Quarterly Update

Pacific Northwest SMART GRID DEMONSTRATION PROJECT

Spring 2012

Something for everyone

For some utilities, smart grid is literally helping to keep the lights on. (See the Summer 2011 newsletter about Fox Island.) For others, economics are the primary driver for smart grid investments. And for still others, integrating variable renewable resources is expected to be a key benefit. For consumers, smart grid can provide information on energy usage and in some cases choices on how, when and at what price, to use energy.

With all of those different drivers, what do the utilities, end-use customers and the region have in common?

For the participants in the Pacific Northwest Smart Grid Demonstration Project, the connection is clear. They will all be using a special signal that is testing whether real-time, two-way communication, can enhance the benefits of smart grid at the local, as well as regional level.

This edition of the Quarterly Update will take a look at how all of the individual parts of the project are working together to address those regional goals, as well as local issues.

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Project Director

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Project Objectives and Attributes

Primary Objectives:

- Develop and validate an interoperable distributed communication and control infrastructure using transactive control signals;
- Measure and validate smart grid costs and benefits;
- Contribute to the development of standards and transactive control; and
- Apply smart grid capabilities to support the integration of renewable resources.

Operational Objectives:

- Manage peak demand;
- Facilitate wind integration;
- Address constrained resources;
- Improve system reliability;
- Improve system efficiency; and
- Select economical resources.

Key Attributes:

- Leave an installed operational base of smart grid assets and successful operational strategies for the region.
- Stimulate the regional and national economy by creating jobs and a vibrant smart grid industry.

Smart Grid brings a variety of benefits

Eleven utilities are participating in the Pacific Northwest Smart Grid Demonstration Project. They all have different drivers for joining, but they also have two big things in common with regards to managing the physical characteristics of electricity:

1. ***Every second, the amount of electricity used in the region must match the amount of electricity that is generated.*** That balancing act can be tricky with some renewable resources such as wind and solar, that can come and go depending on the weather.
2. ***Energy use is not consistent throughout the day – it has peaks and valleys that are fairly predictable.*** During the wee hours of the morning when most people are sleeping, there is very little energy use. When people wake up and start turning on appliances – coffee makers, hair dryers, toasters – electricity use peaks. Energy is typically more expensive during times of peak use.

By helping to manage these two major characteristics of electricity, smart grid can help keep the lights on, keep costs lower than they otherwise would be, and help balance out the variability of wind and solar. Utilities, the region, and end-use customers all are part of the solution.

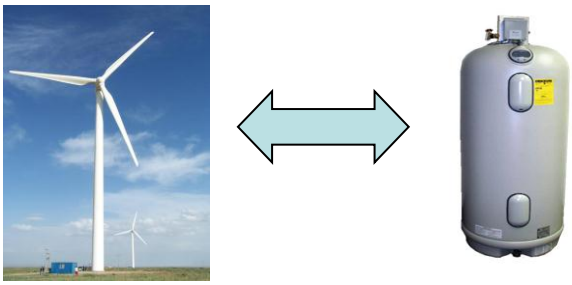
As part of the PNW-SGDP, utilities are implementing a variety of tools to tackle the complex issues of providing power to their customers. For example, part of Avista's project involves providing consumers with in-home displays that they can use to better manage their electricity usage. An aspect of Idaho Falls Power's implementation will determine the energy requirements for charging plug-in hybrid electric vehicles. Flathead Electric is testing whether they can shift peak use with smart appliances, and Lower Valley Energy is working with customers to implement a water-heater control program. These are just a few of the utilities participating, and just a sampling of what they are doing.

"Finding a mix of uses for smart grid assets is an important part of making smart grid cost effective," says BPA's Smart Grid Program Manager Lee Hall. "For example, if a utility is looking to use water heater controllers to reduce their peak, and the region is looking for a place to store extra wind power, they can work together to optimize the investment – share costs and benefits of the same resource."

One of the four operational objectives of the Pacific Northwest Smart Grid Demonstration Project is to help the region bring on more environmentally-friendly sources of electricity, like wind and solar.

This aspect of the project became even more relevant in March, when wind generation on the Bonneville Power Administration's system surpassed the 4,000 megawatt milestone, producing nearly twice as much energy as that generated by coal, gas and nuclear plants at that time. In fact, BPA has the highest percentage of wind penetration, by nameplate capacity, of any balancing authority in North America.

"BPA is particularly interested in using smart grid to help balance for the variable nature of wind," Hall says, "We want to see how the resources in the region, such as smart appliances, batteries and other thermal storage devices, can work together to help balance the system."



Connecting parts of the power system, like a wind project and water heaters, with two-way communication can help optimize the grid.

The PNW-SGDP is testing whether a special signal can help bring those resources together with two-way communication to make best use of them, and address numerous requirements, such as wind integration.

"The power system is becoming more and more complex with mixed programs and mixed resources while being tasked with growing the renewable power portfolio," says Portland General Electric's Smart Grid Manager Mark Osborn. "The signal and each utility's response to the signal needs to be programmed to consider all constraints at once – for both economic and electrical requirements, across all time horizons, to optimize the mix of all available demand-side and supply side resources."

Osborn describes the PNW-SGDP signal as a system that provides a means of coordinating with the complex power system and performs in a way that can be compared to schools of fish and flocks of birds.

"You have individual parts of the power system… appliances in homes, solar rooftops, substations, wind farms, dams, et cetera, that operate in a particular way. Just like a single bird or fish. When you put them all together for a common objective, they act in a very different way; they perform as a unit to make the best use of resources."

These salmon smolts are schooling in a complex system, where as a group, they can be safer and more efficient. The PNWSGDP signal provides a means of coordinating with the complex power system that can connect and optimize resources.

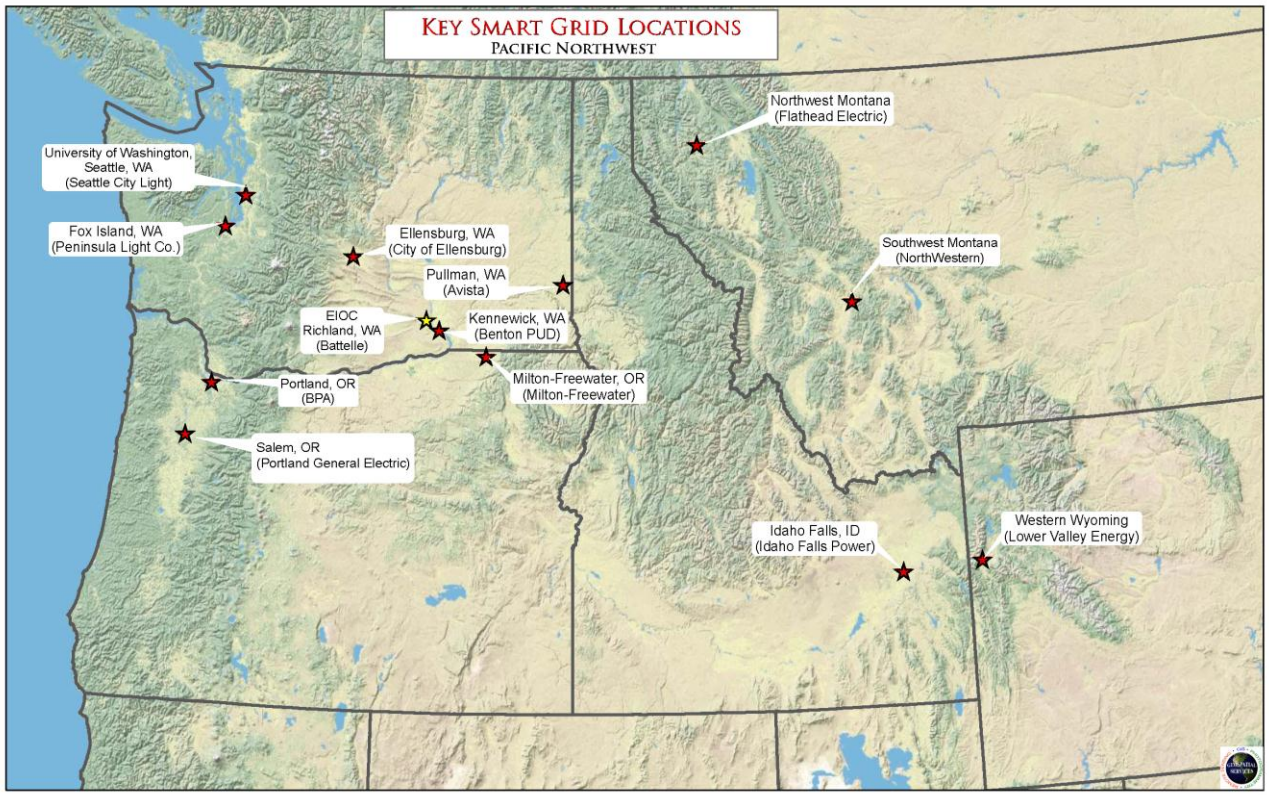
The PNWSGDP's signal, with its real-time two-way communication, is what will tie the responsive assets together, creating the complex system. Can it provide "something for everyone?" Can it provide choices and lower costs for consumers, electrical reliability and a smaller carbon footprint for the region?

"The Pacific Northwest Smart Grid Demonstration Project is a fascinating test of technologies and programs," Hall says. "It has brought unsurpassed collaboration in the region and we're all looking forward the outcomes it may bring."

The project is about half-way through its five-year time frame. Utilities are currently installing the responsive assets and the communication signal is slated to go live this fall.

Outreach update and calendar:

- April 4 -5 – BPA and PGE made presentations to the Advanced Load Control Alliance, Las Vegas, Nevada.
- April 11 – Smart Grid roundtable discussion with U.S. Representative Suzanne Bonamici from Oregon's 1st district, Nancy Sutley, Chair of the White House Council on Environmental Quality, and regional stakeholders, Portland, Oregon.
- April 19 – Pacific Northwest Center of Excellence for Clean Energy, Educational Task Force meeting, Portland, Oregon.
- May 9-10 – Presentation at the Northwest Smart Grid Summit, Portland General Electric, Oregon.



Project description

The Pacific Northwest Smart Grid Demonstration project is a regional endeavor funded by the Department of Energy under the American Recovery and Reinvestment Act of 2009. The goal is to verify the viability of smart grid technology and quantify smart grid costs and benefits. This information will help validate new smart grid business models at a scale that can be adapted and replicated nationally.

With the 50 percent DOE matching funds, this project has a $178 million budget. To date, the project has spent $73 million.

Smart grid can help meet increasing power demands, reduce greenhouse gas emissions, promote energy independence, enhance reliability and help improve national security. It is a system that uses technology to enhance power delivery and use through intelligent two-way communication. Power generators, suppliers and users are all part of the equation.

With increased communication and information, smart grid can monitor activities in real time, exchange data about supply and demand and adjust power use to changing load requirements. Smart grid technology includes everything from interactive appliances in homes to substation automation and sensors on transmission lines.

The regional project, the largest smart grid demonstration project in the nation, is led by Battelle Memorial Institute, Pacific Northwest Division. Participants include the Bonneville Power Administration, utilities, universities and infrastructure partners. It includes 112 megawatts of responsive resources and will last for five years.