Massachusetts Technical Standards Review Group (MTSRG)
Chair: Babak Enayati, National Grid
Vice-Chair: Michael Conway, Borrego Solar Systems
MTSRG Meeting #2
Date: September 17, 2013
Time: 9AM-4PM
Location: National Grid's Worcester Office
(Address: 939 Southbridge St, Worcester, MA 01610) Auditorium
Agenda

Attendees

Members:
Babak Enayati, Ngrid
Mike Brigandi - NSTAR
Cindy Janke, WMECO
John Bonazoli - Unitil
Mike Conway, Borrego Solar (Solar)
Reid Sprite - SourceOne (CHP)
Mike Coddington, NREL (Gov't)
Nancy Stevens, DPU

Bill Walsh - NSTAR
Paul Krell - Unitil
Dan Mungovan - Ngrid
Rob Sheridan - Ngrid (Grid of the future)
Tim Roughan - NGrid
Carter White - RGE (Solar)
Julien Amouyal - SourceOne (CHP)
Gerry Bingham - DOER (Gov't)
Brian Ritzingen, DPU Engineer

Meeting Follow-up and Deliverables / Responsible Member
- Changes to utility practices since March meeting / Babak
- New Mexico reverse power flow case study / Mike Coddington
- GE contact, and redacted reverse power flow GE paper / Bill Walsh
- Draft list of 'significant' and 'moderate' changes / Babak
- MA Group Studies proposal / Mike Conway

1) The meeting kick off by Babak and introduction 5 mins

2) Review and approval of the MTSRG Guidelines 10 mins

Discussion of follow-up position paper after each meeting.
Suggestion - refer to Grid Mod document for format of differences in opinion
Response - Utilities must share their rationale for a certain standard, but TSRG members are not provided the opportunity to challenge that point

Support guideline as presented:

Ngrid - Yes, look at Grid Mod for model on differences within minutes
Unitil - Yes
NSTAR - Yes
WMECO - Yes, concerned that representatives can't make policy decisions for entire company. Members must follow-up with many departments within company.
CHP - Objections noted - no venue for comments, only meet 6 months, no mechanism for interim follow-up
Solar - Objections noted - no venue for comments regarding utility technical policies
Gov't - Objections noted, imperfect model

DPU - Concerns noted, no mechanism for gaining an understanding of member objections

Approved 4-3

3) Status of the company specific interconnection standards 5 mins

Ngrid - ESB 756C - being revised, end of year 2013 for changes, changes from MTSRG
Unitil - practices and standards doc stemming from discussion at TSRG
NSTAR - still targeting March '14 for first document. Living document, under rolling revision
WMECO - In process, Tech standards & policies, for billing, DG seminar slides, completion documents.

March 14, 2014 target date for all company specific standards (one year from first TSRG meeting)

4) Status of data tracking for Expedited Screening 67% vs 100% min load 10 mins

Targeting meeting in December for Feb 28, 2014 DPU report

NSTAR: If penetration is above 67% min load, flicker may become an issue
Ngrid - tracking
Unitil - no formal action, haven't seen projects that fall into range
NSTAR - no firm organizational position
WMECO - minimum load for line sections as well as feeders. Nov1 target date

Utilities to provide load data: Nov 1

5) Changes to the Utility Practices 9:30 AM-10 AM

MA utilities had a number of off-line meetings to work towards commonalities on meeting 1 topics. Ngrid presents commonalities and difference document - **Babak will circulate**

• RTU

Ngrid will not require RTU's for IPPs (No on-site loads, stand-alone generation). PCC recloser will do monitoring and control of generation, regardless of size and voltage class. PCC recloser was only polling data once a day, that frequency will be increased, allowing PCC recloser to do monitoring. PCC recloser only monitors Net load, not bidirectional, so it cannot discern load from generation
Remote monitoring still required for behind load, based on voltage class, DG > 500kW at 5kV, DG > 1MW at 15kV, 1.8MW at DG > 15kV

• Recloser requirement at the PCC

Recloser required at DG > 1MW, or any case-by-case situation where utility analysis deems it necessary

Recloser required at DG > 500kW on 5kV feeder

Gov't - recloser requirement is widely regional (NE), what is rationale?

WMECO - Switching and tagging, DSCADA reclosers can be remotely disconnected while dispatchers transfer load and switch circuits

Ngrid - Protection for DG raises fuse sizes > 100E, causes miscoordination on the balance of the feeder. Reclosers used to disconnect and sectionalize the DG for faults on the feeder.

Unitil - Relatively inexpensive, familiar way of providing full SCADA at site

NSTAR – Additional clarification: customers aren't disconnected for on-site generation. Generator breaker is tripped independently from customer load.

• 3MW PV limit on the 15kV class feeder

No longer being used by NGrid

• DTT

DTT uses to be outlined in document circulated by Babak

• Minimum Load Estimation

Utilities all use 25% for min load estimation on feeders that only have peak readings (drag needle)

Gov't - 15% of peak, measured on 1-2 year data. 25% of monthly may be too conservative.

Ngrid - compared true SCADA date to estimated min loads, 25% was an acceptable average for the data collected

6) Interface transformer configuration, effective grounding requirements

10AM-10:45AM

1. Utility Practices:

• What is the threshold to require effectively grounded source?

• What are the acceptable interconnection transformer configurations?

• When is grounding bank required? How should a grounding bank be sized?

Ngrid - 500kW for effectively grounded sourve, if on an effectively grounded feeder (4 -wire).

- Pri / Sec - wye-g neutral isolated/ delta
- Wye-g/wye-g. with effectively grounded source
- y-g/y-g with a grounding bank
- Delta pri with grounding bank on primary 13.8kV grounding bank (some wind likes to go Dy11)
- To prevent transient and temporary OV on unfaulted phases.

Gov't - Causes for OV - multi-lab/organization effort to study (EPRI/NREL/Sandia/inverter manufacuters) going on right now solidify a set of solutions. Requiring grounding bank may not mitigate tOV at all.
Ngrid - Neg seq components of grounding bank, may effectively move the condition from one point to another.

- Effective grounding, only for faulted conditions. In cases with a high generation;load ratio, tOV cannot be mitigate by effective Grounding

Unitil

- Load:gen to determine if it's effectively grounded. No ungrounded circuits. An excess of load on the other side of the generator can 'manage' the overvoltage condition.
- Require effectively grounded source
- Recommend Wye-G/delta, NGR if needed
- Ground fault detection can be compromised, Neutral Grounding Reactor can come into play

NSTAR

- No firm size for requiring effectively grounded generators
- Allow Y-g on utility side, NGR possibility based on X/R ratio for eff grounding
- Allow Delta on high side with 59N protection (3PTs)
- Allow Y-g/Y-g, Y-g/delta, Delta/Y
- No grounding banks used to this point

WMECO

- Application by application
- DG > 30kW will be analyzed for relaying
- System must be effectively grounded at PCC, no matter of size
- Handful of ungrounded circuits in service territory

2. Discussion
Effectively grounded source common in stators.
Solar - AE/Ropp paper, PV gens (current source) cannot create tOV on unfaulted phases.
Ngrid - During transients, inverter acts more like voltage source. Discussed at IEEE1547.8. Conclusion, in steady state it may but valid, but in transient state, inverter looks more like voltage source until system is settled and switching functions are complete within inverter bridges. Protection of system is dependent on transient period, very important.
Unitil - Neutral shift overvoltage is more dependent on magnitude of current source relative to the islanded load. (load:gen)
Ngrid - high gen:load drives tOV regardless of effective grounding.

7) Customer relaying redundancy (independent of generator)
10:45AM-11:45AM

1. Utility Practices:

• What is the threshold to require redundant relay?

• Which relays are acceptable?

• Location of the interrupting device for each interconnection transformer configuration.

• Are remote motor-operators permitted for customer disconnects?

Ngrid - DG > 500kW, requires redundant relaying.
Acceptable relays - 27/59/81o/u - 50/51 - fail-open. Alarm contact wired to relay trip. Relays must fail-open

Location: Yg/D, interrupter on high-side, delta winding contributes to fault. Z0 circulating in delta provides that fault. Yg/Yg effectively grounded source, interrupter on either side. Yg/Yg with grounding bank, interrupted between tap point where grounding bank is installed and transformer secondary. (Upstream of grounding bank).
Motor operators on customer generators okay with Ngrid

Unitil - No threshold for redundant relaying.
Acceptable functions. IEEE1547 (same)
Location of interrupting device - case by case, depends on the source of the fault current (see Ngrid outline)
Motor operator is accepted

NSTAR - DG > 1MW, inverter required. Asynchronous > 500MW. Synchronous 2 relays for all sizes.
Evaluate integrated relaying systems as utility grade. Two lines of utility grade required.
Ngrid - C37.90 - sums up 'utility-grade'
Functions - 27/59/81o/u, 50/51, 59N. Transfer trip if deemed necessary.
Location: depends on source of overcurrent.
Motor operators accepted

WMECO - DG > 500kW, utility grade
Functions. 27/29/81o/u, 50/51, 59N if delta high side
Location: Case-by-case, source of fault current, on site customer load.
Motor operators: accepted (must check with other departments) as long as it isn't used for tripping.

2. Discussion
CHP: integral generator breaker for synch (engine).
NSTAR: If integrated relay doesn't meet C37.90.
Unitil: not only utility grade. Utility accepted: includes C37.90, but perhaps more. Utility can access a copy of the setting files and interpret. (Foreign relays may be refused)

CHP: Can customer owned devices trip recloser
Ngrid: No, and it’s an administrative requirement as opposed to technical. Customer gear cannot trip utility-owned device. Who owns it? Who does maintenance? Liability, etc
NSTAR: PCC recloser is not considered supplement to customer protection. It's for utility use, data gathering, etc.
WMECO: Customer relays must be re-tested every 6 years.

8) 15 mins break
9) Lunch 12 PM-12:30PM

10) Reverse power flow provisions, Substation Transformers, Requirements (3V0 and N-1 screening) 12:30AM-1:15PM

1. Utility Practices

- Is reverse power flow allowed?

- What are the required substation upgrades if reverse power flow is allowed?

NGrid - Set aside fLTC, feeder regulator settings - Those issues can be resolved by changing settings, upgrading LTCs or regulators

Ngrid -
Allowed: Yes
Requirements: 3V0/59N relay on high side Delta substation transformers. Under-reach on transmission relays is analyzed. High speed detection is analyzed.
Methodology: All feeders on substation bus, N-1 of heaviest loaded feeder, if aggregate generation > (minimum load@ N-1) * .67, then 3V0 is required

Xmission < 115kV, VT's
Xmission >115kV CCVTs

Unitil
Allowed: Case by case.
Concerns with LTC controls,
Concerns for 69kV surge protection (OV)
DTT required when needed for 69kV surge protectors. 59N can respond fast enough, but at those stations, no 69kV CVTs, trip devices (high side breakers). DTT operates on transmission fault. (DTT 7-8 cycle max.)

Does not use (n-1).

NSTAR
Allowed: HICO xfmrs, up to the full rating of the transformer, could drop 1/3 of that for cooling, manufactured within the last 6 years.

Disallowed: Older transformers, need certification from transformer manufacturer, low level of success. Waukeshaw has provided. No one else. No plans for moving off this policy.

Technical concerns -
Exciting xfmr core from secondary winding, with is in closer proximity to core, can create stray flux in ferromagnetic core, can potentially create localized heating of xfmr winding insulation. This leads to loss of life over time, lead to faults. Xfmr seen as key asset for reliability of distribution. NSTAR has prior experience with loss of substation transformers.

Manufacturers; will pull shop drawings and analyze on a case-by-case basis.

NSTAR- Mitigated by reverse power flow deadband. Queueing system will determine DG tripping order.
GE D200 radio system capable at each PCC recloser, writing SCADA script for tripping to DSCADA PCC reclosers

LTC checked for regulate and reverse capability.
59N required on xfmr high side

WMECO
Allowed: Yes, case-by-case. Aggregate DG, size of transformer. LTC concerns for longer circuits.
Transformers with high-side fusing and no breakers are a concern looking forward.
No relay changes to date.
Rotating gen, DTT may be implemented to beat xtranmission switching. So not closing in out of synch

2. Discussion

DPU - Has NSTAR's policy always been to disallow reverse flow?
NSTAR - For 6 years, NSTAR has been buying HEICO, okay with reverse.
Concerns: core saturation, increased ambient noise

Gov't - Utilities polled (19), most say yes, they do or would.
Case study in NM, several MW per day, flowing onto Transmission. Sys Planning put precautions in place. Regular reverse power flow 5-8MW on a 16MVA rated xfmr.
Mike Coddington will circulate the case study.

Ngrid - Aggregate DG > min load on feeder in several areas.
Gov't - Transformers that are physically moved are more apt to fail

NSTAR to follow up with M Coddington to provide GE contact
Gov't - what manufacturer is Ngrid comfortable with?
Ngrid - all, Resistive vs reactive LTC - in resistive, creates active power, adds to reverse power and can push xfmr closer to saturation. 10% margin in resistive. 67% based on failure of a cooling fan.

CHP - Is the 67% used for positive load? No.
Gov't - can we aggregate manufacturers that Ngrid is backfeeding?
CHP - if it's focused on heating, can the heating be tested via oil testing, etc
NSTAR - policy is not set in perpetuity

TSRG will provide support, documentation, data from Ngrid territory in informing NSTAR

CHP - difficult for TSRP to try to prove a negative. To prove that it's not a problem on every transformer across the board. Can NSTAR provide an affirmation that there is a problem in the instances that they're concerned with.
We don't know the genesis of the policy. NSTAR may not know the genesis of the policy.

NSTAR to provide redacted document from GE, articulating issue.

11) Networks, interconnection of PV installations < 1/15 (simplified applications) 1:15 PM-2PM

1. Utility Practices?

3. Zero-export projects and queue-jumping-Kicking this to the agenda for meeting after group-study proposal is worked out – However, it did come up later during "Electrical dependence" discussion

All utilizes - following tariff, currently 1/15 min load of applying customer

Dan Mungovan, NGrid distribution planning - 1/15 was intended to be a benchmark for simplified process. Allowing interconnection without analysis.

2. Discussion (Is 1/15 minimum load a good criteria? Should it be increased?)

Gov't - co-secretary of IEEE1547.6 committee.
1547.6 states >50% of network protectors that influence the customer need to be closed, or the DG must be tripped offline.

CHP - is there a way to come up with a non-arbitrary number for the min?
Gov't - believe 1/15 is a fair number

DG > 1/15 goes to a study. Is not rejected.

NREL working with relay manufacturers on device that detects diminishing load and curtails generation

CHP - minimus may be more dependent on what equipment Is in the building than the actual minimum load. In the future, we may be able to develop a better benchmark based on what the biggest load the customer could potentially drop is.
NSTAR working on pilot program for systems > 1/15

Next agenda - identify DG capacity limit for networks

CHP - High side network interconnections?
Ngrid- Generator required to be interlocked to breaker.
Govt&Ngrid - Ideal for network to be fed from a single bus, introducing a high-side tap introduces another bus, can add different phase angles to voltage and current and affect the operation of the network protectors

12) Tariff definitions 2PM-3PM

1. Utility Practices?

• "Moderate and Significant change" Babak has drafted a list of moderate and

significant changes to start the discussion.

- Babak presents list of examples
- Significant -
  - System size change - substantial disagreement on this item
    - Can we change to only increases?
    - Unitil says no, we want to limit negotiation period
  - Ngrid - Current practice is to provide a study that covers the max generation applied for, and threshold capacities
  - WMECO - Customers can apply with interconnection options, and they will study each option.
  - CHP - final kW output comes after engine purchase +/- 100kW based on generator characteristic (shop drawings), how does that affect system size change? Grid - nameplate rating.
  - Gov't - high volume of interconnection applications to trying to find the right capacity
- New customer name
  - Not significant, project is assigned appropriately
- Application changes PCC

- Principles, based on how much analysis has to be revisited - Unitil
  - If they have to be redone from scratch, that's significant
  - If they study must be amended, not restarted, that's moderate
  - Impact on feeder capacity, impact on other applicants

- **Babak will circulate his draft, Mike Conway and Babak will work on language in interim**
- **Address at special meeting for 67%**

• "Electrical dependence" CA definition; if the output of the DG combines with the output of any earlier queued or existing DG, the facility is "electrically dependent"

Ngrid - per circuit, not substation - islanding studies open feeder at breaker. More islanding studies if it's done per substation
Unitil - per circuit,
NSTAR - per feeder or per substation. If there is reverse flow capability, substation is considered. If not, per feeder is considered
WMECO - applications on one circuit. Other -Several large stand-alone windfarms building a new substation.

NSTAR - queue jumping "any application scenario where a prior applicant's interconnection would preclude subsequent applicant interconnections."

DPU - significant concerns about queue-jumping, philosophically

2. Discussion

13) 15 mins break

14) IEEE 1547a and IEEE 1547.8 updates?
3:15PM-3:30PM

1547a allows for o/u frequency and o/u voltage ride-through in abnormal conditions
Disconnecting DG can makes underfrequency worse
UL will have to recertify next generation of inverters
Islanding concerns
Ngrid pilot program, will be cheap enough to implement. Separate anti-isalnding protection from ridethrough, no longer using frequency perturb.

1547.8 - 1547 is a voluntary standard.
Recommended practices for 1547, plus some recommendations for.4
(1547.4 microgrids)

15) Power factor requirements
3:30PM-4PM

- What is the PF requirement at the PCC?

- Is the generator allowed to regulate the PCC PF?

Ngrid - 95% requirement
Allow to do static pf regulation
if the supply circuit has no voltage regulators, pcc pf regulation.

Unitil - 95% at inverter for IPP
Non-IPP is measured at PCC
No active regulation

NSTAR - 95%
Impact Studies at unity power factor
No power factor requirement
Nothing in ISA stipulates
(NSTAR holds .95 in ISA for future use)

WMECO 95% at inverter
Studied at unity

Any other thoughts for the next meeting?

- Significant and Moderate (work in the interim)
- Group Studies (electrical dependence)
- Capacity limits for networks
- Use of outside contractors for applications and construction (from DGWG document)

Set date for special meeting to address DPU order 11-75 task
Monday December 2, 2013 being held as tentative date for special meeting

Adjourn 4PM