



# **TECHNICAL INTERCONNECTION REQUIREMENTS FOR DISTRIBUTED GENERATION**

## **Micro Generation & Small Generation, 3-phase, less than 30 kW**

### **Audio Dial-in Phone Numbers:**

Toll Free 1 (877) 385-4099

Toronto (416) 883-0133

**Participant Access code: 2792418 #**

# Agenda

- INTRODUCTION
- SCOPE
- STANDARDS
- MICRO GENERATION (10kW or less)
- GENERAL TECHNICAL REQUIREMENTS
- ADDITIONAL REQUIREMENTS FOR 3-PHASE GENERATION UP TO 30 KW



# Introduction

- Renewable power expected to increase significantly between now and 2025 due to the Green Energy Act (GEA)
- Distributed Generation (DG) is not without its challenges:
  - Distribution system was not designed to accommodate and integrate large amounts of distributed generation
  - Must integrate thousands of new DG connections without jeopardizing the reliability and security of our distribution network for our other customers

# Introduction

- *Technical Interconnection Requirements for Micro Generation & Small Generation, 3-phase, less than 30 kW* was created to:
  - Help you understand your role and responsibilities when connecting to the distribution system as a potential DG



# Scope

- These Technical Interconnection Requirements apply to the following individual generating facilities:
  - Micro generation projects where the total generation capacity at the site is 10 kW or less
  - Three-phase (3 Ø) generation projects where the total generation capacity at the site is less than 30 kW

# Scope (continued)

- These Technical Interconnection Requirements are **not** intended to apply to emergency backup generation

## Note:

- *Ontario Energy Board (OEB) has specified a maximum generating capacity of 10kW for Micro-generators*
- *Ontario Power Authority (OPA) has specified that the maximum generating capacity for a micro-FIT contract is 10kW*

# Scope (continued)

- Refer to *“Distributed Generation Technical Interconnection Requirements, Interconnection at Voltages 50kV and Below”* document for:
  - Single-phase installations with an aggregate capacity greater than 10 kW; and
  - Three-phase installations with an aggregate capacity greater than or equal to 30 kW

# TIR REFERENCE DOCUMENT TABLE

		DISTRIBUTED GENERATOR				BACKUP GENERATOR
		SINGLE PHASE $\leq 10$ kW	THREE PHASE < 30 kW	SINGLE PHASE > 10 kW	THREE PHASE $\geq 30$ kW	ALL
REFERENCE DOCUMENT	TECHNICAL INTERCONNECTION REQUIREMENTS FOR DISTRIBUTED GENERATION Micro Generation & Small Generation, 3-phase, less than 30 kW	X	X			
	"Distributed Generation Technical Interconnection Requirements, Interconnection at Voltages 50 kV and Below"			X	X	
	Hydro One Networks Inc. Distribution Customers Conditions of Service					X

# Standards

- Common standards are critical to the safe distribution of electricity
- Owners and Operators of DG facilities are responsible to ensure their generators comply with all applicable Canadian, Ontario, and local codes and standards.
- To qualify for interconnection, generators must comply with all the codes and standards found in *Section 3* of the TIR document



# Common Requirements for Micro and Small Generation

# Micro Generation 10kw or Less

*Section 5 of the TIR document:*

- General Technical Requirements
- System Grounding
- Technical Accommodation Requirements
  - Customer Specific Requirements
  - System Requirements
- Protection and Control Requirements
- Operating Requirements
- Revenue Metering Requirements
- Maintenance

# System Grounding

- The DG system must be grounded in accordance with all applicable codes
- DG equipment must be compatible with the neutral grounding method in use on the Hydro One system
- 3-phase DG connecting to Hydro One four-wire multi-grounded primary feeders must not cause the maximum “Temporary Over Voltage” (TOV) to exceed 130% of nominal line-to-ground voltages

# Technical Accommodation Requirements

Hydro One reviews all applications with respect to two categories of technical accommodation requirements:

- Customer Specific Requirements
- System Requirements

Any measures taken to meet these requirements will be at the generator owner's cost.

# Technical Accommodation Requirements (Cont'd)

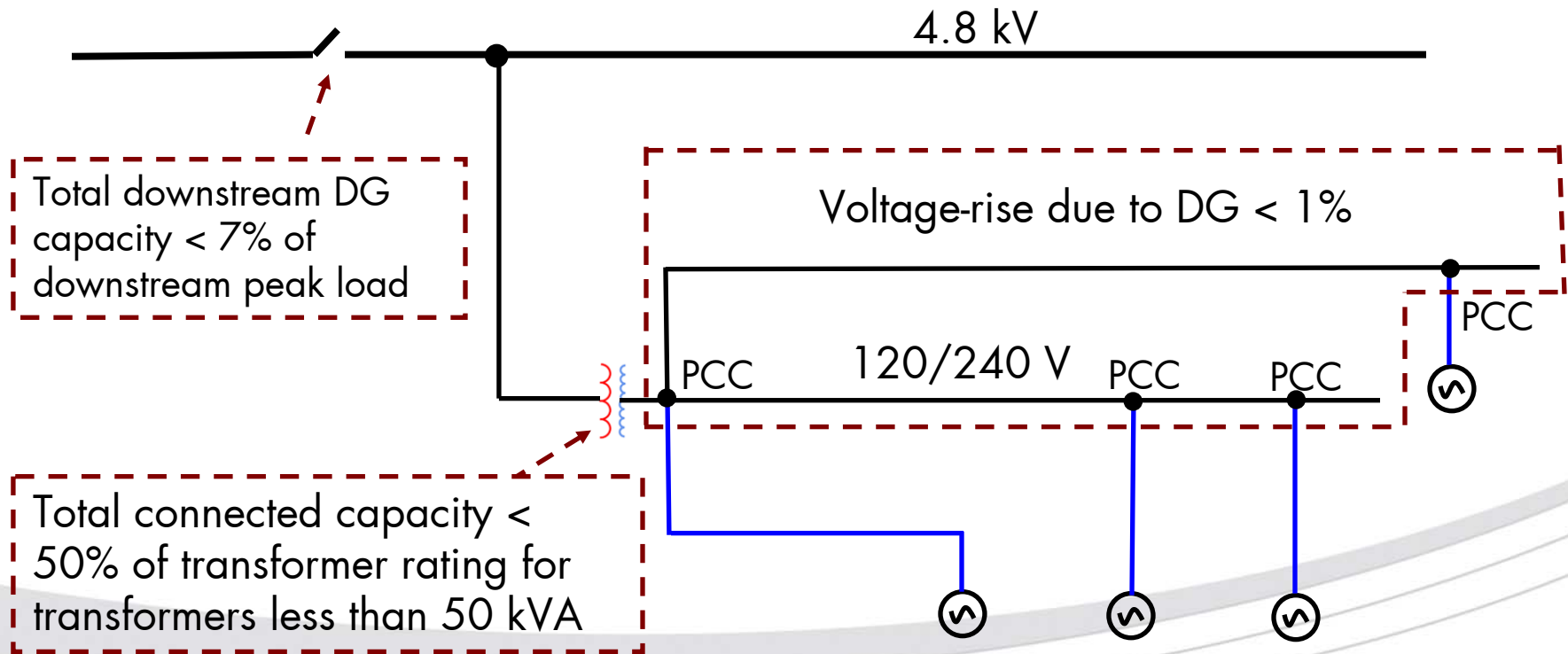
- Customer Specific Requirements
  - Total connected generator capacity shall not cause voltage rise across the secondary service conductor to exceed 1% of operating voltage
  - Total generator capacity shall not exceed 50% of the transformer kVA rating if the transformer kVA rating is less than 50 kVA.
  - Total generator capacity connected line-to-neutral shall not exceed 25% of the transformer nameplate kVA rating

# Technical Accommodation Requirements (Cont'd)

- System Requirements
  - Aggregated generation capacity shall not exceed 7% of annual line section peak load
  - Generating facility shall not cause fault current to exceed 100 percent of short circuit interrupting capability of equipment
  - Voltage unbalance on the distribution feeder must be limited to no more than 2%
  - Transmission system limitations shall be respected

# Technical Accommodation Requirements (Cont'd)

- Most Restraining Accommodation Requirements



# Protection and Control Requirements

- Required for safe, reliable and efficient operation of the electrical distribution system
- DG systems are complex and sophisticated
- Generators must be aware of the key points in protecting themselves and their systems against damage



# Protection and Control Requirements

Includes:

- Interrupting and isolating devices
- Over current and ground fault protection
- Operate within voltage and frequency variations
- Paralleling generation
- System protection
- Feeder Reclosing coordination
- Anti-Islanding

# Operating Requirements

- DG facilities must comply with operating requirements that Hydro One has in place to safeguard the reliability and integrity of the distribution system
- Failure to comply may result in disconnection of the facility from the distribution system, in accordance with the requirements of the Distribution System Code

# Revenue Metering Requirements

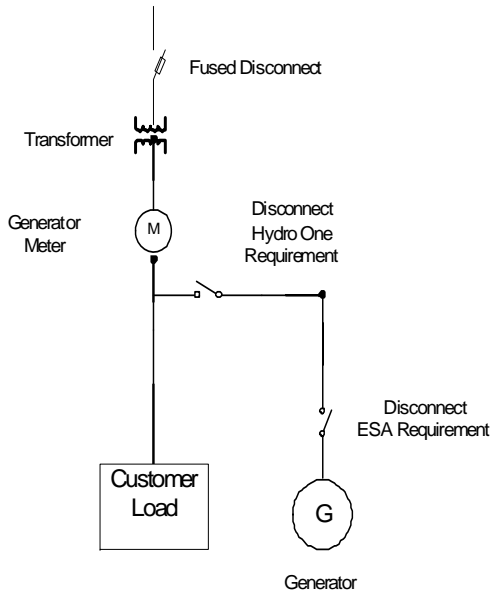
- Metering equipment must be revenue class and shall comply with Measurement Canada and Hydro One requirements
- Revenue metering shall be in accordance with Hydro One's Policy document:
  - "NOP-041" Metering for Embedded Generator Connecting to Distribution Systems

# Revenue Metering Requirements

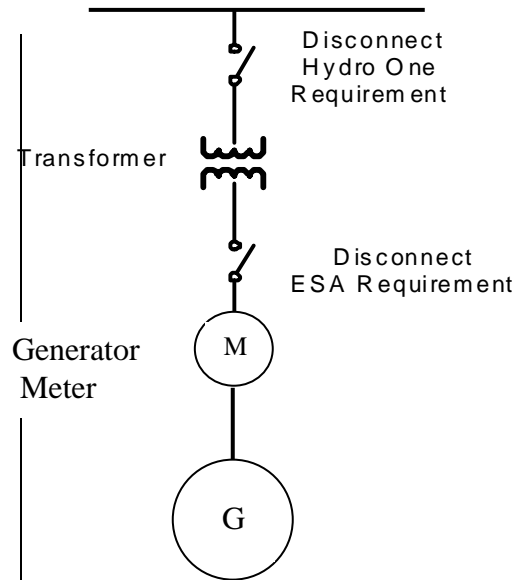
- For *“Parallel”* connections the customers generator meter is to be located beside existing load meter
- For *“Stand Alone”* connections the meter must be located no more than 30m from the transformer (or crossing pole) and be accessible year round
- *“Series Configurations”* are not permitted

# Metering Configurations

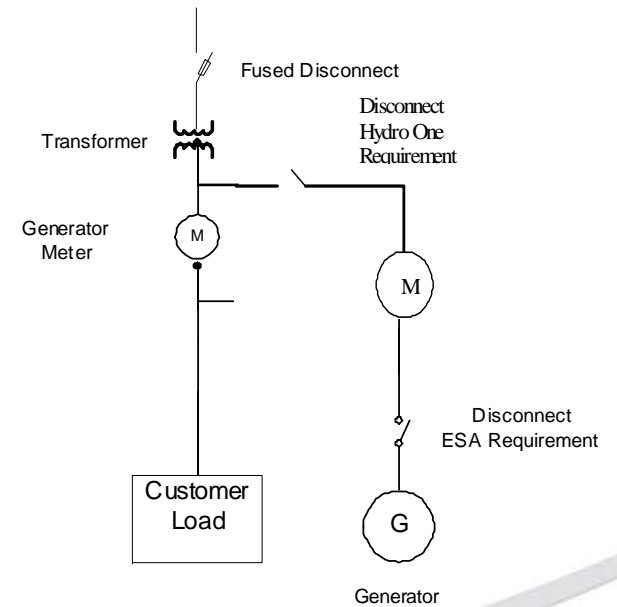
## Net Meter



## Micro Direct



## Micro Parallel



# Maintenance

- DG owner must keep the DG facility in a safe and proper working condition as recommended by the equipment manufacturer and must keep records of maintenance
- Interconnection system protection functions operation must be verified according to the manufacturer's recommended schedule, or at minimum annually

# Additional Requirements for 3-Phase Generation less than 30 kW

# 3-Phase Generation Less Than 30 kW

- Specific and additional requirements are:
  - DG facilities must ensure that upon loss of voltage in one or more phases of the main 3- $\emptyset$  supply, the generator shall:
    - be automatically disconnected from the system; and
    - not be reconnected until the normal voltage on all 3- $\emptyset$  of the main 3- $\emptyset$  supply system are restored
- The “External Disconnect Device” must be gang-operated

# Important Contact Information

## **Hydro One**

Web: [www.HydroOne.com](http://www.HydroOne.com)

E-mail: [DXGenerationConnections@HydroOne.com](mailto:DXGenerationConnections@HydroOne.com)

Phone: 1-877-447-4412 (Option #2)

## **Ontario Power Authority**

Web: [www.powerauthority.on.ca](http://www.powerauthority.on.ca)

Phone: 1-888-387-3403

# Questions