Standardized Interconnection Rules

An Effective Policy to Encourage Distributed Generation

A standardized interconnection rule is one of several tools that states can adopt to increase the amount of clean distributed generation (DG) in their state. Standardized interconnection rules, which are generally developed and administered by a state's public utility commission, establish clear and uniform processes and technical requirements for connecting DG systems to the electric utility grid. These rules are an important mechanism for improving the market conditions for clean DG.

Utility interconnection can be a critical component of a successful DG project. Connecting to the grid enables the facility to:

- Purchase power from the grid to supply supplemental power as needed (e.g., during periods of planned system maintenance).
- Sell excess power to the utility.
- Maintain grid frequency and voltage stability, as well as utility worker safety.

The primary objective of a standard interconnection rule is to obtain the benefits that clean DG can provide without comprising grid safety or reliability.

This topic is of particular interest as the Energy Policy Act of 2005 directs states to consider upgrading their standards for interconnecting small generators within one year of enactment.

Why Is Standard Interconnection Needed?

Standard interconnection rules encourage the application of clean DG by reducing uncertainty. They establish clear and uniform processes and requirements for connecting to the electric utility grid. These uniform requirements ensure that the costs of interconnection are the same throughout the state and are commensurate with the nature, size, and scope of the DG project. They also help DG project developers accurately predict

What Is Clean DG and What Are Its Benefits?

DG is the generation of electricity at or near the energy end-user. Clean energy technologies include renewable energy sources such as solar, wind, geothermal, biomass, biogas, and low-impact hydroelectric, as well as combined heat and power (CHP) (the simultaneous generation of electric and thermal energy from a single source).

Clean DG projects yield numerous public benefits, including:

- Spurring economic development.
- Reducing peak electrical demand on the grid.
- Reducing grid congestion in targeted load pockets, potentially deferring or displacing more expensive transmission and distribution infrastructure investments.
- Reducing the environmental impact of power generation.
- Reducing fuel price volatility.

the time and costs involved in the application process and the technical requirements for interconnection. Finally, standard rules ensure that the project interconnection meets the safety and reliability needs of both the energy end-user and the utility.

What Are the Key Elements of a Standard Interconnection Rule?

Standard interconnection rules address the application process and the technical requirements for interconnecting DG projects of a specified type and size with the electric grid.

Application Process - Includes some or all parts of the interconnection process, starting from when a potential customer considers submitting an application up to the time when the interconnection agreement is finalized. For example, rules might specify application forms, timelines, fees, dispute resolution processes, insurance requirements, and interconnection agreements.

Technical Interconnection Requirements - Includes technical protocols and standards that govern how generators must interconnect with the electric grid. Rules generally specify the type of generation technology that can be interconnected, the required attributes of the electrical grids where the system will be connected, the types of equipment and protocols required for the physical interconnection, and the maximum system size that is eligible for the interconnection process.

These requirements may specify that DG must conform to industry or national standards (such as IEEE 1547 and UL 1741), and might include protection systems designed to minimize degradation of grid reliability and performance, as well to maintain worker and public safety.

Which States Have Adopted Interconnection Standards?

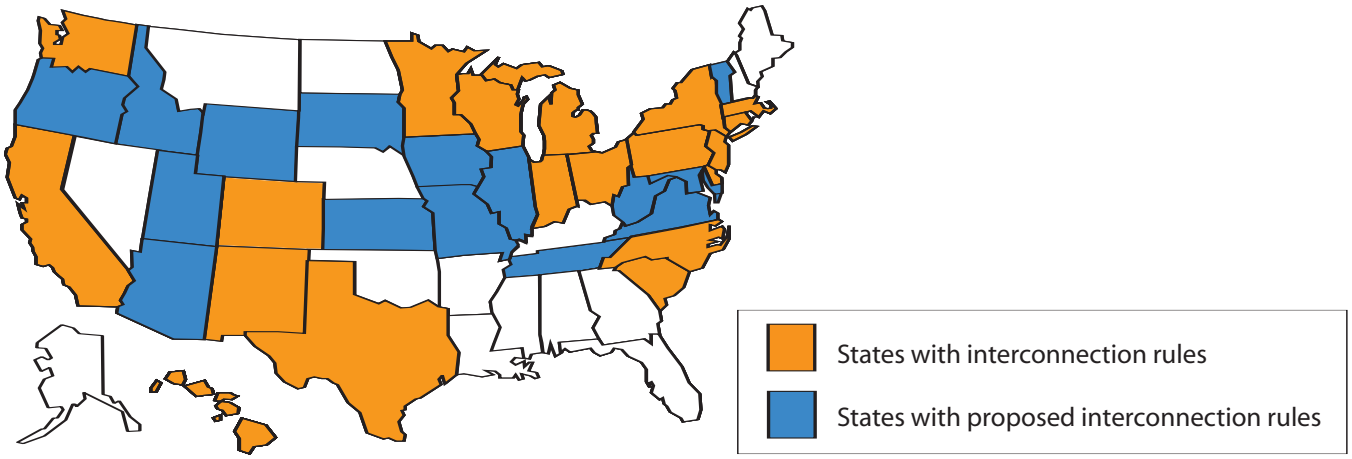
As of May 2007, 18 states have adopted standard interconnection rules for DG (see Figure 1). Fifteen additional states are in the process of developing their rules.

In addition to interconnection requirements, many states have adopted net metering provisions. Net metering occurs when a DG project output exceeds the site's electrical needs and the utility either pays the customer for excess power supplied to the grid or allows the net surplus to carry over to the next month's bill. Net metering provisions streamline interconnection standards but are often limited to specified sizes and types of technologies.

As of May 2007, 41 states plus the District of Columbia have adopted net metering rules (see Figure 2). In some of these states, net metering provisions are limited in scope (e.g., limited to small systems, specified technologies, or particular fuels of local interest). For current net metering information, visit the Interstate Renewable Energy Council at *www.irecusa.org*.

Some state net metering rules lack detailed specifications and procedures for utilities and customers to follow and vary across utilities within the state. Several states, however, have implemented net metering provisions and interconnection rules that provide a complete range of interconnection processes and requirements (e.g., New Hampshire and New Jersey have developed standard interconnection processes and requirements as part of their net metering provision).

Figure 1.
States with DG Interconnection Standards



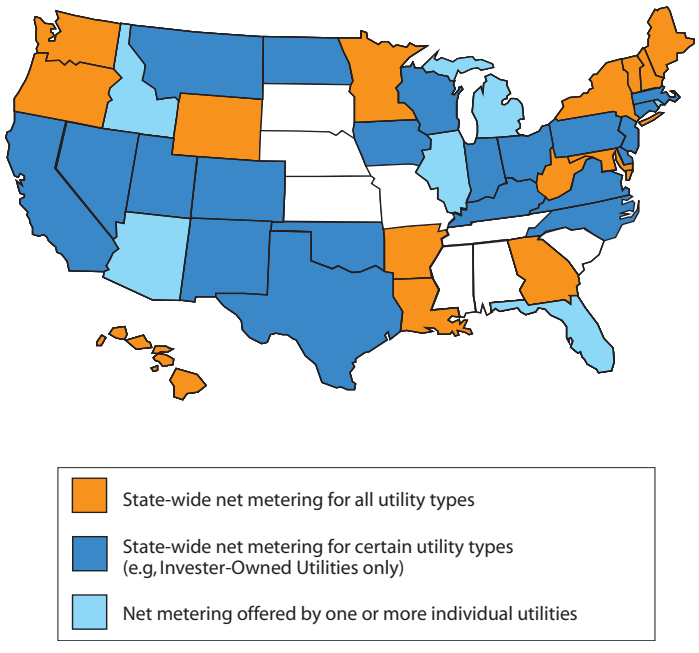
Current as of May 30, 2007

Elements of a Successful Policy

Based on the experiences of states that have developed rules for standard interconnection, a number of best practices have emerged for designing effective interconnection standards that balance the needs of the utility company, DG owners, and the public. States considering interconnection standards can use the best practices that follow as models as they develop their own interconnection rules:

- Work collaboratively with interested stakeholders to develop clear, concise interconnection rules that are applicable to all potential DG technologies. Key stakeholders include:
    - Electric utilities.
    - State public utility commissions.
    - Developers of CHP and renewable energy systems.
    - Third-party technical organizations (e.g., the Institute of Electrical and Electronic Engineers [IEEE 1547] and Underwriters Laboratory, Inc. [UL Standard 1741]).
    - Regional transmission organizations.
    - Other government agencies, such as the Federal Energy Regulatory Commission (FERC) or state environmental and public policy agencies.
- Tailor rules to address specific issues faced by different project sizes. Consider overlaying a screen mechanism to determine which procedure a particular system must go through.
- Develop standards that cover the scope of the desired DG technologies, generator types, sizes, and distribution system types.
- Address all components of the interconnection process, including issues related to both the application process and technical requirements.
- Consider making the application process and related fees commensurate with generator size.
- Create a streamlined process for small and simpler systems that are certified compliant to IEEE 1547 and UL Standard 1741.
- Consider using existing rules and models as templates, including the National Association of Regulatory Utility Commissioners, Interstate Renewable Energy Council, FERC, and rules of other states (see Additional Resources below).
- Try to maximize consistency between the Regional Transmission Organization and the state standards for large generators.
- Where possible, be consistent with other states' rules to help reduce compliance costs for project proponents.
- After adopting a standard, monitor effectiveness and update as needed based on rule effectiveness, feedback from utilities and applicants, changes in DG/CHP and electric utility technologies, and changes in consensus standards of third-party technical organizations.

Figure 2.
States with Net Metering Rules



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EPA Assistance Available

The EPA CHP Partnership is a voluntary program that seeks to reduce the environmental impact of power generation by promoting the use of cost effective CHP. The Partnership assists state policy makers and regulators to evaluate opportunities to encourage CHP through the implementation of policies and programs. See *www.epa.gov/chp.*

State Examples

Developing interconnection requirements is a complex task and states wishing to undertake this process should review the development procedure and actual interconnection standards of other states. The interconnection standards or draft standards cited below (Massachusetts, Texas, Oregon, and Maryland) contain many of the elements of successful interconnection policies highlighted on page 3.

Massachusetts created and adopted a Model Interconnection Tariff through a collaborative, stakeholder-involved process that simplifies the interconnection approval procedure, eliminates fees, and ensures applications are processed within 15 days. These simplified interconnection rules apply to certified single-phase DG units less than 10 kilowatts (kW) in capacity and certified three-phase systems up to 25 kW in capacity. Information on the interconnection process is available on the Massachusetts Technology Collaborative website, at *http://masstech.org/renewableenergy/public_policy/DG/resources/02-38-C_Att-A_Tariff.doc*.

In Texas, the Public Utility Control of Texas (PUCT) adopted interconnection standards in 1999 and the rules apply to DG units with a maximum capacity of 10 megawatts (MW). Under these rules, the PUCT must approve or reject an interconnection application within 4 to 6 weeks and there are pre-certification provisions allowing for fast-track interconnection. In addition, qualifying DG units are not required to carry additional insurance and direct liability for the unit is limited. Information on Texas's interconnection standards can be found in the Distributed Generation Interconnection Manual, available at *www.puc.state.tx.us/electric/business/dg/dgmanual.pdf*.

The Oregon Public Utility Commission (PUC) is developing a Standard Small Generator Interconnection Rule for DG sources, which should be finalized on July 16, 2007. The proposed rule applies to small DG units of 10 MW or less and outlines a four-tiered application fee schedule, depending on the unit's generating capacity and if the unit plans to export power offsite. View Oregon's proposed rule and accompanying documents are available at *www.puc.state.or.us/PUC/admin_rules/intercon.shtml*.

In Maryland, the Small Generator Interconnection Standards Working Group released a proposed rule in March 2007, which offers an expedited interconnection review process for DG units. The working group established draft standard procedures and administrative practices for the interconnection of small DG units of 10 MW or less. The rule should be finalized by November 1, 2007. View Maryland's proposed rule and simplified interconnection application forms at *www.psc.state.md.us/psc/electric/workinggroups.htm.*

Additional Resources

EPA has created *The Clean Energy-Environment Guide to Action*. The Guide provides an overview of clean energy supply technology options and, in addition to interconnection standards, presents a range of policies that states have adopted to encourage continued growth of clean energy technologies and energy efficiency. The Guide is available at *www.epa.gov/cleanenergy/stateandlocal/guidetoaction.htm*.

The National Association of Regulatory Utility Commissioners Model Interconnection Procedures and Agreement for Small Distributed Generation Resources. See *www.naruc.org/associations/1773/files/dgiaip_oct03.pdf*.

The Interstate Renewable Energy Council's Model Interconnection Standards and A Guide to DG Interconnection Issues. See *www.irecusa.org/fileadmin/user_upload/ConnectDocs/ModelICStandards.pdf* and *www.irecusa.org/fileadmin/user_upload/ConnectDocs/ModelICGuide.pdf*.

The Regulatory Assistance Project's Distributed Resource Policy Series supports state policy efforts. See *www.raponline.org.*

The U.S. Combined Heat and Power Association has been an active stakeholder in the development of standard interconnection rules in various states. See *http://uschpa.admgt.com/stateCHP.html#iconnect.*

For more information, contact:

CHP EPA COMBINED HEAT AND POWER PARTNERSHIP

Neeharika Naik-Dhungel
U.S. Environmental Protection Agency
Phone: 202-343-9553
e-mail: *naik-dhungel.neeharika@epa.gov*

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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