Distributed Generation Requirements Update

Toronto Hydro has updated its real time monitoring and control requirements for Distributed Generation facilities. The latest version of the Distributed Generation Requirements (Revision #2, August 15, 2012) will be revised as appropriate to include the clauses below. Until that time, consider the clauses a part of the DGR.

Toronto Hydro’s DGR identifies the requirements for installation of distributed generation (DG) projects connecting to Toronto Hydro’s distribution system feeders. However, the specific requirements for Monitoring and Control were not addressed in the current version.

To address the control and monitoring requirements, the following clauses will be added in the DGR as section 3.5 Control and Monitoring Requirements,

3.5 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 ≥ 50kW will be required to have Monitoring and Control installed and operational prior to connection to the grid.

3.5.1 Overview

3.5.1.1 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 3rd Party 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.
3.5.1.2 DG Site

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

**Generators are required to have a functioning DG Monitoring and Control system prior to connection to the grid.**
3.5.2 Requirements

3.5.2.1 Control Requirements

All generators 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 generator (on/off)
   
   **Option A:** Trip Command is sent from RTU to the inverter(s) communication board
   
   **Option B:** Dry Contact is sent from RTU to inverter(s) auxiliary contact
   
   **Option C:** Dry Contact is sent from RTU to an external contactor

3.5.2.2 Monitoring Requirements

All generators 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) 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); and
   
   d) Three phase currents (A).

2. Device Statuses:
   
   a) Status of consolidated DG units; 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 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 telemetry Reporting Rates shall be:

<table>
<thead>
<tr>
<th>Function</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data measurements</td>
<td>Less than 10s from change in field monitored quantity</td>
</tr>
<tr>
<td>Equipment status change</td>
<td>Less than 10s from field status change</td>
</tr>
<tr>
<td>Scan period for data measurements</td>
<td>Minimum 4s</td>
</tr>
<tr>
<td>Scan period for equipment status</td>
<td>Minimum 4s</td>
</tr>
</tbody>
</table>
3.5.2.3 Real Time Control and Monitoring

3.5.2.3.1 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.

3.5.2.3.2 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.

3.5.2.3.3 Medium and Protocol

1. The DG Owner shall provide real-time operating information to Toronto Hydro as specified in Section 3.5.2.2 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 customer of which communication medium will be used for the proposed project in the Connection Impact Assessment (CIA)
3.5.2.4 Uninterruptible Power Supply (UPS) Requirements

An Uninterruptible Power Supply (UPS) is required to power the RTU Gateway device during a utility outage.

3.5.2.4.1 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 from Toronto Hydro’s distribution system

c. be capable of sustaining continuous telemetry about the DG connection status

3.5.3 Implementation

3.5.3.1 DG Monitoring and Control Procedure

1. Generator reviews Monitoring and Control Requirements outlined in this document.
2. Generator proposes Monitoring and Control design in Connection Impact Assessment (CIA) application.
3. Toronto Hydro reviews proposed design and CIA application.
4. Toronto Hydro completes CIA and approves Monitoring and Control design.
5. Toronto Hydro provides necessary information in CIA for Generator to complete programming and installation of Monitoring and Control design.
6. Generator purchases, installs and configures equipment according to Toronto Hydro CIA specifications.
7. Generator provides ‘Monitoring and Control Submission Form’ to Toronto Hydro.
8. Generator commissions Monitoring and Control design. Toronto Hydro representative present to witness commissioning.
9. Upon verification of Step 8, the Generator will be permitted to connect to the Toronto Hydro electrical distribution grid and SCADA system.
3.5.4 3rd Party SCADA RTU Gateway Configuration

3.5.4.1 Setup
1. The 3rd Party SCADA RTU Gateway shall act as a Serial DNP Server
2. The 3rd Party SCADA RTU Gateway shall be configured as follows

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
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<tbody>
<tr>
<td>Server DNP Address</td>
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<tr>
<td>Client DNP Address</td>
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<tr>
<td>Serial Communications Port Type</td>
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<td>Data Bits</td>
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<tr>
<td>Stop Bit</td>
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<tr>
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<tr>
<td>Allow Unsolicited Messages</td>
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<tr>
<td>Unsolicited Messaging Retries</td>
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<tr>
<td>UTC Offset</td>
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<tr>
<td>DST Enabled</td>
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* Will be provided in the CIA

3.5.4.2 SCADA Mapping
1. The SCADA points shall be, but is not limited to, mapped as follows

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Control Mapping</th>
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<tbody>
<tr>
<td><strong>From RTU</strong></td>
<td><strong>From SCADA</strong></td>
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<tr>
<td><strong>Definition</strong></td>
<td></td>
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</table>
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.

If you have questions related to this bulletin, please email FIT@torontohydro.com or call 416-542-3099.

Thank you,
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Capacity Planning, Asset Management
Toronto Hydro - Electric System Limited