Metric #3: Standard Distributed Resource Connection Policies

M.3.1.0 Introduction and Background

The increasing presence of backup generation among utility customers has led to various efforts for standardizing the process of interconnecting these resources to the grid. The Carnegie Mellon Electricity Industry Center reports that there are now about 12 million backup generators in the United States, representing 200 GW of generating capacity that is growing at a rate of 5 GW per year.[1] Utilities that facilitate the integration of these resources and use them effectively can realize enormous cost savings over the long term. Distributed resources can be used to help alleviate peak load, provide needed system support during emergencies, and lower the cost of power provided by the utility.

The cost, time lag, and onerous review process associated with interconnecting distributed resources to the grid are often cited as major barriers to further adoption of distributed energy resources (DER). Federal legislation attempting to deal with this issue has emerged in progressively stronger language, culminating in the Energy Policy Act of 2005 (EPACT 2005),[2] which requires all state and non-state utilities to consider adopting interconnection standards based on IEEE Standard 1547. IEEE 1547, which was published in 2003, looks strictly at the technical aspects of distributed-generation interconnection, providing a standard that limits the negative impact of these resources on the grid.[3] In part to address some of the permitting aspects of interconnection, the FERC issued FERC Order 2006, which mandated that all public utilities that own transmission assets provide a standard connection agreement for small generators (under 20 MW).[4] This will provide expedited permitting for many customers using distributed generation; however, it is up to each state and utility to determine how to define and implement these rules.

M.3.2.0 Description of Metric and Measurable Elements

(Metric 3) The percentage of utilities with standard distributed resource interconnection policies

The topic also discusses the commonality of such policies across utilities.

M.3.3.0 Deployment Trends and Projections

While compliance with FERC Order 2006 is mandatory for public utilities that own transmission assets, other utilities have come under similar legislation at the state level. The progress of these laws, however, has been fairly slow. Even states complying with the mandatory FERC order have taken over

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[1]Gilmore E and L Lave. 2007. *Increasing Backup Generation Capacity and System Reliability by Selling Electricity during Periods of Peak Demand*. 26th USAEE/IAEE North American Conference, September 16-19, 2007. Carnegie Mellon Electricity Industry Center. Accessed November 24, 2008 at http://www.usaee.org/usaee2007/submissions/Presentations/Elisabeth%20Gilmore.pdf

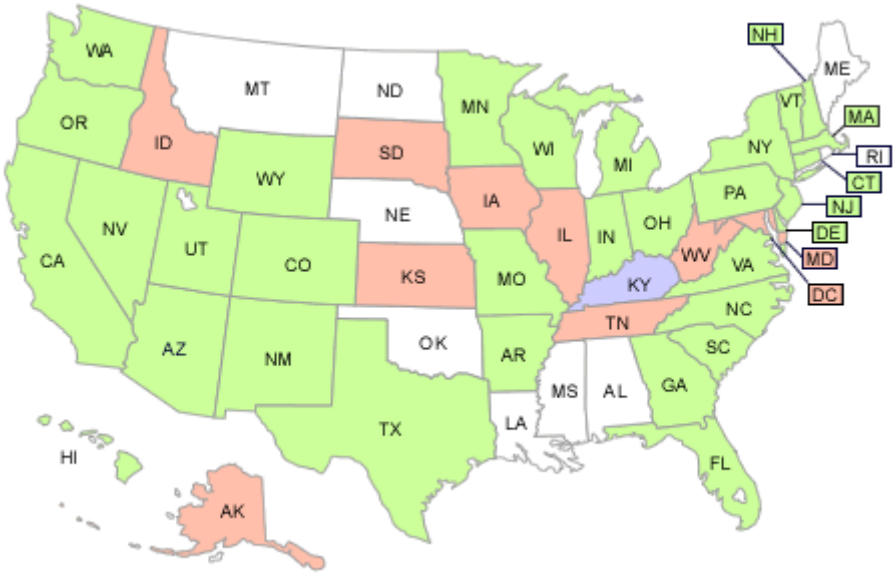
[2]45 USC 15801 et seq. 1986. *Energy Policy Act of 2005*. Public Law 109-58, as amended. Accessed November 26, 2008 at http://www.oe.energy.gov/DocumentsandMedia/EPACT05ConferenceReport0.pdf

[3]Cook C and R Haynes. 2006. *Analysis of US Interconnection and Net-Metering Policy*. North Carolina Solar Center, North Carolina State University, Raleigh, North Carolina. Accessed November 24, 2008 at http://www.ncsc.ncsu.edu/research/documents/policy_papers/ASES2006_Haynes_Cook_.pdf

[4]Federal Energy Regulatory Commission (FERC) Order 2006-A. 2005. *Standardization of Small Generator Interconnection Agreements and Procedures (Order on Rehearing)*. Docket Number RM02-12-001.Washington, D.C. Accessed November 24, 2008 at http://www.caiso.com/14ea/14ead07a4660.pdf

two years to enact these relatively simple rules. States that have taken aggressive action on distributed generation have tended to do so for other reasons, such as meeting renewable portfolio standard requirements.

In February 2008, the Environmental Protection Agency (EPA) did a study of the 50 states and the District of Columbia, assessing their standards for interconnection. They found 31 states with standard interconnection rules for distributed resources, and 11 additional states in the process of developing rules. Of these, the EPA found that 55% had standard interconnection forms, 29% had simplified procedures for smaller systems, 35% had a set timeline for application approval, and 45% had larger system size limits (over 10 kW for residential and over 100 kW for commercial systems).[5] Figures M.3.1 and M.3.2 show the EPA results by state.



- **Policy in place:**
  AR, AZ, CA, CO, CT, DE, FL, GA, HI, IN, MA, MI, MO, MN, NH, NJ, NM, NY, NV, NC, OH, OR, PA, SC, TX, UT, VT, VA, WA, WI, WY
- **Action is pending/possible:**
  AK, DC, IA, ID, IL, KS, MD, SD, TN, WV
- **Some elements of policy are in place:**
  KY
- **Policy not in place:**
  AL, LA, ME, MS, MT, NE, ND, OK, RI

Figure M.3.1. State Interconnection Standards[6]

By multiplying the percentages above by the number of utilities in each state, it is estimated that roughly 61% of utilities have a standard interconnection policy in place, and that 84% of utilities either have a policy in place or will have one soon based on pending legislation or regulation.[7]

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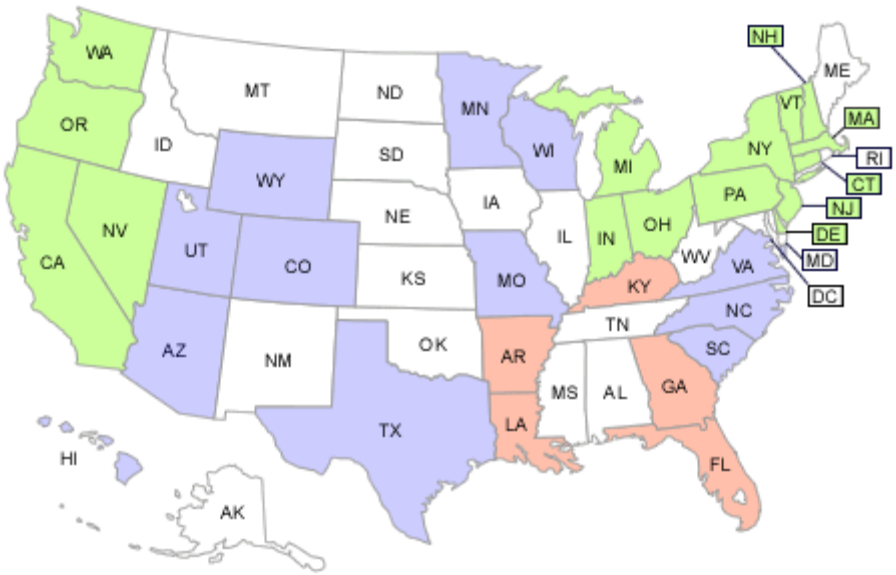
[5]U.S. Environmental Protection Agency (EPA). 2008. *Interconnection Standards*. Combined Heat and Power Partnership (CHP), U.S. Environmental Protection Agency, Washington, D.C. Accessed November 24, 2008 at http://www.epa.gov/chp/state-policy/interconnection.html

[6]EPA 2008. *Interconnection Standards.*



- **Favorable Interconnection Standards:** CA, CT, DE, IN, MA, MI, NH, NJ, NY, NV, OH, OR, PA, VT, WA
- **Unfavorable Interconnection Standards:** AR, FL, GA, KY, LA
- **Neutral Interconnection Standards:** AZ, CO, HI, MN, MO, NC, SC, TX, UT, VA, WI, WY
- **No policy in place:** AL, AK, DC, ID, IA, IL, KS, ME, MD, MS, MT, NE, NM, ND, OK, RI, SD, TN, WV

Figure M.3.2. Favorability of State Interconnection Standards[8]

The EPA's study based its criteria for favorability on whether or not standard forms were in place, time frames for application approval, insurance requirements, distributed-resource sizes allowable, and interconnection study fees. With these factors considered, only 15 states were classified as having "favorable" interconnection standards, with 27 states either being "favorable" or "neutral." The fact that there are five states with unfavorable policies towards distributed generation is also cause for concern, although it is worth noting that that these states are all in the southeast region of the United States.

There are currently about 10 states with new DER interconnection standards under consideration (AK, DC, IA, ID, IL, KS, MD, SD, TN, WV). Most projections show increasing deployment of these resources, especially in the commercial sector where power quality and power reliability are becoming issues of increasing concern. A study from the EPRI, for example, estimates that by 2010, 25% of new electric power generation will be in the form of distributed generation.[9] These resources will require smart-grid technologies and new regulations to integrate effectively, but will greatly benefit utilities if used appropriately.

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[7]Energy Information Administration (EIA). 2002. *Contact Information for Electric Utilities by State*. EIA, U.S. Department of Energy, Washington, D.C. Accessed November 24, 2008 at http://www.eia.doe.gov/cneaf/electricity/utility/utiltabs.html

[8]EPA 2008. *Interconnection Standards.*

[9]Dugan R, TE McDermott, DT Rizy, and SJ Steffel. 2001. "Interconnecting Single-Phase Backup Generation to the Utility Distribution System." In *2001 IEEE/PES Transmission and Distribution Conference and Exposition*. Institute of Electrical and Electronics Engineers, Inc., Piscataway, New Jersey. Accessed November 24, 2008 at http://www.ornl.gov/~webworks/cppr/y2001/rpt/112434.pdf

M.3.3.1 Associated Stakeholders

There are a variety of stakeholders that have added their input to various state processes regarding interconnection:

- Distribution-service providers and electric-service retailers, who will ultimately be responsible for managing the grid impact of these resources
- Suppliers of distributed-resource products and services, who would gain significantly from easier interconnection standards
- Regulators and policy makers, who are concerned with how utilities choose to account for the costs of these resources, as well as other related legislation, such as meeting renewable-portfolio-standard requirements
- End users who have distributed resources on their properties and want to tap into the potential benefits of selling power back to the grid

M.3.3.2 Regional Influences

Regional differences in perception of the dangers and benefits of distributed resources have made an impact on where they are deployed. Many of the regional policies that have emerged are driven by a few major state players; their policies are then copied by other states and regions.

- California's progressive distributed-generation interconnection policies place no limits on the size of the resource. This is coupled with strong incentives for renewable sources of energy such as photovoltaic solar panels primarily for the purpose of promoting cleaner alternative power sources and reducing transmission congestion. California's policies have had a strong impact along the west coast.[10]
- New York, which was one of the first states to adopt a standard interconnection policy in 1999, has continued to provide support for distributed generation. Part of the driver for this has been power outages and transmission congestion, which continue to plague much of the state.[11,12]
- The Mid-Atlantic Distributed Resources Initiative (MADRI), representing the utility interests of Delaware, the District of Columbia, Maryland, New Jersey, and Pennsylvania, has been a strong driver of interconnection standards for distributed resources and has proposed a model that has been adopted by many states.[13,14]

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[10] Shirley, W. 2007. *Survey of Interconnection Rules*. The Regulatory Assistance Project. Montpelier, Vermont. Accessed November 24, 2008 at http://www.epa.gov/chp/documents/survey_interconnection_rules.pdf

[11] Brooks, Susanne, Brent Elswick, R Neal Elliott. ca. 2007. *Combined Heat and Power: Connecting the Gap Between Markets and Utility Interconnection and Tariff Practices (Part 1).* American Council for an Energy-Efficient Economy, Washington D.C. Accessed February 6, 2009 at http://txspace.tamu.edu/bitstream/handle/1969.1/5646/ESL-IE-06-05-29.pdf;jsessionid=E3BEDBFE54ED9C979F738211A5592445?sequence=1

[12] Shirley, W. 2007.

[13] Brooks et al. 2007.

[14] Shirley, W. 2007.

- Many states in the Southeast region have been resistant to implementing favorable standards for interconnection (Figure M.3.2). This may be due to regional challenges that must be overcome specifically in those states, which would require special assistance.

M.3.4.0 Challenges to Deployment

The barriers to deployment may begin to fall as more states adopt progressive policies to allow higher penetrations of DER. Significant barriers will remain in certain regions such as the Southeast, where this groundwork has not been done. If climate legislation is passed, it may prove to be a significant barrier to more traditional forms of DER such as diesel reciprocating engines.

M.3.4.1 Technical Challenges

There is still disagreement among some utilities and DER manufacturers about how to handle DER interconnection at high levels of penetration. With low levels of penetration, most utilities consider their distribution systems to be robust enough to handle disturbances in the system and unexpected DER disconnects. At this point, however, the technical specifications for DER are written conservatively, in order to err on the side of safety.[15] For example, most interconnection agreements require DER not to feed back into the system. Protection schemes presume that power is flowing to the customer; however, some utilities, such as Portland General Electric and DTE Energy Company are accommodating DER integration to provide power flow back into the grid.[16]

M.3.4.2 Business and Financial Challenges

Utilities still have difficulty making the business case for distributed resource integration, especially without integrated distribution and transmission planning. While using DER can aid utilities in reducing transmission congestion, these effects are difficult to model and are generally not within the purview of utilities.

M.3.5.0 Metric Recommendations

The investigation for this metric relies almost exclusively on a one-time study of DER interconnection policies. Reliance on a single report for both a definition of what constitutes a standard DER interconnection policy and an estimate of the number of utilities with such policies in place has shortcomings when considering the potential to monitor trends over time. Thus, future smart grid metric reports should give consideration to both defining what constitutes a standard DER interconnection policy and identifying surveys, reports, or other literature that will yield consistent results over a longer time horizon. Also, consideration should be given to assessing the fairness of DER interconnection policies to encourage a level playing field for DER integrators, utilities, and ratepayers. Further, questions should be devised and used during the process of conducting interviews in support of future smart grid metric reports.

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[15] Institute of Electrical and Electronics Engineers (IEEE) 1547. 2003. *Standard for Interconnecting Distributed Resources with Electric Power Systems.* No. 1547, IEEE, New York.

[16] Waligorski, Joseph G. October 2008. *Utility Consortium Project Summary*. DOE RDSI Peer Review Meeting, Red Bank, New Jersey. Accessed February 6, 2009 at https://events.energetics.com/rdsi2008/pdfs/presentations/thursday-part2/4%20%20Waligorski%20GridApps.pdf