



Glacier Battery Storage Innovation Pilot Project

Project background

Improvements in energy storage technology, such as large-scale battery systems, are making it more practical for utilities to invest in distributed generation systems which capture, store and release energy into the power grid. Puget Sound Energy, in partnership with the Washington State Department of Commerce, is developing a utility-scale battery energy storage pilot project in Glacier, WA to test the benefits of distributed generation.

The Glacier battery storage pilot project entails installation of a 2 megawatt (MW) / 4.4 megawatt-hour (MWh) lithium-ion battery system. The state-of-the-art system is tied to PSE's electric distribution power grid and located in the existing Glacier substation. The project is funded in part by a generous \$3.8 million Smart Grid Grant from the Washington State Department of Commerce in addition to \$7.4 million invested by PSE.

Benefits

The Glacier battery storage pilot project will perform three primary functions:

1. **Serve as a short-term backup power source to a portion of the local Glacier circuit during outages.** The battery system will draw electricity from the distribution system during times of minimal customer usage and will be capable of storing up to 4.4 MWh. During an outage, the battery system will release the stored energy (enough electricity to power the core downtown Glacier area) back into the electric grid. PSE demonstrated the batteries backup power capabilities on August 28, 2017 during a planned outage and will continue to use planned outages to test safely test use of the automation function. Testing ensures the batteries will respond to an unplanned outage in the future.
2. **Reduce system load during periods of high demand.** The battery will be capable of absorbing electricity when customers' power consumption is low, storing that power, and releasing it back into the system when needed. This will help balance the electric system when demand is high and the grid is strained, such as during extreme cold temperatures when customers need to use more electricity to heat homes and businesses.
3. **Balance energy supply and demand, helping to support greater integration of intermittent renewable energy generation on PSE's grid.** Energy storage can be used to fill the minute-to-minute gaps between supply and demand, keeping lights on for customers while maintaining a healthy electric system. With energy storage, PSE can balance out the regional electric system by quickly reacting to a sudden drop or surge from generation output (such as from wind or solar anywhere on the grid) or an unexpected change in power demand from customers. For example, if energy output decreases at PSE's Wild Horse Wind and Solar Facility, the Glacier battery system may be able to balance that decrease in output by picking up a small portion of the load in Glacier.

Battery energy storage technology

Lithium-ion battery technology is not new: roughly half of cell phone and laptop batteries in the U.S. use the same type of lithium-ion chemistry as the Glacier battery. Lithium-ion batteries are becoming more affordable, longer lasting, and able to be manufactured at the scale required for use in utility grids. Many other utilities as well as commercial, industrial and even residential customers are already using battery systems like Glacier's. The Glacier battery storage project, includes four battery modules, each in a standard 40-foot shipping container, and is expected to have a 20-year lifespan. The battery will be monitored and operated remotely using sophisticated software developed locally in the Puget Sound.

Safety

The specific lithium-ion battery system in this project is one of the safest of its kind. The batteries are larger versions of well-studied lithium-ion batteries that have been used safely in consumer electronics, vehicles and buses since the 1990's.

Further, the battery electrolyte the liquid that helps move energy between the positive and negative ends of the battery is non-toxic and the batteries are recyclable at the end of their 20-year life. The battery containers have multiple safety layers including electrolyte containment, 24/7 remote monitoring by our system operators, security cameras, and advanced fire suppression systems.

Location

Glacier is located at the edge of the power grid and experiences frequent and long outages. The transmission line serving Glacier runs along a heavily forested scenic highway, which can make it challenging for repair crews to locate and repair electrical problems during storms. This location will allow us to easily evaluate the performance of the battery system and its specific contributions to the power grid.

Schedule: Planning, construction, evaluation

Permit applications were submitted to Whatcom County in December 2014. Following detailed system impact studies, factory testing of the batteries, and receiving all necessary permitting and jurisdictional approvals, construction began in September 2015.

The first phase of the project connected the batteries with the old Glacier substation and was completed in March 2016. The second phase required upgrades to the existing Glacier substation. This phase was completed in September 2016.

Now that all upgrades are complete and the battery system is fully functional, Pacific Northwest National Laboratory (PNNL) will conduct two phases of testing and evaluation. In mid-September 2017, PSE's team successfully completed the first phase of testing. The second phase is expected to be complete by mid-2018. PNNL's evaluation will help determine the benefits of the battery technology for PSE's local system and identify future applications for the technology for PSE and other utilities.

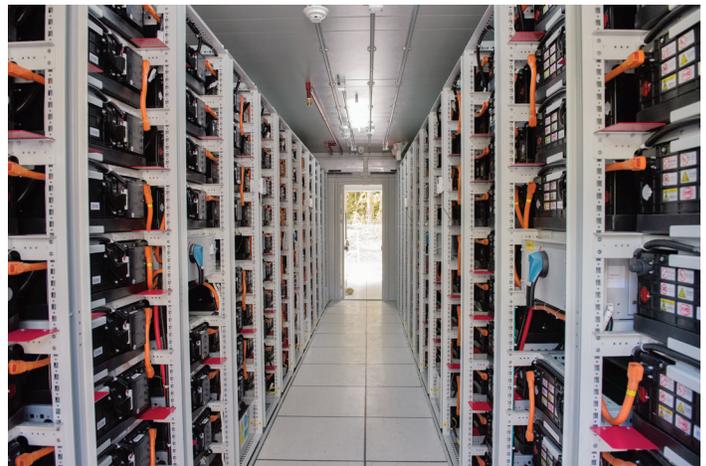
Partnership

PSE is able to implement this pilot project thanks to a generous grant from the Washington State Department of Commerce under the Clean Energy Fund. PSE is proud to partner with Renewable Energy Systems Americas (RES), responsible for leading engineering, procurement and construction of the Glacier battery system; Doosan Tech, a company providing advanced software necessary to control the battery system remotely; and PNNL, evaluating the long-term benefits of the battery technology for PSE's system.

Contact us

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▲ PSE's Glacier Battery project.