

Definitions, Standards, and Test Procedures for Grid Services from Devices

CHALLENGE

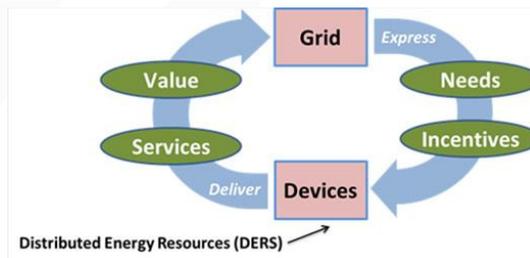
The nation's energy consumption is increasing significantly as use of electronic devices and the desire for creature comforts become more prevalent. With increasing use of power come challenges to the reliability and resiliency of the electric power grid. Grid planners and operators must find ways to ease the burden on the grid, while providing consumers with cleaner, more reliable, and cost-efficient power.

One such way is to spur the deployment of fleets of distributed energy resource (DER) devices—for example, thermal energy storage, batteries/inverters, and commercial refrigeration equipment and lighting—with a proven ability to provide a broad range of grid services. However, to deploy DER devices for grid services, planners and operators must be able to accurately and conveniently assess the efficacy of the devices and be confident that they will exhibit high performance in the field. In addition, those who purchase grid services—such as utilities and consumers—must have confidence that their investments in devices can be recouped through the prices or incentives offered by the grid for services rendered.

APPROACH

A multi-national laboratory team is collaborating with several industry partners to develop a recommended practice for testing the ability of DER devices to provide a variety of existing and new grid services—such as peak load management, independent system operator capacity markets, frequency regulation, and wholesale market price response. Components of this recommended practice include the following:

- Definitions of grid services in the form of standard time-series “drive cycles” that represent the typical patterns of responses required for each grid service. This will be used to reflect how DER devices need to react in order to effectively provide the grid service.



A multi-national laboratory team is partnering with industry to develop standards and test protocols that will test the effectiveness of distributed energy resource devices—such as electric vehicles—in providing grid services.

At-A-Glance

PROJECT LEADS

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PARTNERS

- Electric Power Research Institute
- Multiple independent test labs
- Multiple standards organizations
- Multiple utilities and vendors

BUDGET

\$6.5 million

DURATION

April 2016 – April 2019

TECHNICAL AREA

Devices and Testing

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- Simple, short characterization test procedures that measure the speed, amount, and duration of a device's responses.
- Value-based metrics that describe a device's performance overall and for each service. This

includes effects related to energy efficiency and consumption, effects on comfort or quality for the end user, and information about use patterns that may degrade performance or shorten the device's life cycle.

EXPECTED OUTCOMES

These definitions, test procedures, and metrics will be suitable for use by independent testing laboratories at a reasonable cost. They can also be disseminated to industry and standards development organizations as a voluntary standard rating system. This project will benefit a variety of stakeholders, including the following:

- Manufacturers, who will have access to simple and low-cost testing protocols. This will help them validate and sell more DER devices based on the quality of performance; they will also be able to promote advanced features of new and improved DER devices.
- Grid owners and operators, who will have the ability to readily estimate the performance and value of fleets of DER devices based on simple-to-use models grounded in actual measured characteristics. This will help inform power-operating strategies, device investments, and the design of subsidies or rebates and customer engagement programs.
- Consumers and utilities, who will receive clear information about DER device performance and potential value, which will inform their investments.
- General ratepayers, who will receive a cleaner, more reliable grid at a lower cost.

LAB TEAM



Launched in November 2014 under the U.S. Department of Energy's Grid Modernization Initiative, the GMLC is a strategic partnership between DOE Headquarters and the national laboratories, bringing together leading experts and resources to collaborate on national grid modernization goals. The GMLC's work is focused in **six technical areas** viewed as essential to modernization efforts:

Devices and Testing | Sensing and Measurements | Systems Operations and Control
Design and Planning | Security and Resilience | Institutional Support