Pacific Northwest Smart Grid Demonstration Project
SUCCESS STORIES

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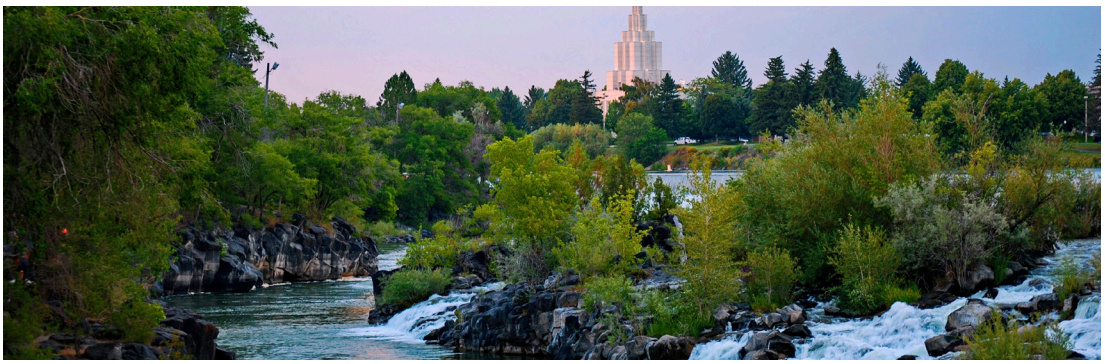

IDAHO FALLS POWER

Small Idaho town gets smarter with automation

Idaho Falls is simply a small, smart city. Since 1900, the western town has generated electricity by making use of the Snake River, which runs right through it. Today, Idaho Falls Power — which is known for its early adoption of tools to improve system reliability — is testing some hefty smart grid technologies as part of the Pacific Northwest Smart Grid Demonstration Project.

It's the nation's largest test of new technologies to see how a future smart grid could operate. Idaho Falls Power is one of 11 utilities participating from five states. The $178 million endeavor also involves five technical firms and two major universities, with funds matched by the Department of Energy. The Bonneville Power Administration is contributing $10 million, also matched by DOE.

A city-wide wireless network

Idaho Falls Power services 23 square miles within the city, which is framed by wide-street neighborhoods and well-educated residents — many of whom work at the Idaho National Laboratory nearby. So when the utility decided to test smart meters through a city-wide wireless network, most of their technologically-savvy customers didn't blink an eye.

The wireless mesh communications system allowed the utility to test a number of new technologies, such as automation of switches in substations for outage restoration. Another benefit of using the wireless network is improving computer and electronic protections.

"We drastically improved cyber security awareness and increased focus in that area as a result of this project," said Mark Reed, generation operations and superintendent at Idaho Falls Power. "That's something near and dear to my heart."

Idaho Falls Power

IDAHO FALLS POWER
Idaho Falls, Idaho

- Locally-owned and operated since 1900
- Largest municipal utility in Idaho
- 27,000 metered customers, including 3,500 commercial customers
- Installed 1,500 AMI meters
- Generates 50 megawatts and sells to BPA

INVESTMENT IN PNWSGDP
$3.5 million

HIGHLIGHTS
- Wireless Mesh Network
- Electric Vehicles
- Capacitors

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Having a secured wireless system means the utility can do more with its smart meter system, or AMI — advanced metering infrastructure — and integrate those meters with the centralized computer system of a substation's control center.

Meters talk to in-home displays wirelessly

The progressive utility has 13,250 smart meters, including 1,500 meters that were installed as part of this project. All 27,000 customers are expected to have a smart meter by May 2015.

Eight hundred in-home display monitors communicate wirelessly with the meters of volunteers, allowing a real-time view of their electric use either by the hour, day or month. Usage trends and costs, as well as important utility messages and alerts, are also displayed. All the information will be available on a web portal and mobile app that customers can access by fall 2014, making it even easier for households to calculate daily energy costs and estimate their bills.

For one long time resident, the technology is about much more than crunching numbers.

"I've looked at the climate data," said Jim Seydel, Idaho Falls Power customer. "I believe we're going to have more extreme weather. I believe under those conditions, we're likely to have more outages than we've had in the past because of climate change. So, I'm looking for ways that I can counter that."

In short, these devices empower customers to take ownership of their energy use and planning. Still, about 135 customers have vetoed the meter.

"I think there is just some confusion about what smart meters are," said Matt Evans, customer relations supervisor at Idaho Falls Power. "When they Google 'smart meter' they find some alarming things."

But the majority of the community, which attracts world-class outdoor recreationists, regional business owners and cultural savvy patrons, has embraced these leading-edge technologies. They can be found just about everywhere … even on appliances.

Hitting the snooze button on appliances

Back in 1934, Idaho Falls was one of the first cities in the United States to adopt devices that could prevent brownouts. These devices were able to cycle water heaters off, using frequencies, when river flows were low or as households began installing electric appliances and using more energy.

Today, the methodology remains the same — only the communication tools are much more advanced. Loads can now be shifted to later in the day when the cost of electricity has fallen or demand has fallen. For this project, 217 volunteers tried a power control device. These devices cycle off electricity to appliances when the need for energy is highest. This avoids unplanned power purchases, which are more expensive.

Heating and cooling costs account for most of IFP's peaks. Forty-one customers signed up for programmable thermostats. With these "smart" in-home displays, the utility can make very subtle temperature adjustments within households for brief periods when energy use is highest — the utility equivalent of rush hour traffic.

The newer systems are also more advanced. Idaho Falls Power alerts the customer before it makes any changes. The thermostat indicates when the utility plans to make a scheduled thermostat adjustment, and the customer always has the option to override or opt out of the utility request.

Improving energy use automatically

Another way to reduce energy consumption is by automating the distribution system. One little electronic device, a capacitor, is helping to make this happen. While capacitors have stored energy and stabilized voltage and power flows on distribution lines for decades, the process is getting smarter with two-way communication. The stable and steady delivery of electrons saves time and money. For big industries, that savings can add up.

Making malt for brewing beer, for example, takes a lot of energy. IFP's largest industrial customers are malt houses, which benefit from something called automated power factor control. A power factor is a measure of the efficiency of the power being used. A power factor of 100 percent means the voltage and current are cycling between positive and negative in unison, but when one lags behind the other, the power factor declines. The lower the power factor, the more power the generator has to supply for each watt being consumed.

One way to improve the power factor is by installing banks of capacitors, which can automatically bring the current and voltage closer to unity. Idaho Falls Power purchased two capacitor banks as part

> "As a result, we gained insight and knowledge on the technology to help us forge into the future a little more prepared with better ideas of where we want to go."
>
> – MARK REED, IDAHO FALLS POWER SUPERINTENDENT

of the project — one for each of its large commercial customers. The projected wholesale energy savings is $37,750 per year. But saving money isn't the only benefit.

"It reduces the electric current on the line," said Reed, "which could defer the large capital cost of an upgrade."

Another way to use distributed automation is through conservation voltage reduction. In this case, CVR reduces the overall voltage on the residential feeder to 1,375 smart-metered customers.

A "self-healing" grid

Let's face it. Lightning causes power outages. That used to mean a utility worker would be dispatched to locate the fault and manually reset switches on the transmission lines to reroute power. Now this can be done automatically through fault detection, isolation and restoration, or FDIR — sometimes referred to as "self-healing" technology. This smart technology can instantly detect a fault and automatically reroute electricity to keep customers from losing power in the first place. The tool uses automated switching between two distribution system feeders and control algorithms to isolate the problem and restore the system.

Saving some for later

Electric vehicles can be great energy storage units. Of course, these mobile batteries also make great transportation tools. Incorporate a solar panel and you have quite a setup.

Here's how it works:
The solar panel charges a stationary battery during the day. That battery, with 10,000 watts of capacity, is hooked up to the car-charging stations. When a car is plugged in, it draws 3.35 kilowatts for four hours from the stationary battery. That means two or three Volts can be plugged in to receive a full charge.

An electric vehicle charges using stored energy from a nearby photovoltaic panel.

"The integration work was outstanding," said Reed. "The AMI interface was really fantastic."

The drive behind the test is to integrate distributed solar with distributed storage to optimize grid efficiency. It works — but with one problem.

The test was nearly complete when the vendor went bankrupt. This has left IFP with no access to the software or any of the data that was collected. If the vendor never returns with the data, the utility is considering working with nearby Idaho National Laboratory to explore possible solutions to retrieving the data.

WHAT'S NEXT for Idaho Falls?

For Idaho Falls Power, the next step is evaluation. Assessing the feasibility and cost-benefit of the smart grid technologies tested in the demonstration project is essential.

"It's how we'll determine which have value for expansion across the entire system," said Reed.

And, of course, they'll be sharing what they've learned.