Technology Advisory

The Evolution of Interconnection Standard – IEEE 1547

What has changed?

In 2003, the Institute of Electrical and Electronics Engineers published for the first time standardized criteria for the interconnection of distributed generation resources into the electric power grid. The guide, "IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems," was reaffirmed in 2008.

Since December 2013, the renamed standard, "IEEE P1547 Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces," has been undergoing a comprehensive overhaul.

What is the impact on cooperatives?

The revised standard expands the scope of the original guidelines, which focused on safety and minimizing disruption of service. In the revised standard, inclusion of "interoperability," which allows dissimilar components to communicate, represents a significant shift toward distributed energy resources (DER).

What do cooperatives need to know or do about it?

NERC Concerns

As the primary watchdog for the nation's Bulk Electric System (BES), the North American Electric Reliability Corporation (NERC) views the IEEE 1547 standard as the means by which distributed energy resources will coexist with and complement the BES. As NERC sees it, IEEE 1547 will head off a potential problem that could emerge as distributed energy resources proliferate.

In the mid-2000s, a problem emerged in Europe, particularly in Germany, involving set points for voltage and frequency limits. The European standard at the time was similar to the original IEEE 1547 guideline, particularly the tight limits imposed for excursions of either frequency or voltage. The goal of the tight standards in the event of a malfunction was to quickly disconnect distributed energy resources, thereby ensuring that outages involving downed lines would not be energized from alternate sources

Germany rapidly expanded the use of DER in mid-2000, attaining high penetration levels and displacing traditional energy sources. Many traditional energy plants were curtailed or closed, thereby increasing the system's susceptibility to instability.

Renewable energy sources have their own challenges. If there is a higher percentage of DER, voltage and frequency go up. If they hit the set point for tripping, they will go off-line. If the remaining traditional generation cannot carry the load, automatic load-

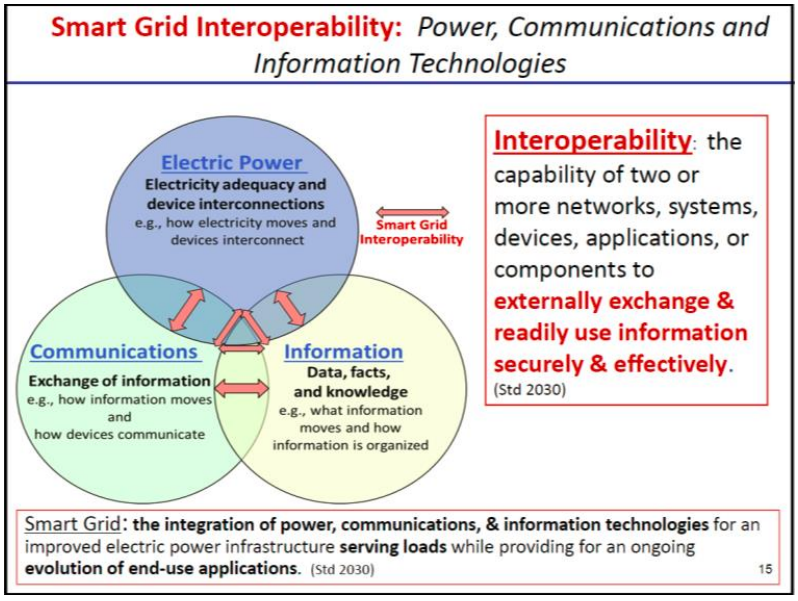
shedding will occur until the situation stabilizes. This can result in a cascading outage. NERC recognized the potential for this to occur in the United States.

Opportunities & Challenges

Traditional distribution system analysis software used for circuit modeling is not well-adapted to assessing circuits with multiple DERs. At some point, dynamic modeling may become necessary. BTS's Analytics Workgroup is grappling with this issue now.

Many distributed energy resources have time-varying or dynamic behavior that are hard to analyze with commercially available static models. These technologies include solar PV, energy storage, and automatic controls like volt-VAR optimization controllers.

Cooperatives and NRECA are building a dynamic modeling tool, the Open Modeling Framework. The open source software makes it easier to run dynamic simulations. Built on top of GridLAB-D, it adds a graphical user interface, data import and coop-specific calculations for financial results (demand charges, non-profit tax strategies). Models for solar financing and PV system planning are available. Tools for planning Volt-VAR Optimization projects, energy storage, and demand response programs are coming on line this year.



The Open Modeling Framework software is available at https://www.omf.coop.

Contacts for Questions

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