Underwriters Laboratories

Streamlining Interconnection

Goals

One of DOE's Distribution and Interconnection R&D's goals is to develop a streamlined system to interconnect distributed generators with the utility grid. In support of this goal, Underwriters Laboratories (UL) is revising an existing standard, UL 1741, to include distributed generation (DG). The revised standard will be called "The Standard for Inverters, Converters, and Controllers for Use in Independent Power Systems." The updated standard will facilitate a means for utility-interconnected DGs to be designed, produced, evaluated, certified, sold, installed, and operated in a smooth and agreeable manner for all parties involved.

Current Results

To accomplish this goal, UL is:

- Determining the status of applicable standards and codes and conducting literature reviews on DG interconnection issues
- Conducting code-related research and development for DG interconnection to the utility
- Reviewing certain interconnection guidelines
- Combining appropriate safety requirements with the necessary utility interconnection requirements from the IEEE P1547 Standard for Distributed Resources Interconnected with Electric Power Systems into one document.

In addition to developing a standard, UL is:

- Designing appropriate test setups to conduct certification tests on DG products
- Verifying capabilities of test facilities to perform tests on DG
- Validating test facilities for conducting the UL safety test
- Conducting witness testing of interconnection configurations.

Literature Review on Distributed Generation

UL completed a review of published literature for information relevant to interconnecting distributed generation equipment to utility distribution systems. The review focused on technical articles detailing safety issues that influence interconnection design and testing. An emphasis was documents written within the past 10 years; however, older documents were considered if they were deemed important and still indicative of current technology and practice.

Three-phase anti-islanding test equipment at UL

National Electric Code Review and Comparison

UL reviewed the current edition of the National Electric Code (NEC) to determine how distributed power system components are addressed. In addition, UL reviewed various interconnection guidelines, including IEEE P1547, to determine compatibilities and differences between these guidelines and the NEC.

UL recommended the following actions be taken:

- Include fine print notes in the IEEE definitions of "local electric power system" and "point of common coupling" to reference similar terms as used in the NEC.
- Because the NEC does not use the term "distributed resource" or "distributed generation," UL recommends that this term be introduced into the NEC, and in particular Article 705, providing consistency between the two documents.
- Harmonize the requirements for the disconnecting means between the NEC and IEEE P1547.

Revision of UL 1741 Standard

The process to revise UL 1741 has involved utilities, electrical authorities having jurisdiction (AHJs), consumers, manufacturers, and other interested parties all working together to develop interconnect requirements for DG equipment.

The process included assembling a balanced Standard Technical Panel (STP), which consists of 50% producers,

Inductive load banks UL uses for anti-islanding tests at the Northgate, Illinois, facility

20% users, and 30% general interest parties. This mix provides a broad base of interests and experience. The first meeting, in November 2001, provided clear direction for many of the issues that need to be addressed.

All appear to support the successful development of the national interconnection document and a standard that will satisfy the needs of manufacturers and stakeholders, provide an appropriate level of safety for DG products, and garner a wide degree of acceptance by all those concerned.

Test Equipment Design

UL is in the process of selecting and designing appropriate test equipment to conduct tests on DG products. To do so, it is:

- Working with equipment manufacturers to design a large simulated utility for DG testing
- Collaborating with national labs on harmonic distortion testing and anti-islanding testing
- Implementing anti-islanding test loads for large three-phase products
- Researching DG test equipment for data acquisition automation
- Working with various utilities to verify test methods.

American National Standards Institute Approval

By combining these requirements, UL will provide a DG American National Standards Institute (ANSI) standard to evaluate utility-interconnected DG products for both electrical safety and utility interconnection. ANSI addresses the needs of AHJs and utility interconnection engineers. ANSI approval for this standard will be sought and maintained using the Continuous Maintenance Method of ANSI approval. Through this method, the current version of UL 1741 will always be the nationally accepted ANSI-approved version.

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.

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

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