Institute of Electrical and Electronics Engineers

Interconnection Standards Development

Overview

The use of distributed resources (DR) has the potential to provide more reliable and lower-cost energy for electricity customers. This is particularly true for customers with on-site generation.

However, one of the many issues facing electric utilities and the developers of DR equipment is the interconnection of DR with the electric power system (EPS). The traditional utility grid is a highly integrated EPS that delivers electricity from central power plants through transmission and distribution power lines to customers across many states. Because of this connectivity, a disruption at one location can have far-reaching consequences on many other parts of the grid. To interconnect DR for safe and reliable operation, many requirements must be met.

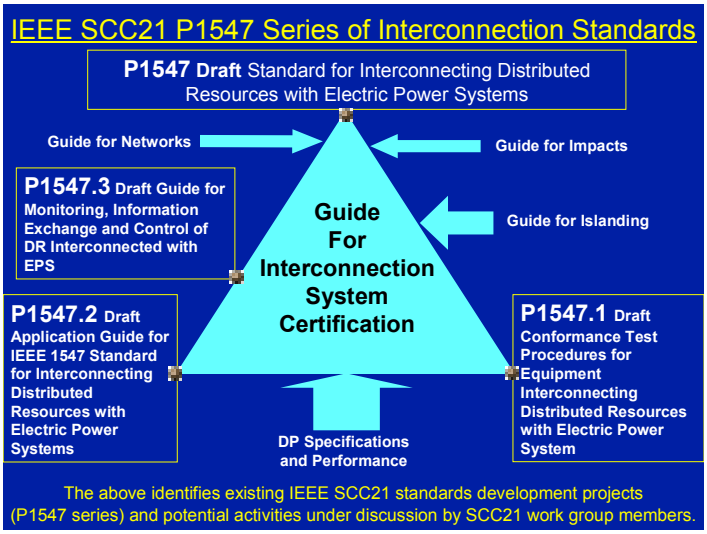
Participants in the DEER Distribution and Interconnection R&D area are working with industry and utilities to develop, through the Institute of Electrical and Electronics Engineers, uniform national standards for the interconnection of distributed resources with electric power systems.

Currently, the technical requirements for interconnection of DR vary by state and utility. And, in some instances, there are major issues and obstacles to an orderly transition to the use and integration of DR with the grid. The lack of uniform national standard requirements and tests for DR interconnection, operation, and certification — as well as the lack of uniform national building, electrical, and safety codes — is understood, and resolving that needs lead time to develop and promulgate acceptance.

Standardized technical requirements tend to provide the framework for greater product and service quality, more interoperability, lower engineering and design costs, and streamlined installation, operation, and maintenance. They also help to safeguard against hazards. Also, uniform technical interconnection standards and simplified contractual and other institutional interconnection requirements at the state and local levels will help facilitate industrial efficiency and a robust market for DR in the increasingly competitive electricity industry.

P1547 Series of Standards

Participants in the DEER Distribution and Interconnection R&D area are working with industry and utilities to develop, through the Institute of Electrical and Electronics Engineers (IEEE) Standards Coordinating Committee 21 (SCC21), uniform national standards for the interconnection of DR with EPSs. The IEEE P1547 series of standards should prove to be a benchmark milestone for both the IEEE standards consensus process and as a model for developing further national standards dedicated to the ongoing success of our nation's electric power system.



IEEE SCC21 P1547 Series of Interconnection Standards

Support for this series, from working group members and the electric power community, has been overwhelming. Since IEEE authorized its inception in March 1999, the P1547 work group has grown to more than 350 members. Approximately 100 attendees participate in meetings, which were held every other month for the first two years and are now held three or four times per year.

P1547 Draft Standard for Interconnecting Distributed Resources with Electric Power Systems

This standard establishes criteria and requirements for interconnection of DR with EPSs. It provides requirements relevant to the performance, operation, testing, safety, and maintenance of the interconnection.

P1547.1 Draft Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems

This standard specifies the type, production, and commissioning tests that shall be performed to demonstrate that interconnection functions and equipment of a DR conform to IEEE 1547. Interconnection equipment that connects DR to an EPS must meet the requirements specified in IEEE Standard P1547. Standardized test procedures are necessary to establish and verify compliance with those requirements. These test

procedures must provide both repeatable results — independent of test location — and flexibility to accommodate a variety of DR technologies.

P1547.2 Application Guide for IEEE P1547 Standard for Interconnecting Distributed Resources with Electric Power Systems

This guide provides technical background and application details to support the understanding of IEEE 1547. This document facilitates the use of IEEE 1547 by characterizing the various forms of DR technologies and the associated interconnection issues. In addition, the background and rationale of the technical requirements are discussed in terms of the operation of the DR interconnection with the EPS. The document includes technical descriptions and schematics, applications guidance, and interconnection examples to enhance the use of IEEE 1547.

P1547.3 Draft Guide for Monitoring, Information Exchange, and Control of Distributed Resources Interconnected with Electric Power Systems

This guide provides guidelines for monitoring, information exchange, and control for DR interconnected with EPSs. It facilitates the interoperability of one or more DR interconnected with an EPS and describes functionality parameters and methodologies for monitoring, information exchange, and control for the interconnected DR with, or associated with, an EPS.

IEEE Standards – International Links

The following direct links to the International Electrotechnical Commission (IEC) organization world standards development community should prove to have far-reaching influences on multinational technology deployment, testing, and certification for all DR technologies. IEC and IEEE have agreed on a dual logo arrangement for IEC to adopt IEEE electronics, telecom, and power generation standards for international use.

In addition, IEEE will contribute via another venue toward international standards development. IEC has created a Joint Coordination Group for Decentralized Rural Electrification Systems (JCG DRES) standards development, with the IEEE SCC21 chair designated as the JCG DRES convenor. Currently, the recently revised IEC Technical Committee 8 System Aspects for Electrical Energy Supply has reestablished its scope to address the broadest system aspects of deregulation of the world's electric power industry: To prepare the necessary standards framework and coordinate the development, in cooperation with other TC/SCs, of the international standards needed to facilitate the functioning of electricity supply systems in open markets.

IEEE and SCC21

IEEE is a nonprofit, technical professional association of nearly 380,000 individual members in 150 countries and is focused on electro and information technologies and sciences. Currently, IEEE has nearly 900 active standards and another 700 under development. SCC21 oversees the development of standards in the areas of Fuel Cells, Photovoltaics, Dispersed Generation, and Energy Storage and coordinates efforts in these fields among the various IEEE societies and other affected organizations. This ensures that all such IEEE standards are consistent and properly reflect the views of all applicable disciplines. The SCC21 also reviews all proposed IEEE standards in these fields before their submission to the IEEE Standards Association Standards Board for approval and coordinates submission to other organizations. Contacts are:

IEEE SCC21 Chair: R. DeBlasio
IEEE SCC21 Secretary: T. Basso
http://grouper.ieee.org/groups/scc21/

Distribution and Interconnection R&D (Formerly Distributed Power Program)

DOE's Distribution and Interconnection R&D supports the development of technologies and policies that enable distributed generation (e.g., photovoltaic systems, wind turbines, fuel cells, and microturbines), storage, and direct load control technologies to be integrated into the electric system. Through a collaboration of national laboratories and industry partners, DOE's Distribution and Interconnection R&D pursues activities in: (1) strategic research, (2) technical standards, (3) distribution system technology, (4) interconnection technology, and (5) mitigation of regulatory and institutional barriers.

Contacts

NREL Technical Monitor
Tom Basso (303) 275-3753
National Renewable Energy Laboratory
1617 Cole Blvd.
Golden, CO 80401

NREL DEER Technology Manager
Richard DeBlasio (303) 275-4333
National Renewable Energy Laboratory
1617 Cole Blvd.
Golden, CO 80401

DOE Manager
William P. Parks (202) 586-2093
U.S. Department of Energy
EE-2D/Forrestal Building,
1000 Independence Ave., SW
Washington, DC 20585

Additional Distributed Power Information
http://www.eren.doe.gov/distributedpower

Produced for the U.S. Department of Energy, 1000 Independence Avenue, SW Washington, DC 20585 by the National Renewable Energy Laboratory, a DOE National Laboratory.

DOE/GO-102003-1684 January 2003

Printed on paper containing at least 50% wastepaper, including 20% postconsumer waste.