



# **Massachusetts Technical Standards Review Group (MTSRG)**

March 6, 2013 Meeting Minutes

Date: Mar 6, 2013

Time: 9AM-4PM

Location: E3.961 MOHWAK

National Grid Office: 40 Sylvan Rd, Waltham, MA 02451

**Attendance:**

Chair: Babak Enayati, National Grid

Vice-Chair: Michael Conway, Borrego Solar Systems

Member (utility): Mike Brigandi, NSTAR

Member (utility): John Bonazoli, Unitil

Member (utility): Erik Morgan, WMECO (alternate)

Member (non-utility): Michael Coddington, NREL

Member (non-utility): Reid Sprite, SourceOne

**Utility:**

Tim Roughan, National Grid

Bill Bush, NSTAR

Paul Krell, Unitil

Jennifer Shilling, WMECO

**Inverter:**

Sonwook Hong, Solectria

John Fearelli, Solectria

**Customer:**

Gerry Bingham, DOER

Robert Flottesmesch, Constellation

William Wohlfarth, Broadway Electrical

Fran Cummings, SEBANE

**Via telecon:**

Robert Broderick, Abraham Ellis, Sandia Labs

Michael Ropp, NPPT

# The meeting kick-off by Babak, review and approval of the MTSRG Guidelines

## 10 mins

- Guideline not finalized, to be approved for next meeting
- Comments and recommendations from non-members, to use Chair & Vice-chair as a conduit for offering agenda topics for future meetings
- Goal of TSRG: to produce document highlighting commonalities and differences in standards among utilities
- Chair would like to emphasize that utilities have final say on editing common technical manual

## Agenda:

### 1.0 Existing Utility-Specific Standards and Guidelines

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The following documentation should be reference on a Utility-specific basis. The documents are Company standards or official guidelines pertaining to the parallel connection of distributed generation to the electric power system.

#### 1.1 National Grid – ESB 756, Appendix C

[http://www.nationalgridus.com/non\\_html/shared\\_constr\\_esb756.pdf](http://www.nationalgridus.com/non_html/shared_constr_esb756.pdf)

## **1.2 NSTAR – 14-Point Clarification Document**

[http://www.nstaronline.com/business/rates\\_tariffs/interconnections/documents.asp](http://www.nstaronline.com/business/rates_tariffs/interconnections/documents.asp)

## **1.3 Unitil – Distributed Energy Resources Homepage**

<http://www.unitil.net/der/>

## **1.4 WMECO – Distributed Generation Requirements**

<http://www.wmeco.com/residential/understandbill/ratesrules/distribgenrequirements.aspx>

# 2.0 Anti-Islanding

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In the event that a portion of the utility electric system is electrically separated from the rest of the electric system, a DG facility on that section of the system could possibly island with the load on that section, such that insufficient anti-islanding provisions at the DG facility could lead to run-on times beyond the 2 second limit prescribed in IEEE 1547. The following section describes each utilities' anti-islanding screening methodology, as well as mitigation requirements for projects that fail anti-islanding screening.

## **2.1 National Grid**

### **2.1.1 Screening**

DG applications over 500kW are screened for potential islanding conditions. National Grid conducts detailed Risk of Islanding studies for all projects that fail anti-islanding screening. The screening tools vary by type of DG technology, and are as follows:

- PV: Sandia 2012-1365 screening tool

- Rotating Generation: If aggregate rotating generator size <33% minimum feeder load then anti-islanding study is not required. If aggregate rotating generator size >33% minimum load and there are enough VAR sources on the islanded section of the feeder to self excite the generator, islanding study is required.
- PV in parallel with rotating generators: If aggregate rotating generator size > 20% aggregate PV rating and there are enough VAR sources on the islanded section of the feeder to self excite the generator, islanding study is required.

If a detailed Risk of islanding determines that run-on times can exceed 2 seconds, a direct transfer trip scheme is required.

## **2.2 NSTAR**

### **2.2.1 Screening**

Preliminary screening tools such as Load to Generation ratio, fault current contribution, amount and type of other DG on the feeder and reactive power matching are used to determine whether there is a risk of islanding a give facility. Once a risk is identified NSTAR may implement a more advanced protection or transfer trip scheme, ask for system upgrades or suggest the customer decrease the power their facility is exporting.

## **2.3 Unitil**

### **2.3.1 Screening**

DG applications are screened for potential anti-islanding by load to generation ratio at each device location that could operate to form an island boundary. Unitil conducts detailed Risk of Islanding studies for all projects that fail anti-islanding screening. The screening tools vary by type of DG technology, and are as follows:

- PV: DG < 50% minimum daytime load
- Rotating Generation: DG < 33% minimum load
- Aggregate and/or mixed resources: DG < 50% minimum load

If a detailed Risk of islanding determines that run-on times can exceed 2 seconds, a direct transfer trip scheme is required.

## 2.4 WMECO

### 2.4.1 Screening

DG applications are screened for potential anti-islanding by load to generation ratio, per feeder section. WMECO requires DTT for all applications that fail anti-islanding screening. The anti-islanding screen is as follows:

- DG < 33% minimum load

## 2.5 Anti-Islanding Mitigation (Common)

Direct Transfer Trip is the common means of anti-islanding mitigation. Leased phone-line is the most common communications medium, although radio systems can be used where line-of-sight is available.

# 3.0 Other DTT Utilizations

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## 3.1 National Grid

N/A - Direct transfer trip schemes are used solely as an anti-islanding mitigation practice.

### **3.2 NSTAR**

Direct transfer trip schemes are used primarily for mitigating reverse power flow at the upstream substation supply transformer, but can also be utilized to mitigate voltage conditions and flicker that may develop due to the interconnection of DG. Direct transfer trip is considered for any facility that may cause any of the adverse conditions mentioned above, and also where upstream devices are at risk of reclosing out of step during an adverse condition. If a System Impact study determines that system stability or power quality standards are compromised under certain load to generation conditions, a direct transfer trip scheme may be required to disconnect the DG.

### **3.3 Unitil**

Direct transfer trip schemes may be required for fault mitigation at the transmission level.

### **3.4 WMECO**

Direct transfer trip schemes may also be required in the event of loop-scheme feeder transfers through networked reclosers.

## **4.0 DG Capacity – Feeder Limits**

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### **4.1 National Grid**

80% of the feeder cable thermal rating (aggregate 9 MVA generation on a 15kV class feeder) is the limit for the regular feeders. Larger generation can be interconnected to the express feeders if proper cable size is used.

#### **4.1.1 Minimum Daytime Load Approximation if the measurement data is not available**

Minimum load = 25% of maximum Peak

### **4.2 NSTAR**

The DG's effect on LTC operations is considered as part of the System Impact Study. No hard limit.

#### **4.2.1 Minimum Daytime Load Approximation if the measurement data is not available**

Minimum load = 25% of Peak

### **4.3 Unitil**

Capacity issues are considered as part of the System Impact Study. No hard limit.

#### **4.3.1 Minimum Daytime Load Approximation if the measurement data is not available**

Minimum load = 30% of Peak

### **4.4 WMECO**

Capacity issues are considered as part of the System Impact Study. No hard limit. Application with a considerable load to generation mismatch are flagged in the application process.

#### **4.4.1 Minimum Daytime Load Approximation if the measurement data is not available**

Minimum load = 30% of Peak

## **5.0 Remote Control & Monitoring**

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## **5.1 National Grid**

National Grid requires the installation of an RTU for DG applications of 1MW and above. If the DR has local load, remote control is installed on the generator breaker, parallel to the load. Otherwise, the PCC recloser will be controlled through telemetrics. Any device capable of DNP3 can be used in lieu of the RTU.

### **5.1.1 Data Monitored**

- kW, kVA, KVAr
- A,B,C phase amps
- A-B, B-C, C-A voltages
- Customer breaker status (supervisory only)

### **5.1.2 Communications Medium**

- Leased multi-protocol line (MPLS).

## **5.2 NSTAR**

NSTAR installs SCADA-capable PCC reclosers.

### **5.2.1 Data Monitored**

- Net Power

### **5.2.2 Communications Medium**

- MDS Radio

## **5.3 Unitil**

Unitil requires the installation of real-time remote monitoring via a RTU or similar equipment for DG facilities of 1MVA and above. This monitoring is required at the designated interconnection Interrupting Device for the overall DG facility. If a company-owned recloser at the PCC is being required for other reasons, monitoring of that recloser can serve this purpose.

In addition, Unitil also requires real-time remote monitoring at any Interrupting Device for each individual unit of more than 500kVA, even if the Interrupting Device for the overall DG facility is also being monitored. For units from 250kVA to 500kVA, recording interval metering may be allowed instead of real-time monitoring, and revenue metering that may otherwise already be required can serve this purpose.

Unitil requires remote control only for larger installations using system-specific determinations.

### **5.3.1 Data Monitored**

- Connection or Unit Status
- Active and Reactive Power Flow (three-phase)
- Voltage – facility or unit side (per phase)
- Voltage – utility side
- Current (per phase)
- Frequency – facility or unit side
- Protective Relay Status (if applicable)
- DC Control System Status (if applicable)
- other states or quantities as specifically warranted

### **5.3.2 Communications Medium**

- to be determined case-by-case

## **5.4 WMECO**

WMECO installs SCADA-capable PCC reclosers. Reclosers can be used to remotely disconnect the generator.

### **5.4.1 Data Monitored**

- N/A

### **5.4.2 Communications Medium**

- N/A

## 6.0 PCC Recloser Requirements – Threshold DG Size

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### 6.1 National Grid

DG  $\geq$  500kW

### 6.2 NSTAR

DG  $\geq$  1MW

*NOTE: NSTAR reserves the right to implement a recloser in any case it is deemed necessary to interconnect a DG facility with the potential to cause an adverse condition.*

### 6.3 Unitil

DG  $\geq$  1MW

### 6.4 WMECO

N/A

## 7.0 External Disconnect Requirement – Small DG Threshold Size

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### 7.1 National Grid

DG >25kW

### 7.2 NSTAR

DG >10-25kW

**7.3 Unitil**  
DG > 10kW

**7.4 WMECO**  
DG > 10kW

## 8.0 Witness Test Protocols

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### 8.1 National Grid

National Grid requires witness testing of the Customer redundant relaying for  $DG \geq 500kW$ . For  $DG < 500kW$ , National Grid requires testing of generator internal relaying, as well as UL certification. The Witness Test is conducted by a third party, and attended by a Utility representation for supervision and approval of results. ESB 756C provide a sample witness test.

#### 8.1.1 Required Documentation

- Witness test procedure
- Energization plan

#### 8.1.2 Required Test Points

Relay set-points should be specified in accordance with IEEE 1547. Underfrequency ride-through should be modified according to the NPCC A.03 curve. Clearing times include breaker operation.

- 27 Undervoltage
- 59 Overvoltage
- 81o/u Overfrequency, Underfrequency
- 51N Neutral Overcurrent
- 51C Phase Overcurrent (Voltage-Controlled)
- 59N Neutral Overvoltage

## **8.2 NSTAR**

NSTAR requires witness testing of the Customer redundant relaying for PV $\geq$ 1MW, Synchronous DG  $\geq$  500kW, and all asynchronous DG. For DG < 200kW, NSTAR requires that the Customer submit pictures of the installation, documentation of UL listing of the equipment, and proof of compliance with all applicable codes.

### **8.2.1 Required Documentation**

- All information called for within the NSTAR Tariff and 14-Point clarification document
- Relay settings
- Coordination study

### **8.2.2 Required Test Points**

Relay set-points should be specified in accordance with IEEE 1547. Underfrequency ride-through should be modified according to the NPCC A.03 curve. Clearing times include breaker operation.

- 27 Undervoltage
- 59 Overvoltage
- 81o/u Overfrequency, Underfrequency
- 51N Neutral Overcurrent
- 51 Phase Overcurrent
- 59N Neutral Overvoltage

## **8.3 Unitil**

For Simplified Track projects, Unitil conducts witness testing during the meter upgrade.

### **8.3.1 Required Documentation**

- Witness test procedure

### 8.3.2 Required Test Points

Relay set-points should be specified in accordance with IEEE 1547. Fast response clearing times (e.g. 0.16 sec.) include breaker operation.

- 27 Undervoltage
- 59 Overvoltage
- 81o/u Overfrequency, Underfrequency
- 51N Neutral Overcurrent
- 51 Phase Overcurrent
- 59N Neutral Overvoltage

## 8.4 WMECO

For  $DG \geq 30kW$ , WMECO conducts witness tests of the customer redundant relays. For  $DG < 30kW$ , the witness test confirms that the system is installed per the application, and that the generator protection complies with 2-second trip and 5-minute reconnection time.

### 8.4.1 Required Documentation

- Certified test results
- Print-out of inverter settings
- One-Line Diagram
- Three-Line Diagram
- Relay schematic

### 8.4.2 Required Test Points

Relay set-points should be specified in accordance with IEEE 1547. Underfrequency ride-through should be modified according to the NPCC A.03 curve.

- 27 Undervoltage
- 59 Overvoltage
- 81o/u Overfrequency, Underfrequency
- 51N Neutral Overcurrent

- 51 Phase Overcurrent
- 59N Neutral Overvoltage

## **8.5 Failure Protocol (Common)**

In the event of a failed witness test (i.e. test results of a relay function fall outside of a certain tolerance), the witness test is rescheduled, and the failed elements are retested.