Distributed Energy Planning Workshops

Meeting Notes: December 13, 2006 - Policy Workshop 3

The third Distributed Energy Planning Workshop convened on December 13 at MTC Headquarters in Westborough, MA. Fran Cummings from MTC served as the facilitator, with 18 additional participants on site and 8 by teleconference/webinar. A listing of participants for all Workshops appears at the end of these minutes. The agenda and materials for the Workshop, including the revised Guidance Document, are posted on the MTC website at:

http://www.masstech.org/dg/2006-12-13_Workshop.htm

The following meeting notes are structured around the Agenda, which had been posted in advance at the above link. References to Attachments refer to the Attachments to the December 31, 2006 report to the Department of Telecommunications and Energy (DTE) entitled "Update on Distributed Energy Planning Workshops."

Welcome and Introductions (9:00 – 9:20 AM)

Fran began the meeting by reviewing the schedule for completing a report to the DTE prior to the end of the year. The Working Group discussed the question of whether MTC or the Distribution Planning Work Group (DPWG) is submitting the report. The WG is facing a tight schedule for review and acceptance of report by the WG for delivery before December 31. There is limited availability of WG members in this time frame.

Review Results of Workshops 1 and 2 on September 27 and November 15 (9:20 – 10:00 AM)

Charlie Salamone discussed results from prior workshops. The presentation discussed the Matrix of Challenges and Solutions (Attachment D of final submission), which has been expanded into the Guidance Document (extracts in Attachments B and C). The presentation is available at:
http://www.masstech.org/dg/DGRoles.ppt

Charlie then presented and expanded on the two roles of DG in distribution planning – the technical, economic, and legal challenges for each. Most workshop participants indicated that DG installed by utilities is not permitted in MA. They felt that giving incentives to customers is possible but unlikely to work. DG does occur for customer-driven reasons. They questioned how can we take advantage if it does occur. They expressed the view that the key is managing the cost.

Role #1: Leverage Future Value of Customer DG

Questions discussed with respect to Role 1 included the following: If DG occurs in response to generation market and /or policy drivers, is there a way, with some incremental modifications or layers, to take advantage of the DG later? For example, is there optional low-cost customer equipment or design configuration that would facilitate and support the reliable operation of DG within the utility distribution system? Is there utility equipment or design that would facilitate the reliable operation of widespread DG within the distribution system? Due to reliability and

operation requirements, customers will generally not be receptive to disconnection by the utility when they lose their internal generation. We must clarify how the customer takes first steps without making this commitment. The decision and the cost would be the customer's. The technical approach might be for the customer to island off or shed load. Will the customer elect to do this?

The utility would need to upgrade to accommodate the future operating arrangement. Charlie presented a screening process for identifying sites. Utilities would perform this task as part of their initial planning process. Light industrial loads were described as not offering an opportunity.

During the discussion of Role 1, it was noted that presenting a cost–benefit analysis to justify installing even a basic recloser rather than fuses is already a significant challenge. Any substantial increase in cost would make this assessment even more difficult. When installing a recloser, choosing a more elaborate and DG-friendly bidirectional flow tolerant controller with communications adds a 50% cost premium over a basic unit with hydraulic operator and controller designed for one power flow direction. How do we show benefits that give confidence that the additional investment will be utilized and bring adequate returns? Overall, when upgrades are due to happen, can the utility make DG friendly decisions?

It was also noted that the incremental cost of DG friendly equipment may be lower when and if decisions are made for grid modernization, through which many systems would be highly DG friendly in their base case configuration. Utilities continue to evaluate new system configurations and modern equipment, some of which could be part of a redesign of the distribution system (i.e., Modern Grid Initiative). But they have seen significantly increased cost to make the transition. The Modern Grid approach takes the utility to more sophisticated operations but with higher costs for planning, design, procurement and installation of the distribution system. It was suggested that existing rates do not support the Modern Grid approach, which will cost more than today's distribution systems. Right now the high overall energy costs make it difficult to look at raising rates to fund the distribution companies' Modern Grid approaches that may be more supportive of customer DG. A clear picture of challenges and possible approaches might help utilities and regulators in deciding on rate cases where the fundamental approach to DG is at stake. Utilities are interested in trying pilot installations in conjunction with MTC (e.g., congestion relief pilots).

Contractual issues between utilities and customers relating to DG have not been included in study to date but will have to be addressed, through EPRI and other projects.

Role #2: Seeking Locations to Use DG as Distribution Deferral Resources

This is the role at the core of the earlier Navigant study covered in the June 2006 DPWG report, in which the utility would identify circuits where planned capacity upgrades might be deferred through customer DG, and would promote use of DG there. It was observed that the following was stated on Page 36 of the June 2006 DPWG Report: "Based on the conclusions in the Navigant Economic Analysis, DG appears to provide some positive benefits in deferral of distribution investment, but only within narrow windows of opportunity, based on specific timeframes, need dates and specific feeder lines, and only when DG is combined in a package of resources that includes energy efficiency and demand response measures. Thus, the deferral value results, on their own, summarized in the Navigant Report, do not provide support for widespread deployment of DG."

It was noted that an essential part of Role 2 would be development of a straightforward analytical screening process (e.g., annual) that would increase the efficiency of actively

pursuing DG as a solution for deferral. The utilities expressed concern that significant resources would be needed to identify the few viable instances where DG would defer upgrades to distribution infrastructure. They repeated their concern over the lack of experience with operational issues regarding implementing DG within the distribution system and suggested that at this time the primary effort should be on the implementation of pilots which would be needed to show practical issues and solutions.

In conclusion, the DPWG felt that Role 2 has limited opportunities, and faces economic and practical challenges to operate successfully. By contrast, Role 1 deserves more attention and work - there will be many more customer-driven DG installations, and thus more possibilities for utility planning benefit.

Guide Document, December 11 Draft, and Related Discussions (10:00 – 11:00 AM)

The KEMA document, titled at that time "Planning Guidelines for Customer Owned Distributed Generation", has technical content not planned for detail review at the Workshop – some of this had been done in preceding teleconferences. See The basis for discussion at the Workshop was the December 11 draft:

http://www.masstech.org/dg/2006-12-11-DRAFT-Planning-Guide-KEMA.doc

Eric Udren of KEMA characterized the guide as a work in progress - it will not be complete prior to submittal to the DTE at the end of the year, and is proposed for completion in 2007. The stakeholders confirmed that the guide provides the type of information that would be useful to support customer DG applications. The document would support both utilities and customers working in a relationship under Role 1 discussed above. The presentation discussed the DG penetration issues, including examples of when high penetration of DG could provoke problems - there are thresholds beyond which there could be significant system-wide response issues. The discussion cited a GE study on DG high-penetration system impacts that suggests that DG could help or hurt system response to disturbances, depending on specific DG response characteristics. IEEE 1547 rules, required by existing tariffs, were not created with recognition of these response issues. A penetration level of 15% - 20% has been considered as a threshold at the distribution circuit level, but at the system level smaller penetrations could impact performance during disturbances. The utility group suggested that this issue be highlighted in the report.

The presentation continued on the layout of the planning guide, including how the Matrix of Challenges and Solutions has been mapped into the Guidelines. The concept of adding example cases, with diagrams and explanations, for each of the problems discussed in the report was presented and accepted by the group. The draft presents a number of factors that could be used as part of a flow chart that would provide a means to review or screen installations for possible problems and solutions. It was noted that the Modern Grid approach could be included as part of the control & monitoring section, and that this includes communications for DG maintenance as described in draft IEEE 1547-3. Participants felt that system loss issues, which have proven difficult to analyze in the past, should be omitted here and dealt with in economic analysis later, if at all. It was suggested that NPCC guidelines should be analyzed and incorporated where appropriate.

It was requested that Guidelines should include a previously-discussed CHP example cited on Page 2 of the November 15 Workshop 2 minutes.

There was some discussion concerning wind projects - large wind farms are connected at distribution as well as transmission level. Smaller wind farms below the ISO involvement size level of 5 MW are not necessarily studied for impact upon the transmission system. It was

requested that the guidelines explain this distinction, and focus on handling these smaller installations.

The group felt that the title suggests that the document is a comprehensive overall guide, although it is intended to be a toolbox for use by utilities and customers in identifying and addressing potential problems. A change of title was requested, and handled in the breakout discussions described below. The revised title is "Guidance Document for Customer-Owned Distributed Generation Applications."

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Photovoltaic (PV) hybrid ridethrough solution discussion

Jim Bing of New Energy Options presented a PV discussion referencing the diagrams in the section of the Guidelines that was then numbered 6.5, Special Issues for Solar Photovoltaic (PV) DG. The discussion began with a review of the voltage and frequency limits for response of PV to the utility circuit. The presentation also reviewed a variety of typical PV installations and interconnections, some of which included energy storage and local load control options. PV systems are highly configurable, originating with free-standing (off-grid) applications. The simplest Scenario 1 connection with no storage or load shedding comprises 80% of installations. The fault scenario discussion noted that all units must be IEEE 1547 compliant; UL testing standard 1741 has been harmonized with 1547. These systems all wait 5 minutes after the system is restored before reconnecting to the grid, and Distribution Company inspectors check for this behavior, even though IEEE 1547 allows for shorter adjustable delay. Energy storage options include a Beacon Power flywheel system, and a 1 MW battery storage system from SAFT.

EPRI Work on DG Applications

Dan Rastler and Bill Steely presented several of their EPRI DG initiatives by telephone. EPRI is working on technical assessment and characterization of cost, performance, and emissions of technologies they identify. How do these technologies interact on the grid? EPRI is working specifically on:

- Radio DG communications.
- Software tool (which may become publicly available) for screening radial interconnections.
- DG on spot and grid networks – a tougher problem than radial circuits.
- Impact of penetration level.
- Best practices on the utility side for using DG to support planning and operations with focus on high concentrations of PV. It is possible that EPRI will publicly share key results.
- Software tool – when to use DG to defer capital upgrade investment.
- How the utility monetizes the benefit of customer DG.
- Assessment of near-term benefits of communications.
- Finding demonstrations and applications – peak shaving, premium power, and energy storage. Do they meet availability and greenhouse gas emissions requirements?
- Opportunity fuels – natural gas, biomass, and biodiesel. How to serve emissions and other constraints in an urban area.
- Market integration – how to work through DG regulatory variations among the states.
- Business case and business models - how can customer owned and operated equipment be monetized and related back to the utility?
- Working with DUIT on testing inverters.

EPRI has looked at the MTC Guidelines draft, and sees it as ambitious, and needing to be actionable. They suggested adding more on PV, as well as including application related sections from both the customer and utility sides. EPRI offered send comments and wants to engage in the document development process. (EPRI did send more detailed comments after the Workshop).

Breakout Sessions (11:00 AM – 12:30 PM)

Technical Session

The technical group discussed the current state of the guide and noted that it serves as a review of solution strategies at this stage, with appropriate level of detail. Following up the earlier morning discussion of how the title needs revision, the Guidelines were renamed as "Guidance Document for Customer Owned Distributed Generation Applications".

Utility markups are to be received for Section 1.2. Section 1.4 is to be revised to address high penetration DG impacts on higher level systems - at least identify the potential problems without necessarily suggesting solutions. It can point out that control and protection systems may need to change to address future concerns with penetration. In the original Section 1.5, DG as impacted by the document may not begin to appear until 2009, if not later. It was suggested that the document explain that ISO reviews are required for units greater than 5 MW, even though 5 MW is below the IEEE 1547 10 MW limit. One utility is processing a 15 MW distribution application of wind generation, but this will have ISO review. Most DG installations are under 1 MW. NPCC input is to be incorporated.

Underfrequency generator tripping needs attention. The Guidance Document needs a Section 3.1.4 – what does IEEE 1547 tells you, plus regional procedures. Large generating units are to remain on line during frequency excursions. IEEE 1547 says small units *can* do it, but are small units actually being set for compliance with the regional Under Frequency Load Shedding (UFLS) schemes? Utility participants suspected this may not be closely tracked.

In Section 4 operational issues have been added to the title and content. The group discussed switching and green-stripe tagging issues that could call for units to trip quickly and remain off line rather than staying on line. The field repair crews validate that the circuit is dead, ground the circuit conductors, and work with gloves. NESC requirements have not been addressed. What are the *incremental* risks in the operations of the distribution system when the DG is considered as an integrated resource supporting the increased customer load on a circuit?

Economic Session

Mike Stocki of UMass made a presentation about potential DG adoption scenarios and a sensitivity comparison with Navigant results for customer-owned DG. Fran Cummings of MTC also presented elements of a potential framework for DG cost-effectiveness, including deferral and other benefits, and including incremental costs to make DG a potential distribution resource.

Other Outstanding Issues from 2006 Report (1:00 – 2:30 pm)

Role of Non-Dispatchable PV in Distribution Planning

Jim Bing made a presentation on Non-Dispatchable PV:
http://www.masstech.org/dg/MTCDG12-13Workshop-1061212.ppt

This included discussion of the capacity value of PV plants. Jim's presentation referred to the following paper prepared by D. S. Shugar of PG&E in 1990, "PV in the Utility Distribution System: The Evaluation of System and Distributed Benefits," which is posted at:

http://www.masstech.org/renewableenergy/public_policy/DG/resources/1990-05-22-PVBenefits-DShugar-PG-E.pdf.

The group noted that, while PV may not contribute fully to peak load reduction, it may provide for lower pre-contingency loading that increases available capacity under contingency conditions. The discussion also included the meteorological data bases used by PV installers for planning.

The discussion turned to the impact of PV and the two utility roles discussed above. The group observed that Role 1 (in which the utility tries to utilize benefits of DG that the customer chooses to connect) is more practical to learn about and handle now. As utilities connect PV now, the question is what to do to take advantage of it. Utilities asked how they can actually get the benefit. It was noted that there is international experience with the use of DG as a tool for distribution planning.

One participant proposed that DG should be able to connect without particular utility response to the one installation – rather, take advantage of the statistical behavior of a population of units. This would be related to how the utility reacts to customers who buy and use air conditioners – the customers don't plan this with the utility. This approach assumes there are a relatively large number of DG units operating on a circuit. Today only a limited number of DG units are installed on any specific circuit.

Discussion of EPRI STAC Project

Gerry Bingham of MA-DOER provided an overview of the current effort by the EPRI State Technologies Advancement Collaborative (STAC) group. In earlier phases of the program, an experimental project had a tough time finding customers who agree to physical assurance. They were also not seeing major benefits from deferring line upgrades. DG can have a business disincentive for utility – lost revenue – so how do we make a business case? He noted that they committed to review and develop new business models for DG integration, focusing on the bottom line for each stakeholder. The EPRI STAC group is looking for the right business models for a January California Workshop. One next step will be discussions with utility participants to see if any would be interested in pilot testing the proposed business models. At the end of the EPRI effort will be a review of the pilots that are selected for implementation. The DPWG is interested in stakeholder briefing and opportunity for input later. EPRI is planning a promotional presentation at the end of the project.

The Modern Grid Initiative

Bruce Renz made a presentation on this Initiative, which is posted at:

http://www.masstech.org/renewableenergy/public_policy/DG/resources/2006-12-09-Renz-DFT-Modern-Grid.pdf.

One comment was that the Modern Grid Initiative is working aht a high level (20,000 feet), as compared to the DPWG application detail focus (1,000 feet). For overall background see http://www.moderngrid.org. There is a white paper expounding on characteristics stated on Slide 4. IntelliGrid talks about replacing meter with consumer portal.

Within the Morgantown project, Phase 2 (planned for 2008) will be a demonstration of dynamic islanding with DER. The project also includes grid-friendly appliances that sense voltage and frequency.

There was a discussion of ways for the DPWG to stay connected with these and other projects.. Bruce suggested reviewing the San Diego Smart Grid Study, summarized in the following presentation:

www.masstech.org/renewableenergy/public_policy/DG/resources/2006-11-16-SanDiego-ModernGrid-Anders-EPIC.pdf

RPI Renewable Energy Test-Bed

Nag Patibandla of the RPI Center for Future Energy Systems introduced the "renewable energy test-bed" for which it has received a state grant and summarized RPI renewable energy efforts.

Discussion on How to Proceed with Report and Supporting Documents (2:30 – 5 PM)

The stakeholders reviewed a detailed outline for a comprehensive report, posted at:

http://www.masstech.org/dg/2006-12-11-DRAFT-Outline-Workshop-Report.doc

As discussed during the introduction, the submission would have to be appropriate considering the short available time before the committed December 31 delivery date. Also, it was noted that DTE has not yet reacted officially to the prior June 2006 report, and the WG felt the need to propose a logical basis for any continuing work.

The Utility group felt that the Guidance Document was needed and useful, but that there are issues in the draft Report that they are not yet comfortable with. Users are concerned about what reviewers will perceive as the intent of the report if it is not fully developed prior to filing. They felt that the additional work needed would not be feasible prior to the end of the year.

The group noted that the formal DG Collaborative process was completed in June 2006. The group agreed that the more recently raised issues must inevitably be dealt with, and continuing the effort should help all stakeholders prepare for this use of DG. The utilities felt that as long as they can confront these issues without being forced to follow specific uneconomic or technically unfeasible approaches, they are supportive of continuing with development of the Guidance Document. They discussed how the two roles for utilities are interesting and worth developing, but creating the Guidance Document is seen as a precondition to understand the issues that must be addressed for each role. They stated a commitment to making the effort to develop the Guidance Document as quickly as is practical. They see Report Outline Section 4 on the two utility roles as fine in concept, but wording needs work before utilities would be comfortable with the message. They asked about what is the customer experience for each utility role? A number of factors on the two roles, ranging from resource issues to customer contract requirements, would need to be explained. Some participants thought that Role 1 may have more impact on transmission and forward capacity than on the distribution system. Others asked if there is a need for a contractual arrangement to implement Role 1.

The Workshop group agreed that the economic analysis work (Section 5) is not ready for use.

There was discussion about how to see value in proceeding further. To date the group has been resource deficient for completing the document. The primary question seems to be: "What is

the recommendation of the Working Group?" If the group agrees that a program for deferring line upgrades would yield only targeted and limited results (if any), why not say that in the report now instead of continuing to state that it's "inconclusive." We could then agree to concentrate on roles for DG in a context broader than just deferring upgrades; by seeking to quantify (and compensate) benefits wherever it is installed instead of asking where DG can replace wires. The utilities were concerned that the effort was directed at forcing the utility to include DG as a utility deferral solution, even though the implementation steps cannot be carried out today. Also, there is not enough DG, or financial incentive to pursue such an approach. The importance of incorporating this work into anticipated attention from the next administration was highlighted. It was stated that in going forward, DTE will need to know what utilities are willing to do on their own, versus what might be mandated.

There was some discussion on the reluctance of customers to forego having a distribution supply backup even if they had their own DG resource. Perhaps the issue of customer need for utility backup at times of DG outage should be treated separately from the ability to configure DG as a distribution resource. On a related reliability topic - if DG does not perform properly, utilities are concerned about who should not be responsible for the negative service quality impact. It may be appropriate to ask EPRI to look at contractual responsibility issues.

The group requested that underfrequency load shedding (UFLS) be considered in the Guidance Document and in future tariffs.

Bruce Renz explained the priorities in the California Loading Order for handling supply deficiency:

a) Improve efficiency

b) Use renewables. By 2010, CA would like to go from 5% to 20% renewables (but very unrealistic).

c) Use demand response.

d) Central generation with clean technologies (no coal).

f) Future – plug-in hybrid vehicles as fuel-cell generators.

A comment was made that regulators need to think more broadly and "loosen handcuffs" on utilities. California is still vertically integrated. In MA, generation is separated and distribution companies are wire companies only. This complicates the establishment of the utility roles.

At prior Workshops the utilities had agreed to provide lists of equipment needed for DG utilization with costs. The utilities stated that they have been attempting to identify incremental costs but were having difficulties extracting this data from their records. It was suggested that KEMA might help with data it would access independently from other sources. A few case studies could identify the costs of with DG use. Utilities wanted examples of straightforward versus complex cases. The goal is to guide customers who never did this before. The group heard about how customers want transparency to predict costs before they apply new equipment for PV applications.

The discussion moved to consideration of whether MTC should continue to fund work by KEMA to complete the Guidance Document. Utilities favored continuing development in early 2007. The Document would not be filed with the DTE. Instead, note would be submitted that such an effort is in progress and seeking feedback. KEMA suggested two more workshops (perhaps in February and March) to get stakeholder participation in development of the guide by April. The authors were asked to seek EPRI feedback on the Guidance Document.

The WG returned to the key question of what type of report should be filed with the DTE at the end of December. It was noted that the report will just be informational; telling the DTE what has been accomplished. The report or cover letter is to be based on Statement 2 now appearing at the beginning of the Report Outline. Attachments are to be the Guidance Document table of contents (TOC) with draft of Chapter 1; and the Matrix of Challenges and Solutions from earlier workshops. A heading showing the addition of material on examples of how CHP projects have demonstrated a capability for ride-through is to be added to the TOC for the Guidance Document. An example from Section 3.3.1 of the Guidance Document is also to be included as an attachment. .

Comments were made that the DPWG must address the related business issues, not just technical issues. It must invest time and money going forward to look at this. The Working Group members felt that the DPWG should also continue to exist as a forum as the economic, regulatory and technical situation for DG evolves.

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