

Bonneville Power Administration
**Considering Heat Pump Water Heaters
for the Pacific Northwest**

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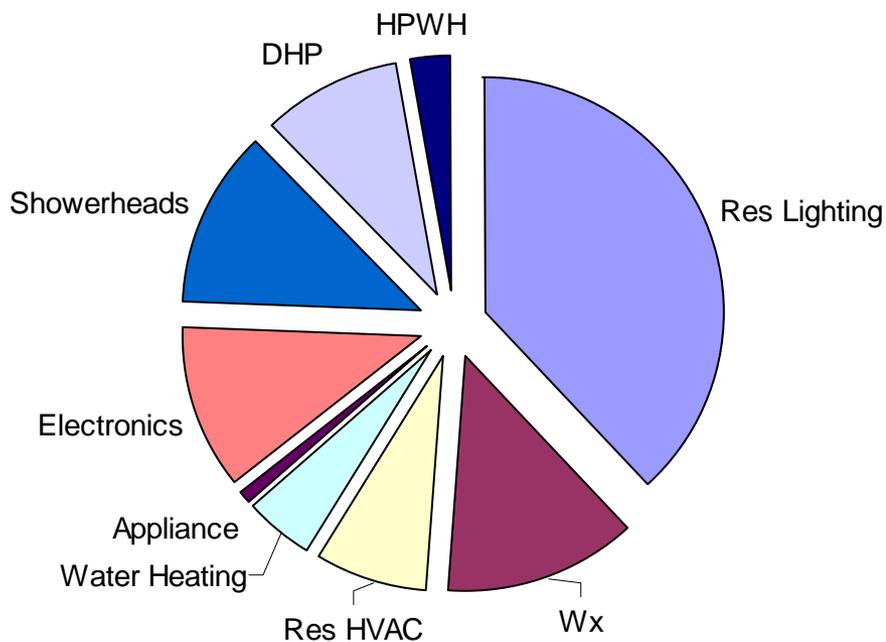


Overview

- Residential share of the draft Sixth Power Plan
- BPA's approach for heat pump water heaters (HPWH) funded by Technology Innovation
- How do they work? What do they look like? What types are out there?
- BPA Lab Testing Project
- BPA/EPRI Demonstration Project
- How to express interest in participating in the Demonstration Project



Residential – draft Sixth Power Plan measures



Initiative	5 yr public share – aMWs	5 yr public share – units
Lighting	109	13,625,781
Weatherization	37	535,250
Res HVAC	22	66,552
Showerheads	36	2,445,618
HPWH	8	31,129



What is the potential of HPWH and our approach?

Potential: Only 8 aMW or 31,614 units in next 5 years

Approach: *Proceed with caution.....*

Draft Sixth Power Plan potential (5.2 million households in PNW)

- 3.70 million single family homes
- ...of these 1.49 million use electric water heat (40%)
- ...of these 673,000 have a water heater in garage (45%)
- 33,000 (5% in 5 years)



Hurdles to overcome

- Historical experience
- Noise concerns
- Freeze protection
- Issues with exhaust air
- Confirmation of savings



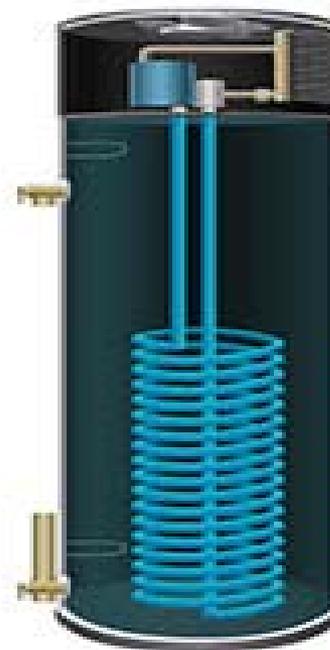
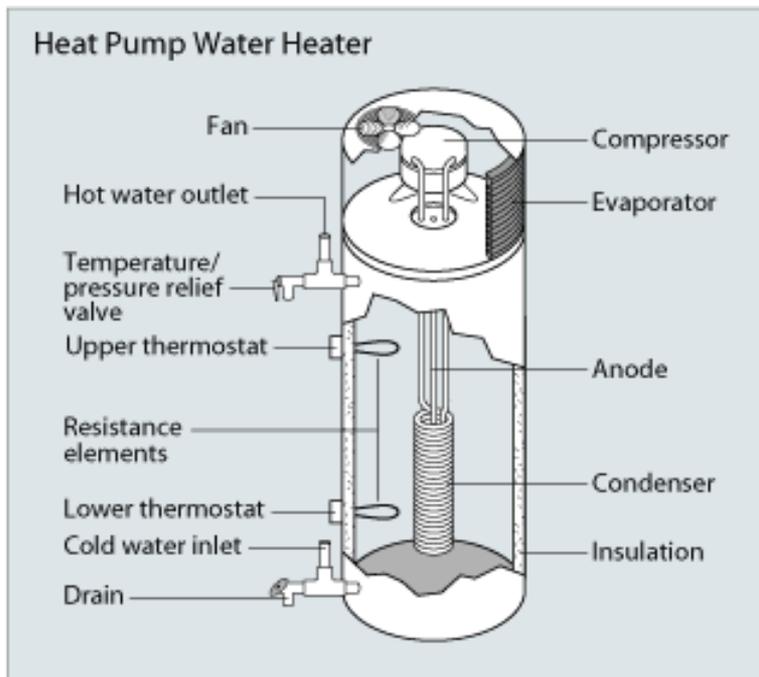
How do HPWH work?

To understand the concept of heat pumps.....
imagine a refrigerator *working in reverse*.

While a refrigerator removes heat from an enclosed box and expels that heat to the surrounding air, a HPWH takes the heat from surrounding air and transfers it to water in an enclosed tank.



What does a HPWH look like?



Types of HPWH



Add-On

- Designed to augment existing tank
- Wall mounted or on top of existing tank
- Typical of types in 1980s and 1990s
- Manufacturer example: Air Tap



Types of HPWH



Integrated (drop-in, stand alone)

- Storage tank and heat pump in one system
- Back-up resistance heating elements
- Designed to replace existing tank
- Typically more efficient than add-on
- Major US manufacturers: GE, AO Smith, Rheem



Types of HPWH



Split System

- Separated heat pump (typically outdoors)
- Indoor storage tank
- Commercial availability is limited
- Manufacturer example: Daikin Eco Cute (Japan)

Other Split Systems

- Daikin Altherma (Europe) – These offer residential users the opportunity to heat rooms and water.



Major US HPWH manufacturers



GE
50-gallon



AO Smith
80-gallon



Rheem
50-gallon



Our approach to technology



NEEA – drafted Northern Climate specification

- Spec to improve performance in northern climates
- Supported by NEEA, MEEA, NEEP

BPA – laboratory testing*

- Testing 3 integrated units

EPRI – in field technology pilot*

- 40 units installed in PNW homes
- 10 control sites in PNW homes (electric water heaters)

Other

- PGE installing 10 units in employees homes
- Other PNW utilities installing a few
- Plumbing distributors stocking units
- 60 plumbers showed up at HWPH kickoff held by PGE



HPWH – BPA & NEEA

BPA

- Lab testing
- Assisting utilities with in-home technology testing
- Developing installation guidelines

NEEA (Northwest Energy Efficiency Alliance)

- HPWH regional coordination
- Drafted Northern Tier spec for HPWH
- Working with manufacturers



BPA lab testing

Testing 3 US manufactured integrated units

- Impact of ambient intake air
- Impact of exhaust air on home/garage
- Impact of inlet water temperature
- Issues about condensation
- Potential for icing on coils
- Impact of clogged filter
- Recovery time
- Hot water draw profile
- Noise of unit during operation



BPA lab testing: project goals

- Gather impact data specific to the region to:
 - a) “prove” there are conditional impacts and encourage manufacturers to address them, or
 - b) “disprove” the impacts, allowing installations to commence in the region.
- Evaluate the lab testing results and provide manufacturer-specific feedback to assist BPA in driving Pacific Northwest region-specific technology improvements.



BPA lab testing: project team

BPA: Project management, methodology oversight, lab test regional coordination, evaluation review, regional rollout of results.

Ecotope, Inc. – Develop the analytical methods, protocols and lab testing necessary to evaluate HPWHs and provide technical evaluation reports on the results.

Advisory Team – Develop and assist in determining the lab testing criteria. Members include utilities, RTF, contractors, consultants from the region and EPRI.



BPA lab testing: timeline (2010)

January	Issue final M&V plan
January	M&V plan to manufacturers for feedback
January	Issue RFP for laboratory testing
Spring	Lab testing underway
Summer	HPWH assessment and technical report finalized and posted to www.bpa.gov/go/residential



EPRI Energy Efficiency Demonstration

- Nationwide testing of 200+ residential HPWHs
 - GE, AO Smith, Rheem
- Joint collaborative research with multiple utilities
- BPA utilities will test 40 units in the region (with an additional 10 control homes)
- HPWHs monitored for: efficiency, performance, reliability, electric demand, application issues and customer behavior



EPRI Energy Efficiency Demonstration

40 treatment sites (single-family residential homes, maximum 10 per utility)

- Provided with new HPWH
- Instrumented and monitored for up to 2 years
- Daily uploads of data to EPRI via internet
- Occupant observations before and after installation
- Occupants permitted to adjust water temperature and operating modes as desired
- Occupants instructed to operate HPWH normally, year-round



EPRI Energy Efficiency Demonstration

10 control sites (single-family residential homes, maximum 3 per utility)

- Instrumented and monitored for up to 2 years
- Provides baseline for comparison with treatment sites



EPRI Energy Efficiency Demonstration

Criteria for selection

- Single-family homes
- Wireless internet access
- Residence is owned by the occupants
- Residence has only one water heater
- Residence is likely to be occupied by the same family during the entire demonstration test period
- Location, location, location!



EPRI Energy Efficiency Demonstration

Timeline

- Jan./Feb. 2010: BPA to identify five to six areas (cities/utilities) where HPWH may be installed
- Feb./Mar. 2010: BPA, utility and Contractor to identify treatment and control sites for each area
- Mar./Apr. 2010: Begin installation of HPWHs and/or metering equipment in homes
- Dec. 2011: Metering ends
- Jan./Feb. 2012: Metering equipment removed



EPRI Energy Efficiency Demonstration

Participating utility responsibilities

- Identify potential “treatment” and “control” homes
- Assist with pre-survey of potential homes
- Assist with a minimum of three, customer surveys: before install, one month after install, and several months after install
- Assist with home scheduling for HPWH installations and metering installations/removal.
- Assist with installer/contractor survey



Next steps and timeline

January – Summer 2010

- Lab pilot underway

February 2010 – December 2011

- EPRI technology testing

Early 2012

- EPRI technology report finalized

April 2011 – October 2011

- RTF may provisionally deem (for the purpose of pilots and data collection)



Next steps and resources

- Watch for the email announcement coming soon for BPA/EPRI demonstration pilot application
- Check out BPA's Web site for more information about HPWHs and other residential activities
www.bpa.gov/go/residential
 - Link to NEEA's Northern Climate spec
<http://www.nwalliance.org/ourwork/documents/HPWHNorthernTierSpecFinal.pdf>
 - Link to BPA's lab testing protocols (*coming soon*)
- Join us for an update on HPWHs at the 2010 Utility Summit: Targeting Success (March 17-18 in Portland)



Contact Information

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Northern Climate Spec for HPWH

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