



## Big Batteries Provide Big Results

**S&C Featured Solution:** S&C Turnkey Solution

**Location:** Charleston, West Virginia

### Customer Challenge

American Electric Power's Chemical Substation in Charleston, West Virginia, is the site of North America's first megawatt-class sodium-sulfur battery for shaving load peaks.

The 20-MVA, 138/15-kV transformer in this substation had been operated very close to its limit during an extremely hot summer. Rather than pursuing a significant substation expansion project, AEP looked for other solutions to the problem. It found an excellent alternative in the Distributed Energy Storage System. With partial funding from the U.S. Department of Energy's Sandia National Laboratories, AEP decided to install such a system and keep it there until the cost of new substation could be justified.

The 1.2-MW Distributed Energy Storage System can supply 7.2 MWh of electrical energy on demand. It consists of 20 series-connected battery modules.

Each module contains 320 sodium-sulfur batteries and can provide 360 kWh, or 50 kW of continuous power for 7.2 hours or—under peak-load conditions—60 kW for 3 hours plus 25 kW for 7.2 hours.

The battery modules store energy overnight, when power demand is typically lower. Charging time is approximately 10 hours. During the day—when the substation transformer is pushed to its limit—the Distributed Energy Storage System provides the additional energy needed. Battery life expectancy is 3500 to 5000 operations, depending on the depth of discharge.

The battery modules, which operate at 570°F (299°C), are housed in a vacuum-sealed, double-wall enclosure. A 1.25-MVA power conditioning system inverts the 600-Vdc output to 480 Vac. The power conditioning system communicates with AEP's SCADA system to determine which of the eight available peak-shaving profiles is best suited for dispatching battery output.

*Distributed Energy Storage System.*





## S&C Solution

The sodium-sulfur batteries were furnished by the Japanese supplier NGK Insulators Ltd. The enclosure was provided by a local firm, Kanawha Manufacturing Company.

S&C Electric Company furnished the power conditioning system and also served as integrator for the entire Distributed Energy Storage System project. In that latter role, S&C was responsible for overall project management, including all aspects of engineering and equipment installation. S&C provided:

- Equipment layout, foundation, and conduit details
- Procurement and installation of all medium- and low-voltage cables and terminations
- Installation oversight of the battery modules
- Procurement and installation oversight of the enclosure
- Procurement and installation of the power conditioning system
- Portable generation for battery charging during installation
- Integration with the existing SCADA system
- System testing and commissioning

## Results

Since its commissioning, the system has had an excellent track record.

AEP has proposed several other applications for this technology. S&C will serve as the single point of contact for these applications, with responsibility ranging from design engineering and equipment procurement to final commissioning.

With its modular design, the system can be expanded to any power level required. It can be enhanced with a “dynamic islanding” capability as well: a control scheme that maximizes the number of customers served by the system during an outage.

*Installation of battery rack.*

