

# Moving energy in time

A123 Energy Solutions, a division of A123 Systems LLC and a part of Wanxiang Group, develops and manufactures advanced batteries for electric grid, backup power and lead-acid replacement. From its headquarters in Flanders, MA. (USA), Mr. Roger Lin, Director of Product Marketing talks about the methods used to store electricity on a large scale within an electrical power grid, and about the recent commissioning of the company's Grid Storage Solution (GSS) for Red Eléctrica de España, the Spanish Transmission System Operator.

Grid Energy Storage refers to the methods used to store electricity on a large scale within an electrical power grid. Electrical energy is stored when production from power plants exceeds consumption, and this stored energy is then used when consumption exceeds production. In this way, electricity production need not be drastically scaled up and down to meet momentary consumption; instead, production is maintained at a more constant level. This has the advantage that fuel-based power plants, for example coal, oil or gas plants, can be more efficiently and easily operated at constant production

levels. "The storage of energy to fill the shortfall intermittency or for emergencies, is part of a reliable energy supply," says Mr. Lin. "One of the key benefits of Grid Energy Storage is that it stabilises the grid." Adding value to grid storage, A123's Grid Battery System (GBS) is based on modular rack-integrated energy storage units. These are available as High-Rate (HR) and Long-Duration (LD) units, and can be scaled from hundreds of kilowatts to hundreds of megawatts. The long-duration system is actually a completely different energy storage cell than the high-rate systems, although it

uses the company's same lithium-iron-phosphate chemistry. Mr. Lin explains. "Specifically, while its high-rate systems are built with its 26650 cylindrical cells, the long-duration batteries are built with its AMP20 prismatic pouch cells, the same that are being used for electric vehicle customers like General Motors for its Chevy Spark." These prismatic cells, stacked together into storage racks and integrated into formations suitable for supporting grid-scale tasks, can add up to 4 megawatt-hours of storage within a 53-foot storage container. Lithium-ion has so far been seen primarily as a "power" application, unsuited for long-term energy storage or shifting, as compared to competing technologies like sodium-sulphur batteries, flow batteries or emerging aqueous electrolyte-based metal batteries. All of A123's Grid Battery System units are available with on-board touch screen

control panels, heat/smoke detection and an integrated fire suppression system. The A123 Energy Response Operating System, or AEROS™, is the software component of the Grid Storage Solution. AEROS delivers full command and control functionality for seamless integration with utility systems. Mr. Lin explains: "AEROS is designed to work with all our systems, providing full control of the batteries, the safety mechanisms, performance monitors, and also to the recording activities on the battery systems, which are significant for analysis and future study."

With over 100 megawatts deployed to date, A123 Energy Solutions is the world's leading supplier of lithium ion battery systems for grid energy storage. The company's global utility and independent power producer customers include AES Energy Storage, Sempra Generation, Southern California Edison, Dongfang Electric Corp., Vestas, Maui Electric and Northern Powergrid. These and other customers are deploying the Grid Storage Solution for a number of applications, including frequency regulation, spinning reserve, renewable integration and substation storage. One of the latest installations of the Grid Storage Solution can be found in Spain. Here, the system will absorb surplus energy production, mostly from renewable energy sources, and discharge upon demand. The so called Almacena Project is the first European system of its kind to be connected to the transmission grid. The project was co-financed by the European Regional Development Fund (ERDF) and has the capacity to meet the simultaneous demand of 300 Spanish households. The system is rated at 1MW for three hours, including power



conversion and controls, and was installed and commissioned at the Carmona substation near Seville in late December 2013. The energy storage project was led by REE, the sole transmission agent and operator of the Spanish electricity system, and was co-financed by the European Regional Development Fund. A123 Energy Solutions provided a turnkey solution to REE, performing all the site preparation, installation, final commissioning and maintenance of the standardized 1MW/3MWh system.

"We will continue to install systems and winning contracts that help ease the strain on grids," Mr. Lin adds. "We just won a contract with Japanese manufacturer IHI Corporation, which

wants to manage its peak power demand and integrate on-site large-scale solar PV at an IHI factory in the Tohoku region of Japan, the northern section of Honshu Island that's still struggling to meet electricity needs in the aftermath of the 2011 Fukushima disaster."

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