

# Solar-To-Battery Energy Storage Project

## General Project Description

Xcel Energy has installed a large, utility-scale battery energy storage system at SolarTAC as part of a three-year test program with Xtreme Power to evaluate how energy storage can assist in operating a distribution system with high levels of solar production in comparison to the customer loads on the system. Solar is a growing part of our energy resource mix and the variability common with solar energy production can lead to significant voltage fluctuations and other grid management concerns. Solar generation produced at SolarTAC provides an ideal opportunity to study the issue and solutions related to accommodating large amounts of solar energy on our system.



## Project Development

Our experience with several solar facilities in southern Colorado, and elsewhere, shows that passing clouds can cause the output of solar photovoltaic (PV) resources to drop from 100 percent output to 20 percent in less than one minute and to climb back to 100 percent just as quickly. This variability affects our ongoing ability to manage the distribution system when solar PV levels begin approaching 25 percent of distribution feeder loads. Our analysis of these issues, conducted with SunEdison and the National Renewable Energy Laboratory, led to energy storage as a possible solution for mitigating the effects of this variability on our customers.

## Project Goals

The project will demonstrate the use of a utility-scale energy storage technology in mitigating the effects of high levels of solar PV variability on distribution feeders. Specific areas of concern for the utility system include: voltage swings, grid instabilities and PV output mismatches with feeder load peak.

## Testing will include:

- The energy storage system's ability to effectively slow solar energy ramp rates as seen by the distribution system,
- Temporarily replace solar PV energy contributions when clouds pass over the PV installations, and
- Effectively extend the solar PV output peak to better match the feeder load peak.

## Project Facts

### Location:

Installed at the Solar Technology Acceleration Center (SolarTAC) located in Aurora, Colo., near Denver International Airport

### Energy storage technology:

1-megawatt, 1 megawatt hour advanced lead-acid (dry cell) battery system

### Energy storage system acquisition:

Three-year leasing agreement with Xtreme Power of Kyle, Texas

### Project timeframe:

2011 – 2013

### Project cost:

\$1.6 million for site preparation, grid interconnection, monitoring and controls, operations and maintenance and energy storage system leasing agreement

### Other project participants:

In addition to Xtreme Power, the Electric Power Research Institute (EPRI) will provide \$99,000 to support the energy storage system testing and Amonix will directly supply up to 500 kW of concentrating solar PV power from its testing project at SolarTAC



### About Xcel Energy:

Xcel Energy is a U.S. investor-owned electricity and natural gas company with regulated operations in eight Midwestern and Western states. Based in Minneapolis, Minn., we provide a comprehensive portfolio of energy-related products and services to approximately 3.4 million electricity customers and 1.9 million natural gas customers through four wholly owned utility subsidiaries. According to the American Wind Energy Association, Xcel Energy is the No. 1 wind energy provider among U.S. utilities and is ranked No. 5 among U.S. utilities for solar capacity by the Solar Electric Power Association. As the original founding member of SolarTAC, the company has the opportunity to learn and to capitalize on solar technologies that offer the greatest benefit for electricity customers.

### About SolarTAC:

The Solar Technology Acceleration Center (SolarTAC) is an integrated, world-class facility where the solar industry and solar energy users can test, validate and demonstrate advanced solar technologies under actual field conditions. The SolarTAC mission is to increase the performance, cost-effectiveness and reliability of solar energy products for rapid deployment in the growing commercial market.

### Xtreme Power:

Based in Kyle, Texas, Xtreme Power engineers, manufactures and operates large-scale digital power systems for use in renewable energy and micro-grid applications. Xtreme Power's Dynamic Power Resource™ (DPR™) combines the energy storage capabilities of the company's proprietary PowerCell™ technology with its micro-second controls and high-efficiency power electronics, creating a comprehensive solution to the intermittency and variability challenges facing utilities and independent power producers looking to implement clean energy to the electrical grid. By providing scalable systems engineered specifically to the needs of its customers, Xtreme Power offers a safe and cost-effective approach to dramatically increase the feasibility of renewable energy. Xtreme Power is backed by investors SAIL Capital Partners, Bessemer Venture Partners, The Dow Chemical Company, Fluor Corp., BP Alternative Energy, Dominion Resources, POSCO ICT, SkyLake & Co. and Spring Ventures, LLC.

