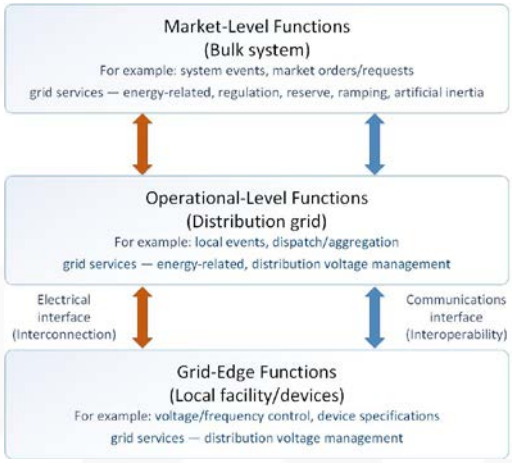
Standards for DER Interconnection and Interoperability

CHALLENGE

To achieve widespread deployment of emerging DER technologies (e.g. distributed generation, battery storage, responsive loads, electric vehicles) to provide critical grid services, there must be unambiguous communication and coordination between these new technologies. Standards for interconnection and interoperability must be consistent across all devices of a single technology as well as across different technologies that interact related to grid operations to enable the critical benefits for grid reliability, safety, and security both during normal operations and during unexpected events.



High level example of coordination needed from higher (grid service) functions to lower level (device) capabilities.

APPROACH

The team identified and evaluated key standards across multiple domains to identify gaps (defined as any activity needed to harmonize requirements among standards development organizations, minimize conflicting requirements among technology domains, or streamline conformance test procedures) preventing effective management of DER grid services.

The team identified challenges posed by interconnection, interoperability, and testing of DERs.

The project team worked to fill identified gaps by working with standards development efforts and validating needed interconnection and interoperability standards and test procedures for DERs at national laboratory facilities

Project team members provided direct input to standards development efforts under various working group efforts across multiple standards development organizations to foster harmonization of requirements across DER technology domains.

At-A-Glance

PROJECT LEADS

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Partners

- Smart Grid Interoperability Panel
- National Institute of Standards and Technology
- GridWise Architecture Council
- Electric Power Research Institute
- Standards Development Organizations
- Utilities
- Vendors

BUDGET

$3.6 million

DURATION

March 2016 – December 2019

TECHNICAL AREA

Devices and Testing

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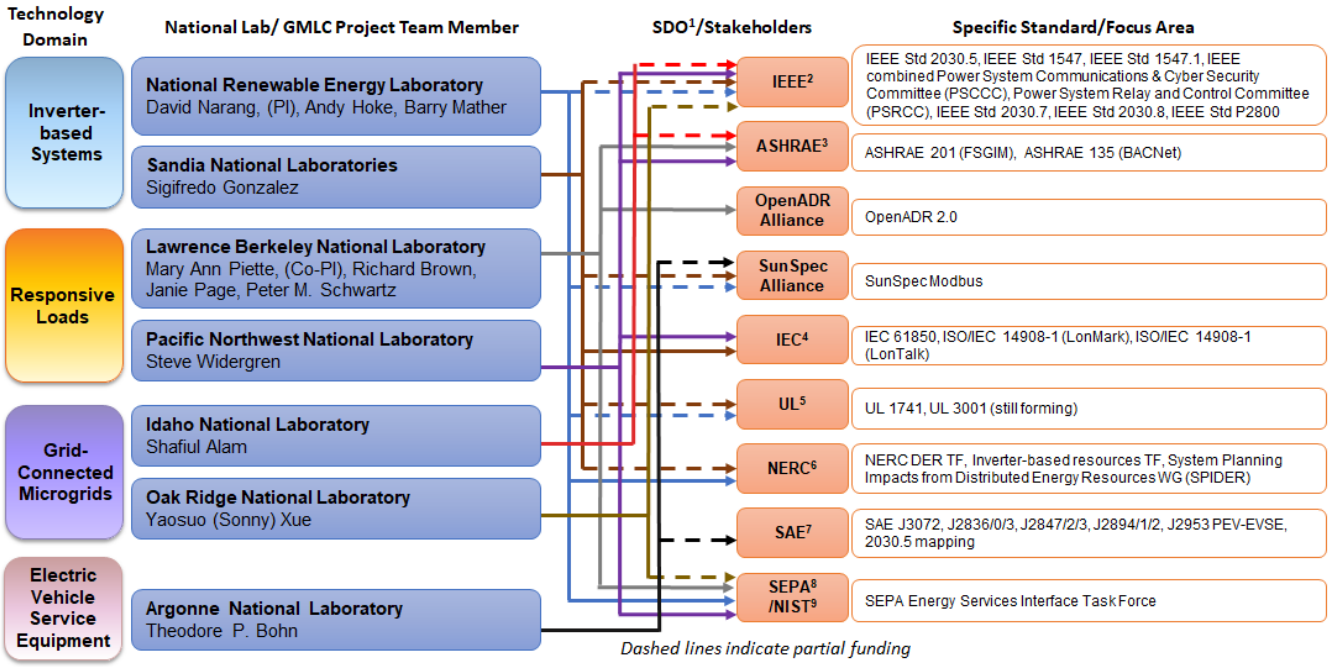

[1]Standards development organizations, [2]Institute of Electrical and Electronics Engineers, [3]American Society of Heating, Refrigerating and Air-Conditioning Engineers, [4]International Electrotechnical Commission, [5]Underwriters Laboratory, [6]North American Electric Reliability Corporation, [7]Society of Automotive Engineers, [8]Smart Electric Power Alliance, [9]National Institute of Standards and Technology

Technology areas of focus included inverter-based DER (including photovoltaics and energy storage), responsive loads, electric vehicles and grid-connected microgrids.

Grid services of specific interest included energy, regulation, distribution voltage management and synthetic inertia.

EXPECTED OUTCOMES

The project team contributed to updates to some of the most widely adopted standards across the United States for existing DER. These updated and revised standards will help to improve the interoperability of DER such as inverter based DER including PV and energy storage and will also pave the way for increased reliance on these technologies under both normal and abnormal grid conditions.

Looking ahead to the provision of grid services from newly emerging DER technologies such as electric vehicles and responsive loads, this project has contributed to efforts in these industries to develop widely applicable interfaces such as the energy services interface. Industry efforts are ongoing and could benefit from the reference material and recommendations in the team's survey and gap analysis report.

LAB TEAM

Argonne NATIONAL LABORATORY · INL Idaho National Laboratory · BERKELEY LAB · NREL NATIONAL RENEWABLE ENERGY LABORATORY · OAK RIDGE National Laboratory · Sandia National Laboratories · Pacific Northwest NATIONAL LABORATORY

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