American Recovery and Reinvestment Act (ARRA)

Tehachapi Wind Energy Storage Project

Lithium-ion battery and smart inverter technologies will improve grid performance and wind integration

U.S. DEPARTMENT OF ENERGY | Electricity Delivery & Energy Reliability

Energy Storage Program

Southern California Edison

Southern California Edison (SCE) is positioned to demonstrate the effectiveness of lithium-ion battery and smart inverter technologies to improve grid performance and assist in the integration of variable energy resources. This project will be sited at the Tehachapi Wind Resource Area, one of the largest wind resource areas in the world, where as much as 4,500 MW of wind resources are expected to come online by 2015. An existing SCE substation located approximately 100 miles north of Los Angeles, California, will host the demonstration.

Overview

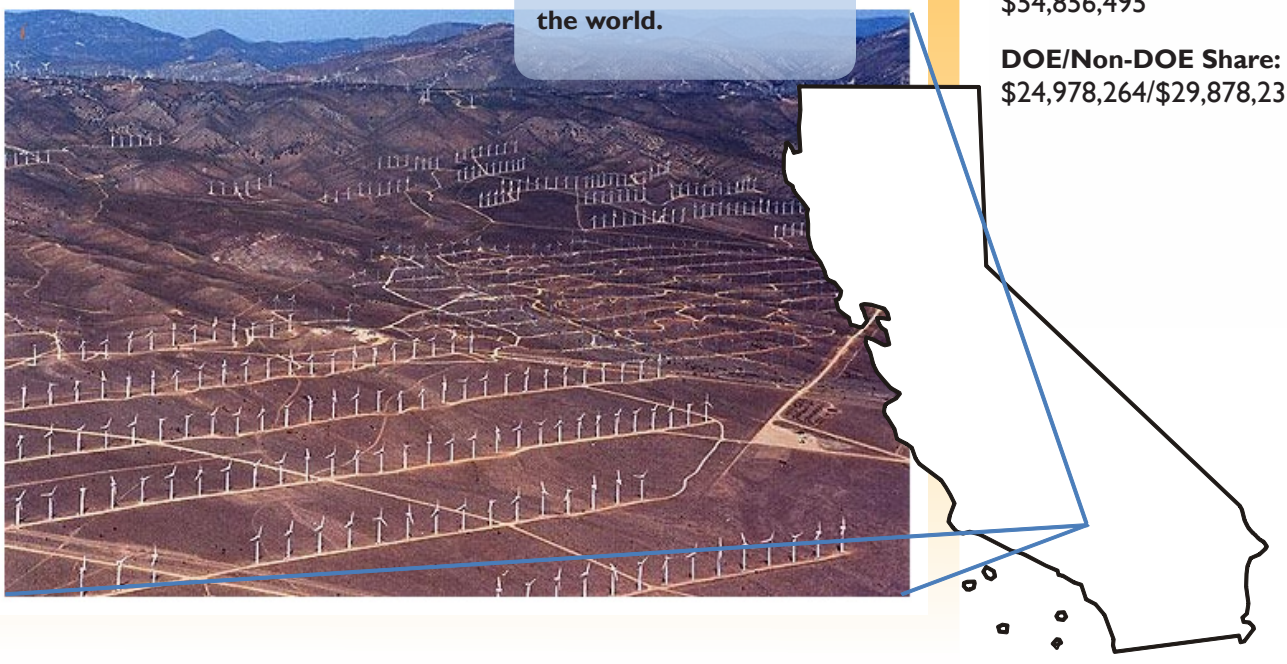
The Tehachapi Wind Energy Storage Project (TSP) Battery Energy Storage System (BESS) consists of an 8 MW-4 hour (32 MWh) lithium-ion battery and a smart inverter system that is cutting-edge in scale and application. SCE will test the BESS for 24 months to determine its capability and effectiveness to support 13 operational uses (see sidebar).

SCE's Demonstration Project

The Tehachapi Wind Energy Storage project will test an 8 MW-4 hour (32 MWh) lithium-ion battery and smart inverter system. This will help store energy from the existing ~5,000 wind turbines and any future additions.
The major equipment used includes the following:

- 8 MW-4 hour lithium-ion battery array
- Power conversion system
- Transformers
- Communication gateway
- Phasor measurement unit

The project was sited at the Tehachapi Wind Resource Area because it is one of the largest wind resource areas in the world.



Project Benefits

Transmission

- Provides voltage support/grid stabilization
- Decreases transmission losses
- Diminishes transmission congestion
- Increases system reliability by load shed deferral
- Defers transmission investment
- Optimizes renewable-energy-related transmission

System

- Provides system capacity/resource adequacy
- Integrates renewable energy (smoothing)
- Shifts wind generation output

Grid

- Frequency regulation
- Spin/non-spin/replacement reserves
- Ramp management
- Energy price arbitrage

Budget

Total Project Value:
$54,856,495

DOE/Non-DOE Share:
$24,978,264/$29,878,231

Timeline

June 2011:
Completed installation of baselining equipment

November 2011:
Completed BESS manufacturing plan

Q4 2013:
Completed acceptance testing for battery system

Q4 2015:
Complete operations, measurement, and testing

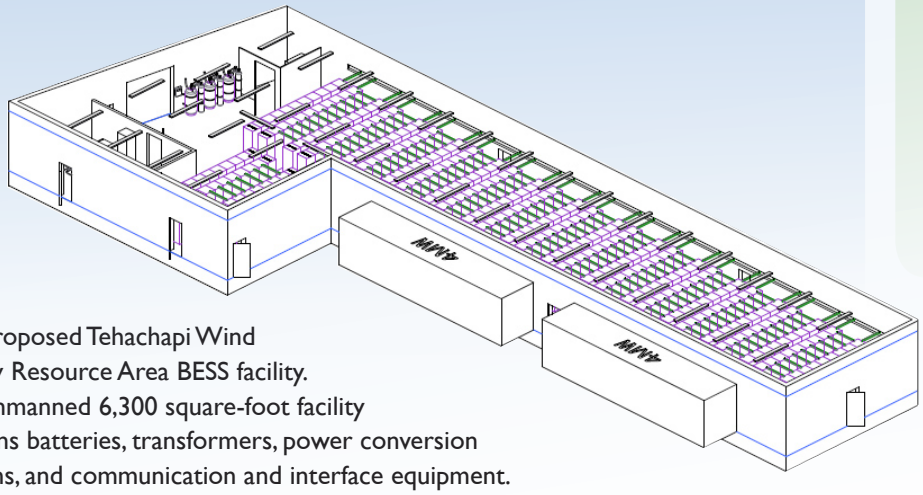
Goals

- Validate the performance and effectiveness of lithium-ion technology
- Demonstrate the integration of intermittent resources
- Gain practical knowledge to develop a smarter, more efficient electrical grid
- Advance market readiness of utility-scale storage

Project Partners

- Southern California Edison
  www.sce.com
- California Independent System Operator
  www.caiso.com
- Quanta Technology
  www.quanta-technology.com

The Battery Energy Storage System Facility



The proposed Tehachapi Wind Energy Resource Area BESS facility. The unmanned 6,300 square-foot facility contains batteries, transformers, power conversion systems, and communication and interface equipment.

For More Information

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Related Reading

Sandia National Laboratories, "Energy Storage Systems Program (ESS)," http://www.sandia.gov/ess/.

"Southern California Edison Finalizes Stimulus Grant to Start Large-Scale Energy Storage Demonstration," October 2010, http://www.edison.com/files/102010_news1.pdf.

Importance of Energy Storage

Large-scale, low-cost energy storage is needed to improve the reliability, resiliency, and efficiency of next-generation power grids. Energy storage can reduce power fluctuations, enhance system flexibility, and enable the storage and dispatch of electricity generated by variable renewable energy sources such as wind, solar, and water power. The Office of Electricity Delivery and Energy Reliability Energy Storage Program funds applied research, device development, bench and field testing, and analysis to help improve the performance and reduce the cost of energy storage technologies.

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