Energy &
Homeland Security
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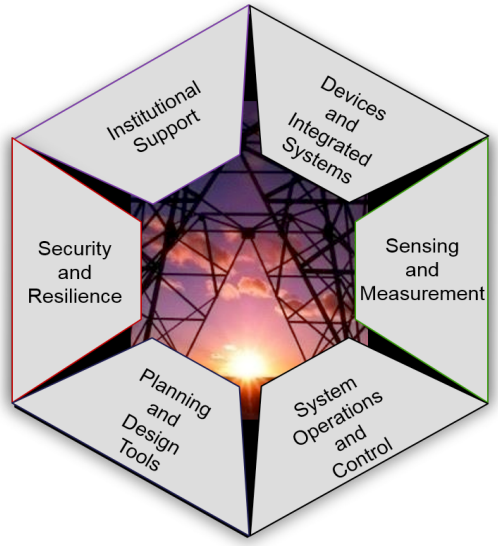
GRID MODERNIZATION RESEARCH AT SANDIA: GRID MODERNIZATION LABORATORY CONSORTIUM

Working toward a modern electric grid to deliver electricity to consumers in a network that enables consumer choice, increased efficiency, and resilience against disruptions due to natural disaster or attack.

GRID MODERNIZATION LABORATORY CONSORTIUM MISSION

In November 2014, the U.S. Department of Energy (DOE) launched a cross-cut initiative in Grid Modernization. This included the launch of the Grid Modernization Laboratory Consortium (GMLC) to engage the national labs working on DOE grid programs to frame a new integrated approach for planning and delivering innovations and thought leadership in support of grid modernization. This new, crosscutting approach ensures that DOE research and development investments and capabilities are fully coordinated. As one of 13 laboratories participating, Sandia plays a vital role in GMLC by applying its history of addressing national security needs and advancing resilience technology.

Comprised of 65 leading scientists and engineers from across the DOE national labs, the technical teams are aligned with six technical areas:



SECURITY AND RESILIENCE LEADERSHIP

As the lead laboratory for the Security and Resilience technical thrust, Sandia is focused on providing a pathway to comprehensive multi-scale security and resilience for the nation's power grid. Increasing threats and hazards include physical and cyber threats along with weather, interdependency, and aging infrastructure hazards. The security and resilience pillar will be working to improve the ability to identify, detect, and protect against potential threats and hazards; reduce recovery capacity/time; and respond to incidents.

SANDIA-LED PROJECTS

In addition to supporting other national laboratories on 30 projects across the nation—including projects in New Mexico, Kentucky, Alaska, Louisiana, Vermont, Virginia, and Hawaii—Sandia is leading the efforts of six GMLC projects in core activities, pioneer regional partnerships, solar energy technologies, and energy storage.

GMLC Testing Network

Sandia is leading the development of a lab-based catalog of testing capabilities available at national laboratories, universities, utilities, and other industry groups, as well as a roadmap document identifying opportunities for strategic investment. In addition, an open library will be available as a public repository of component models, simulation tools, and testing resources.

Energy Storage Industry Acceptance and Analysis

Sandia is the lead DOE lab in the development and implementation of energy storage demonstration projects and in performance analysis of energy storage systems in the field. Sandia works with the DOE in enabling energy storage systems deployment, and supports the U.S. Department of Defense, state energy offices, utilities, industry, and universities by providing design analysis, operational evaluation, and technology verification of energy storage systems. Sandia also has developing international collaborations with entities in the European Union, Japan, and Singapore.

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Vermont Regional Partnership Enabling the Use of Distributed Energy Resources

Sandia is working to optimize storage, develop a broadly adoptable holistic approach to distributed energy resources (DER), and assist Vermont utilities in meeting the state's ambitious goal of obtaining 90% of its energy from renewable sources by 2050. To accomplish this, significant changes in Vermont's distribution-system architecture and operations will be needed to mitigate the impacts of high penetrations of variable and DER such as voltage violations, equipment failures, thermal overloads, and safety and reliability issues.

Grid Analysis and Design for Resiliency in New Orleans

Sandia is leading the effort for the framework and development of priority distribution upgrades and advanced microgrid pilot projects that can help bolster resiliency for New Orleans and other coastal U.S. cities during hurricanes, tornadoes, floods, and other disasters that coastal cities face.

Rapid QSTS Simulations for High-Resolution Comprehensive Assessment of Distributed PV Impacts

This project will accelerate Quasi Static Time Series (QSTS) simulation capabilities through the use of new and innovative methods for advanced time-series analysis. By reducing the computational time and complexity of QSTS analysis and developing high-resolution proxy data sets, QSTS analysis could be the next industry-preferred photovoltaics (PV) impact assessment method.

Secure, Scalable, Stable Control and Communications for Distributed PV

As the only laboratory working on this project, Sandia's goal is to develop a distributed control and communications architecture that refines the SunShot Systems Integration communications target metrics by clearly articulating the impact of each metric on the grid.

Energy Storage Demonstrations - Validation and Operational Optimization

Sandia is collaborating with states, utilities, and storage providers to help elucidate storage benefits and integration challenges. Four demonstration projects for this effort cover a wide range of promising technologies and applications: Green Mountain Power (Vermont), Salem Smart Grid Center (Oregon), Electric Power Board of Chattanooga (Tennessee), and Los Alamos County (New Mexico). The outcome will be analysis that identifies the value streams for each potential application, as well as operational modes and control strategy for the optimal utilization of the energy storage system to maximize the value streams.

PARTNERING WITH SANDIA

Modernization of the U.S. electric grid entails dramatic transformations, with close collaboration required across industry, states, federal agencies, regulators, and numerous other stakeholders. In addition to leading the lab-to-lab technical teams to best leverage intellectual and scientific assets, the labs also play a key role in engaging regional stakeholders in new concepts.

For example, the labs are providing institutional support to states, local communities, tribes, and others to develop new regulations needed to unleash the potential of the modern grid. The labs will also engage in the development and implementation of regional and local demonstrations, co-funded by industry, to accelerate the rate of impact of the new innovations emerging from the DOE Grid Modernization efforts.

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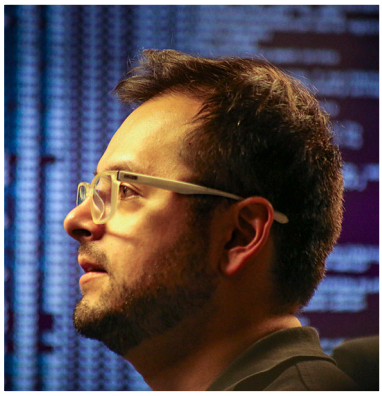
U.S. Department of Energy



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