on distribution system voltage $\geq 15$ kV
<b>Large</b>	$\geq 10$ MW

### 1. What is the process and requirements internal to Toronto Hydro?

The Toronto Hydro "[Conditions of Service Complete Document](#)" (i.e. including the reference documents) contains among other things information for the connection of embedded generation facilities. More specifically, you may select the relevant bookmark:

- Distributed Generation Requirements reference document outlines the classifications and general terms and conditions for the connection of embedded generation facility to the distribution system.
- Attachment Schedule B1 in Distributed Generation Requirements reference document titled "*Micro-Embedded Load Displacement Generation Facility Connection Agreement*" provides the terms, conditions, and technical requirements for load displacement generators that are 10 kW or less.
- Attachment Schedule B2 in Distributed Generation Requirements reference document titled "*Embedded Generator Connection Agreement*" provides the default legal terms and conditions for embedded generators that are greater than 10 kW.
- Attachment in Distributed Generation Requirements reference document titled "*Toronto Hydro General Requirements for Parallel Generation*" provides technical requirements for interconnecting parallel generation greater than 10 kW. These technical requirements may be replaced by the applicable CSA Interconnection Standards (C22.2 No 257 and C22.3 No. 9) once they are approved and issued by the CSA in 2006.
- Section 6, Reference #4 titled "*Toronto Hydro Requirements for the Design & Construction of Customer-Owned High Voltage Substations*" provides guidance for the design and construction of 13.8 kV and 27.6 kV customer owned substations, including substation switchgear and primary cable.

#### **Note: Net Metering Program**

Toronto Hydro has established a [Net Metering Program](#) for customers who are planning to install a generator that uses a renewable technology. Net Metering is a program whereby eligible customers with specific generation facilities can reduce their net 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. For instance, all residential, solar panel, and small wind turbine installations could benefit from this program.

### 2. What external approvals are part of the Toronto Hydro connection process?

Depending on the size, type, fuel, and location of generation facilities, the connection of your generation facilities to our distribution system may require approvals from various regulators that govern the electricity industry in Ontario. Below are some of the relevant organizations you may need to engage for the connection of an embedded generation facility.

#### **a) Independent Electricity System Operator (IESO)**

The [Independent Electricity System Operator](#) (IESO) manages the Ontario power grid, provides the hourly energy spot market prices, as well as sets and enforces the Market Rules for participating in the Ontario electricity market.

A [System Impact Assessment](#) is conducted by the IESO prior to the customer connecting an embedded generation facility that is 10 MW or greater in size.

Embedded generators that are over 20 MW or are participating in the Renewable Energy Supply Contract are required to register with the IESO as a Market Participant and must comply with all market rules, including metering requirements.

### **b) Ontario Energy Board (OEB)**

The Distribution System Code (DSC) issued by the OEB sets out the minimum conditions that distributors must meet in carrying out their obligations to distribute electricity in Ontario, under their licence. The interconnection process and requirements for embedded generation are governed by the "[Distribution System Code](#)" including [Appendix F](#).

The [Ontario Energy Board](#) regulates the electricity and gas industry in Ontario. The [Ontario Energy Board Act, 1998](#), Section 57, requires that electricity market participants be licensed in order to export power to the distribution grid. More specifically, the Generator must obtain a [Generator Licence](#) from the OEB when:

- a) The Applicant intends to sell power into the IESO-administered market.
- b) The Applicant intends to settle for amounts through a distributor's retail settlement system for energy injected into the distributor's distribution system (i.e. sell electricity through the distributor). If so, the Applicant must have a connection agreement and a service agreement for settlement purposes with the distributor.

Generally, a generator licence is not required for load displacement generator or net metering customers.

### **c) Electrical Safety Authority (ESA)**

The Ontario [Electrical Safety Authority](#) sets and enforces standards for electrical safety through the Ontario Electrical Safety Code. Before connecting to the Toronto Hydro distribution system, the customer is required to have the ESA inspect their generation facility and provide a Connection Authorization to Toronto Hydro.

## **3. What other external approvals may apply that are not part of the Toronto Hydro connection process?**

The customers should also be aware that other approvals might be required such as those from the Ontario Ministry of Environment (MOE), the Canadian Environmental Assessment Agency (CEAA), etc.

### a) Ontario Ministry of Environment (MOE)

Depending on the size, type, fuel, and location of generation facilities, the MOE may require that the customer carry out an environmental assessment.

The [Ontario Ministry of Environment](#) sets environmental standards for electricity projects in Ontario and ensures that generators, distributors and transmitters follow rules and standards when constructing and operating facilities.

[Guide to Environmental Assessment for Electricity Projects](#) provides the environmental assessment requirements for electricity projects. They apply equally to the public and private sectors.

Projects involving generators less than 1 MW typically do not require environmental screening or environmental assessment. Please contact the MOE to determine whether an environmental assessment is required.

### b) Canadian Environmental Assessment Agency (CEAA)

The [Canadian Environmental Assessment Agency](#) controls the federal environmental assessment process and it applies whenever a federal authority has a specified decision-making responsibility for a project.

Depending on the impact of the generation facilities on federal jurisdiction, a federal environmental assessment may be required.

Please contact the CEAA to determine whether a federal environmental assessment is required.

## How do I apply for connection of an embedded generator?

If you are interested in connecting an embedded generation facility to the Toronto Hydro distribution system, please complete the [Distributed Energy Resources \(DER\) Application Form](#) and email to Toronto Hydro at [DER@torontohydro.com](mailto:DER@torontohydro.com).

Customers without e-mail access can request the form and submit the completed form by regular mail to the following address:

Generation Planning  
Capacity Planning Department  
Toronto Hydro - Electric System Limited  
500 Commissioners St, 3<sup>rd</sup> Floor  
Toronto, ON  
M4M 3N7  
Tel: 416 542 3099  
Attn: Gary Thompson

## **Appendix 1(iii) - Feed-in Tariff Distributed Generation Connection Overview**



## **FEED-IN TARIFF (FIT) DISTRIBUTED GENERATION (DG) CONNECTION (An Overview of Processes, Requirements and Approvals)**

This overview provides a comprehensive set of references that are intended to familiarize the customer about the overall process, requirements, and approvals that may apply to connections of Feed-in Tariff (FIT) DG facilities to the Toronto Hydro distribution system.

The Ontario Energy Board (OEB) has created rules within the Distribution System Code (DSC) that require Local Distribution Companies (LDC's) to facilitate to connect DG facilities to the respective LDC's distribution system accordingly.

### **Programs under FIT to connect**

Customers interested in connecting an embedded generator to the Toronto Hydro distribution system will follow the process established by the OEB for one of the four Generator classifications.

<b>Program</b>	<b>Rating</b>
<b>MicroFIT</b>	≤ 10 kW, for customer's own use, mostly residential and small commercial
<b>FIT Capacity Allocation Exempt</b>	(a) > 10 kW but ≤ 250 kW, connected on distribution system voltage < 15 kV (b) > 10 kW but ≤ 500 kW, connected on distribution system voltage ≥ 15 kV
<b>FIT Capacity Allocation</b>	All the other sizes not listed above, having maximum limits as follows: Solar – 10 MW, Water – 50 MW and Other – Unlimited.

### **Connection of DG Facilities**

Building a generation facility and connecting it to the Toronto Hydro distribution system requires attention to safety, adherence to technical standards, all in compliance with regulatory requirements. Connection of a DG facility involves several steps and both parties have distinct responsibilities.

#### **What is Toronto Hydro responsible for?**

- The safety, reliability, and efficiency of its distribution system, and ensuring that the new generation connection does not adversely affect the distribution system or existing customers
- Ensuring that the Distribution System Code and applicable standards are followed

#### **What is the Generator responsible for?**

- The safety, design, construction, operation, metering, protection and control, and maintenance of the generating facility
- Contacting the various agencies involved well before finalizing plans
- Ensuring all necessary submissions and agreements are completed and required payments made
- Considering using a consultant to assist with the connection requirements, process, and approvals

## What are the reference documents that specify process and requirements internal to Toronto Hydro?

- The Toronto Hydro “**Conditions of Service Complete Document**” (i.e. including the reference documents) contains among other things information for the connection of distributed generation facilities. More specifically, you may select the relevant bookmark;
- “**Distributed Generation Requirements**”, one of the reference documents attached to the Conditions of Service outlines the classifications and general terms and conditions for the connection of distributed generation facility to the distribution system.
- “**Toronto Hydro Parallel Generation Requirements**”, an attachment to the “Distributed Generation Requirements” document provides technical requirements for interconnecting parallel generation greater than 10 kW.
- “**Toronto Hydro Requirements for the Design & Construction of Customer-Owned High Voltage Substations**”, section 6, Reference #4 in the Conditions of Service provides guidance for the design and construction of 13.8 kV and 27.6 kV customer owned substations, including substation switchgear and primary cable.

Note: All the above documents are posted on Toronto Hydro website.

## What external approvals are part of the Toronto Hydro connection process?

Depending on the size, type, fuel, and location of generation facilities, the connection of your generation facilities to our distribution system may require approvals from various regulators that govern the electricity industry in Ontario. Below are some of the relevant organizations you may need to engage for the connection of an embedded generation facility.

### a) Ontario Energy Board (OEB)

The Distribution System Code (DSC) issued by the OEB sets out the minimum conditions that distributors must meet in carrying out their obligations to distribute electricity in Ontario, under their licence. The interconnection process and requirements for embedded generation are governed by the “Distribution System Code” including Appendix F.

The Ontario Energy Board regulates the electricity and gas industry in Ontario. The Ontario Energy Board Act, 1998, Section 57, requires that electricity market participants be licensed in order to export power to the distribution grid. More specifically, the Generator must obtain a Generator Licence from the OEB when:

- i. The Applicant intends to sell power into the IESO-administered market.
- ii. The Applicant intends to settle for amounts through a distributor’s retail settlement system for energy injected into the distributor’s distribution system (i.e. sell electricity through the distributor). If so, the Applicant must have a connection agreement and a service agreement for settlement purposes with the distributor.

Generally, a generator licence is not required for load displacement generator or net metering customers.

## **b) Independent Electricity System Operator (IESO)**

The Independent Electricity System Operator (IESO) manages the Ontario power grid, provides the hourly energy spot market prices, as well as sets and enforces the Market Rules for participating in the Ontario electricity market.

A System Impact Assessment is conducted by the IESO prior to the customer connecting an embedded generation facility that is 10 MW or greater in size.

Embedded generators that are over 20 MW or are participating in the Renewable Energy Supply Contract are required to register with the IESO as a Market Participant and must comply with all market rules, including metering requirements.

In the case the customer wants to participate in the IESO Feed-in Tariff Program of renewable energy sources, the customer will need to sign a Feed-in Tariff contract with the IESO. <http://fit.powerauthority.on.ca/>

## **c) Electrical Safety Authority (ESA)**

The Ontario Electrical Safety Authority sets and enforces standards for electrical safety through the Ontario Electrical Safety Code. Before connecting to the Toronto Hydro distribution system, the customer is required to have the ESA inspect their generation facility and provide a Connection Authorization to Toronto Hydro.

### **What other external approvals may apply that are not part of the Toronto Hydro connection process?**

The customers should also be aware that other approvals might be required such as those from the Ontario Ministry of Environment (MOE), the Canadian Environmental Assessment Agency (CEAA), etc.

#### **a) Ontario Ministry of Environment (MOE)**

Depending on the size, type, fuel, and location of generation facilities, the MOE may require that the customer carry out an environmental assessment.

The Ontario Ministry of Environment sets environmental standards for electricity projects in Ontario and ensures that generators, distributors and transmitters follow rules and standards when constructing and operating facilities.

Guide to Environmental Assessment for Electricity Projects provides the environmental assessment requirements for electricity projects. They apply equally to the public and private sectors.

Projects involving generators less than 1 MW typically do not require environmental screening or environmental assessment. For certainty, you are encouraged to contact the MOE to determine whether an environmental assessment is required.



**b) Canadian Environmental Assessment Agency (CEAA)**

The Canadian Environmental Assessment Agency (CEAA) controls the federal environmental assessment process and it applies whenever a federal authority has a specified decision-making responsibility for a project.

Depending on the impact of the generation facilities on federal jurisdiction, a federal environmental assessment may be required.

For certainty, you are encouraged to contact the CEAA to determine whether a federal environmental assessment is required.

**How do I apply for connection of an FIT or MicroFIT generation facility?**

If you are interested in connecting a distributed generation facility under the FIT program to the Toronto Hydro distribution system, please complete a MicroFIT Connection Application Form or Distributed Energy Resources (DER) Application Form and email to Toronto Hydro at [DER@torontohydro.com](mailto:DER@torontohydro.com) .

Customers without e-mail access can request the form and submit the completed form by regular mail to the following address:

Generation Planning  
Capacity Planning Department  
Toronto Hydro - Electric System Limited  
500 Commissioners St, 3<sup>rd</sup> Floor  
Toronto, ON  
M4M 3N7  
Tel: 416 542 3099

Attn: Gary Thompson

## 6.2 Appendix 2 – Agreements

- (i) Schedule B1:
  - Micro-Embedded Generation Facility Connection Agreement
- (ii) Connection Cost Agreement – Offer to Connect, Small Generation – Capacity Allocation Exempt
- (iii) Schedule B2:
  - Form of Connection Agreement for a Small Embedded Generation Facility or a Mid-Sized Embedded Generation Facility
- (iv) Schedule B3:
  - Connection Agreement for an Embedded Generation Facility Larger than 10 MW
- (v) Schedule C:
  - Wholesale Market Participant Connection Agreement Terms and Conditions

**Appendix 2(i) - Schedule B1:**

**Micro-Embedded Generation Facility Connection Agreement**

## **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.

Customer Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Print Name: \_\_\_\_\_

Your Hydro Account Number: \_\_\_\_\_

I confirm that the following information is true and accurate:

Nameplate rating of Generator: \_\_\_\_\_ KW Total installed generation \_\_\_\_\_ KW

Type: ☐ Wind Turbine ☐ Photovoltaic (Solar) ☐ Hydraulic Turbine ☐ Fuel Cell  
☐ Other \_\_\_\_\_

Inverter Utilized: ☐ Yes ☐ No

Inverter Certification: ☐ C22.2 #107.1 ☐ Site Certified by the ESA

For office use: Station \_\_\_\_\_ Feeder \_\_\_\_\_ Date Connected \_\_\_\_\_

### 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 <b>V (Volts)</b>	Frequency <b>F (Hertz)</b>	Maximum number of cycles to disconnect	
		Seconds	Cycle
<b>V</b> < 0.5 Vn	60	0.1	6
0.5 Vn • • <b>V</b> < 0.88 Vn	60	2	120
1.10 Vn • • <b>V</b> < 1.37 Vn	60	2	120
<b>V</b> • • 1.37 Vn	60	0.033	2
Vn	<b>F</b> < 59.5*	0.1	6
Vn	<b>F</b> > 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 <b>V (Volts)</b>	Frequency <b>F (Hertz)</b>	Maximum clearing time*	
		Seconds	Cycles
<b>V</b> < 0.5 Vn	60	0.16	9.6
0.5 Vn • • <b>V</b> < 0.88 Vn	60	2	120
1.10 Vn • • <b>V</b> < 1.20 Vn	60	1	60
<b>V</b> • • 1.20 Vn	60	0.16	9.6
Vn	<b>F</b> < 59.3	0.16	9.6
Vn	<b>F</b> > 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) - Connection Cost Agreement – Offer to Connect, Small  
Generation – Capacity Allocation Exempt**

## **Connection Cost Agreement – Offer to Connect, Small Generation – Capacity Allocation Exempt**

For further information, contact:

Distributed Energy Resources (DER)  
Toronto Hydro Electric System Limited  
[DER@torontohydro.com](mailto:DER@torontohydro.com)  
416-542-3099



**Appendix 2(iii) - Schedule B2:**

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

**FORM OF CONNECTION AGREEMENT FOR A SMALL EMBEDDED  
GENERATION FACILITY OR A MID-SIZED EMBEDDED GENERATION  
FACILITY**

This Connection Agreement is made this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

**BETWEEN**

\_\_\_\_\_, (the "Distributor")

**AND**

\_\_\_\_\_, (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 \_\_\_\_\_ *[insert licence number]* (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 that were submitted to the Distributor in accordance with the process set out in the Distribution System Code (the "Code") (altogether, the "Application") and the Distributor and the Customer have signed a connection cost agreement (both of which are attached to this Agreement as Schedule A).

**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 conditions herein contained, 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; and
- (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.

## **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 section 12.1 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 term 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

\_\_\_\_\_  
Distributor Signature Date

\_\_\_\_\_  
Name (Print)

\_\_\_\_\_  
Title



## **SCHEDULE A**

### **Application and Connection Cost Agreement (recitals)**

See the attached Application and connection cost agreement.

*[To be attached by the Parties]*

## **SCHEDULE B**

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

#### **B.1 Single Line Diagram and Connection Point**

*[To be inserted by the Parties]*

#### **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:

*[To be completed by the Parties]*

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

*[To be completed by the Parties]*

#### **B.3 Metering Installation Diagram**

*[To be inserted by the Parties]*

## **SCHEDULE C**

### **List of Other Contracts (section 3.4)**

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

*[To be completed by the Parties]*

## **SCHEDULE D**

### **Technical and Operating Requirements (section 4.1(d))**

The following technical and operating requirements apply to the Facility:

*[To be completed by the Parties]*

## **SCHEDULE E**

### **Billing and Settlement Procedures (section 5.3)**

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

*[To be completed by the Parties]*

## **SCHEDULE F**

### **Contacts for Notice (section 12.1)**

*[To be completed by the Parties – different contacts may be listed for different purposes]*

## **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 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 is 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(iv) - Schedule B3:**

**Connection Agreement for an Embedded Generation Facility Larger than  
10 MW**

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3**

#### **CONNECTION AGREEMENT FOR AN EMBEDDED GENERATION FACILITY GREATER THAN 10 MW**

#### **TERMS AND CONDITIONS**

##### **ARTICLE 1: CONNECTION**

- 1.1 The Embedded Generation Facilities shall be connected to the THESL Distribution System and remain Energized at the Point 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: POINT OF CONNECTION AND JURISDICTION**

- 2.1 The point of delivery and connection for the Embedded Generation Facilities located at the Site shall be where the THESL supply feeders connects to the high voltage disconnect switches (the "Point of Connection") or such other points as may be designated by THESL.
- 2.2 THESL shall have jurisdiction over and control of 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 closed operations of the circuit breakers to ensure the non-parallelism of the supply feeder; and
  - (ii) THESL revenue billing metering equipment;
- or such areas as may be designated by THESL.

##### **ARTICLE 3: COVENANTS OF THE CUSTOMER**

- 3.1 The Embedded Generation Facilities, 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 Embedded Generation Facilities ("Required Approvals") throughout the Term.

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

- 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) pay in a timely manner such other payments as it may agree with THESL including standby and other charges; (iii) make such payments in accordance with THESL’s billing cycle as notified to the Customer from time to time; and (iv) 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 Embedded Generation Facilities:
- (a) violate, or cause THESL to violate, any provision of its Distribution License;
  - (a) contravene any laws of the Province of Ontario or any laws of Canada having force and effect in the Province of Ontario; or
  - (b) violate any provision contained in the Conditions of Service.
- 3.5 The Customer shall comply as soon as possible with any directive received from THESL that THESL makes for the purpose of meeting any of its obligations under its Distribution License.
- 3.6 The Customer shall construct, maintain and operate the Embedded Generation Facilities in such a manner that THESL does not incur operating costs as a result of the connection with the Customer which exceed the revenues received in respect of the connection with the Customer.
- 3.7 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.
- 3.8 The Customer shall prepare and deliver to THESL, from time to time, or upon request from THESL, a plan for regularly scheduled maintenance to ensure that all parts of the Embedded Generation Facilities, including, connection devices and protection and control systems are maintained in good working order. THESL shall review the proposed maintenance plan to ensure that it complies with the Distribution System Code and the Conditions of Service and otherwise meets the level of standards, procedures and instructions set by THESL from time to time, which shall include, without limitation, the following standards, procedures and instructions:

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

- (a) only Competent Persons may carry out inspections, repairs and maintenance;
- (b) periodic tests must be performed on each protection system to verify that the system operates as designed and testing intervals for each protection system should not exceed four years for microprocessor - based systems and 2 years for electro-mechanical based systems;
- (c) a visual inspection of the generator facility at least once a year to note obvious maintenance problems such as broken insulators or other damaged equipment;
- (d) a plan for any deficiencies identified during inspections to be noted and repaired as soon as possible having regard to the severity of the problem, due diligence concerns of THESL and the Customer and financial and material requirements;
- (e) delivery to THESL, prior to the first inspection or upon request, a list of all critical protective and/or interlocking equipment;
- (f) immediate notification to THESL of any deficiencies involving critical protective equipment; and
- (g) delivery to THESL of all relevant inspection and repair reports that may effect the protection and performance of THESL Distribution System.

The Customer will maintain the Embedded Generation Facilities in accordance with the maintenance plan and otherwise in a manner consistent with Good Utility Practice.

- 3.9 The Customer shall limit the effects of harmonic voltages and currents on the THESL Distribution System caused by the Embedded Generation Facilities 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 Embedded Generation Facilities to achieve acceptable power quality, the Customer shall make such modifications, at its own cost, within such time period as is specified by THESL, acting reasonably; provided that if the modifications are not completed within that time period, THESL shall be entitled to disconnect the Embedded Generation Facilities from the THESL Distribution System without any further notice and the provisions of Section 5.4 shall apply.
- 3.10 The Customer shall provide and install before the performance of any of the Tests under this Agreement, and maintain, at its cost, all protective, interlocking and isolating devices deemed necessary by THESL, in its sole discretion, to allow for the safe interconnection, disconnection,

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

isolation and emergency operation of the Embedded Generation Facilities.

- 3.11 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 Embedded Generation Facilities, or to install, inspect, read, calibrate, maintain, repair, alter, remove or replace any 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 they are made aware of such practices and procedures.

The Customer agrees to provide suitable space at the Site for THESL's meters and wires and, where necessary, poles, cables, transformers and other appliances and equipment (collectively "Metering Equipment") 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 the prior written consent of THESL (not to be unreasonably withheld) it will not permit anyone who is not an agent of THESL to remove, inspect or tamper with same, including moving, inspecting or tampering with any meter seals. The Customer agrees that Representatives of THESL shall have reasonable access to the Site and Embedded Generation Facilities for the purposes of reading, examining, preparing or removing its Metering Equipment and for the purpose of inspecting the Customer's appliances, equipment and wiring.

- 3.12 The Customer shall comply with and be bound by the provisions of any Operating Schedule which is delivered to the Customer by THESL from time to time and shall operate the Embedded Generation Facilities in accordance with those provisions.
- 3.13 The Customer shall have no rights of access to any THESL Apparatus or lands or property owned by THESL.
- 3.14 If, as a consequence of the connection of the Embedded Generation Facilities to the THESL Distribution System or the Tests performed hereunder, (i) damage occurs to the Apparatus owned or operated by THESL ("THESL Apparatus") or the THESL Distribution System, or (ii) THESL incurs increased costs in operating the THESL Distribution System, the Customer shall, within 10 days of receipt of an invoice therefore, pay the amount of any such damage or increased costs to THESL.
- 3.15 The Customer shall comply with all metering requirements imposed by THESL, acting reasonably from time to time including, if so required by Hydro One, THESL or any regulatory authority in accordance with

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3**

applicable laws, at any time, installing at the Customers expense performance metering equipment.

- 3.16 If the Customer installs performance metering equipment in accordance with Section 3.15, 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.

#### **ARTICLE 4: COSTS**

- 4.1 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.
- 4.2 Any amount required to be paid under this Agreement, whether for the cost of the Tests or otherwise, which is not paid on the due date therefore, shall bear interest at the rate 12 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.

#### **ARTICLE 5: TERM AND TERMINATION**

- 5.1 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 5.1, THESL shall have the right to terminate this Agreement prior to the specified effective date of termination pursuant to Section 5.2 or any other provision of this Agreement allowing for termination.
- 5.2 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;
  - (b) failure to comply with any other material covenant or obligation set forth in this Agreement within 14 days receipt of notice of default from the non-defaulting party; or
  - (c) the occurrence of a material breach or default under any other agreement which the Customer has with THESL.

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

- 5.3 (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 Embedded Generation Facilities from the THESL Distribution System in accordance with Section 6.1 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.
- 5.4 Upon termination of the Agreement the THESL for any reason, 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 9; Article 10 and Section 12.3;
  - (e) subject to termination being in accordance with this Agreement, THESL shall have no liability whatsoever to the Customer arising from such termination; and



## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3**

- (f) THESL may, if it has not already done so, disconnect the Embedded Generation Facilities from the THESL Distribution System.
- 5.5 Upon termination of the Agreement by Customer in accordance with its provision, 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 9; Article 10 and Section 12.3;
  - (d) subject to termination being in accordance with this Agreement, the Customer shall have no liability whatsoever to THESL arising from such termination; and
  - (e) THESL shall, if has not already done so, disconnect the Embedded Generation Facilities from the THESL Distribution System.

#### **ARTICLE 6: DISCONNECTION**

- 6.1 Notwithstanding anything else contained in this Agreement, THESL may disconnect the Embedded Generation Facilities 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 Embedded Generation Facilities from the THESL Distribution System immediately without any notice to the Customer; and

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

- (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, and reliability of the THESL Distribution System and quality of electrical power and 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 inspections or maintenance;
  - (d) upon termination of the Agreement pursuant to Section 5.1 or 5.3;
  - (e) immediately without notice, upon issuance of an order or directive requiring disconnection by any court or regulatory authority having jurisdiction over disconnection; or
  - (f) for any other reason specified in this Agreement or the Conditions of Service.
- 6.2 If THESL exercises any rights to disconnect the Embedded Generation Facilities pursuant to this Agreement for a 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 Embedded Generation Facilities be reconnected, the Customer shall pay the 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 amounts which may be due and owing to THESL under this

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

Agreement. Such costs shall be paid in full prior to the reconnection of the Embedded Generation Facilities.

Prior to the initial connection, or upon request of THESL after any disconnection, the Customer shall comply with the following conditions prior to such connection or reconnection:

1. Testing
  - (a) THESL shall provide prior written notice to the Customer of the Tests which it reasonably determines must be performed prior to reconnection;
  - (b) 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
  - (c) after completion of the Tests, the Customer shall deliver the results of the Tests to THESL.

The Embedded Generation Facilities shall not be connected or 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 connection or reconnection.

#### 2. ESA Approval

The Customer shall, at its expense, have the Embedded Generation Facilities 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 Embedded Generation Facilities to allow for the performance of the Tests, and in-service operation of the Embedded Generation Facilities and deliver, or have delivered, to THESL such written certificate from the ESA. THESL will not allow the Embedded Generation Facilities 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 Embedded Generation Facilities and all other requirements of THESL for the connection of the Embedded Generation Facilities to the THESL Distribution System are met.

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

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3**

#### **ARTICLE 7: INSURANCE**

- 7.1 The Customer shall, at its own expense, acquire and maintain during the Term any and all insurance required by the laws in effect in Ontario for the testing, operation and maintenance of the Embedded Generation Facilities, including the following insurance coverage:
- (a) comprehensive general liability insurance with limits of not less than ten million dollars (\$10,000,000.00) inclusive per occurrence for bodily injury, death and damage to property, including loss of use and, such insurance should include, but not be limited to, blanket contractual and cross liability coverage; and
  - (b) all risk property insurance with limits of not less than five million dollars (\$5,000,000.00) inclusive per occurrence.
- 7.2 Upon request, the Customer shall provide THESL with written proof of insurance coverage consistent with the above provisions. Where applicable, each policy shall list THESL and its Representatives as Additional Insureds.
- 7.3 The Customer shall ensure that any contractor it retains to perform any of the Tests hereunder obtains and maintains, the same types and levels of insurance as set forth in Section 7.1 and that THESL and its Representatives are named as additional insureds under such insurance policies, where applicable.
- 7.4 THESL, acting reasonably, may from time to time request that the Customer take out additional insurance coverage and the Customer shall acquire such additional policies and provide written proof of such additional coverage within thirty (30) days of such request. All policies of insurance provided for under this section shall provide that THESL shall receive at least thirty (30) days prior written notice of cancellation, termination or of any material change to the Customer's insurance. The Customer shall not terminate, allow to lapse or change the terms of the Customer's insurance as required herein without THESL's prior written approval.
- 7.5 If the Customer fails to provide proof of, and maintain the insurance required herein, THESL will be entitled to obtain and maintain such insurance and give written notice of that fact to the Customer. The cost of obtaining and maintaining the insurance will be at the expense of the Customer and the Customer will reimburse THESL for any amount paid by THESL related thereto within ten (10) days of receipt of an invoice therefore.

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

#### ARTICLE 8: COMPLIANCE WITH LAWS

- 8.1 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 9: LIABILITY

- 9.1 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 Embedded Generation Facilities, 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.
- 9.2 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 Customer 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 and which result in physical damage to the property of the Customer; and
  - (b) neither THESL nor any of its Representatives shall be liable to the Customer 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

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

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 10: INDEMNIFICATION**

- 10.1 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 Tests, Commissioning, connecting or operating the Embedded Generation Facilities regardless of whether such Tests, Commissioning, connecting or operating were in accordance with this Agreement and whether the Customer has been negligent in the performance of the Tests or its operation of the Embedded Generation Facilities, or which relate to, arise out of, or are attributed to a breach of, or default under this, Agreement, or the negligence or willful misconduct of the Customer or any of its Representatives.
- 10.2 “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 public enemy, war, insurrection, earthquake, explosion, or order, regulation or restriction imposed by any authorities having authority to issue such order, regulation or restriction, (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 Embedded Generation Facilities 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.
- 10.3 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:

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3**

- (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 10.3(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.
- 10.4 The Customer may not materially increase the generated supply at the Point 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 generated supply is made in contravention of this Section 10.4, it shall be an Event of Default, THESL shall have the right to terminate this Agreement pursuant to Section 5.3 and the provisions of Section 5.4 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 any unapproved increase in the generated supply.

#### **ARTICLE 11: RELATIONSHIPS OF PARTIES**

- 11.1 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 12 MISCELLANEOUS PROVISIONS**

- 12.1 From time to time certain improvements, additions or other changes ("Modification") to the Embedded Generation Facilities may be required for their economical, reliable and safe operation. The Customer may not make any 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

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

contain the conditions that the Modification shall be made (i) in accordance with the standards and procedures 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's refusal to give any such consent, it may elect to terminate this Agreement upon thirty (30) days prior written notice. If any Modification is made in contravention of this Section 12.1, THESL shall have the right to terminate this Agreement pursuant to Section 5.3 and the provisions of Section 5.4 shall apply to such termination.

12.2 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.

12.3 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)*;
- (c) the submission of a dispute shall not act as a stay of performance of obligations under this Agreement; and
- (d) the decision of the arbitrator will be final and binding with no right of appeal.

Nothing contained in this Section 12.3 shall be interpreted as limiting any jurisdiction granted to the Ontario Energy Board by any applicable law.

12.4 THESL shall invoice the Customer and the Customer shall pay to THESL, within 10 days of receipt of an invoice, all additional or special costs relating to the interconnection with, or the operation of, the THESL Distribution System while interconnected with, the Embedded Generation Facilities. For the purpose of this Section 12.4 "additional or special costs" shall mean those costs incurred by THESL which THESL, in its sole discretion, determines arise out of the special nature and characteristics of the Embedded Generation Facilities and are costs not normally incurred by THESL in the ordinary course of interconnection with, or operation while interconnected to, facilities operating in parallel.



## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3**

- 12.5 The Customer agrees that THESL shall have the right to revise any provision in this Agreement, including any Operating Schedule, 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; or (b) to make the provisions of this Agreement comply with all applicable laws or 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 5.4 shall apply to any such termination.
- 12.6 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 party.

#### **ARTICLE 13: DEFINITIONS**

- 13.1 In this Agreement, the definitions contained in Appendix 1 of Schedule A attached hereto shall have the meanings set forth therein and, in addition, the following terms shall have the meanings set forth below:
- (a) "Agreement" means the agreement of THESL to connect the Embedded Generation Facilities to the THESL Distribution System upon these terms and conditions and the Customer's deemed agreement pursuant to the Distribution System Code and the Conditions of Service to be bound by these terms and conditions.
  - (b) "Apparatus" means structures, equipment and 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 this Agreement.
  - (g) "Distribution License" means any license to distribute electricity issued to THESL by the Ontario Energy Board.

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule B3

- (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) "Embedded Generation Facilities" means the generation facilities of a generator which are not directly connected to the IMO-controlled grid but are instead connected, or to be connected, to the THESL Distribution System.
- (j) "Emergency" means a condition or situation which in the judgement of THESL will affect THESL's ability to meet its obligations to (i) maintain safe, adequate and continuous electric service or (ii) avoid damage to any property or persons.
- (k) "Energized" means the joining of the Embedded Generation Facilities 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 Point of Connection.
- (l) "ESA" means the person or body designated under the *Electricity Act*, 1998, S.O. 1998, c.15, Schedule A as the Electrical Safety Authority.
- (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) "Operating Schedule" means any operating schedule delivered from time to time by THESL which specifies, among other things, standards and procedures for operating and maintaining the Embedded Generation Facilities.
- (o) "Point of Connection" has the meaning set forth in Section 2.1 hereto.

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions** **Schedule B3**

- (p) "Representatives" means the respective directors, officers, employees, contractors or agents of either party hereto, as applicable.
- (q) "Site" means the physical location of the Embedded Generation Facilities.
- (r) "Term" has the meaning set out in Section 5.1 hereto.
- (s) "Tests" means the tests performed on the Embedded Generation Facilities to ensure that the Embedded Generation Facilities are properly designed for connection, and are acceptable to be connected, to the THESL Distribution System.
- (t) "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 2(v) - Schedule C:**

**Wholesale Market Participant Connection Agreement Terms and  
Conditions**

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C**

#### **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.

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C

- 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.

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C

- 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:



## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C

- 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;

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C**

- 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;

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C

- 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.

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C

#### 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,

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C**

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

## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C

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.

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C**

#### **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 Section 4.3 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.

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C**

- 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.



## Section 6 – REFERENCES

### Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C

- 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.

## **Section 6 – REFERENCES**

### **Standard Toronto Hydro Connection Agreements and Terms of Conditions Schedule C**

- 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.

### **6.3    *Appendix 3 - Application Forms***

- (i)     Distributed Energy Resources (DER) Application Form
- (ii)    Connection Impact Assessment Generator Form
- (iii)   MicroFIT Connection Application Guidelines and Form
- (iv)    FIT Connection Application Guidelines
- (v)    Net Metering Connection Application Guidelines

## *Application Forms*

For the most up-to-date Application Forms and Guidelines, please contact:

***Distributed Energy Resources (DER)***  
***Toronto Hydro Electric System Limited***  
**[DER@torontohydro.com](mailto:DER@torontohydro.com)**  
***416-542-3099***

or visit the following web pages:

- (i) Distributed Energy Resources Application Form

<http://www.torontohydro.com/sites/electricsystem/electricityconservation/feedintariff/Pages/FITConnectionProcess.aspx>

- (ii) Connection Impact Assessment Generator Form

<http://www.torontohydro.com/sites/electricsystem/electricityconservation/feedintariff/Pages/FITConnectionProcess.aspx>

- (iii) MicroFIT Connection Application Guidelines and Form

<http://www.torontohydro.com/sites/electricsystem/electricityconservation/feedintariff/Pages/MicroFITConnectionProcess.aspx>

- (iv) FIT Connection Application Guidelines

<http://www.torontohydro.com/sites/electricsystem/electricityconservation/feedintariff/Pages/FITConnectionProcess.aspx>

- (v) Net Metering Connection Application Guidelines

<http://www.torontohydro.com/sites/electricsystem/business/yourmeter/Pages/NetMeteringConnectionProcess.aspx>

#### **6.4    *Appendix 4 - Charges, Standards, Sketches and Availability***

- (i)    MicroFIT or FIT Capacity Allocation Exempt Summary of Connections and Charges
- (ii)   Standard for Net Metering – Residential Service
- (iii)   Standards for MicroFIT Program Residential Service
- (iv)   Sketch of Commercial Feed-in Tariff Parallel Connection Outline
- (v)    Sketches for Feed-in Tariff Program
- (vi)   Toronto Hydro Requirements and Recommendations for FIT Projects
- (vii)   Distribution Availability Test (DAT) Information
- (viii) Distributed Generation Monitoring and Control Requirements

**Appendix 4(i) - MicroFIT or FIT Capacity Allocation Exempt Summary of  
Connections and Charges**

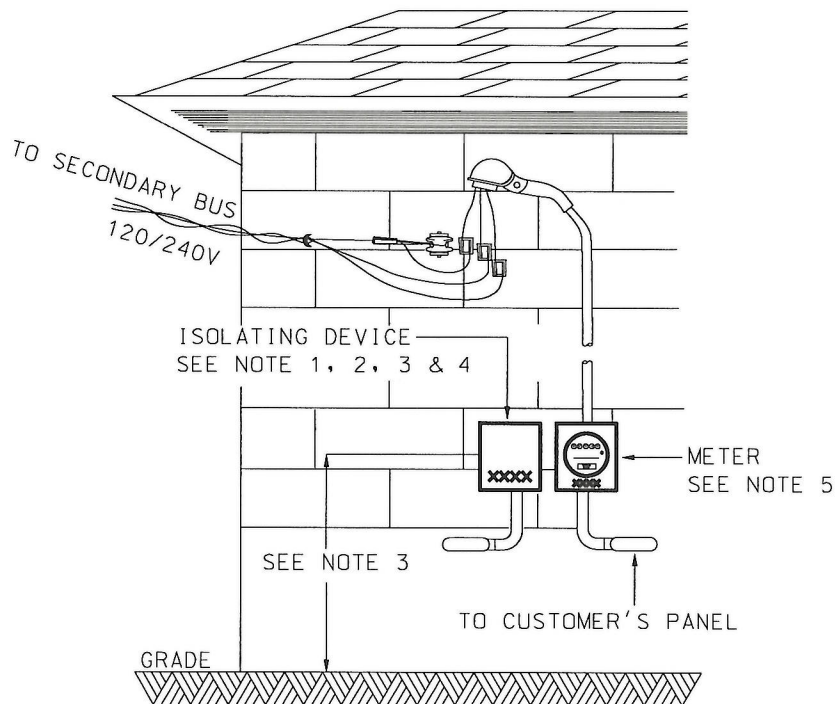
## **MicroFIT or FIT Capacity Allocation Exempt Summary of Connections and Charges**

For schedules, connection charges and fees, contact:

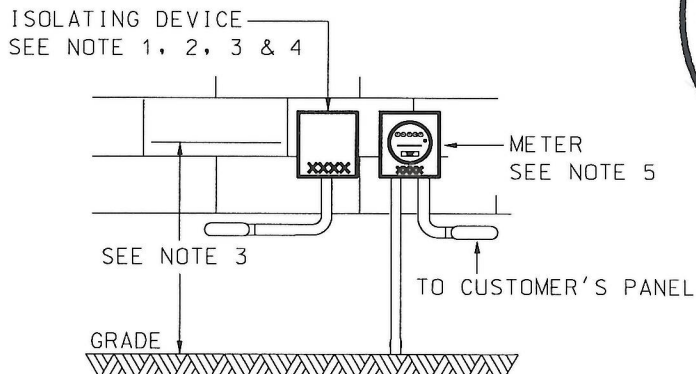
Distributed Energy Resources (DER)  
Toronto Hydro Electric System Limited  
[DER@torontohydro.com](mailto:DER@torontohydro.com)  
416-542-3099

## **Appendix 4(ii) - Standard for Net Metering – Residential Service**





⚠ DEVICE ISOLATION / OVERHEAD SUPPLY -  
METER AND ISOLATING DEVICE LOCATION



⚠ 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**



Approved By:

2016-05-30 [Signature]

Drafted By:  
M. S.

Designed By:  
S. K.

Original Issue:  
K. S. 2007-04-23

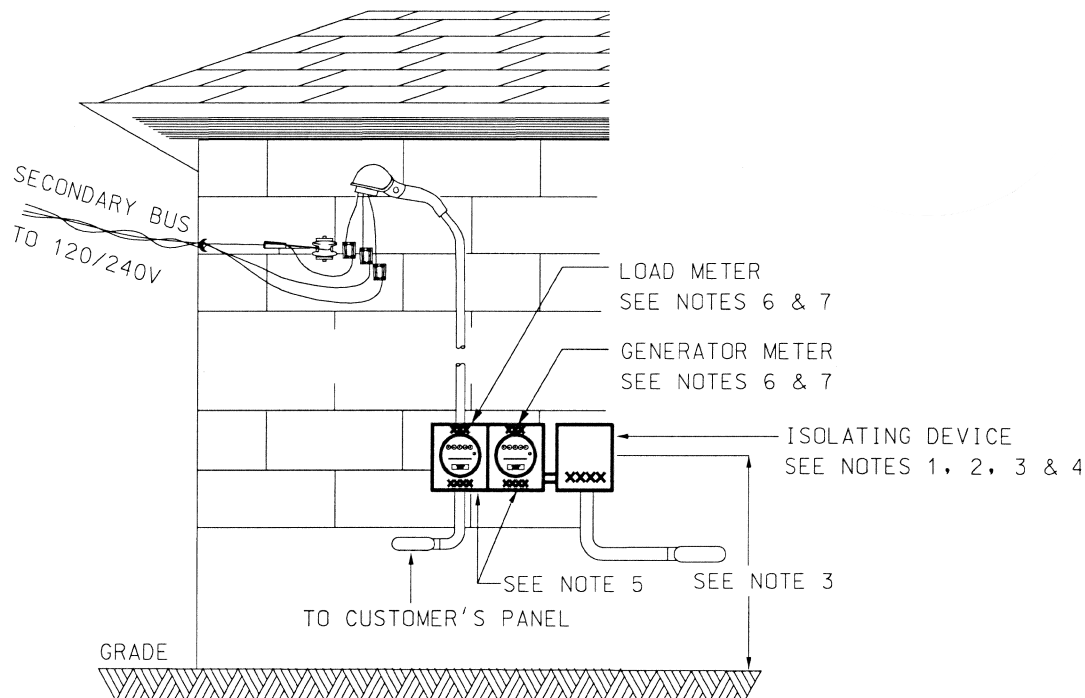
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N. T. S.

Rev: 3

17-9500

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## **Appendix 4(iii) - Standards for MicroFIT Program Residential Service**



## OVERHEAD 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 FROM OUTDOOR. OUTDOOR INSTALLATION SHALL BE WEATHER-PROOF.
- 2) THE ISOLATING DEVICE SHALL BE WITHIN 1000 mm (3'-4") OF THE "GENERATOR" 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 6 mm (1/4") HIGH WHITE LETTERS "DG SYSTEM DISCONNECT" ON BLACK BACKGROUND TO BE FASTENED PERMANENTLY TO ISOLATING DEVICE AS SHOWN.
- 5) CUSTOMER SHALL SUPPLY AND INSTALL A 75 mm X 19 mm (3" X 3/4") LAMACOID PLATE, COMES WITH MINIMUM 6 mm (1/4") HIGH WHITE LETTERS "WARNING-TWO POWER SOURCE SYSTEM" ON BLACK BACKGROUND TO BE FASTENED PERMANENTLY TO METER BASE AS SHOWN.
- 6) CUSTOMER SHALL SUPPLY AND INSTALL A 75 mm X 19 mm (3" X 3/4") LAMACOID PLATE, COMES WITH MINIMUM 6 mm (1/4") HIGH WHITE LETTERS "LOAD METER" & "GENERATOR METER" ON THE RESPECTIVE METER, "LOAD" AND "GENERATOR" ON BLACK BACKGROUND TO BE FASTENED PERMANENTLY TO METER BASE AS INDICATED.
- 7) CUSTOMER SHALL SUPPLY AND INSTALL METER BASE AS PER SECTION 6 - REFERENCE #6 "TORONTO HYDRO-ELECTRIC SYSTEM METERING REQUIREMENTS 750 VOLTS OR LESS" IN THE CONDITIONS OF SERVICE.

DISTRIBUTION CONSTRUCTION STANDARD  
Revenue Metering



Approved By:

2013-11-07

Drafted By:  
K.H.

Designed By:

I.E.

Original Issue:

K.S. 2010-03-11

Scale:

N.T.S.

Rev:

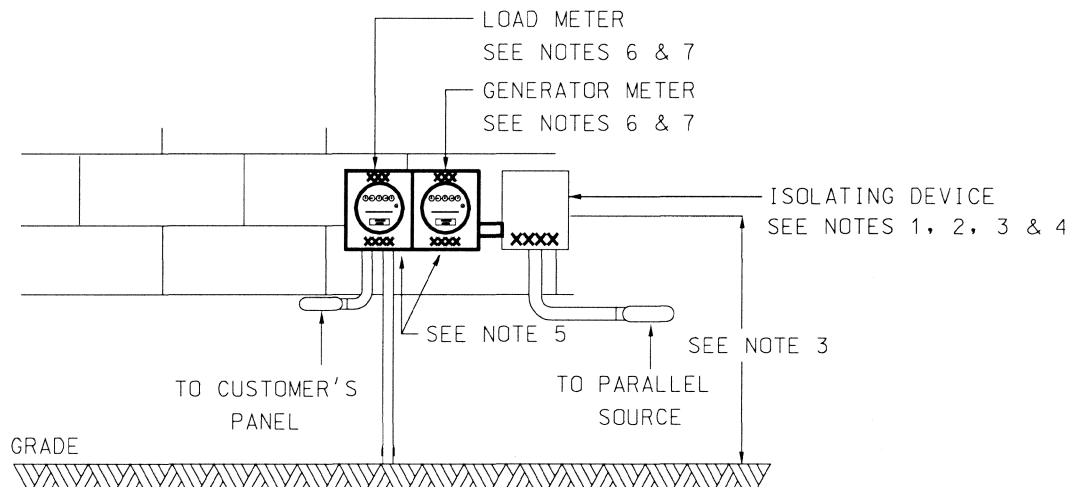
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## FEED-IN TARIFF

### RESIDENTIAL SERVICE MOUNTING LOCATION INDIRECT PARALLEL CONNECTION



## UNDERGROUND SUPPLY - METER AND ISOLATING DEVICE LOCATION

DISTRIBUTION CONSTRUCTION STANDARD  
Revenue Metering



Approved By:

2013-11-07

Drafted By:  
K.H.

Designed By:  
I.E.

Original Issue:  
K.S. 2010-03-11

Scale:  
N.T.S.

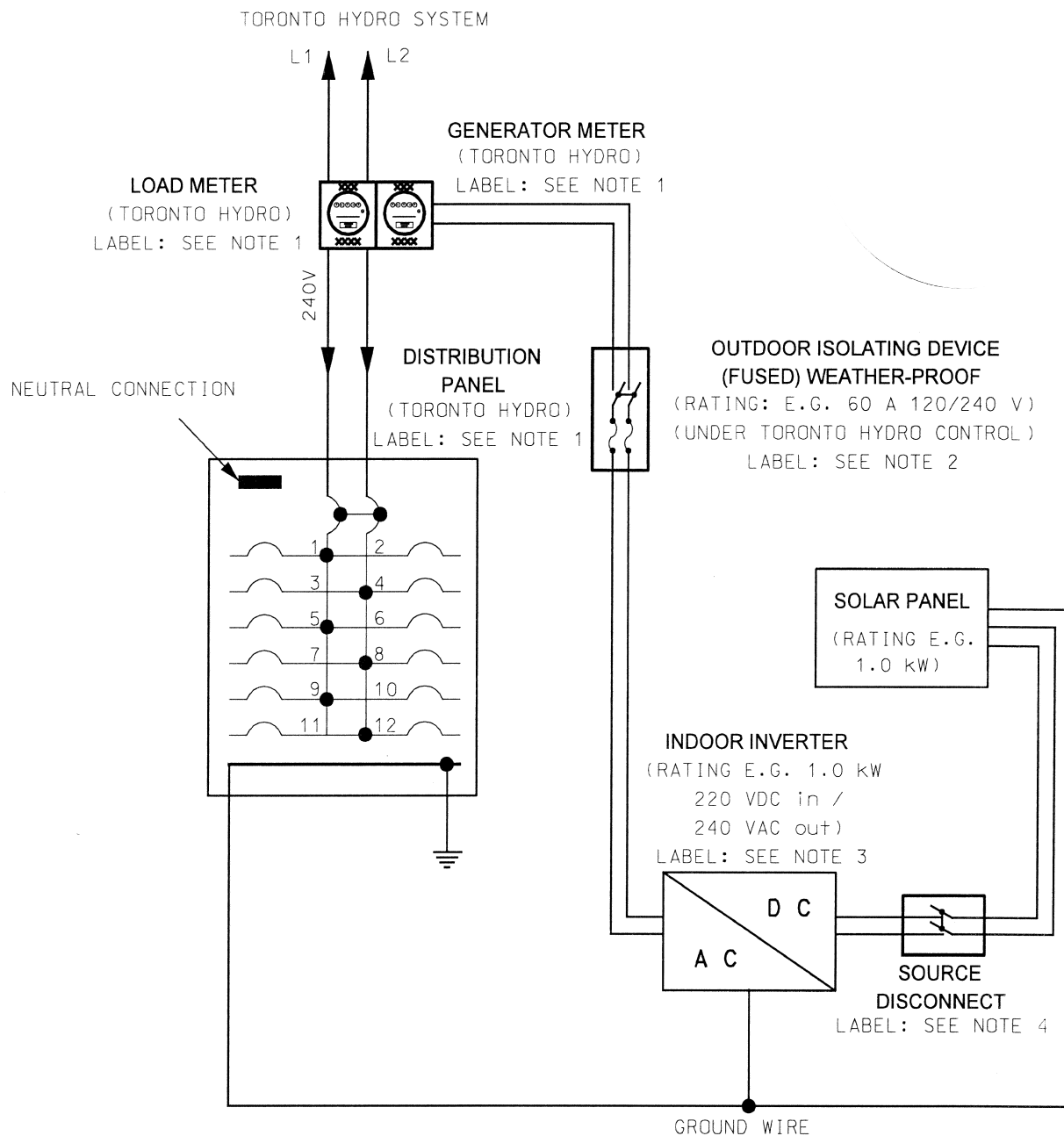
Rev:

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**FEED-IN TARIFF**  
**RESIDENTIAL SERVICE MOUNTING LOCATION**  
**INDIRECT PARALLEL CONNECTION**



**SINGLE LINE DIAGRAM**

**NOTES:**

- 1) LABELLED "WARNING-TWO POWER SOURCE SYSTEM".
- 2) MUST BE VISIBLE, ACCESSIBLE AND LOCKABLE FROM OUTDOORS, AND LABELLED "DG SYSTEM DISCONNECT".
- 3) LABELLED "UTILITY-INTERCONNECTED" AND "WARNING-POWER FED FROM MORE THAN ONE SOURCE".
- 4) LABELLED "DG SOURCE DISCONNECT".
- 5) ALL CONDUITS, WIRE SIZES AND TYPES SHALL BE AS PER OESC REQUIREMENT.
- 6) ALL INSTALLATIONS SHALL BE AS PER ESA REQUIREMENT.


DISTRIBUTION CONSTRUCTION STANDARD Revenue Metering			FEED-IN TARIFF PROGRAM RESIDENTIAL SERVICE GRID TIE EXPORT OF POWER INDIRECT PARALLEL CONNECTION			
	Approved By:			Original Issue:	Scale:	Rev:
	Drafted By:			K.S. 2010-05-18	N.T.S.	1
						17-9710
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## **Appendix 4(iv) - Sketch of Commercial Feed-in Tariff Parallel Connection Outline**


# COMMERCIAL FEED IN TARIFF PARALLEL CONNECTION OUTLINE

2 Generation Planning Department

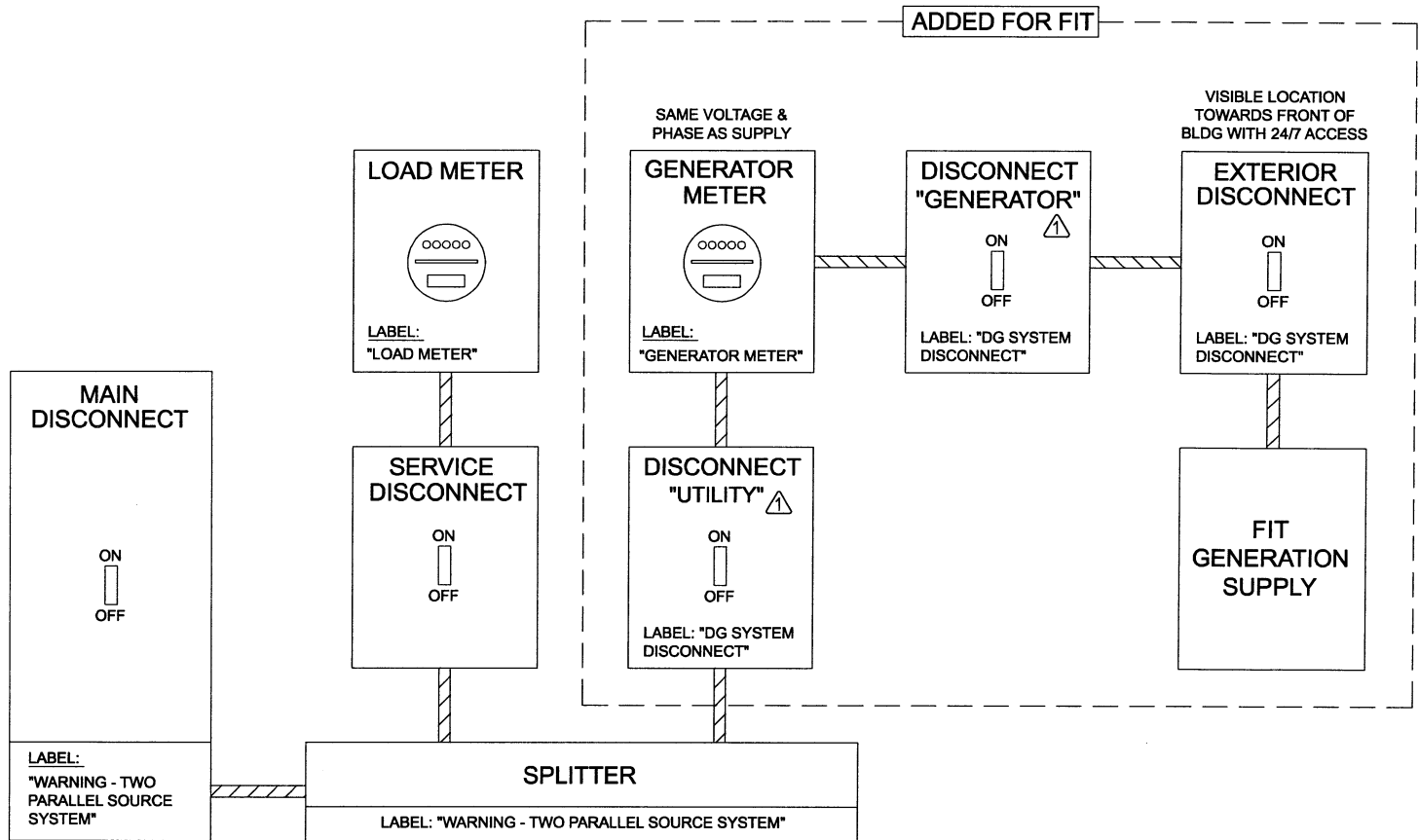
1. All Distributed Generation (DG) systems shall be connected to Toronto Hydro Electric System at the existing supply voltage.
2. FIT connection point shall be determined by Toronto Hydro and ESA and must be ahead of all metering.
3. DG system metering base shall be identical to voltage and phase as supply meter.
4. Customer shall supply and install meter base as per Section 6 - Reference # 6 "Toronto Hydro - Electric System Metering Requirements 750 Volts or Less" in the Conditions of Service.
5. All labels shall be 75 mm x 19 mm (3" x 3/4") lamacoid plate c/w minimum 6 mm (1/4") high white letters on black background to be fastened permanently to the respective item.
6. Customer shall supply and install the following labels at their specified locations:
  - "LOAD METER" & GENERATOR METER"
  - "DG SYSTEM DISCONNECT"
  - "WARNING - TWO PARALLEL SOURCE SYSTEM"
  - "GENERATOR" & "UTILITY"
7. If applicable, Toronto Hydro shall supply the following labels which are to be installed by the customer:
  - "PARALLEL GENERATOR" on overhead connection standpipe applied 250 mm (10") below weather head.
8. Toronto Hydro shall supply and install the following labels:
  - "PARALLEL GENERATOR" in vault or equipment room controlled solely by Toronto Hydro.
  - "PARALLEL GENERATOR" on pad-mounted equipment or any other Toronto Hydro equipment.
9. If no main service disconnect exists at location, customer shall consult ESA for requirements.
10. The exterior isolating device is supplied by the customer for use by Toronto Hydro personnel and shall be visible, accessible and lockable 24/7 at a height of 1730 mm (5' - 8"). Location of DG Disconnect shall be determined per Toronto Hydro site visit.
11. The exterior isolating device can be equipped with customer lock if "U" bolt is provided by the customer for a Toronto Hydro lock to be placed at one end.
12. DG Distribution Panel or Disconnect shall be in the same location as the meter and shall be labeled "Parallel Generator Source."
13. Meter room isolating devices shall be within 2000 mm (6' - 6") of the "Generator" meter.
14. Additional disconnect switch shall be installed when connected to a splitter for meter base isolation. It is not required when connected to a distribution panel through a circuit breaker.

DISTRIBUTION CONSTRUCTION SKETCH Generation Planning		COMMERCIAL FEED IN TARIFF (FIT) PARALLEL CONNECTION OUTLINE TYPICAL UNDERGROUND OR OVERHEAD SUPPLY					
	Approved by: <i>[Signature]</i> 2012 - 01 - 20						
	Drafted by: A.M.E.	Designed by: T.T.	Original issue: K.S. 2011-11-22	Scale: N.T.S.	Rev. 2	SKE-41	1/2

15. If "Generator" meter is not in the same room as the "Load" meter, dedicated Bell line shall be installed from the "Generator" meter to the "Load" meter.
16. When Tap Box or Bus Bar Connection Point is necessary, it is subject to ESA approval.
17. All conduits and wire sizes shall be as per ESA requirements.
18. Customer is responsible for all inspection, isolation and standby costs.
19. Toronto Hydro layout requirements are in addition to OESC requirements.
20. Customer shall adapt existing service to accommodate layout requirements.
21. Equipment layout is subject to Toronto Hydro site inspection.

DISTRIBUTION CONSTRUCTION SKETCH Generation Planning		COMMERCIAL FEED IN TARIFF (FIT) PARALLEL CONNECTION OUTLINE TYPICAL UNDERGROUND OR OVERHEAD SUPPLY						
	Approved by: <i>Kalacka</i> 2012-01-20		Original issue: K.S. 2011-11-22		Scale: N.T.S.	Rev. 2	SKE-41	2/2
	Drafted by: A.M.E.	Designed by: T.T.						





EXISTING CUSTOMER INFRASTRUCTURE

DISTRIBUTION CONSTRUCTION SKETCH  
Generation Planning



Approved By: *[Signature]*

2011/09/02

Drafted By:  
A.E.G.

Designed By:  
T.T.

Original Issue:  
K.S. 2010-11-22

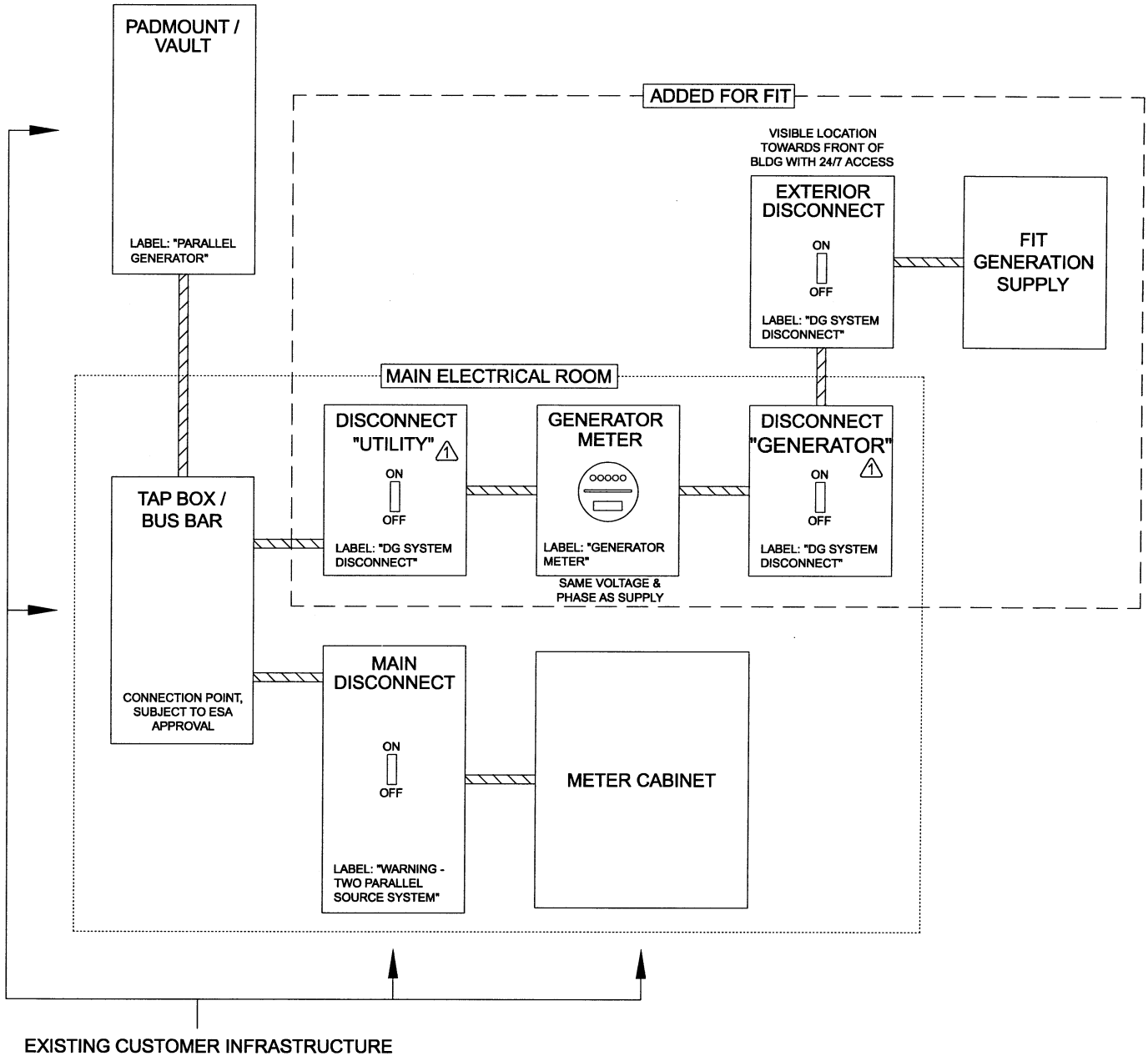
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Rev:  
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SKE-42

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**COMMERCIAL FEED IN TARIFF  
PARALLEL CONNECTION OUTLINE  
TYPICAL UNDERGROUND OR OVERHEAD SUPPLY**



DISTRIBUTION CONSTRUCTION SKETCH  
Generation Planning



Approved By:

2011/09/02

Drafted By:  
A.E.G.

Designed By:  
T.T.

Original Issue:  
K.S. 2010-11-22

Scale:  
N.T.S.

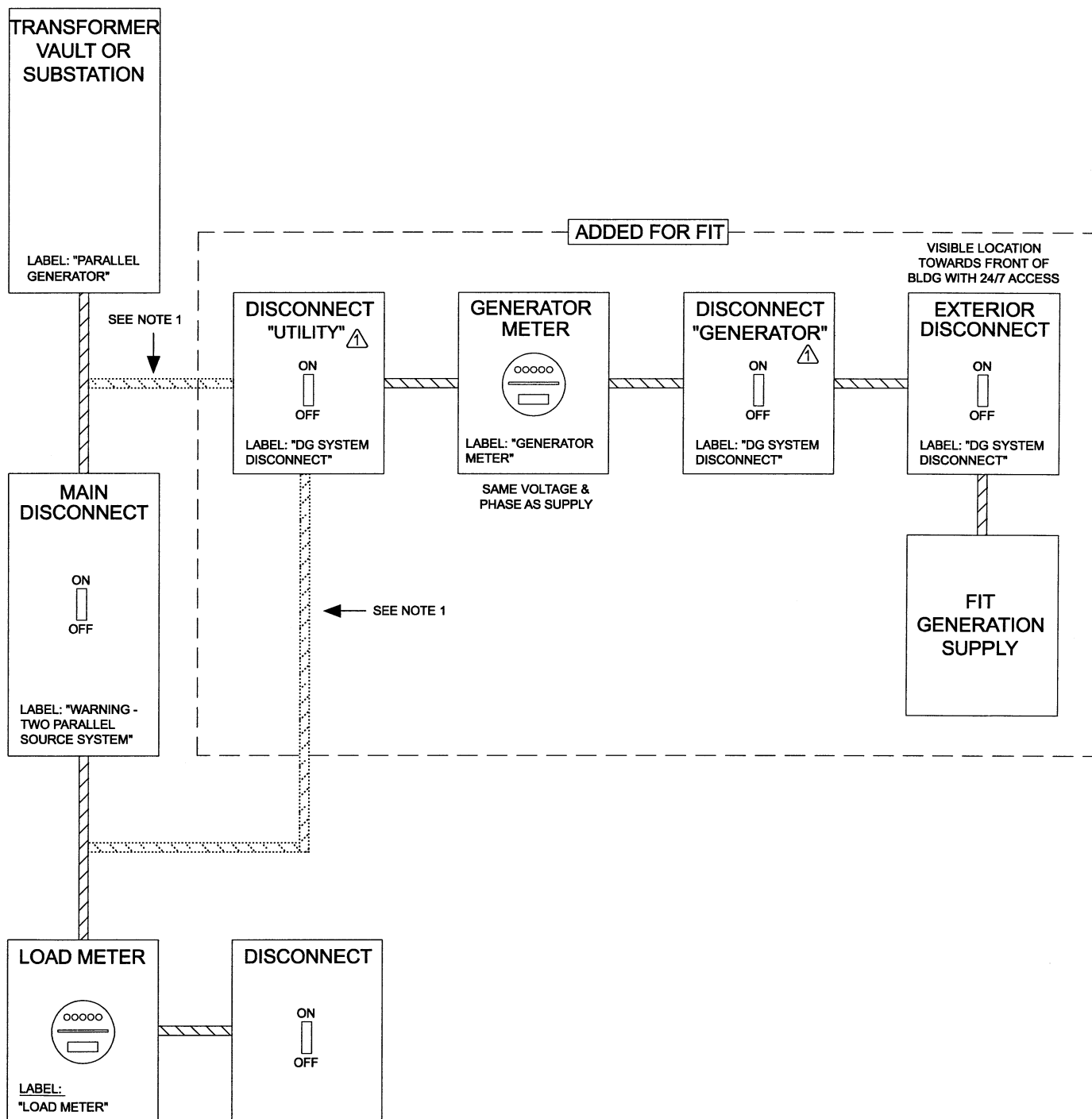
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SKE-43

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**COMMERCIAL FEED IN TARIFF  
PARALLEL CONNECTION OUTLINE  
TYPICAL PADMOUNT OR VAULT SUPPLY**



# EXISTING CUSTOMER INFRASTRUCTURE

## NOTES:

- 1) DG SYSTEM DISCONNECT SWITCH MAY BE CONNECTED TO THE LINE SIDE OR THE LOAD SIDE OF THE MAIN DISCONNECT SWITCH

DISTRIBUTION CONSTRUCTION SKETCH  
Generation Planning



Approved By: *[Signature]*

2011/09/02

Drafted By:

A.E.G.

Designed By:

T.T.

Original Issue:

K.S. 2010-11-22

Scale:

N.T.S.

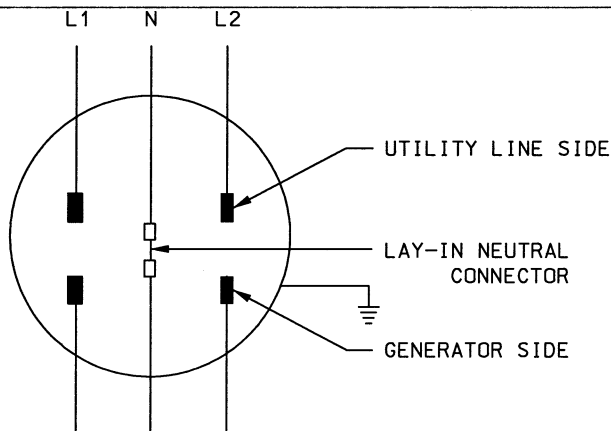
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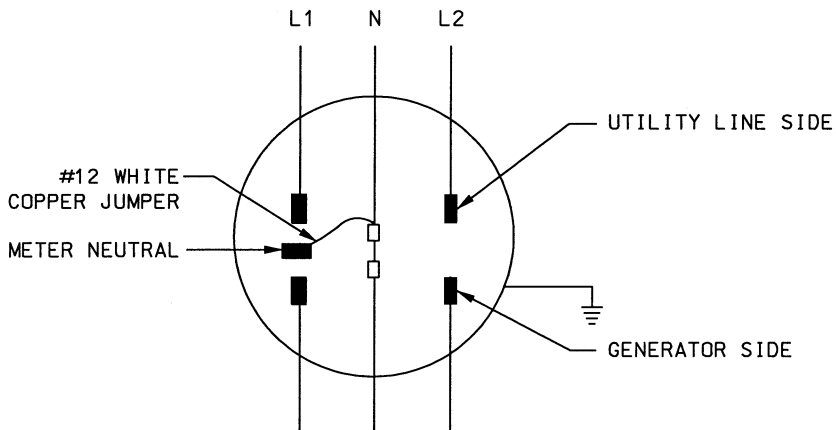
## COMMERCIAL FEED IN TARIFF PARALLEL CONNECTION OUTLINE LARGE GENERATION SERVICES

SKE-44

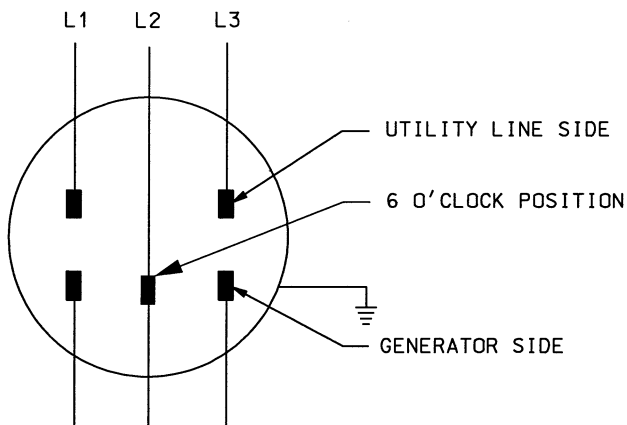
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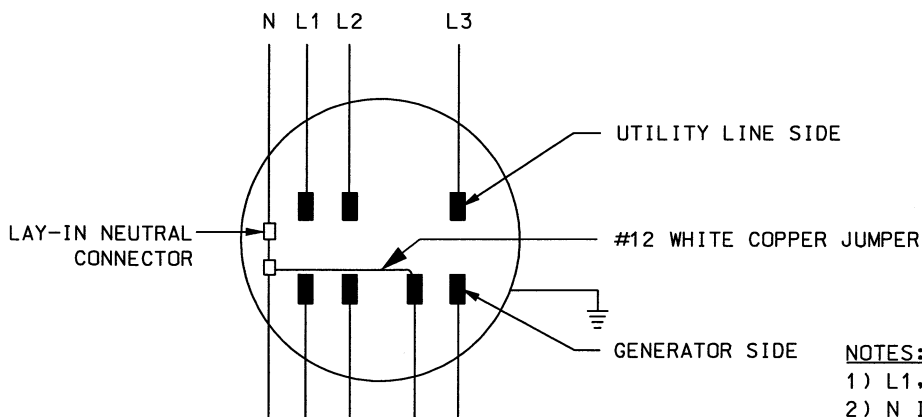
120/240 VOLT SINGLE-PHASE  
4-JAW SOCKET



120/208 VOLT 2-PHASE PLUS NEUTRAL  
5-JAW SOCKET



600 VOLT 3-PHASE, 3-WIRE  
5-JAW SOCKET  
(NOT AVAILABLE TO  
NEW CUSTOMERS)



3-PHASE, 4-WIRE  
7-JAW SOCKET

**NOTES:**

- 1) L1, L2, & L3 ARE SECONDARY LINE TERMINALS.
- 2) N IS NEUTRAL.

DISTRIBUTION CONSTRUCTION SKETCH  
Distributed Generation Revenue Metering



Approved By:

2011/09/02

Drafted By:

A.E.G.

Designed By:

T.T.

Original Issue:

Scale:

N.T.S.

Rev:

0

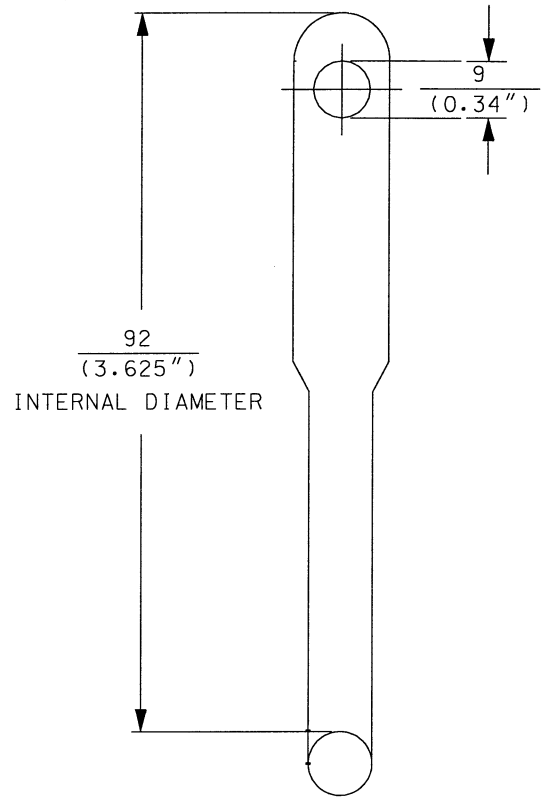
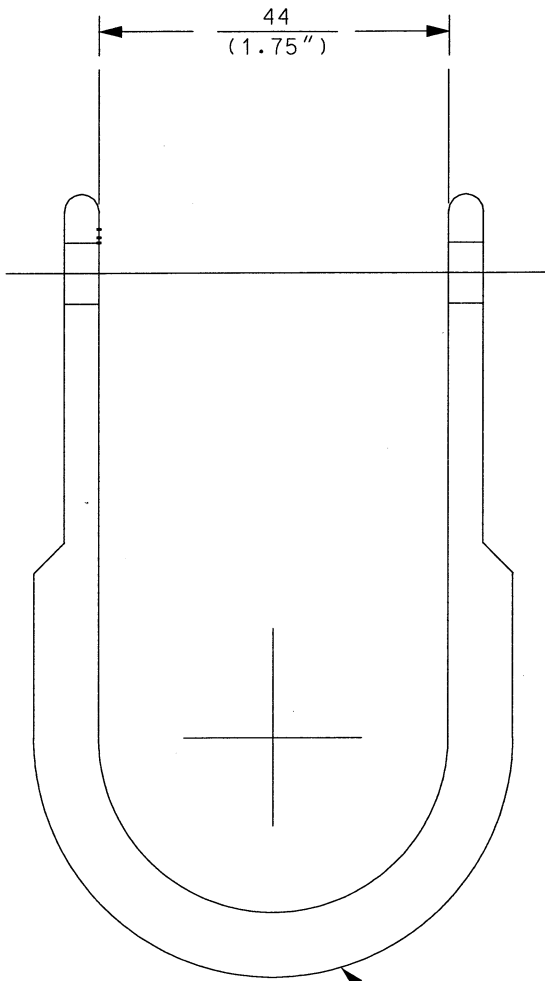
SKE-70

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## SECONDARY - TYPICAL TERMINAL ARRANGEMENTS

S-BASE TYPE, 120/240, 120/208 & 347/600V, 200A

## **Appendix 4(v) - Sketches for Feed-in Tariff Program**



SEE NOTES 2 AND 3

**NOTES:**

- 1) REFER TO POINT NO.11 IN SKE-41 "COMMERCIAL FEED IN TARIFF CONNECTION OUTLINE" FOR DETAILS.
- 2) STEEL ROUND BAR SHALL BE 9.5(0.375").
- 3) HOT DIP GALVANIZED IN ACCORDANCE WITH CSA G164 SPECIFICATION.

DISTRIBUTION CONSTRUCTION STANDARD

**"U" BOLT DETAIL**  
**FOR DISTRIBUTED GENERATION**



Approved By:  
*[Signature]* 2011/10/14  
Drafted By: S.P.  
Designed By: T.T.

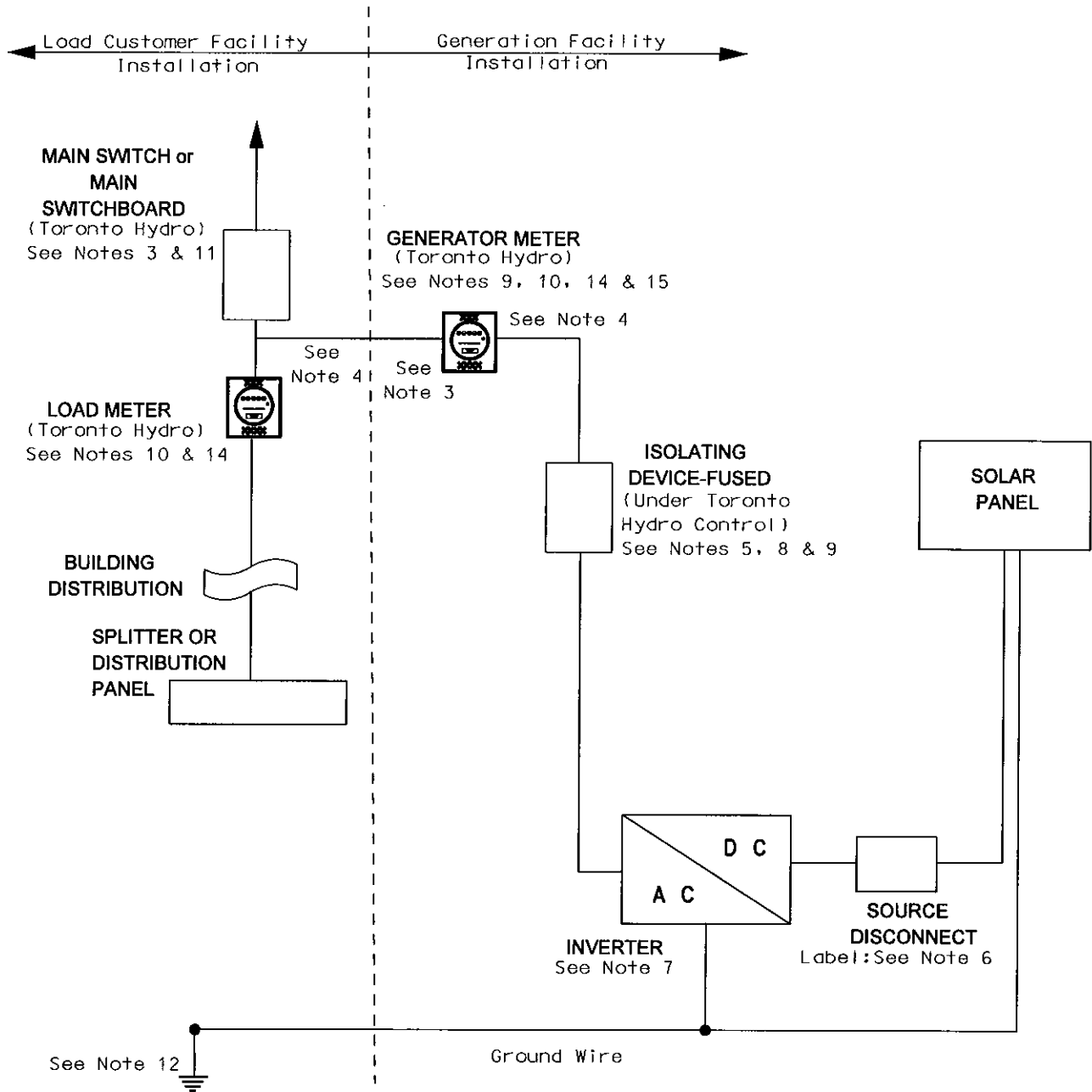
Original Issue:

Scale:  
N.T.S

Rev: 0

SKE-65

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# FEED-IN TARIFF NON-RESIDENTIAL SERVICE INDIRECT PARALLEL CONNECTION



civil:   
 electrical: *blaker*   
 original issue: *Sep 13/2010*   
 scale: N.T.S.

rev. 1

rev. 2


rev. 3

SKE-29

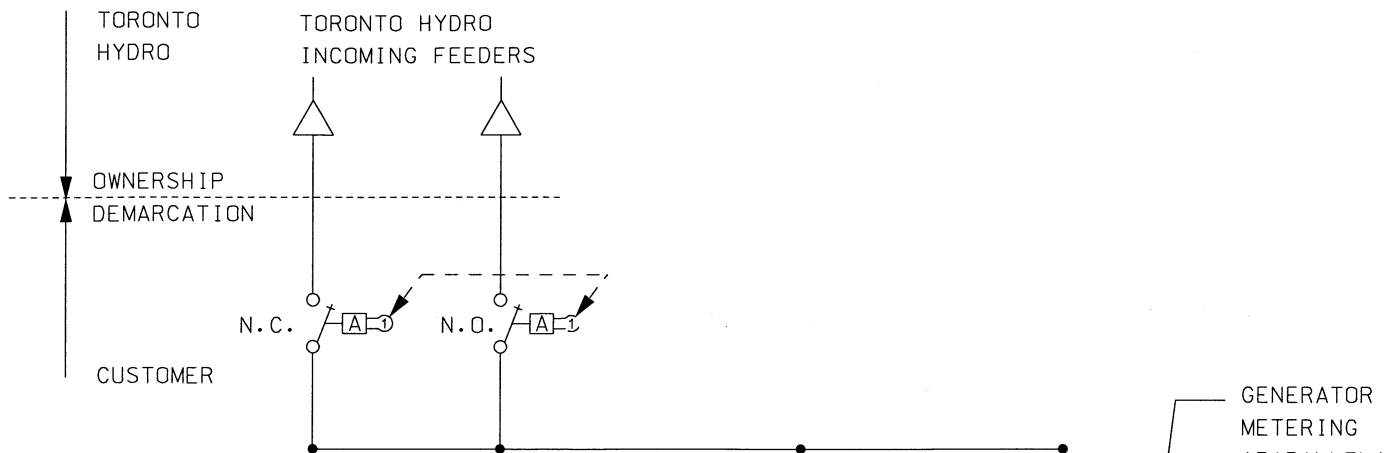
1/2

**NOTES:**

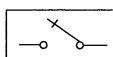
1. All labels shall be supplied and installed by customer, except for "Parallel Generator" on service mast.
2. All labels shall be 75 mm x 19 mm (3" x 3/4") Lamacoid plate c/w minimum 6 mm (1/4") high white letters on black background to be fastened permanently to the respective item.
3. Label "WARNING - TWO POWER SOURCE SYSTEM" to the main switch.
4. Label "LOAD METER" & "GENERATOR METER" to the respective, "Load" and "Generator" meter base as shown.
5. Label "DG SYSTEM DISCONNECT".
6. Label "DG SOURCE DISCONNECT".
7. Label "UTILITY - INTERCONNECTED" AND "WARNING - POWER FED FROM MORE THAN ONE SOURCE".
8. The isolating device, e.g. fused disconnect switch or circuit breaker, is supplied by customer for use by Toronto Hydro Personnel and shall be visible, accessible and lookable.
9. The isolating device shall be within 1000 mm of the "Generator" meter.
10. Customer to supply and install meter base as per Section 6 - Reference # 6 "Toronto Hydro - Electric System Metering Requirements 750 Volts or less" in the Conditions of Service.
11. Main switch or Main Switchboard shall indicate location of DG Disconnect Switch using Lamacoid labels. Label shall be 19 mm (3/4") wide Lamacoid plate c/w minimum 6 mm (1/4") high white letters on black background and shall be fastened permanently.
12. Grounding shall meet ESA requirements.
13. Additional disconnect switch shall be installed when connected to a splitter for meter base isolation. Not required when connected to a distribution panel through a circuit breaker.
14. If "Generator" meter is not in the same room as the "Load" meter, a dedicated Bell line shall be installed from the "Generator" meter to the "Load" meter.
15. Generator shall be connected to the load side of "Generator" meter base.
16. All conduits, wire types and sizes shall be as per ESA requirements.
17. Metering arrangement is applicable to different voltages, subject to the availability of meters in Toronto Hydro for the appropriate voltage.

			<b>FEED-IN TARIFF NON-RESIDENTIAL SERVICE INDIRECT PARALLEL CONNECTION</b>					
			civil: original issue: 5-2p 13/2010	electrical: <i>Kdarker</i> scale: N.T.S.	rev. 1	rev. 2	rev. 3	SKE-29

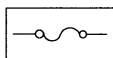




#### LEGEND:



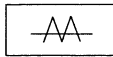
LOADBREAK SWITCH



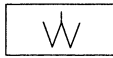
FUSE



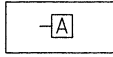
POWER TRANSFORMER



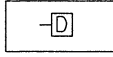
CURRENT TRANSFORMER



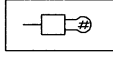
VOLTAGE TRANSFORMER



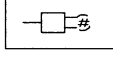
MECHANISM LOCK:  
KEY RELEASED WHEN  
SWITCH LOCKED OPEN



MECHANISM LOCK:  
KEY RETAINED WHEN  
DOOR OPEN

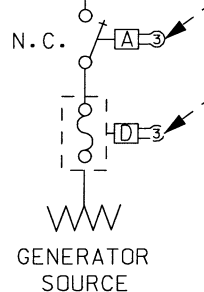
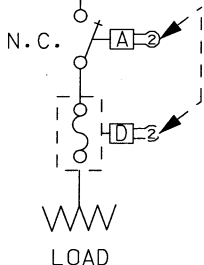


# KEY SHOWN IN LOCK



# KEY REMOVED FROM LOCK

LOAD METERING  
SEE NOTE 1



INTERLOCK A1 TO A1: PREVENTS THE INCOMING LINES FROM  
BEING PARALLELED BY THE CUSTOMER.

INTERLOCKS A2 TO D2, A3 TO D3: PREVENTS THE FUSE COMPARTMENT  
DOOR FROM BEING OPENED WHILE THE ADJACENT SWITCHES ARE CLOSED.

#### NOTES:

- 1) METERING IS INDICATED ON THE PRIMARY SIDE OF THE LOAD AND THE GENERATOR SOURCE. HOWEVER, DUE TO SITUATIONAL CONSTRAINTS, IT MAY BE REQUIRED TO METER ON THE SECONDARY SIDE OF THE LOAD AND THE GENERATOR SOURCE.
- 2) FUSED LOADBREAK SWITCHES MAY BE INSTALLED ON THE LINE SIDE OF THE LOAD AND GENERATOR METERING TO ACCOMMODATE INSTALLATION AND/OR SWITCHING NEEDS.

DISTRIBUTION CONSTRUCTION STANDARD

## FIT - PRIMARY CONNECTED DG REQUIREMENTS

### TYPICAL SINGLE LINE DIAGRAM



Approved By: *[Signature]*  
2011-09-12

Drafted By:  
A.M.E.

Designed By:  
T.T.

Original Issue:

Scale:  
N.T.S.

Rev:

0

SKE-62

1/2

# INSTALLATION REQUIREMENTS:

- 1) ALL LABELS SHALL BE SUPPLIED AND INSTALLED BY CUSTOMER.
- 2) ALL LABELS SHALL BE 75mm X 19mm (3" X 3/4") LAMACOID PLATE COMPLETE WITH MINIMUM 6mm (1/4") HIGH WHITE LETTERS ON BLACK BACKGROUND TO BE FASTENED PERMANENTLY TO THE RESPECTIVE ITEM.
- 3) LABEL "WARNING - TWO POWER SOURCE PARALLEL SYSTEM" AT THE MAIN SWITCH.
- 4) LABEL "LOAD METER" & "GENERATOR METER" AT THE RESPECTIVE LOAD AND GENERATOR METER BASE AS SHOWN.
- 5) LABEL "DG SYSTEM DISCONNECT".
- 6) LABEL "DG SOURCE DISCONNECT".
- 7) LABEL "UTILITY - INTERCONNECTED" AND "WARNING - POWER FED FROM MORE THAN ONE SOURCE".
- 8) THE ISOLATING DEVICE, E.G. FUSED DISCONNECT SWITCH OR CIRCUIT BREAKER, IS SUPPLIED BY CUSTOMER FOR USE BY TORONTO HYDRO PERSONNEL AND SHALL BE VISIBLE, ACCESSIBLE AND LOCKABLE.
- 9) THE ISOLATING DEVICE SHALL BE WITHIN 5mm FROM THE "GENERATOR" METER.
- 10) CUSTOMER TO SUPPLY AND INSTALL METER CABINET AS PER SECTION 6 - REFERENCE #6 "TORONTO HYDRO - ELECTRIC SYSTEM METERING REQUIREMENTS 750 VOLTS OR LESS" IN THE CONDITIONS OF SERVICE.
- 11) MAIN SWITCH OR MAIN SWITCHBOARD SHALL INDICATE LOCATION OF DG DISCONNECT SWITCH USING LAMACOID LABEL. LABEL SHALL BE 19mm (3/4") WIDE LAMACOID PLATE COMPLETE WITH MINIMUM 6mm (1/4") HIGH WHITE LETTERS ON BLACK BACKGROUND AND SHALL BE FASTENED PERMANENTLY.
- 12) GROUNDING SHALL MEET ESA REQUIREMENTS.
- 13) A DEDICATED BELL LINE SHALL BE INSTALLED FOR THE "GENERATOR" METER.
- 14) GENERATOR SHALL BE CONNECTED TO THE LOAD SIDE OF "GENERATOR" METER.
- 15) ALL CONDUITS, WIRE TYPES AND SIZES SHALL BE AS PER ESA REQUIREMENTS.
- 16) METERING ARRANGEMENT IS APPLICABLE TO DIFFERENT VOLTAGES, SUBJECT TO AVAILABILITY OF METERS IN TORONTO HYDRO FOR THE APPROPRIATE VOLTAGE.
- 17) INSTALLATION OF 1/2" EMT CONDUIT BETWEEN THE REVENUE METERING CABINET AND THE TELECOM ROOM WITH 2 PAIR / 4 CONDUCTOR TELEPHONE CABLE AND RJ11 (4 PIN) TELEPHONE JACK. THE TELEPHONE JACK IS TO BE LEFT AT THE BOTTOM OF THE METER CABINET WITH ENOUGH TELEPHONE CABLE TO ALLOW MOUNTING THE JACK ANYWHERE IN THE CABINET. THE TELEPHONE CABLE TERMINATING IN THE TELECOM ROOM IS TO BE CLEARLY LABELED "TORONTO HYDRO METERING".
- 18) TORONTO HYDRO WILL ARRANGE TO HAVE THE TELEPHONE LINE ACTIVATED. CUSTOMER OWNED TELEPHONE LINES OR CUSTOMER SHARED TELEPHONE LINES ARE NOT ACCEPTABLE.
- 19) INSTALLATION OF A 120V DUPLEX RECEPTACLE AT THE BOTTOM RIGHT CORNER OF THE METER CABINET. IF POSSIBLE, THE RECEPTACLE IS TO BE CONNECTED TO AN UNINTERRUPTIBLE POWER SUPPLY (UPS).
- 20) THE NAME AND PHONE NUMBER OF AN ON-SITE CONTACT PERSON.

DISTRIBUTION CONSTRUCTION STANDARD

## FIT - PRIMARY CONNECTED DG REQUIREMENTS INSTALLATION REQUIREMENTS



Approved By: *[Signature]*

2011-09-12

Drafted By:  
A. M. E.

Designed By:  
T. T.

Original Issue:

Scale:  
N. T. S.

Rev:

0

SKE-62

2/2

**Appendix 4(vi) - Toronto Hydro Requirements and Recommendations  
for FIT Projects**

# Toronto Hydro Requirements and Recommendations for Feed-in-Tariff Projects

The Generator shall:

1. Assume the connection cost of upgrading, if applicable, the size of service cables and/or the utility transformer;
2. Confirm that the disconnect switch available for Toronto Hydro operation is accessible, visible, lockable and contains a viewing window;
3. Provide communication facilities for metering as necessary. Requirements for metering are attached herewith;
4. Provide monitoring and control of the DG facilities as necessary.
5. Confirm that upon operating the main exterior disconnect on the line side of the meter open, all individual disconnects connected on the utility side of inverters will trip open<sup>1</sup>;
6. Perform a test on site that confirms that upon operating the main exterior disconnect open, all inverters connected upstream on the project will automatically shut down due to the anti-islanding feature of the inverter being enabled. Toronto Hydro personnel must be present to witness this test

Customer is to provide test results to Toronto Hydro prior to full settlement of account;

7. Perform tests to confirm that individual, "N" quantity of inverters, and total operation (i.e. one inverter on, two inverters on and all Quantity "N" inverters on at a time) does not in any way compromise the stability or reliability of the connection point. Parameters to be tested and reported on will include at a minimum:
  - a. Power Factor
  - b. Harmonics
  - c. Phase Rotation
  - d. Voltage Regulation
  - e. Synchronization
  - f. Over and Under Frequency Protection

All of the above requirements and recommendations must adhere to Toronto Hydro's utility requirements for connection - Conditions of Service Reference #3: Distributed Generation Requirements.

1. Upon re-energization of Toronto Hydro supply, it is the responsibility of the Generator to reclose the breaker/disconnect(s) on inverter(s) and turn inverter(s) on.

## ***Warning Signs and Diagrams***

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

### **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 embedded generator and isolation point with their locking and interlocking arrangements, if any available.

Operating designations will be assigned to the switching equipment of the generation 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.

## ***Commissioning and Witnessing Requirements***

- a) 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 Authorization to Connect from ESA.
- b) As per Section 4.7.4 of 'Toronto Hydro – Distributed Generation Requirements', Toronto Hydro has the right to witness the commissioning and testing of the connection of generation 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.
- c) A commissioning verification report certified by a Professional Engineer shall be provided to Toronto Hydro for all projects greater than 10kW. The commissioning report shall be submitted for approval before the operation of the distribution generation facility. Requirements for commissioning are attached herewith

## ***Metering Requirements***

Toronto Hydro requires telephone line communication capability with all DG's which are connected to its grid.

Communication requirements for metering:

1. Installation of ½ EMT conduit between the revenue metering cabinet and the Telecom room with a 2 pair/4 conductor telephone cable and a RJ11 (4 pin) telephone jack. The telephone jack is to be left at the bottom of the meter cabinet with enough telephone cable to allow mounting the jack anywhere in the cabinet. The telephone cable terminating in the telecom room is to be clearly labeled TORONTO HYDRO METERING.
2. Toronto Hydro will arrange to have the telephone line activated. Customer owned telephone lines or customer shared telephone lines are not acceptable.
3. Installation of a 120V duplex receptacle at the bottom right corner of the meter cabinet. The receptacle is to be connected to an uninterruptible power supply (UPS), if possible.
4. Toronto Hydro shall be provided with the name and phone number of an on-site contact person.



# Toronto Hydro - Electric System

## FIT Commissioning Requirements and Reports

Comments and inquiries can be e-mailed to: [DER@torontohydro.com](mailto:DER@torontohydro.com)

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

Generation Planning & System Studies  
Toronto Hydro-Electric System Limited  
3rd Floor  
500 Commissioners Street  
Toronto, Ontario  
M4M 3N7

Attn: Gary Thompson

To contact Toronto Hydro call (416) 542-3099 or e-mail at: [DER@torontohydro.com](mailto:DER@torontohydro.com)

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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.

## **TABLE OF CONTENTS**

<b>INTRODUCTION.....</b>	<b>3</b>
<b>FIT PROJECT COMMISSIONING SUMMARY .....</b>	<b>4</b>
<b>EQUIPMENT VERIFICATION AND COMMISSIONING TESTING CHECKLIST .....</b>	<b>5</b>
<b>EQUIPMENT RATINGS AND REQUIREMENTS .....</b>	<b>5</b>
<b>ELECTRICAL SPECIFICATIONS .....</b>	<b>6</b>
<b>CEASE TO ENERGIZE .....</b>	<b>6</b>
<b>CEASE TO ENERGIZE - ON SITE TESTING .....</b>	<b>7</b>
<b>MONITORING AND CONTROL .....</b>	<b>8</b>
<b>DEFECIENCIES.....</b>	<b>9</b>
<b>SUPPLEMENTARY DOCUMENTATION.....</b>	<b>10</b>
<b>VERIFICATION OF REPORT AND SIGNAURE BLOCK .....</b>	<b>10</b>
<b>COMMISSIONING TEST LAYOUT &amp; HARMONIC DISTORTION TABLE.....</b>	<b>11</b>
<b>APPENDICIES.....</b>	<b>12</b>



## INTRODUCTION

The technical requirements for parallel generation 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 Generator 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 generation 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 ***FIT 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 distribution generation facility.

The verification of the ***FIT Commissioning Report*** must be signed and sealed by a 3<sup>rd</sup> 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 Appendix F.2 of the Distribution System Code's ("DSC"), Institute of Electrical and Electronics Engineers ("IEEE") Standard 1547, and CAN/CSA C22.2 No. 257-06. Generators 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 Generation facility shall also satisfy the following: "*Toronto Hydro Requirements for Design and Construction of Customer-Owned Substation High Voltage Substations*".

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

<b>FIT PROJECT COMMISSIONING SUMMARY</b>					
<b>Project Details</b>					
<b>FIT Reference No.</b>					
<b>Project Address</b>					
<b>Project Name</b>					
<b>System Size (kW)</b>					
<b>Transformer Station and Bus</b>					
<b>Feeder Name</b>					
<b>Utility Transformer Size (kVA)</b>					
<b>Utility Transformer Voltage (HV/LV)</b>					
<b>Number of Strings</b>					
<b>Number of Inverters</b>					
<b>Inverter Manufacturer</b>					
<b>Inverter Serial Numbers</b>					
1.		2.		3.	
4.		5.		6.	
7.		8.		9.	
10.		11.		12.	
13.		14.		15.	
16.		17.		18.	
19.		20.		21.	
22.		23.		24.	
<b>Contact Information</b>					
<b>DG System Owner</b>					
<b>DG System Owner Contact</b>					
					<b>PEO File No.</b>
<b>Design Engineer</b>					
<b>Commissioning Engineer</b>					
<b>3<sup>rd</sup> Party Independent Engineer</b>					
<b>Toronto Hydro Representative</b>					
<b>Notes:</b>					
<b>Commissioning Information</b>					
<b>Date of Commissioning</b>					
<b>General Weather Conditions</b>					
<b>Power Analyser</b>					
<b>Notes:</b>					

## 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
Inverters, circuit breakers and protective relays are functioning correctly	DSC Appendix F.2 Section 5  Toronto Hydro Requirement		
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. DG 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  $\leq 0.5\text{sec}$ . 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 generation facility ceases to energize under the following conditions: <b>Internal Faults</b> at the Customer's Facility  <b>External Faults</b> 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 DG 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. DG disconnect switch must remain open for a minimum of 2 minutes.
4. Upon confirmation of Step 3, the main exterior DG 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  $\leq 0.5\text{sec}$ . 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 generation 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		
System ceased to energize for 5 minutes, upon the re-closing of the main exterior DG disconnect switch (Step 5).	CSA C22.2 No. 257-06 Clause 5.3.11		
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 Generation Facility has provision for real time monitoring items:			
1. Analogue Quantities	Toronto Hydro Requirement		
a) Apparent Power (KVA) output and Power Factor and direction for each unit or total for the DG Facility			
b) Frequency (Hz)			
c) Phase to phase voltage (V)			
d) Three phase currents (A)			
2. Device Statuses			
a) Status of consolidated DG 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 DG Facility has fallen below 0.9 or over 1.1			
d) Status of DG facility has changed			
The Generation Facility has provision for real time control:			
the ability to remotely dispatch the generator (on/off)	Toronto Hydro Requirement		

**DEFICIENCIES**

<b>Item</b>	<b>Deficiency</b>	<b>Resolution</b>
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 ( <b>Appendix C</b> )			
Authorization to Connect from ESA ( <b>Appendix C</b> )			
Single line electrical drawing which identifies the as-built Connection Point (sealed by P.Eng) ( <b>Appendix A</b> )			
Letter of confirmation that equipment and installation meets CSA and/or other applicable electrical safety standards (conducted by an Independent P.Eng) ( <b>Appendix B</b> )			
PV string tests ( <b>Appendix I</b> )			

VERIFICATION OF REPORT AND SIGNATURE BLOCK	
<b>DG System Owner</b>	
Name of DG System Owner (Print)	
Signature of DG System Owner	
Date (dd/mm/yyyy)	
<b>Independent Engineer</b>	
Name of Professional Engineer (Print)	
Signature of Professional Engineer	
Date (dd/mm/yyyy)	
Licensed Professional Engineer Province of Ontario - Seal	



## DG Disconnect Switch

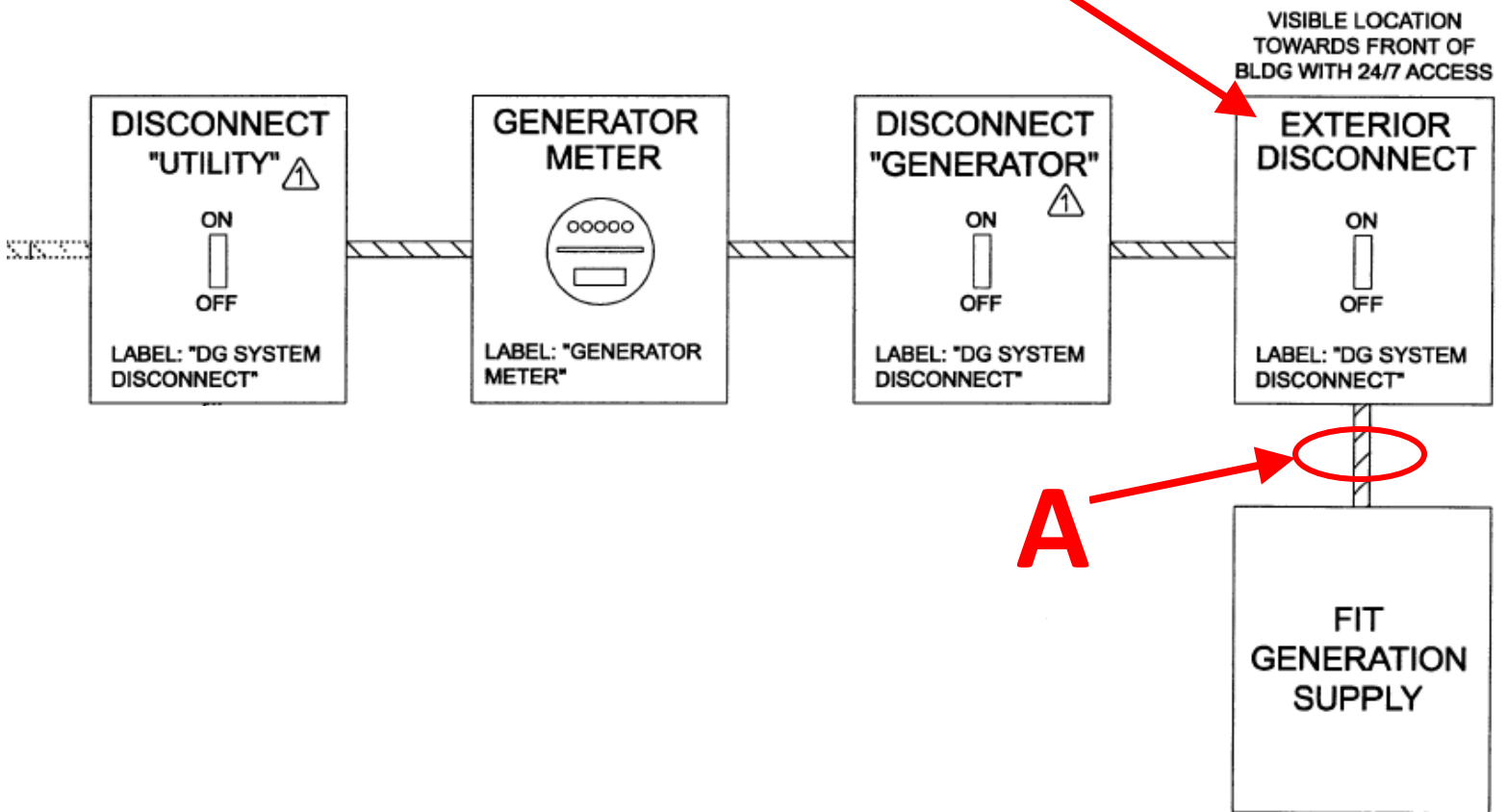


Figure 1: Commissioning Test Layout

Limits of current harmonic distortion*		
Harmonic numbers	Maximum distortion	
	Even harmonics, %	Odd harmonics, %
2 <sup>nd</sup> through 9 <sup>th</sup>	1.0	4.0
10 <sup>th</sup> through 15 <sup>th</sup>	0.5	2.0
16 <sup>th</sup> through 21 <sup>st</sup>	0.4	1.5
22 <sup>nd</sup> through 33 <sup>rd</sup>	0.2	0.6
Above 33 <sup>rd</sup>	0.1	0.33

\*Source: CSA C22.2 No. 107.1, Table 15.

Table 1: Limit of Current Harmonic Distortion

# **APPENDIX A**

## **As Built Single Line Diagram**

*[To be inserted]*

# **APPENDIX B**

**Letter of Confirmation - conducted by an Independent P.Eng**

*[To be inserted]*

# **APPENDIX C**

## **Applicable ESA & CSA Certificates**

*[To be inserted]*

# **APPENDIX D**

**Inverter(s) Documentation (Certificates, Production Test Reports, Data Sheets, etc)**

*[To be inserted]*

# **APPENDIX E**

## **Electrical Specifications - Steady State Plots**

*[To be inserted]*

# **APPENDIX F**

## **Cease to Energize - On Site Testing: Plots**

*[To be inserted]*

# **APPENDIX G**

## **Cease to Energize - On Site Testing: Waveform Captures**

*[To be inserted]*



# APPENDIX H

**Power Analyzer Documentation (Data Sheets, Compliance Certificate, etc)**

*[To be inserted]*

# **APPENDIX I**

## **PV String Tests**

*[To be inserted]*

# **APPENDIX J**

## **Miscellaneous Documentation**

*[To be inserted]*

## **Appendix 4(vii) - Distribution Availability Test (DAT) Information**

# Distribution Availability Test



Information to Customer for DG Application		
Customer Address:		Date: _____
Requestor:		
Requestor Company:		
Proposed kW:		

## Section 3 - Project Connection Requirements

Q.1	Is the Project a Small FIT Project	Yes	
		No	
Q.2	GPS coordinates of Location of Project	Customer to provide	
Q.3	GPS coordinates of the connection point for the project	Customer to provide	
Q.4	Project is connected to:	Transmission System	
		Distribution System	
Q.4(b)(i)	Name of Local Distribution Company	Toronto Hydro	
Q.4(b)(ii)	Project connecting on:	3 Phase	
Q.4(b)(iii)	The proposed Connection point is at:	Feeder	
		Transformer Station	
Q.4(b)(iii) (a)	Name of Transformer Station to which Feeder is connected		
	DESN		
	Bus ID		
Q.4(b)(iii) (b)	Identify the feeder to which the Project will be connecting:		
Q.4(b)(iii) (c)	Name of Distribution Station and distribution feeder (if applicable) to which the Project will be connecting	DS:	
Q.5	Connection Voltage level in kilovolts (in kV)		

## Additional THESL Information

Technical Description:			
	Transformer Location Number		
	Transformer Rating (kVA)		
	Transformer Voltage		
	Proposed generation is greater than transformer KVA rating?		
	Does the project require expansion	Yes	
		No	
	Location of Metering (Pri or Sec)		

Notes:

## **Appendix 4(viii) - Distributed Generation Monitoring and Control Requirements**

# **MONITORING AND CONTROL REQUIREMENTS FOR DISTRIBUTED GENERATION 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 Distributed Generation (DG) Facilities  $\geq 50kW$  will be required to have Monitoring and Control installed and operational prior to connection to the grid.***

## **2. Overview**

### **2.1 THESL SCADA System**

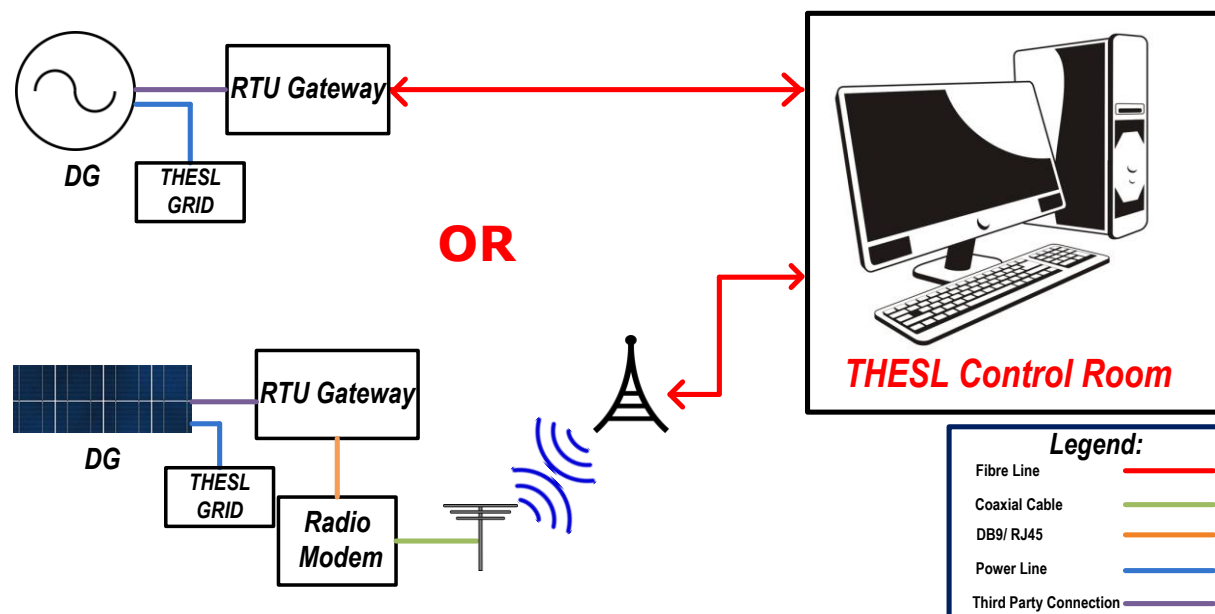
Real time monitoring and control provides the Toronto Hydro Control Room with the necessary information and control to:

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

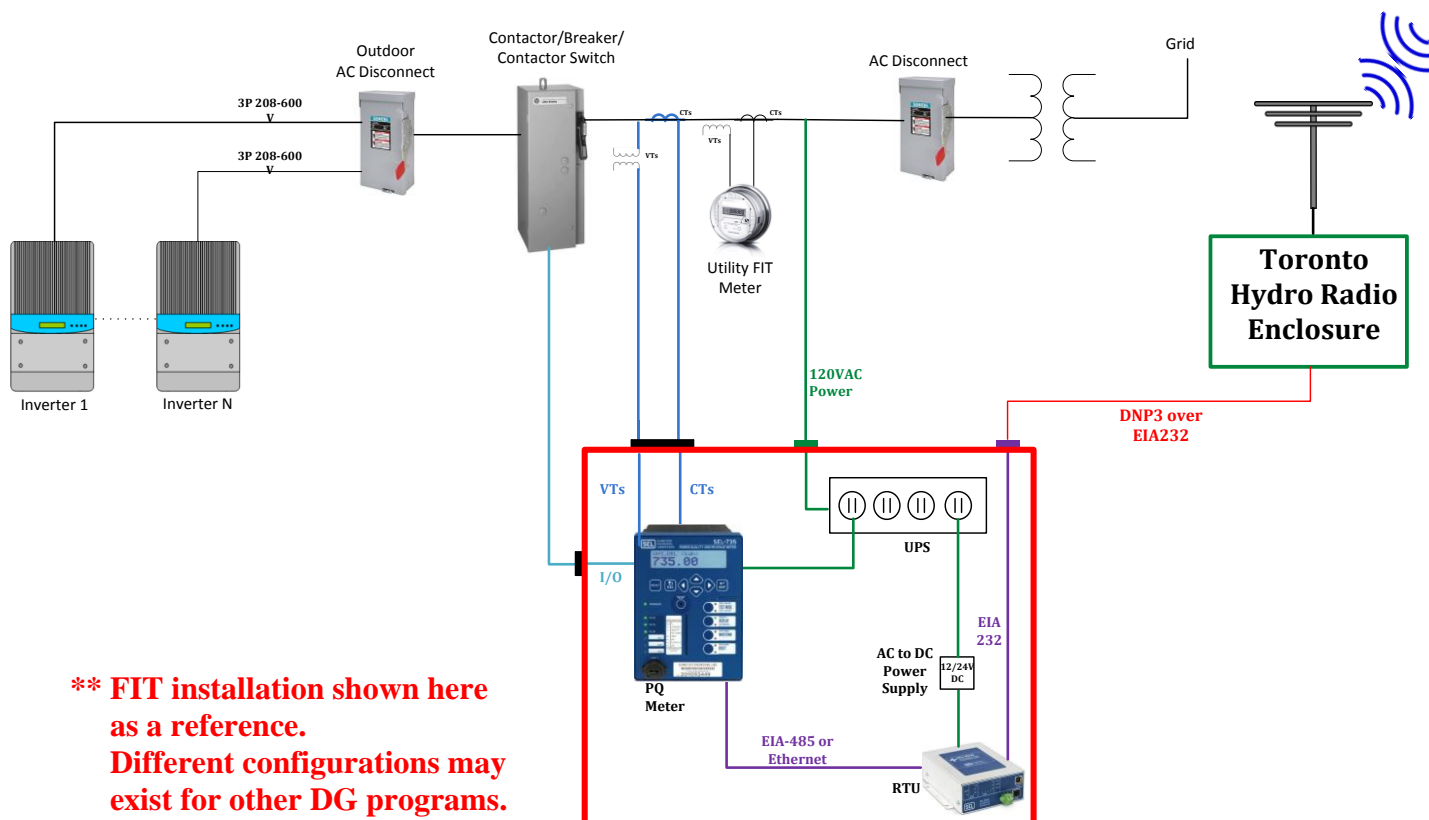
- i. polls the DG for the necessary analogue quantities;
- ii. interfaces with Toronto Hydro's communications network via a fibre or radio link.

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



## 2.2 DG Site

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





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

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

All DG 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 DG 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.)

No. of Generators	Available Option		
	A	B	C
1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
$\geq 3^{\dagger}$			<input checked="" type="checkbox"/>

$\dagger$  Daisy chaining of inverters is not allowed.

#### 3.2 Monitoring Requirements

##### 3.2.1 Monitoring

All DG 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 DG Facility;
  - c) Frequency (Hz);
  - d) Phase to phase voltage (V); and
  - e) Three phase currents (A).
2. Device Statuses:
  - a) Status of consolidated DG units;
  - b) Status of protective relays; and
3. Unsolicited response will be sent to Toronto Hydro when:
  - a) Voltage or frequency has reached +/-6% of nominal value;
  - b) Current or apparent power has reached 105% of max generation or -1% of max generation;
  - c) Power factor of the DG Facility has fallen below 0.9 or over 1.1;
  - d) Status of DG 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 DG 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<sup>Ψ</sup>.

No. of Generators	Available Option	
	A	B
1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
≥ 3 <sup>†</sup>		<input checked="" type="checkbox"/>

<sup>†</sup> Daisy chaining of inverters is not allowed.

<sup>Ψ</sup> 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 DG Owner may be required to disconnect the DG 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 DG 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 DG Owner 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 DG Owner 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 DG Facility.
3. If applicable, the DG Facility will interface to a Toronto Hydro radio modem with a straight-through DB9 male to male cable.
4. Surge protection and backup power will be provided for the RTU and other miscellaneous equipment.

### 3.5 Medium and Protocol

1. The DG 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 DG 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 DG Owner of which communication medium (fibre/radio/Bell line) and protocol (Ethernet DNP/Serial DNP) will be used for the proposed DG Facility in the Connection Impact Assessment (CIA).
5. DNP3 (or IEC61850) protocol is required between DG 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 DG Owner use. Access will be **Read-Only over Modbus protocol**. No other connections to the RTU will be permitted for the DG Owner.
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 DG Facility from Toronto Hydro's distribution system.
- c. Be capable of sustaining continuous telemetry about the DG connection status.
- d. Be equipped with two (2) 120V outlets for Toronto Hydro use.

## Appendix A - SCADA RTU Configuration for Inverter Based DG

### 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

<b>Server DNP Address</b>	*
<b>Client DNP Address</b>	*
<b>Serial Communications Port Type</b>	EIA232
<b>Baud Rate</b>	9600
<b>Data Bits</b>	8
<b>Parity Bit</b>	None
<b>Stop Bit</b>	1
<b>Full Duplex</b>	FALSE
<b>Allow Unsolicited Messages</b>	TRUE
<b>Unsolicited Messaging Retries</b>	3
<b>UTC Offset</b>	0
<b>DST Enabled</b>	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 <sub>a</sub>
4	Current I <sub>b</sub>
5	Current I <sub>c</sub>
6	Apparent Power
7	Power Factor
8	Frequency

Monitoring (Digital Input)	
From RTU	Definition
0	On/Off Status

Control (Digital Output)	
From SCADA	Definition
0	On/Off Command

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 <sub>a</sub>	A	1	5% of max	1% of Max	105% of Max	-1% of Max
Current I <sub>b</sub>	A	1	5% of max	1% of Max	105% of Max	-1% of Max
Current I <sub>c</sub>	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 DG 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 Distributed Generation (DG) facilities ≥50kW will be required to have Monitoring and Control installed and operational prior to connection to the grid.***

## **Appendix B -**

### **Sample SCADA RTU Configuration for Synchronous Based DG**

#### **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

<b>Server DNP Address</b>	*
<b>Client DNP Address</b>	*
<b>Serial Communications Port Type</b>	EIA232
<b>Baud Rate</b>	9600*
<b>Data Bits</b>	8
<b>Parity Bit</b>	None
<b>Stop Bit</b>	1
<b>Full Duplex</b>	FALSE
<b>Allow Unsolicited Messages</b>	TRUE
<b>Unsolicited Messaging Retries</b>	3
<b>UTC Offset</b>	0
<b>DST Enabled</b>	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

<b>Server DNP Address</b>	*
<b>Client DNP Address</b>	*
<b>Allow Anonymous DNP IP Clients</b>	FALSE
<b>Client IP Addresses</b>	*
<b>Server IP Port</b>	*
<b>Allow Unsolicited Messages</b>	TRUE
<b>Unsolicited Messaging Retries</b>	3
<b>UTC Offset</b>	0
<b>DST Enabled</b>	FALSE
<b>Transport Protocol</b>	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 Frequency
1	Gen #1 Phase A Amps	31	Gen Tie #1 A-B Volts
2	Gen #1 Phase B Amps	32	Gen Tie #1 B-C Volts
3	Gen #1 Phase C Amps	33	Gen Tie #1 C-A Volts
4	Gen #1 Bus Ref Frequency	34	Gen Tie #1 Bus Ref Voltage
5	Gen #1 A-B volts	35	Gen Tie #1 KiloWatts
6	Gen #1 B-C volts	36	Gen Tie #1 KVAR
7	Gen #1 C-A Volts	37	Gen Tie #1 HZ
8	Gen #1 Bus Ref Voltage	38	Utility #1 Phase A RMS Current
9	Gen #1 KiloWatts	39	Utility #1 Phase B RMS Current
10	Gen #1 KVAR	40	Utility #1 Phase C RMS Current
11	Gen #1 KVA	41	Utility #1 A-B RMS Voltage
12	Gen #1 HZ	42	Utility #1 B-C RMS Voltage
13	Gen #2 Power Factor	43	Utility #1 C-A RMS Voltage
14	Gen #2 Phase A Amps	44	Utility #1 Average Current
15	Gen #2 Phase B Amps	45	Utility #1 Average Line Voltage
16	Gen #2 Phase C Amps	46	Utility #1 3 Phase Real Power
17	Gen #2 Bus Ref Frequency	47	Utility #1 3 Phase Reactive Power
18	Gen #2 A-B volts	48	Utility #1 3 Phase Apparent Power
19	Gen #2 B-C volts	49	Utility #1 System Frequency
20	Gen #2 C-A Volts	50	Utility Tie #1 Ph A RMS Current
21	Gen #2 Bus Ref Voltage	51	Utility Tie #1 Ph B RMS Current
22	Gen #2 KiloWatts	52	Utility Tie #1 Ph C RMS Current
23	Gen #2 KVAR	53	Utility Tie #1 A-B RMS Voltage
24	Gen #2 KVA	54	Utility Tie #1 B-C RMS Voltage
25	Gen #2 HZ	55	Utility Tie #1 C-A RMS Voltage
26	Gen Tie #1 Power Factor	56	Utility Tie #1 Average Current
27	Gen Tie #1 Phase A Amps	57	Utility Tie #1 Average Line Voltage
28	Gen Tie #1 Phase B Amps	58	Utility Tie #1 3 Phase Real Power
29	Gen Tie #1 Phase C Amps	59	Utility Tie #1 3 Phase Reactive Power




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

**\*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 DG 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 Distributed Generation (DG) facilities  $\geq 50\text{kW}$  will be required to have Monitoring and Control installed and operational prior to connection to the grid.***