# Certification of Grid-Connected Distributed Energy Resources

Photovoltaics, microturbines, fuel cells, high-speed flywheels, ultra capacitors, and windmills with increased efficiency, extended storage time, and reduced weight and size are but a few of the new exciting, progressive technologies for generating and storing electric energy. However, there is a need to better understand how these new devices will interact with each other, the existing power system, and other connected loads.

Distributed energy resources (DER) hold great promise for improving the efficiency and reliability of the electric power system. Increased use of distributed generation can delay or eliminate the need to build additional central generating plants and transmission and distribution lines. Distributed generation can also help reduce transmission losses, improve power quality to end users, and smooth peaks in demand patterns. However, before the benefits of distributed generation can be fully realized, significant technical, business, and regulatory barriers must be overcome.

A recent DOE study noted several barriers to interconnection to the electric power system. Most of these barriers involved special equipment or testing required by utilities for safety, reliability, and power quality. Although safety issues are generally covered by UL, there is an urgent need for testing and certification of distributed generation equipment to ensure a compatible, reliable interconnection with the electric power grid and other load equipment.

**THE NEED FOR CERTIFICATION** Ensuring a compatible interconnection involves knowing about many DER design, installation, and performance characteristics and how these will interact with the electric power system. Every installation is unique, and without some common denominator, every evaluation can be time-consuming and costly. In the fast-paced development of generation and storage technologies, standards have evolved that provide a starting point for easier and more uniform connections. There is growing consensus that a process to certify DER equipment is needed, and that it should be lead by the utility industry.

**PROJECT SUMMARY** This project is intended to pilot the first testing and certification program for interconnection of DER equipment. In this collaborative project, test criteria to determine the compatibility of distributed generation will be developed from sponsor inputs and based on existing standards, such as the National Electric Safety Code, and emerging standards, such as the IEEE P1547. Available hardware representing popular microturbine, fuel cell, or other DER technologies will be piloted through a certification process. For these selected cases, test protocols will be developed and applied to demonstrate what will be required for such equipment to be certified as grid-compatible. This work can become the model and framework for future expansion to a DER equipment certification program.

The project brings in the needed utility technical leadership element to several other important related activities by EPRI, DOE, and IEEE. For example DER technology development and demonstration projects have led to new hardware that is ready for deployment. The voluntary consensus standards development by IEEE has created a benchmark for interconnection requirements. By piloting several of these new technologies through a structured certification program, we expect that many of the lingering technical issues and related barriers can be resolved. This is made possible by pooling the technical expertise of EPRI members and having access to the best available test facilities and equipment.

By applying these resources, the selected DER equipment can be evaluated in many different inter-connection scenarios and variables that are likely in real systems. The performance and ultimate certification for grid compatibility of the DER equipment will be conducted in an electrical environment similar to the expected operating environments.

DER equipment selected for the pilot will be tested for immunity and emissions in the classic sense of electromagnetic compatibility (EMC). Tests include the ability to

withstand the extremes of different operating environments without upset (immunity) and without exhibiting behavior that might upset or damage other connected equipment or the grid (emissions). Also, the specified energy performance and appropriate response to various grid conditions will need to be shown for certification.

Equipment that pass these tests will be "certified" and labeled to be compatible with the grid. The intended result of labeling is to provide all economic sectors with a simple method to compare equipment ratings, performance testing, and interconnection service activities that will make it realistic to capture the full value of DER systems.

This pilot project will provide the basis for extending this DER certification capability to other testing laboratories through a follow-on accreditation program

**DELIVERABLES** Depending on available project funding, anticipated project deliverables include:

- Pilot certification for one or more of the following types of DER equipment: fuel cells, microturbines, flywheels, small internal-combustion systems, wind, or solar.
- Application-specific test protocols for the technologies that are included in the certification program.
- Specific certification test results with conclusions and recommendations.
- Documentation (certification documentation process, test briefs, application notes, solutions, and so on as appropriate) of generic test results.
- Updates on related standards.
- Web site access to DER certification activities.
- Training on proper application, installation, and operation of certified DER equipment

**RETURN ON INVESTMENT** This project will provide sponsors with practical knowledge of the certification process and the benefits of specifying certified equipment, and will help you and your customers make informed business decisions regarding the application of specific distributed generation equipment.

**DEMONSTRATED VALUE** Working closely with utilities, manufacturers, and standards organizations, EPRI PEAC has installed a variety of DER equipment in its new Power Quality Distributed Resources (PQDR) Park, which is adjacent to the Power Quality Test Facility in Knoxville, Tennessee. This strategic location enables EPRI PEAC to evaluate the compatibility of DER equipment with a wide variety of loads and line configurations.

**COST OF PARTICIPATION** The cost to participate in this project is $40,000 (or $20,000 Tailored Collaboration plus $20,000 EPRI matching funds).

**PROJECT STATUS AND SCHEDULE** Construction of the new PQDR Park adjacent to the EPRI PEAC Power Quality Test Facility in Knoxville, Tennessee is complete, and this facility is ready to pilot certification testing. Depending on the number of participants and the available funding this project will begin in second quarter 2001.

**WHO SHOULD JOIN** This project is offered to utilities, regulatory and government agencies, and other interested parties who seek to improve standards and practices for safe and effective interconnection and parallel operation of DR systems. The option of joining through Tailored Collaboration, with EPRI cost sharing, is available to members of any EPRI research target in years 2000 or 2001

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