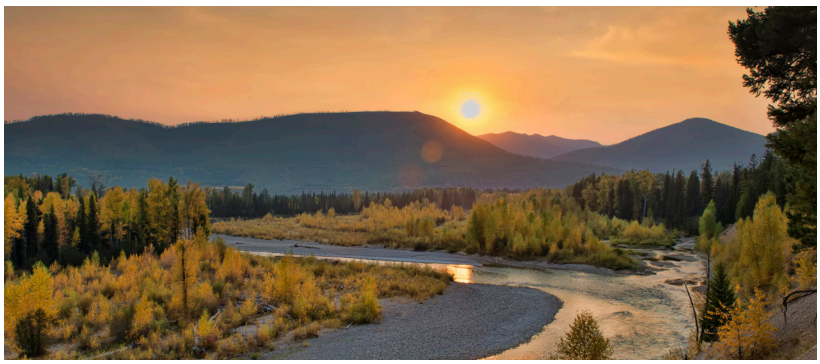
Pacific Northwest Smart Grid Demonstration Project
SUCCESS STORIES
JULY 30, 2014

FLATHEAD ELECTRIC CO-OP



Building a smart grid the cooperative way

Tucked in the mountains of Glacier Country in Northwest Montana, Flathead Valley's grand landscapes and unspoiled freshwater lake attract recreationalists year-round. Legendary, small-town hospitality appears even in unexpected ways — like the local electric cooperative's participation in the Pacific Northwest Smart Grid Demonstration Project.

With 48,000 members, Flathead Electric Co-op is the second largest electric utility in Montana. Yet it maintains the cooperative spirit of neighbor helping neighbor. When granted the opportunity to help consumers reduce their energy use during periods of peak demand and save money on their monthly power bills, Flathead put its members' needs and interests first.

Flathead is one of 11 electric utilities, five technical firms and a major university participating in the Pacific Northwest Smart Grid Demonstration Project. It's the largest project of its kind in the United States, spanning five states and 60,000 metered customers. The purpose of the project is to test key functions of a future smart grid and move the nation closer to establishing a more efficient and effective electric grid. The $178 million project is funded by each utility participant with matching funds from the Department of Energy through the American Recovery and Reinvestment Act of 2009. The Bonneville Power Administration is contributing $10 million, also matched by DOE.

With the project in its fifth and final year, Flathead is planning for further investment in some of the technologies it has tested. The utility is also teaching others what it has learned.

A solid foundation for smart grid

Flathead was a prime candidate for the project because it had already invested in developing an advanced metering

Your Co-op Flathead Electric

FLATHEAD ELECTRIC CO-OP
Kalispell, Montana

- Locally-owned & operated since 1937
- Second largest utility in state
- 3,900 miles of line
- 48,000 customers
- 165 megawatts on average

INVESTMENT IN PNWSGDP:
$2.3 million

HIGHLIGHTS:
- 96 percent participation
- Single point of contact
- Completed a system wide AMI rollout

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infrastructure, a crucial component of the two-way communication between the utility and end-users. Households fitted with these advanced meters allow the utility to monitor electricity use in real time and identify peak-use times, when electricity is most expensive.

"This is different from conventional energy conservation because, while participants may not actually use less energy in total, they may choose to use it at times of lower cost to the co-op," says Flathead Regulatory Analyst Russ Schneider. "This has the potential to ultimately reduce power supply expenditures for members and the co-op as a whole."

Flathead's objectives included completing installation of the advanced metering infrastructure in Northwest Montana, determining member preferences and comparing the cost effectiveness of three program options offered to members who volunteered.

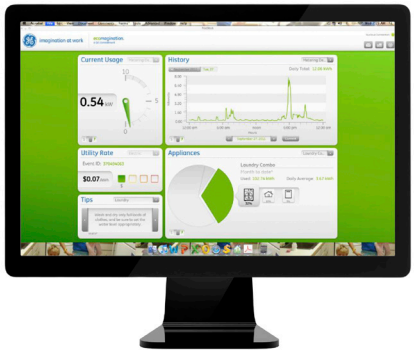
But first the co-op needed community buy-in.

Peak Time

Flathead emphasized customer education and outreach and put tremendous thought into designing a program that its members would support, down to the project's name. Instead of the term "smart grid," Flathead's leaders chose a name they felt would better describe the pilot's purpose and resonate with members: Peak Time

"I think that worked well for us. We wanted to be very clear about what we were trying to do as a cooperative," says Teri Rayome-Kelly, Flathead's demand response coordinator. "And we also stressed what was in it for them — what they would gain for participating. We basically used any kind of communication tool available and talked to every community group that would listen. We did a lot of boots on the ground stuff."

Peak Time aims to help energy consumers reduce energy use when the



demand for — and cost of — power is highest. This type of adjustment in energy consumption is called demand response. Smart grid-enabled demand response requires two-way communication between the utility and the end-users.

The method for carrying out this communication was also an important consideration for Flathead. Based on some initial reactions from members about the use of wireless networks to transmit information, the co-op chose to use an "over the power line" approach, and emphasized that in its communications.

To gather the most information about member preferences, Flathead offered three options:

OPTION 1: In-home display
A free in-home display unit notifies households of peak demand times, signaling them to reduce consumption until demand on the system declines.

Participants receive a $5 monthly credit and an annual rebate determined by their energy consumption. If the participant's highest hour of use during the billing cycle is during a non-peak time, the participant receives $4/kilowatt for the difference in consumption between the highest non-peak hour and the highest peak hour.

The in-home display was the least-costly option to implement, at about $125 per member. Its purpose was to show consumers how much electricity they were using and when they were using it.

Due to some limitations of the emerging technology, Flathead has been unable to use the tool as it had planned, such as to send volunteers data about their

> "I think the biggest thing that's misunderstood with smart meters or two-way meters or remote meter reading is there's going to be more privacy intrusions by that than having a person actually walk around your house once a month to check the meter. There's a little bit of disconnect on the privacy/security aspect of it with the public compared to what was done or what they're willing to accept from other technology."
>
> — RUSS SCHNEIDER, REGULATORY ANALYST

current use or billing information. The only information households receive is an indication that it is a peak time, signaling them to reduce their energy use until the demand on the system decreases.

Keeping the households tuned-in to the tool during the five-year demonstration has been a challenge.

"There is a little bit of attrition on a long project," says Schneider. "Utilities need to have an actionable activity for the members on a regular basis in order to keep them engaged."

OPTION 2: Water heater demand-response unit

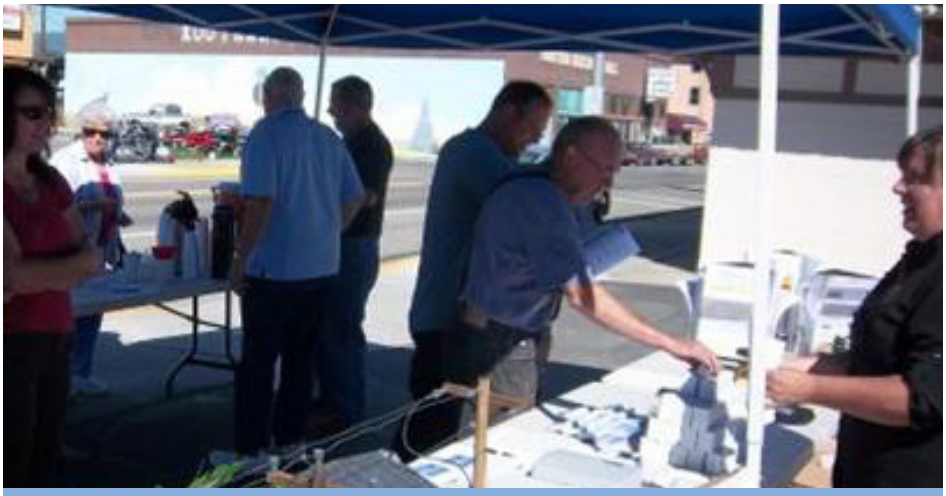
A free demand-response unit automatically cycles off participants' water heaters for up to two hours during times of peak demand to reduce energy consumption.

Members who volunteered for this option receive an $8 monthly credit. The co-op uses over-the-power-line technology to operate each household's water heater in response to peak demands.

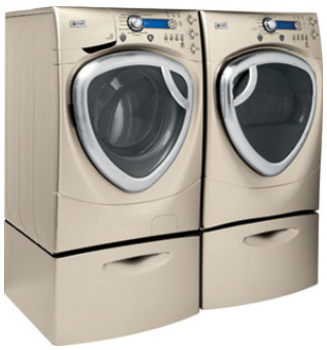
The water heater cycling has produced the most reliable savings across most peak demand events. On average, this option reduced energy consumption by 0.58 kilowatts per unit. With an average installation cost of $413, the utility expects it could recover the investment in three to five years.

"The demand response units attached to hot water heaters are very reliable," says Rayome-Kelly. "I can't think of any significant challenges we've had with those. When we started this, we thought this test group would be the hardest one to sign people up for, because you're hooking equipment onto their water heaters. But people really accepted that quite well. It wasn't a problem to get people to sign up."

Flathead received zero complaints from members regarding a lack of hot water.



Teri Rayome-Kelly chats with residents to rally participation in Peak Time.



OPTION 3: Home Energy Network

Volunteers paid $800 for new appliances — a dishwasher, clothes washer and dryer — plus an electric water heater demand response unit and equipment that enables the appliances to communicate with the utility over the members' home wireless internet connection.

Using a signal sent over the power line from the integrated advanced metering infrastructure system to each participant's wireless internet connection, energy-efficient appliances can be cycled off or put into an energy-saving mode as needed to reduce demand on the system. If the participant's highest hour of use during the billing cycle is during a non-peak time, the participant receives $4/kilowatt for the difference in consumption between the highest non-peak hour and the highest peak hour.

When Flathead offered a Home Energy Network option, it didn't take long for the utility to realize it had taken on more than it had anticipated.

"We hadn't planned on being in the appliance business," said Rayome-Kelly. "But as a small community, we don't have any big box stores, so we had to look for a contractor to install those for us."

Appliance handling and installation scheduling became a newly acquired skill for some.

"I can level a washer with the best of 'em," Rayome-Kelly said.

While the smart appliances proved that they could reduce household peak energy use by up to 2.34 kilowatts, it was the most costly option to implement. It cost about $2,500 more to install the smart appliances and related equipment, compared to the cost of new traditional appliances.

Flathead also learned that the integration of different technologies can be messy. Technical issues arose from the use of interoperable appliances, which struggled

to communicate with the Home Energy Network. Vendors had to learn about new technologies and new products and figure out how to make them work together. Flathead also faced challenges integrating its own internal systems with the Home Energy Network.

At the end of the day, the co-op's pilot project gathered important data, and learned key lessons to improve future implementation.

WHAT'S NEXT for Flathead?

With a toolkit of expertise and lessons learned, the co-op is ready to get started with a demand response program that makes sense to the bottom line.

"We're already planning to do an extended water heater program," says Schneider. "We're planning to connect 1,000 water heaters each year for five years."