



LEAD BATTERIES: ENERGY STORAGE CASE STUDY



East Penn Manufacturing MW-Scale Services to Balance and Smooth USA's Largest Grid

Pennsylvania, USA

There is an increasing need for regulation services due to the large-scale integration of intermittent wind and solar generation which affects the physical operation of the modern grid.

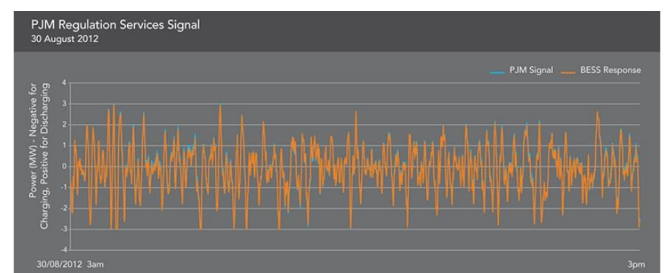
The grid scale energy storage system, operational since 2012, provides 3 MW regulation services on the grid of PJM Interconnection, which is the largest of 10 Regional Transmission Organisations / Independent System Operators in the USA.

Regulation services are necessary to provide fine tuning in real time for the network to match supply and demand and keep a constant frequency. The PJM energy storage project demonstrates the efficiency of UltraBattery® technology for managing regulation services. East Penn has shown that lead technology is not only capable of continuous cycling, it can also equal or outperform any other battery technology in grid frequency regulation, one of the most demanding applications for any battery.

Technical Specification

The 3 MW UltraBattery Energy Resource is implemented both in a building and in a containerized format, to demonstrate flexibility in approach for prospective adopters.

Using four strings of UltraBattery cells, it connects to the grid from inside the East Penn Manufacturing site in Pennsylvania. The project provides continuous frequency regulation services bidding in to the open market on PJM, and the system responds to PJM's fast response signal (see below). The project also provides peak demand management.



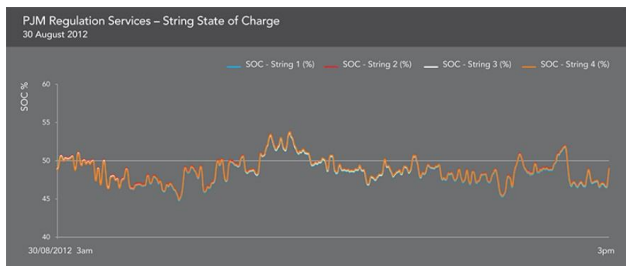


For frequency regulation services, the batteries roam in approximately 40% Partial State-of-Charge band. The system implements an application that follows the PJM signal and maintains the State-of-Charge (see below).

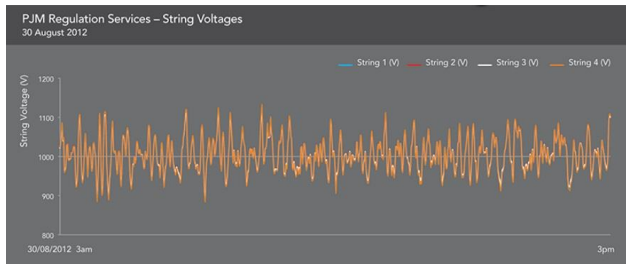
About the Company

East Penn is located at Lyon Station in Pennsylvania and is the largest single-site battery manufacturing operation in North America.

The 520-acre campus uses the most technically advanced methods to manufacture batteries for automotive, motive power, reserve power and energy storage.



The frequency regulation services system tracks the string voltage and individual voltage of the cells, which are maintained in conservative bands to extend longevity (see below).



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