



## Putting the Smart Inverter to Work at Portland General Electric

In a “green” state like Oregon, it should come as no surprise that the largest electric utility, Portland General Electric (see sidebar), now generates over 10% of its electricity with renewable resources. Such an aggressive posture puts the utility well on its way to meeting the Oregon Department of Energy’s Renewable Portfolio Standard of 25% by 2025.

Although most of the utility’s renewable capacity is currently in wind energy, PGE already ranks 8TH in the nation for total solar capacity, according to the Solar Energy Power Association (SEPA). As a pioneer in distributed, renewable energy resources, PGE knew it would eventually face some challenges integrating wind and solar power. “What we didn’t know, is just how soon we would need to tackle these challenges,” says Mark Osborn, PGE’s Distributed Resources Manager.

Osborn attributes the rapid growth in solar power to a convergence of several factors, including the state’s aggressive renewable energy standard, generous federal and state grants and tax credits, the emergence of new business models for both utility and customer-owned generating facilities, and the continual decline in the cost of PV power. Osborn also notes the growing risks posed by coal-fired plants with the likelihood of future restrictions or taxes being imposed on carbon emissions.

Rather than resist the inevitable, PGE is taking a leadership position by fully embracing PV power. “Most utilities look at distributed solar as just negative load,” Osborn explains. “We view solar as the future of renewable energy, and are aggressively pursuing its adoption under several initiatives.” Among those initiatives is the partnership with PV Powered under the SEGIS program.

Under this initiative, PGE is installing an enhanced prototype of a PV Powered inverter in a smart islanding demonstration along the Oregon Solar Highway that utilizes measurements from synchrophasors manufactured by Schweitzer Engineering Labs. The Solar Highway, the first of its kind in the U.S., is a photovoltaic proof-of-concept demonstration conducted by a collaboration of PGE, US Bank and the Oregon Department of Transportation (ODOT). The 100+ kW system contains about 8,000 square feet of solar panels extending about the length of two football fields along the right-of-way at the interchange of Interstate 5 and Highway 205 in Tualatin, a suburb of Portland. The state, through the leadership of its governor, has plans to build the world’s largest Solar Highway with a total capacity exceeding 3 MW.

### Portland General Electric (PGE)

Portland General Electric ([www.portlandgeneral.com](http://www.portlandgeneral.com)) is a fully integrated electric utility that was established in 1889. Today PGE has a 4,000 square-mile service area with a population of some 1,663,000 people and more than 818,000 residential, commercial and industrial customers, making it Oregon’s largest electric utility. PGE’s peak load has exceeded 4,000 MW, and the utility now has over 12 MW of solar capacity, three-fourths of which is customer-owned. PGE earned a Solar Business Achievement Award from the Solar Electric Power Association for being the first utility in the nation to develop a unique third-party ownership model (a “turn-key” solar energy engineering, procurement and construction, or EPC, consortium) to help develop large-scale solar projects throughout its service area.



This aerial view of the Oregon Solar Highway shows the PV Powered inverter located at the west end (left side) of the long array of solar modules.

During the SEGIS demonstration project, PGE will evaluate different techniques for overcoming challenges in two key areas: unintentional islanding and grid instability, particularly when caused by voltage/frequency sags. According to Osborn: "We've found that inverters are rather benign when generating below 15 percent of the load on any distribution feeder. But as the percentage approaches 30, there can be significant problems if the utility fails to implement some means of monitoring and control."

A particular problem PGE wants to solve is one that results from the now common practice of inverters disconnecting during a voltage or frequency sag. "Sags usually occur during periods of peak demand, just when PV power is normally needed the most," Osborn notes. "Two-way communications with the inverters, combined with constant measurements from the synchrophasors, should enable us to use the inverters to mitigate against sags and flicker much more effectively." The two-way communications will also enable PGE to remotely disconnect and reconnect the inverters.

If time and resources permit, PGE will also explore two other advancements: using inverters to export VAr power and integration with the utility's GenOnSys distributed generation and demand response control system. GenOnSys, which was custom-developed by PGE, is the first such application to implement the International Electrotechnical Commission's new distributed resources standard (IEC 61850-7-420). "The goal with GenOnSys is to make solar power more dispatchable by treating all inverters, whether owned by PGE or our customers, as a sort of 'virtual power plant' possessing significant capacity. With this approach, large-scale, distributed PV power can become more of an asset than a problem."

## About PV Powered

PV Powered is the innovation leader for grid tied PV inverters in the residential, commercial and utility markets setting the industry standard for reliability and efficiency. Founded in Bend, Oregon in 2003, and recently acquired by Advanced Energy Industries (AEIS) the company's vision is to tackle three significant issues affecting the growth of solar power usage world-wide – (1) dramatically improving the reliability of inverters, (2) lowering the Levelized Cost of Ownership for PV power generation and (3) making distributed PV a scalable and controllable resource on the utility grid.

We offer the industry's broadest range of inverters for residential applications, five models of commercial grid-tied inverters covering the spectrum of commercial rooftop applications, and our new 1MW PowerVault™ solution for ground mounted medium voltage utility-scale power systems. With the industry's first standard 10-year nationwide warranty and optional 20-year extended warranty, we stand behind our products in ways that count. The company's complete line of inverters is compliant with the Buy American Act and is eligible for use in government projects funded by the federal stimulus package. For more information on the company, visit [www.pvpowered.com](http://www.pvpowered.com).



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