Energy &
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GRID ENERGY STORAGE AT SANDIA: ELECTRICAL ENERGY STORAGE DEMONSTRATION PROJECTS

Sandia's role in grid-tied field demonstration projects provides an understanding of energy storage operation in grid applications, optimization, system reliability, and the economic impact in different markets.

OVERVIEW OF SANDIA'S ENERGY STORAGE PROGRAM

Modernization of the electricity infrastructure is critical for the economic vitality and the future of the country. Sandia's support for this grid modernization vision includes a broad research program in energy storage technologies and systems. The laboratories' work is focused on making energy storage safe, reliable, and cost effective. Through research, development, and implementation, Sandia's projects support new battery technology innovation, advancements in power electronics and power conversion systems, improvements to the safety and reliability of energy storage systems, and the deployment of energy storage technologies in the electric grid. Sandia's grid energy storage research is primarily supported by the U.S. Department of Energy's (DOE) Office of Electricity Delivery and Energy Reliability (OE) – Energy Storage Program.

THE CHALLENGE

Energy storage technologies can support the grid in several ways such as demand reduction, infrastructure deferments, reliability, frequency regulation, energy management, renewable firming, and backup power. In order for Energy Storage Systems (ESS) to become widely deployed, they should meet the following challenges:

- Be cost competitive with other alternatives
- Meet the regulatory requirements
- Have validated reliability and safety
- Be accepted by industry

CAPABILITIES

Sandia strives to help ESS meet these challenges by collaborating with developers, academia, utilities, energy storage providers, and others to understand and improve ESS.

Sandia's expertise allows us to:

- Provide initial analysis and modeling of the grid to determine the appropriate applications for the ESS, the need for distributed energy resources (DER), and the financial benefits of energy storage for the given markets
- Model ESS to determine size MW/MWh for optimum cost benefit
- Develop Requests for information (RFI) and Requests for Proposals (RFP)
- Review proposals and vet technologies
- Develop conceptual electrical plans for energy storage installations in microgrids and power distribution systems
- Work with the project team to vet energy resources and control methods
- Review contract documents to ensure requirement compliance
- Vet commissioning plans and testing protocols for both factory tests and field installations
- Provide technical support during construction and commissioning
- Conduct operational performance data review and analysis
- Provide analysis and develop optimization algorithms

CURRENT DEMONSTRATION PROJECTS

Sandia is currently involved with over 18 energy storage projects. Each project is at a varying level of completion and each is designed to address the DOE's key challenges. Featured projects include the following:

Sterling Municipal Light Department ESS

Sandia contributed to the analysis, request for proposal, and deployment of a 2 MW, 3.9 MWh Li-ion energy storage system for the Sterling Municipal Light Department. At the time of commissioning, the system is the largest system of its kind installed in New England and the first utility scale project in Massachusetts. Using solar energy, the system can provide

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up to 12 days of clean backup power to nearby police stations and emergency dispatch centers in case of a grid outage. During normal operation the system also provides demand reduction capabilities.

Green Mountain Power ESS

Green Mountain Power, with support from DOE-OE and Sandia, installed a 3 MW/3.4 MWh Li-ion and Lead Acid energy storage system integrated with 2.5 MW of photovoltaic power. The system provides resilient backup power to a nearby school and emergency shelter. During normal operation the system also provides demand reduction capabilities.

Cordova Electric Cooperative ESS

With the Cordova Electric Cooperative (CEC), Sandia is providing in-depth analysis and technical consulting in the design, installation and commissioning of their 1MW, 1MWh Li-ion Energy storage system. The system will help reduce their diesel fuel consumption in their hydro-diesel islanded microgrid . Sandia through DOE is providing cost share to support the project.

National Energy Lab of Hawai'i Authority Collaboration

Sandia is currently partnering with the National Energy Lab of Hawai'i Authority (NELHA) and the Hawaii Electric Light Co (HELCO) and providing technical consulting, system evaluation, and analysis services for their 500KWh vanadium Redox Flow battery project. The project will analyze the use of ES in an Island application. Sandia through DOE is providing cost share to support the project.

Helix Power Flywheel Demonstration

Along with NYSERDA, Sandia has partnered with Helix Power to provide technical support for the composite components of their flywheel technology. Helix Power hopes to successfully demonstrate their full scale 1 MW- 90 second platform that will recycle braking energy from subway systems to be used as propulsion energy. Sandia through DOE is providing cost share to support the project.

Energy Market Authority of Singapore CRADA

The Energy Market Authority (EMA), in partnership with Singapore Power and Sandia, is developing two projects to demonstrate ESS at two different substations. The goal of the work is to understand the benefits of energy storage in their market and the reliability of energy storage in their tropical environment.

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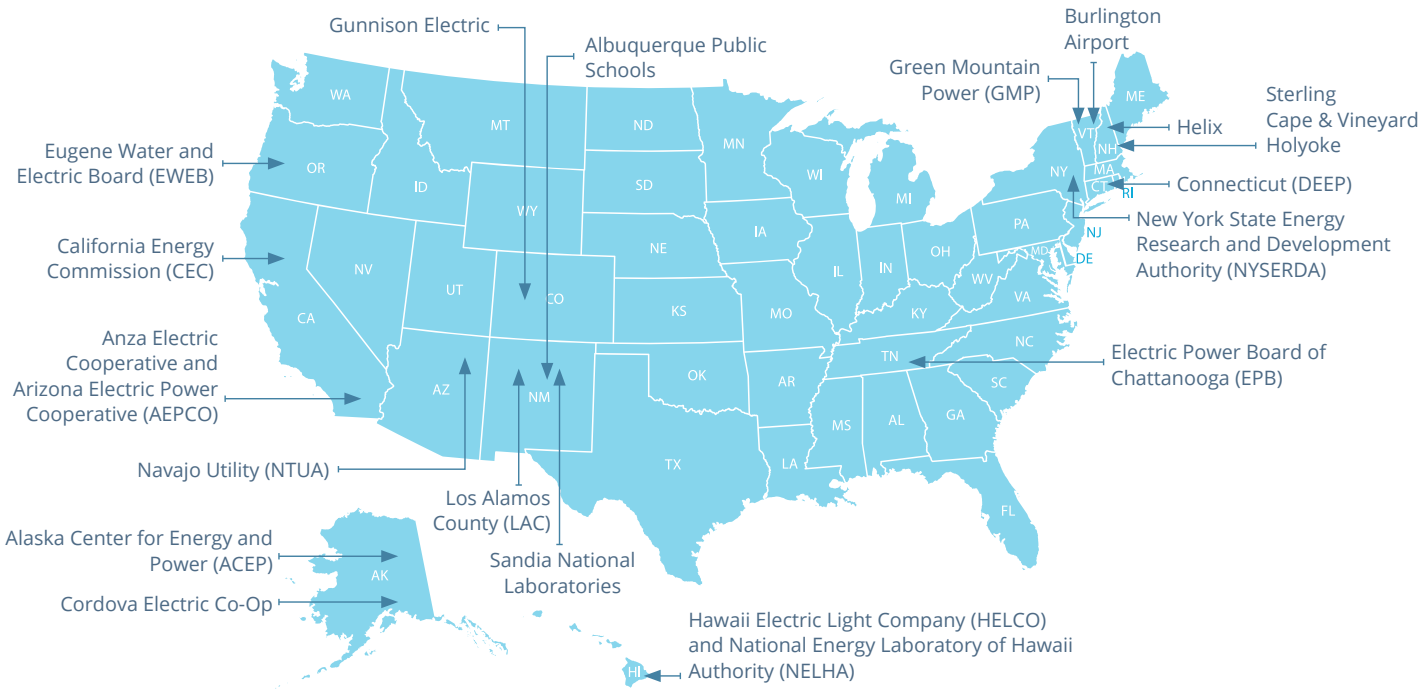
FY 17 Demonstration Projects



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