

BPA: Heat pump water heaters coming to a home near you

Local News

Posted by: David Haviland

Posted on : November 26, 2012 at 7:46 am

Portland, OR - Your neighbors up the street won't stop talking about their heat pump water heater and your third cousin just bought one and posted a photo on Facebook. But long before the likes, tweets and texts, BPA and a group of Northwest public utilities were working behind the scenes to determine if the technology was a water heating game-changer for Northwest residents.

Big bucket of potential savings

New heat pump water heaters use about half the energy of your typical electric water heater. Since water heating accounts for 15 to 20 percent of most homes' electricity use, you can significantly reduce your energy consumption and save money on your utility bill by making the switch. With electric water heaters in four out of every 10 Northwest homes, the Northwest Power and Conservation Council's Sixth Power Plan projects that about 33,000 homes will make the switch from electric to heat pump water heating within the next four years, which would save the region enough electricity to power nearly 7,000 homes for an entire year. By making an energy-saving switch like swapping your electric water heater with a heat pump water heater, not only do you immediately save money on your utility bill, you're also doing your part to reduce energy demand. That in turn reduces the need for investments in new, more expensive energy generation, helping keep future electric rates low.

Rise of an energy-saving star

Heat pump water heaters weren't always considered an energy-saving darling. Rewind the clock to the 1980s when Northwest companies experimented with heat pump technologies; many of the early units were fraught with reliability and customer service issues. Some units performed so poorly that they were pulled from the market. "Early on we saw a lot of poor performing units

and customers had limited access to technical support," said Kacie Bedney, BPA project manager. "Couple that with concerns about their noise, the cooling exhaust air and the general skepticism about their suitability in the Pacific Northwest climate, and it seemed doubtful we'd be encouraging Northwest residents to adopt the technology." So BPA and Northwest public utilities took a wait-and-see approach on the technology until big name brands began releasing units in the late 2000s. "The arrival of major manufacturers in the market prompted us to give the new generation of heat pump water heaters a serious look," said Sarah F. Moore, BPA residential sector lead.

Passing the test

So how do you find out if a technology is viable in the Pacific Northwest? You test it.

In 2009, BPA's Technology Innovation Office, which funds research that promises significant energy savings to the Northwest, added heat pump water heaters to its research portfolio. Years earlier, BPA's research and development group implemented a pioneering approach in the region's study of ductless heat pumps. The model leverages technical studies into tentative proof of savings that's then scaled up to regional implementation.

"It really boils down to collaborating with other utilities and industry groups so research efforts aren't duplicated and the right investments are being made," said Terry Oliver, BPA's chief technology innovation officer.

BPA is now working with the [Electric Power Research Institute](#), Duke Energy, Southern California Edison, the Tennessee Valley Authority and others to make its research model a standard practice for utilities studying the implementation of new and advancing technologies.

Although heat pump water heaters have proven their worth in warmer regions of the country, researchers didn't know how effective they would be in the Northwest's heating and cooling zones. So the research started with lab testing in 2009. In 2010, BPA and Northwest utilities began testing 40 heat pump water heaters in single-family homes across the Northwest as part of a national demonstration project sponsored by EPRI that included 160 units around the country. Fourteen Northwest utilities partnered with BPA in the heat pump water heater pilot project: [Benton Public Utility District](#) (Washington); [Benton Rural Electric Association](#) (Washington); [City of Bonners Ferry, Idaho](#); [City of Richland, Wash.](#); [Clark Public Utilities](#) (Washington); [Eugene Water & Electric Board](#) (Oregon); [Hood River Electric Cooperative](#) (Oregon); [McMinnville Water and Light](#) (Oregon); [City of Milton-Freewater](#) (Oregon); [Missoula Electric Cooperative](#) (Montana); [Ravalli Electric Cooperative](#) (Montana); [Snohomish Public Utility District](#) (Washington); [Springfield Utility Board](#) (Oregon); and [Wahkiakum Public Utility District](#) (Washington).



A heat pump water heater uses electricity to move heat instead of generating it, which makes it two to three times more efficient than a conventional electric water heater. "By participating in projects like these we can help verify energy savings on technologies that we may be unable to easily evaluate on our own," said Kevin Fischer, energy efficiency adviser, Benton County PUD No. 1. "We can then be confident in the energy savings estimates and give our customers an unbiased perspective." The pilot tested three currently available models that are "drop-in" replacements for an existing electric water heating system, assessing the performance and reliability of the units over a range of operating conditions. Researchers looked at how much usable hot water the units produced in one hour and the amount of energy consumed in a day. They also studied other factors that affect energy savings such as the model of heat pump water heater, type of heating system in the home and the impact of where the units were installed (typically in a garage, laundry room or closet). Researchers noted the homeowner's satisfaction with the test units. Mike Wright, a pilot program participant, said two of his initial concerns, the change in temperature around the unit (a cooler garage) and the noise (noticeably louder than a conventional water heater), weren't deal breakers for his family. "If I had the choice of purchasing another heat pump or an electric water heater, I would choose another heat pump water heater because of its energy efficiency," he said. "We're saving about \$15 to \$20 a

month on our energy bill.” Field testing ended in the spring and the final reports showed the new units performed well in all focus areas. The amount of energy savings varied based on the type of heating system, installation location and climate. For instance, homes with interior installed units and heat pump heating saw the most energy savings, while other types of systems offered savings via a tradeoff from the heating, ventilation and air conditioning systems.

Pilot participant Aisha Soria said her family could never go back to her electric water heater. “We’ve never run out of hot water, we love the savings and it’s really sleek looking too.”

Pilot earns praise

In February, EPRI recognized the Northwest Heat Pump Water Heater Pilot Project with a Power Delivery & Utilization Technology Transfer Award for its leadership and significant contributions to promoting the technology. Ammi Amarnath, senior program manager from the Electric Power Research Institute, says lessons from this project can influence the market and bring future benefits to consumers.

“By establishing connections between utility members and manufacturers we can expect to see new products that are even more in line with the interests and needs of utilities and their residential customers.”

Your water heater is a battery

Beyond cutting utility bills and reducing region-wide energy demand, heat pump water heaters may also be a future resource for the Northwest power grid. BPA and Northwest utilities are currently testing different types of demand response and energy storage technologies, including water heaters, as a potential solution to help integrate wind power to the transmission grid and manage peak load (times of high energy usage). Peak load occurs not only seasonally, in high heating or air-conditioning seasons, but on a daily cycle, such as in the morning and evening. Since electricity has no shelf life, meaning supply must equal demand and it must be consumed the moment it’s produced, the thermal energy stored in water heaters could be a flexible resource for grid operators to call upon. This would allow local utilities to use home appliances like water heaters to balance the variable output of wind generators as well as the varying demands for energy on the electric system. Water heaters can be outfitted with an electronic device that would enable utilities to signal them to turn on to absorb excess energy from the grid or turn off during periods of peak energy demand whenever needed, keeping the grid stable and making more efficient use of available energy.

One of the new BPA-funded pilot projects will test whether heat pump water heaters, which are more efficient than conventional water heaters, can effectively store energy.

“We believe water heaters could be part of a portfolio of cost-effective resources that could provide energy storage. Water heaters are an especially good solution because there is little impact on the consumer,” notes Lee Hall, BPA’s smart grid program manager.

“We also understand the importance of saving energy, so we are testing how energy efficiency and storage can work together.”

Kick-starting a trend

Utilities look at the payback over the life of a product. A heat pump water heater will save the average home about \$300 a year compared to a standard electric unit, which pencils out to about \$3,000 of savings over the typical 10-year lifetime of a standard water heater.

Long-term savings aside, heat pump water heaters are more expensive to purchase than electric units. An 80-gallon heat pump water heater costs between \$1,000 and \$2,000, compared to about \$600 to \$900 for an efficient electric model. So BPA and Northwest public utilities are offering an economic incentive to make the energy-saving switch even more appealing. "I believe customers who take a closer look at the technology will see how easy it is to save both energy and money on their water heating … and they get the added benefit of cooling a space if they need it," said Chuck Weseman, operations manager, Hood River Electric Co-op. Accelerating the adoption of heat pump water heaters across the Northwest takes a multi-faceted effort and the [Northwest Energy Efficiency Alliance](#) is driving the market on a variety of fronts. "We're focused on building a region-wide understanding of the technology throughout the product channel," said Alexis Allan, NEEA's group product manager for the residential sector. NEEA and its partners are providing data to influence manufacturers to develop units that are better suited for the Northwest climate. And manufacturers are responding. Recent testing shows that many products are now meeting updated specifications. NEEA's also pushing for federal standards for heat pump water heaters with tanks greater than 40 gallons. On the retail side, NEEA trains contractors, oversees a trade-ally network of experts and works with retailers on innovative promotions. "So whether you're a distributor, retailer or installer, NEEA's your resource to learn more about the technology," adds Allan. BPA and Northwest public utilities expect heat pump water heaters to deliver tremendous energy savings in the Northwest for many years to come. "Bottom line, the region's done its homework and heat pump water heaters are going to push a lot of hot water tanks into early retirement," said Stephanie Vasquez, BPA's heat pump water heater program manager. Some Northwest utilities already offer incentives for installing heat pump water heaters and many will soon be adding incentives to their energy efficiency offerings. Click [here](#) to learn more about heat pump water heaters or contact your local electric utility.