

Grid-Scale Energy Storage Demonstration Using UltraBattery® Technology

Demonstrating new lead-acid battery and capacitor energy storage technology to improve grid performance

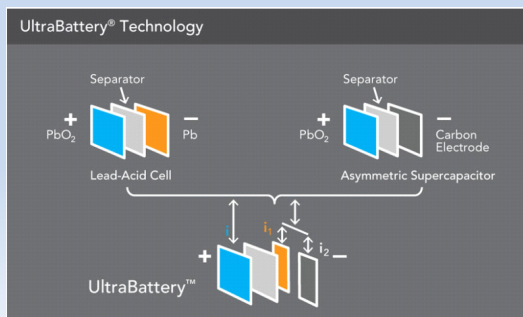
East Penn Manufacturing, through its subsidiary Ecoult, has designed and constructed an energy storage facility consisting of an array of UltraBattery® modules integrated in a turnkey battery energy storage system.

The UltraBattery® technology is a significant breakthrough in lead-acid energy storage technology. It is a hybrid device containing both an ultracapacitor and a battery in a common electrolyte, providing significant advantages over traditional energy storage devices.

The system is selling up to 3 MW of frequency regulation to PJM Interconnection's grid. In addition to frequency regulation, the system provides demand management services to a local utility during specified peak power periods. These services provide up to 1 MW for 1–4 hours. This project will serve as a model for the implementation of energy storage technologies on a much a broader scale, which will enable the transition to a “smarter” grid.

More About the Technology

The UltraBattery® is a new energy storage technology that operates more efficiently in continuous Partial State of Charge (PSoC) use than traditional lead-acid batteries. The hybrid device combines the advantages of advanced lead-acid technology with the advantages of an asymmetric capacitor. This enables an optimal balance of an energy storing lead-acid battery with the quick charge acceptance, power discharge, and longevity of a capacitor.



Project Benefits

- Provides frequency regulation and ancillary services for the PJM market
- Provides additional demand management services options
- Enables integration of renewable energy technologies, such as solar and wind

Advantages of the Ultrabattery®

- Combines advantages of lead-acid batteries and ultracapacitor technologies
- Low-cost, high-performance energy storage solutions for grid-scale applications
- High efficiency in PSoC
- High cycle life
- Virtually 100% recyclable technology
- Complete and scalable platform for energy storage systems

Budget

Total Project Value:
\$5,087,269

DOE/Non-DOE Share:
\$2,543,523/\$2,543,746

Equipment

The equipment used for the PJM demonstration includes:

- 15 kV switchgear
- 69 kV bus and fused switch
- 4 battery strings- one containerized string and three strings installed in building
- 1,920 UltraBatteries® that combine an asymmetric ultra-capacitor and a lead-acid battery in one unit
- 1 power conversion system
- 1 master programmable controller
- 1 battery monitoring system



The PJM Interconnection regulation services project in Lyon Station, Pennsylvania.

Timeline

- September 2010:**
Released updated project management plan
- April 2012:**
Completed building construction
Completed system integration
- May 2012:**
Verified operational readiness
- July 2012:**
Began operation
- July 2013:**
Submit 12-month data analysis report
- January 2015:**
Submit 30-month data analysis report
- April 2015:**
Submit final scientific/technical report

Goals

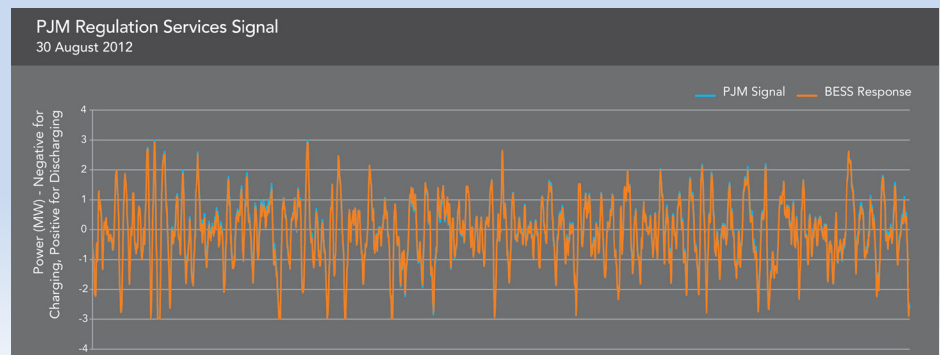
- Demonstrate the economic and technical viability of an UltraBattery[®] system for frequency regulation, ancillary services, and demand management
- Establish the cost of the UltraBattery[®] and attendant controlling power electronics required for a utility grid management application

Project Partners

- Ecoult
www.ecoult.com
- PJM
www.pjm.com
- PPL Energy Plus
www.pplenergyplus.com
- Met-ED
https://www.firstenergycorp.com/met_edison.html

UltraBattery[®] Technology in Operation

The UltraBattery[®] demonstration is already showing promising results in its service to the PJM Interconnection. The image to the right shows the Battery Energy Storage Systems' (BESS)'s accurate response to PJM's regulation services signal.



For More Information

Kimberly Nuhfer, Project Manager
National Energy Technology
Laboratory
Kimberly.Nuhfer@netl.doe.gov

Jeff Seasholtz, Principal Investigator
East Penn Manufacturing
jseasholtz@dekabatteries.com

Related Reading

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

East Penn, "East Penn & Ecoult Launch PJM Regulation Services Project with DOE Support to Demonstrate the Advantages of Deka UltraBattery[®] Technology", 15 June 2012, <http://www.dekabatteries.com/default.aspx?pageid=1929>.

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.

October 2012