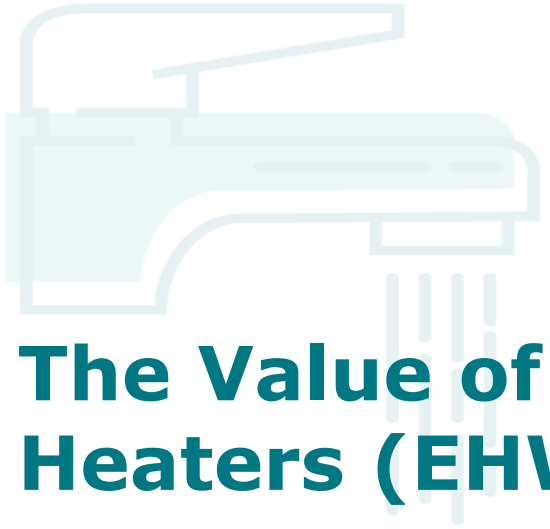

The Value of Electric Hybrid Water Heaters (EHWH)

Helping Consumers Make the Best Water Heating Decisions

HOT WATER SOLUTIONS

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State of the Market

HOT WATER SOLUTIONS

Over ??? electric water heater replacements per year

Policy is pointing toward electrification, favoring efficient electric products

102 utilities offer discounts on electric hybrid water heaters (EHWHs)

Qualifying product from (all major brands):
A. O. Smith, Bradford White, Rheem, Sanden

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Training Outline

HOT WATER SOLUTIONS

EHWH Product Overview

EHWH Benefits

Installation Considerations

Rebates and Resources

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EHWH Product Overview

HOT WATER SOLUTIONS

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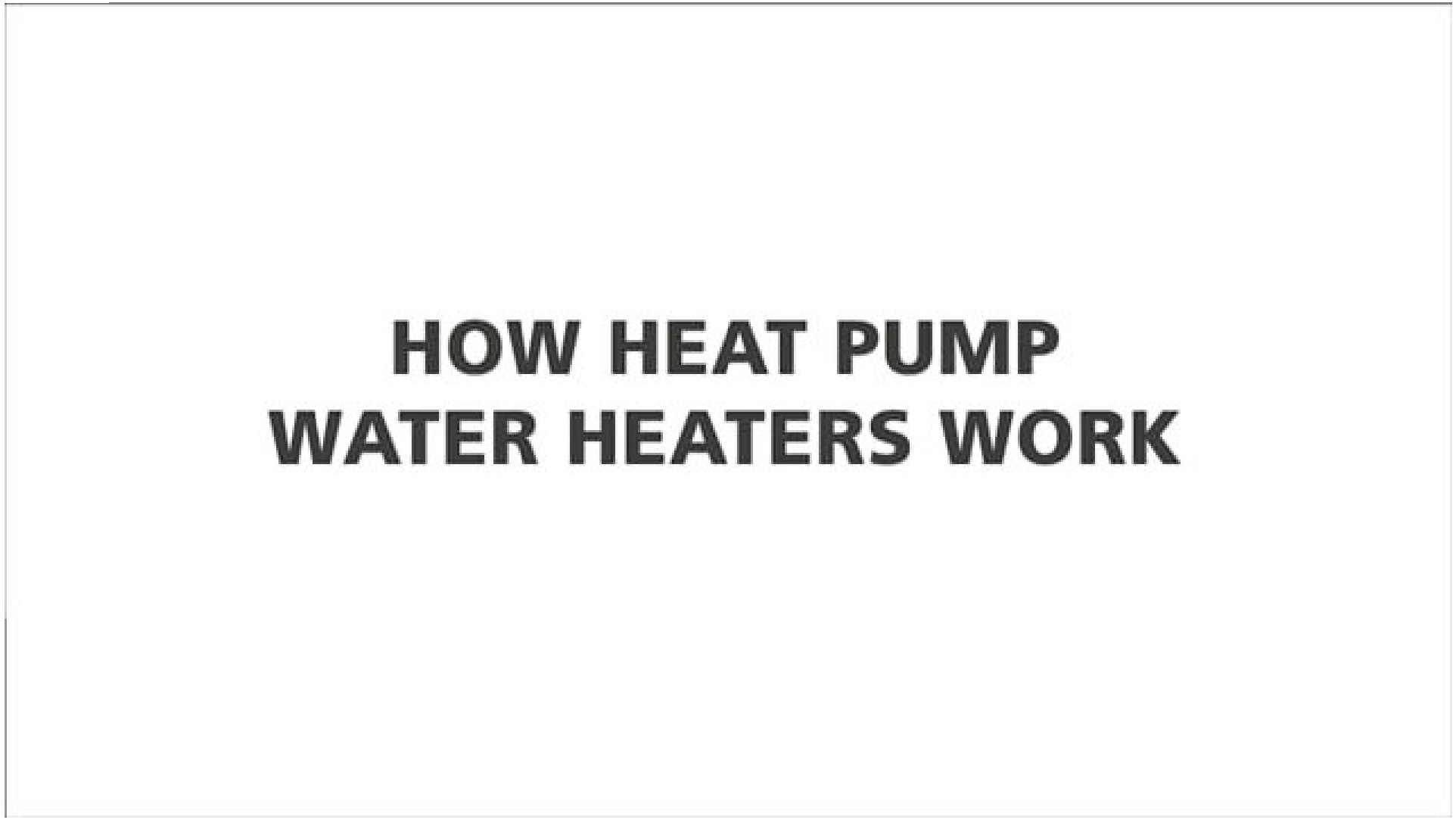
Product Overview

HOT WATER SOLUTIONS

Click to watch video.



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Product Overview

HOT WATER SOLUTIONS

Electric Hybrid Water Heaters (EHWHs)

- Ambient air is pulled into unit and heat is absorbed by the evaporator coil
- Compressor increases the temperature of the refrigerant
- Heated refrigerant is pumped into the condenser coil
- Condenser coil tubing wrapped around the tank transfers heat from the refrigerant to the water

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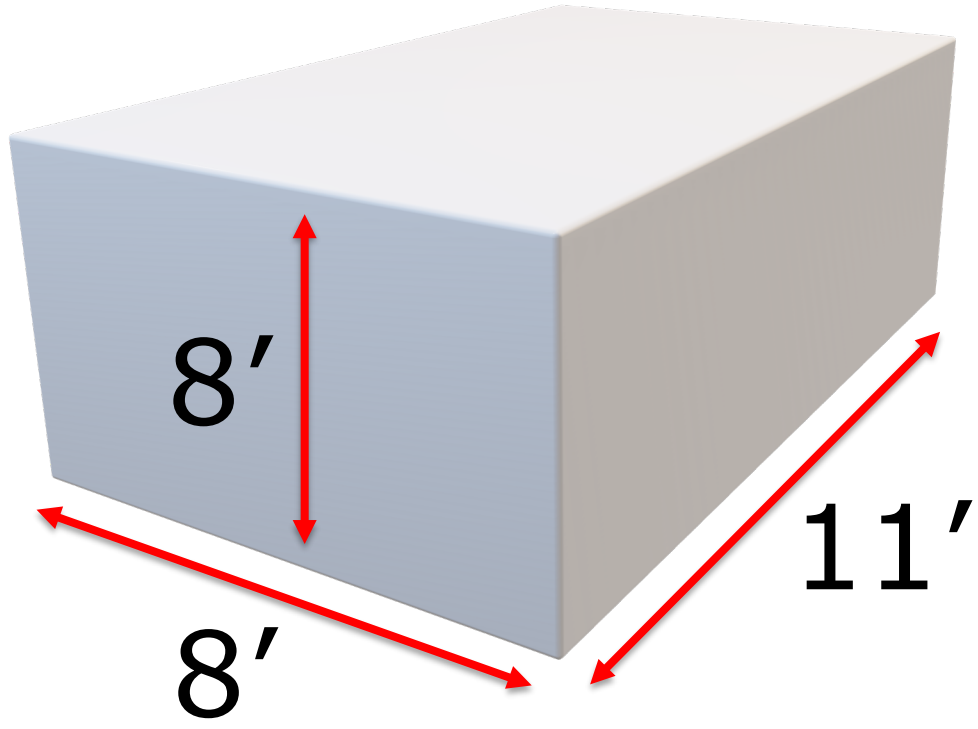
Space Requirements

HOT WATER SOLUTIONS

- ~700 cubic feet of space (roughly an 8x8x11 room)
  - Volumetric requirements may vary by manufacturer. Check with your manufacturer on latest installation requirements.
- Garages and open basements are ideal
- Don’t have 700 cubic feet? Compensate by adding louvered doors, venting or ducting
- Ducting is usually not needed, but if it is, must follow duct length rules

Example 8 x 8 x 11=704 cubic feet



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Space Heat Interaction

HOT WATER SOLUTIONS

- **1-2 degrees** temperature impact during heating months
- Effects are felt **only when the unit is running**, 3-5 hours/day
- Only impacts installs in conditioned space; **not garage or basement**

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Space Heat Interaction

HOT WATER SOLUTIONS

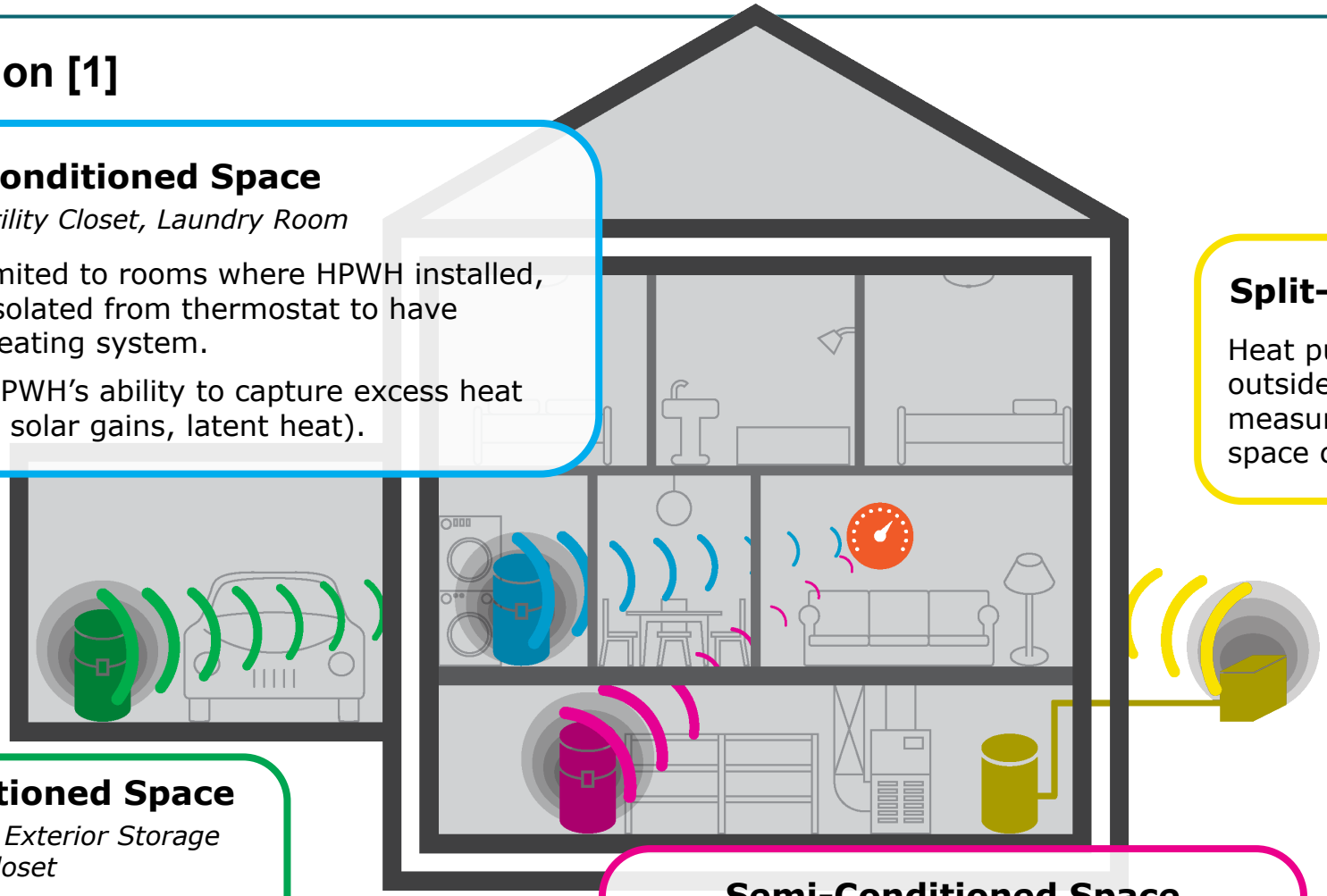
Space Heat Interaction [1]

Fully-Conditioned Space

Mainfloor Utility Closet, Laundry Room

Cooling effect is largely limited to rooms where HPWH installed, and typically sufficiently isolated from thermostat to have minimal effect on space heating system.

Effect further limited by HPWH's ability to capture excess heat (heating shoulder season, solar gains, latent heat).



Split-System HPWH

Heat pumps installed outside a house have no measurable impact on space conditioning.

Non-Conditioned Space

Garage, Attic, Exterior Storage Closet

No noticeable impact on space-heating system. Heat is replaced from outside.

Semi-Conditioned Space

Basement

In spaces within insulated building envelope but not actively heated, feedback to space heating system is limited even further than in fully conditioned spaces.

[1] Ben Larson, Larson Energy Research

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Space Heat Interaction

HOT WATER SOLUTIONS

!

If the temperature in the room drops more than 15 degrees Fahrenheit, it is an indication of inadequate space in the room.

Normal temperature drop is only 3-5 degrees when the water is being heated, and quickly returns to normal temperature.

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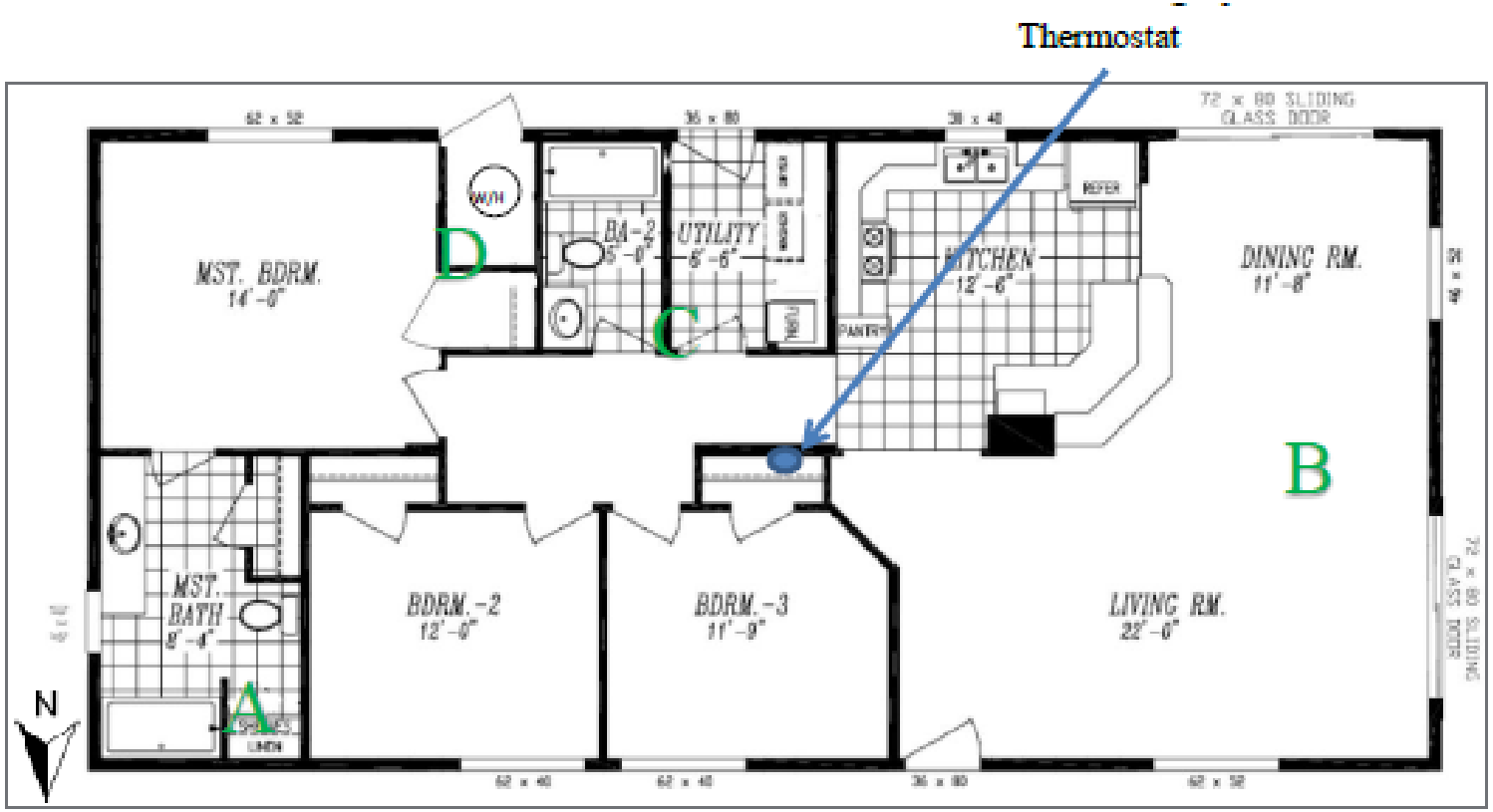
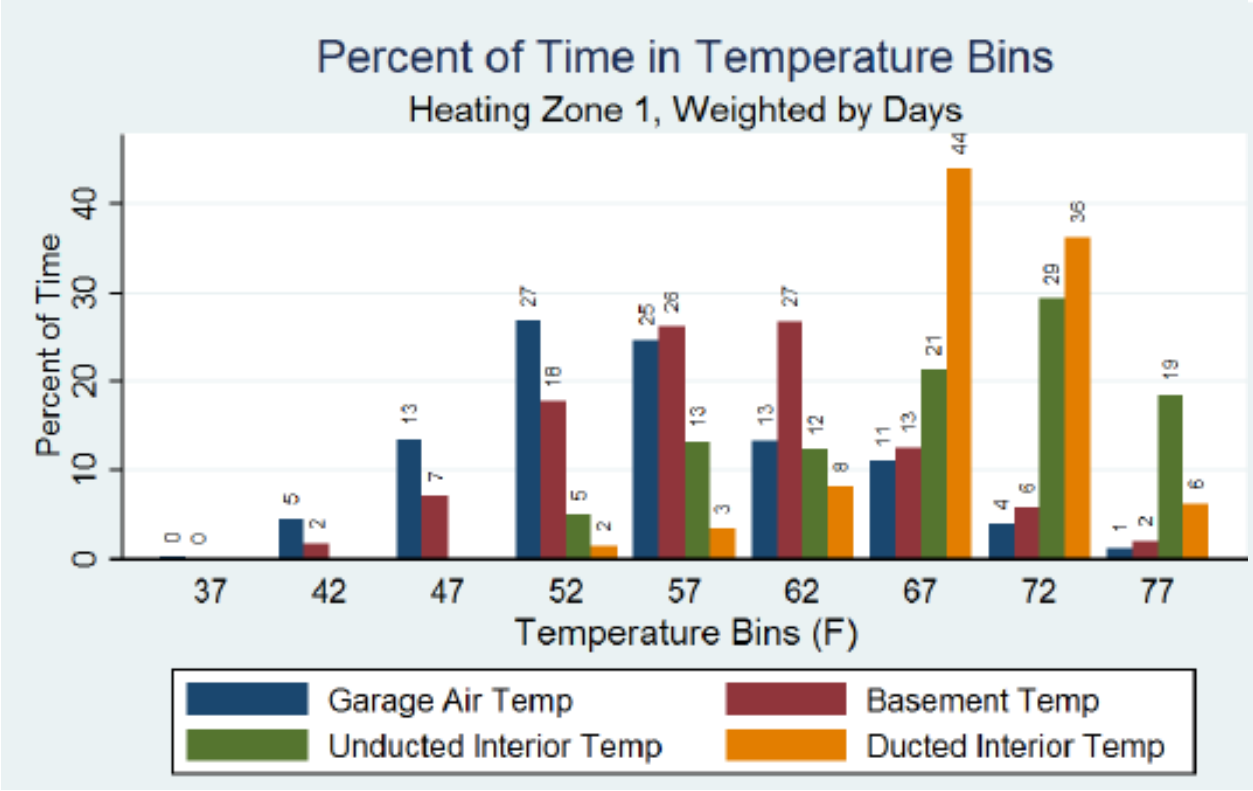
Electric Bill Impacts

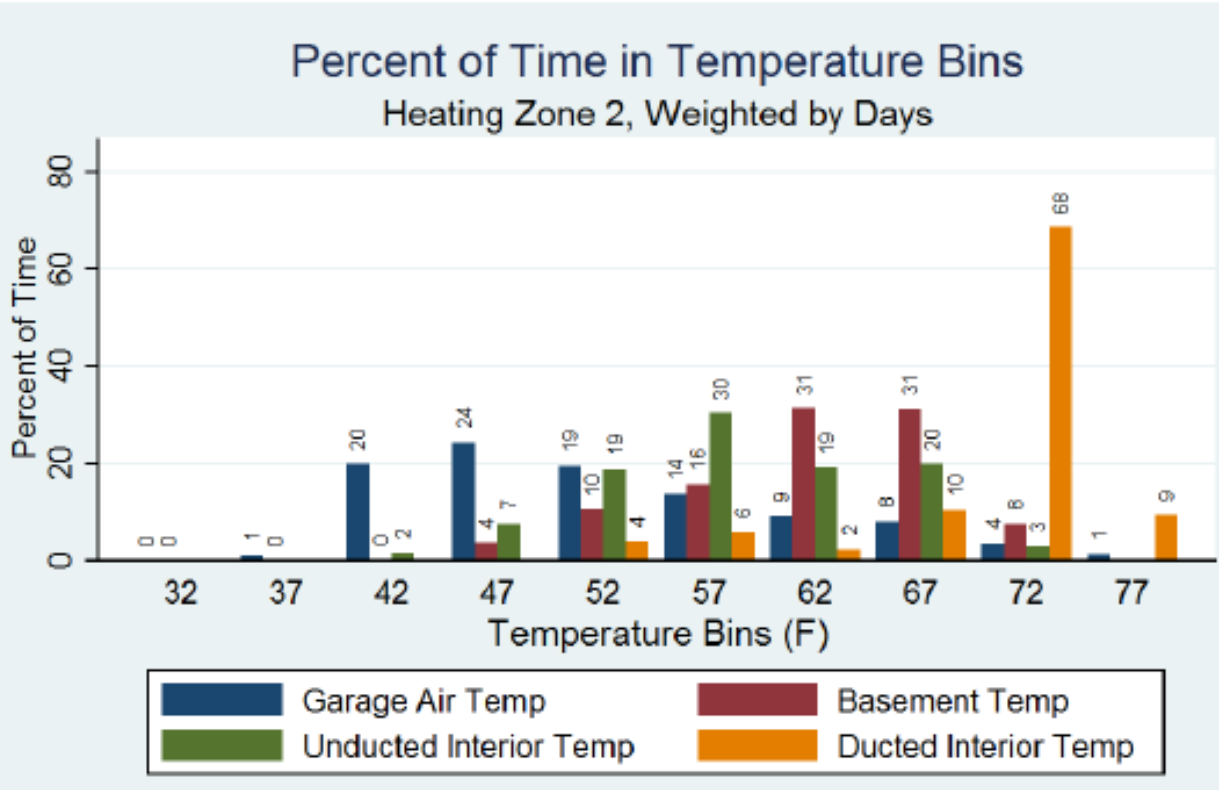
- Detailed Study by PNNL (Pacific Northwest National Lab)
  - Winter: modest impact (less than 5 degrees difference in the room where the tank was located)
  - Spring and Fall: neutral impact
  - Summer and high humidity: EHWHs are beneficial for cooling and dehumidification



https://neea.org/img/uploads/interaction-between-heat-pump-water-heaters-and-heating-system.pdf

How Much Time Do EHWHs Operate at Different Temperatures?





Northwest garages typically stay above operating range temperatures, even in zones 1 & 2, making them ideal installation locations.

Heating Zones 1 & 2 cover the vast majority of the populated PNW.

If you are worried EHWHs working in colder spaces, put the units in Hybrid Mode.

Overcoming Small Spaces

HOT WATER SOLUTIONS

Louvering

- Louvered doors or other form of venting

Ducting

- Outside to outside ducting
- Inside to outside ducting (may cause negative pressure in tight homes and increase heat loss)
- Inside to inside ducting (usually the best solution)

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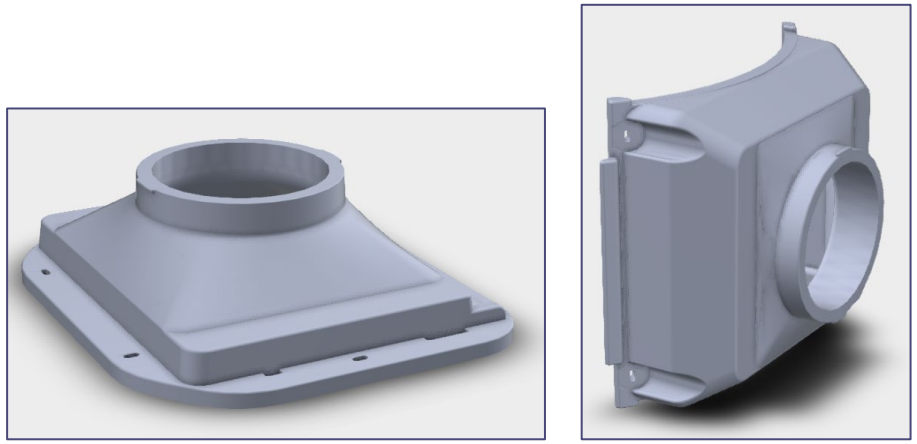
Ducting

HOT WATER SOLUTIONS

If ducting is necessary, a duct adapter kit may be required.

- Duct adaptor kit includes both inlet and outlet duct adapters
- Maximum distances vary by manufacturer
- Must be ordered ahead of time

Connect to 8” flex duct



A. O. Smith Duct Adapter Kit

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Ducting: Duct Condensation

HOT WATER SOLUTIONS

Pull flex duct over all exposed metal on exhaust duct to prevent condensation on exposed metal parts.

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Ducting: Attaching the Duct Work

HOT WATER SOLUTIONS

Tape can work, but tensioning ties pulled tight with a tensioner work better.

Tensioning Tool

Tensioning Ties

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Filter Maintenance

HOT WATER SOLUTIONS

Allow a minimum of 6-inches of clearance for filter maintenance.

Control panel should be visible for homeowner awareness.

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Installation Considerations Summary

HOT WATER SOLUTIONS

Space

- ~700 cubic ft. of space (roughly a 9x9x8 room), ducting or louvered door
  - Certain manufacturers now require 450 cubic ft of space - Check each manufacturer's specific clearance requirements and reference the "Shrinking Room" Experiment for more information.

Ducting

- Confined spaces or to move cold air

Condensate

- Remove condensate
  - Pump or sloped system
  - Terminate into an existing drain or outside

Filter Maintenance

- Warning lights should be visible
- Filter must be accessible

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Advanced Water Heating Specification

HOT WATER SOLUTIONS

The Advanced Water Heating Specification (AWHS) was developed by Northwest Energy Efficiency Alliance (NEEA) in partnership with utility stakeholders, energy efficiency organizations and market partners to advance electric hybrid water heater (EHWH) technology in residential applications.

The AWHS aims to provide guidance to manufacturers, contractor and consumers who prioritize development and/or purchase of products that meet ENERGY STAR® criteria in addition to providing high consumer satisfaction rates.

Included in the AWHS is the Qualified Products List which serves as a resource for contractors and homeowners to identify currently-available products—as well as forward-looking products—whose performance and supported installation applications meet the latest federal and state level requirements.

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Qualified Products List

HOT WATER SOLUTIONS

Table 1. Integrated HPWH Product Tier Overview			
Tier	**Minimum Cool Climate Efficiency (CCE)**	**Minimum Features**	**Sound Levels**
Tier 1.0	2.0	• ENERGY STAR compliance • Freeze protection	dBa < 65
Tier 2.0	2.3	Tier 1 plus: • Minimal use of resistance heating elements (see Section 5.1) • Compressor shut-down/notification • 10 year warranty • Condensate management	dBa < 60
Tier 3.0	2.6	Tier 2 plus: • Simultaneous intake and exhaust ducting capabilities • Air filter management • Override and default mode behavior as per Section 6.1	dBa < 55
Tier 4.0	3.0	Tier 3 plus: • Physical design or default controls that limit resistance element heating to less than upper 50% of tank	dBa < 50
Tier 5.0	3.5	Tier 4 plus: • No resistance element usage in default	dBa < 50

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Uniform Energy Factor Rating

HOT WATER SOLUTIONS

Uniform Energy Factor (UEF) Rating

A water heater's UEF rating is a measure of its energy efficiency, with higher numbers denoting more efficient units. The UEF calculation represents how much energy the water heater uses and how much energy is used to power the water heater itself.

Think of UEF like an exchange rate: Water heaters with high UEF ratings will yield a higher return on every dollar of energy you put in.

In general, ENERGY STAR® certified conventional gas and electric water heaters have UEF ratings between 0.65 and 0.95 — or 65 to 95 cents on the dollar you put into your heater.

Electric hybrid water heaters can have UEF ratings of 2.75 to 3.5. or higher

For every $1 spent by consumer, they get up to $3 worth of hot water.

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New Construction Market

HOT WATER SOLUTIONS

The new construction market favors EHWHs.

Washington

In Washington code, a EHWH is worth **2 credits** and is often the most effective way for builders to earn required credits. (option 5c)

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Material Check In

HOT WATER SOLUTIONS

Electric Hybrid Water Heaters (EHWHs) heat water by:

A. Electric resistance elements
B. Compressing the water and heating it up
C. Transferring heat energy from the surrounding air and transferring it to the water utilizing the refrigeration cycle

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EHWH Benefits

HOT WATER SOLUTIONS

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EHWH Benefits

HOT WATER SOLUTIONS

- **On average, $80-100/person in annual savings** per household
- **Immediate savings** through rebates
- **90% consumer satisfaction** [1]
- **Peace of mind:** 10-year warranty with modest maintenance
- Same **reliable hot water** delivery

[1] Monica Nevius, Jared Powell, Melissa Meek, "Northwest Heat Pump Water Heater Market Progress Evaluation Report #6"

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Savings

HOT WATER SOLUTIONS

	2 People	4 People	6 People
Annual Savings	$180	$360	$540
10-Year Savings	$1,800	$3,600	$5,400

Standard Electric tanks: still no savings…

Based on average price of .12 kWh

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Reliability

HOT WATER SOLUTIONS

Heat pump technology is *not* new - it has been around for over 60 years.

A. O. Smith, Bradford White, and Rheem have over **350 years of combined experience** in the water heating industry.

Extended Warranty Life:

- Most conventional water heaters come with a 6-year warranty
  - For a surcharge, manufacturers offer a 10-year warranty for 50-gallon conventional water heaters
- Manufacturers are more confident in electric hybrid water heater technology and offer a standard 10-year warranty on the product
  - The 10-year warranty comes standard on all 50-gallon EHWHs

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Consumer Satisfaction

HOT WATER SOLUTIONS

Details found in latest NEEA Market Progress Evaluation Report [1].

Homeowner awareness of EHWHs has doubled since 2016

In 2021, it's estimated over half of Northwest homeowners are aware of EHWHs, which is more than double the consumer awareness from five years ago.

Purchasers are highly satisfied with their EHWHs

When surveyed, over 90% of EHWH purchasers reported being satisfied with their EHWH unit, including product performance, hot water supply, maintenance requirements and changes in electricity bills.

98% of respondents who owned an EHWH said they *have* recommended (69%) or *would* recommend (29%) an EHWH to their friends and family.

EHWH owners indicated excellent reliability

Only 5% of surveyed purchasers had contacted a professional to perform repairs or provide service on their EHWH and 96% were satisfied with the EHWH's maintenance requirements.

[1] Monica Nevius, Jared Powell, Melissa Meek, "Northwest Heat Pump Water Heater Market Progress Evaluation Report #6"

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Consumer Satisfaction

HOT WATER SOLUTIONS

- **90%** of EHWH purchasers in the Northwest are *satisfied* with [1]:
  - Product performance
  - Hot water supply
  - Maintenance requirements
  - Changes in electricity bills
- In a different study, it was found EHWHs have sufficient capacity to meet large loads (>100 gallons per day), even in *heat pump only* mode [2]. Manufacturers have installed back-up electric resistance elements in the EHWH tank that deploy control strategies to heat water to keep up with high demand hot water loads.

[1] Monica Nevius, Jared Powell, Melissa Meek, "Northwest Heat Pump Water Heater Market Progress Evaluation Report #6", [2] Sarah Widder, Cadeo Group LLC, Ben Larson, and Ecotope, Inc., "The HPWH Handbook: Optimum Installation Practices and Answers to Lingering Research Questions"

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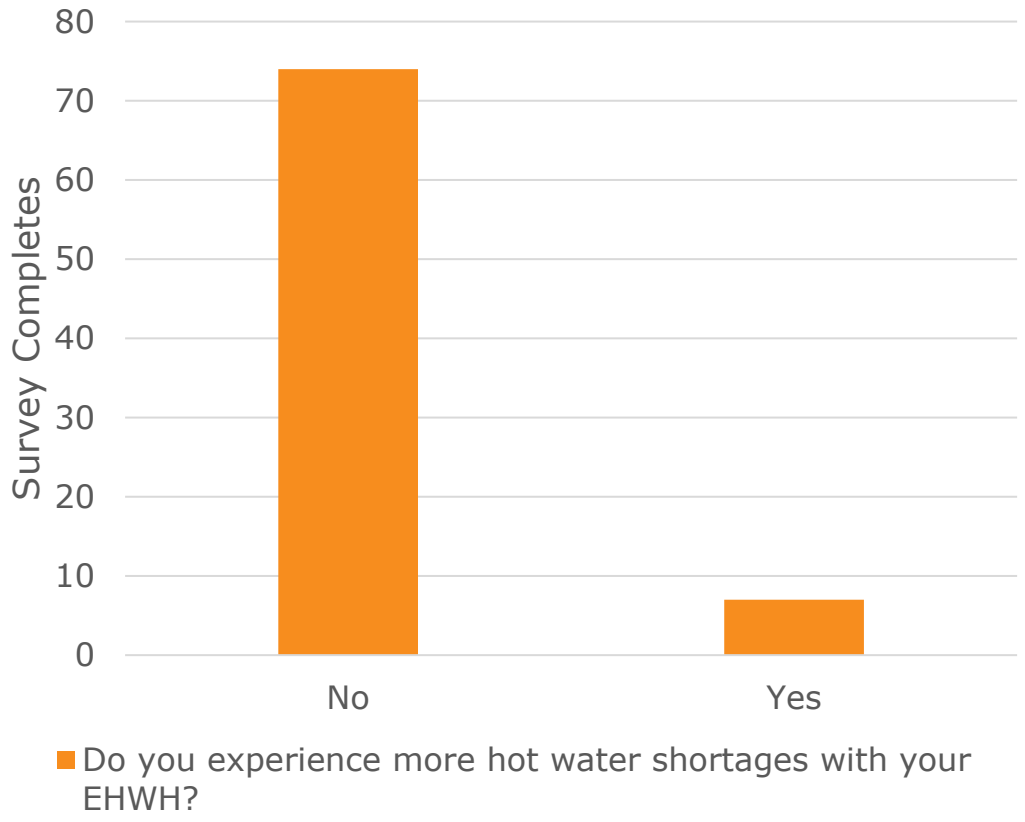
Consumer Satisfaction

Hot Water Supply in Michigan Basements [1]

- **91%** of respondents indicated they *have not experienced more hot water shortages after switching to a HPWH*
  - **2/3** of those respondents most commonly keep their EHWH in *hybrid* mode
  - **1/3** of those respondents most commonly keep their EHWH in *heat pump only* mode



[1] Dan Cautley, Kevin Gries, Dianna Cacko, and Justin Margolies, "Installed Performance of Heat Pump Water Heaters in a Cold Climate"

EHWH Benefits vs. Standard Tanks

HOT WATER SOLUTIONS

FEATURES	BENEFITS	EHWH	STANDARD TANK
Reliable Hot Water	Hot water when you need it	✓	✓
10 Year Warranty	Peace of mind	✓	
Cuts cost by up to 70%	Save up to $100/person annually or $2,000+ over 10 years	✓	
Rebates to offset cost	Low upgrade costs lead to faster payback	✓	
Inflation Reduction Act Credit	If qualified, customer gets additional credits/rebates to offset cost	✓	

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Installation Considerations

HOT WATER SOLUTIONS

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Product Compatibility – Sizing Considerations

HOT WATER SOLUTIONS

Choosing the right tank for a household

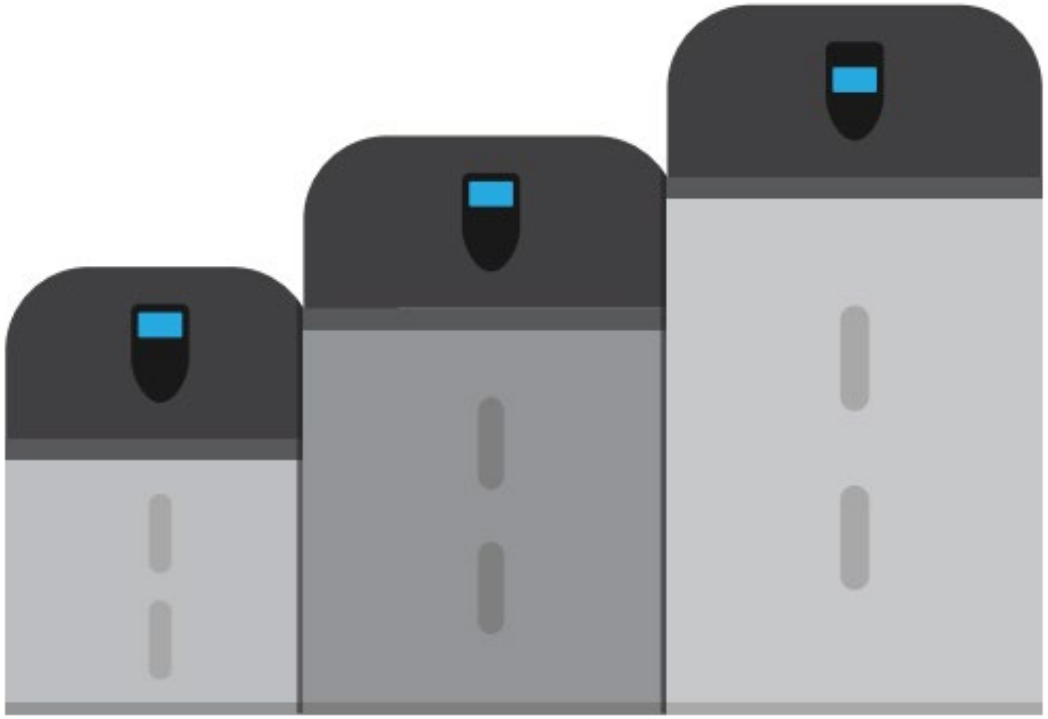
Size the tank appropriately to meet the household's needs according to:

- Family size
- Hot water demand requirements
- Installation location

Make sure the water heater can handle the household's hot water usage by considering the number of bedrooms and bathrooms in the house.

If the location allows for a larger tank, it is best practice to size up one tank size.

Plumbing codes specify the size of the tank based on the number of bedrooms and bathrooms in a household and categorize the tank by the first-hour rating.



50 Gallon	65 Gallon	80 Gallon
Up to 2 adults -or- 1 adult and 1 child	3 adults -or- 2 adults and 2 children	4+ adults -or- 2 adults and 3+ children

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Product Compatibility – Sizing Considerations

HOT WATER SOLUTIONS

To maximize efficiency and savings, size UP!

In order to maximize the energy savings of an EHWH, choose the next tank size up. Bigger EHWHs can be more efficient in the long run, since they are less likely to rely on backup electric resistance heating. This will ensure the household has plenty of hot water for all occasions and result in more energy savings for the consumer.

Compared with standard electric tanks, EHWHs typically have a **higher** first-hour rating.

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Product Compatibility – Sizing Considerations

HOT WATER SOLUTIONS

The third shower dilemma

Many households are likely to have three or more back-to-back showers.
Consider the following sizing guidelines when bidding an EHWH:

# of consecutive 10-minute showers	Appropriate tank size
1-2	50 gallon
3	65 gallon
4+	80 gallon

The functionality of the heat pump in addition to electric elements means a EHWH offers the same, or better, responsiveness than a standard electric tank.

Longer recovery time periods, such as overnight, allow the EHWH to maximize the compressor run time and minimize electric resistance operating time.

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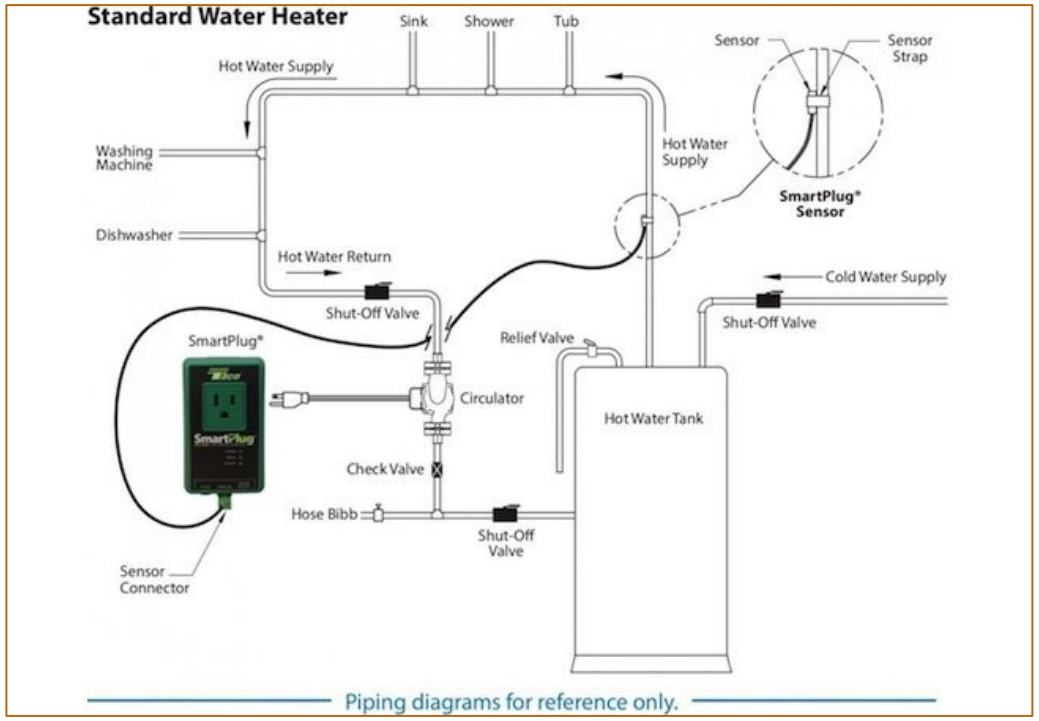
Uncontrolled Recirculation Pumps



An uncontrolled recirculation pump uses more energy because an EHWH must keep using the electric element. Even with an on-demand or a timed recirculation pump, the homeowner may find it necessary to place the tank in high-demand mode. It is not recommended to run continuous recirculation, but to run with an on-demand or a timed recirculation pump.

The Taco Smart Plug is an easy and smart solution – the system learns the hot water draw pattern of the household.

Tempering Valves

HOT WATER SOLUTIONS

- Tempering valves are an effective method of increasing the hot water storage of any water heater
- For every 10°F increase in tank temperature, it results in the equivalency of ten or more gallons of hot water
- They can be a good solution to overcome space limitations of larger tanks

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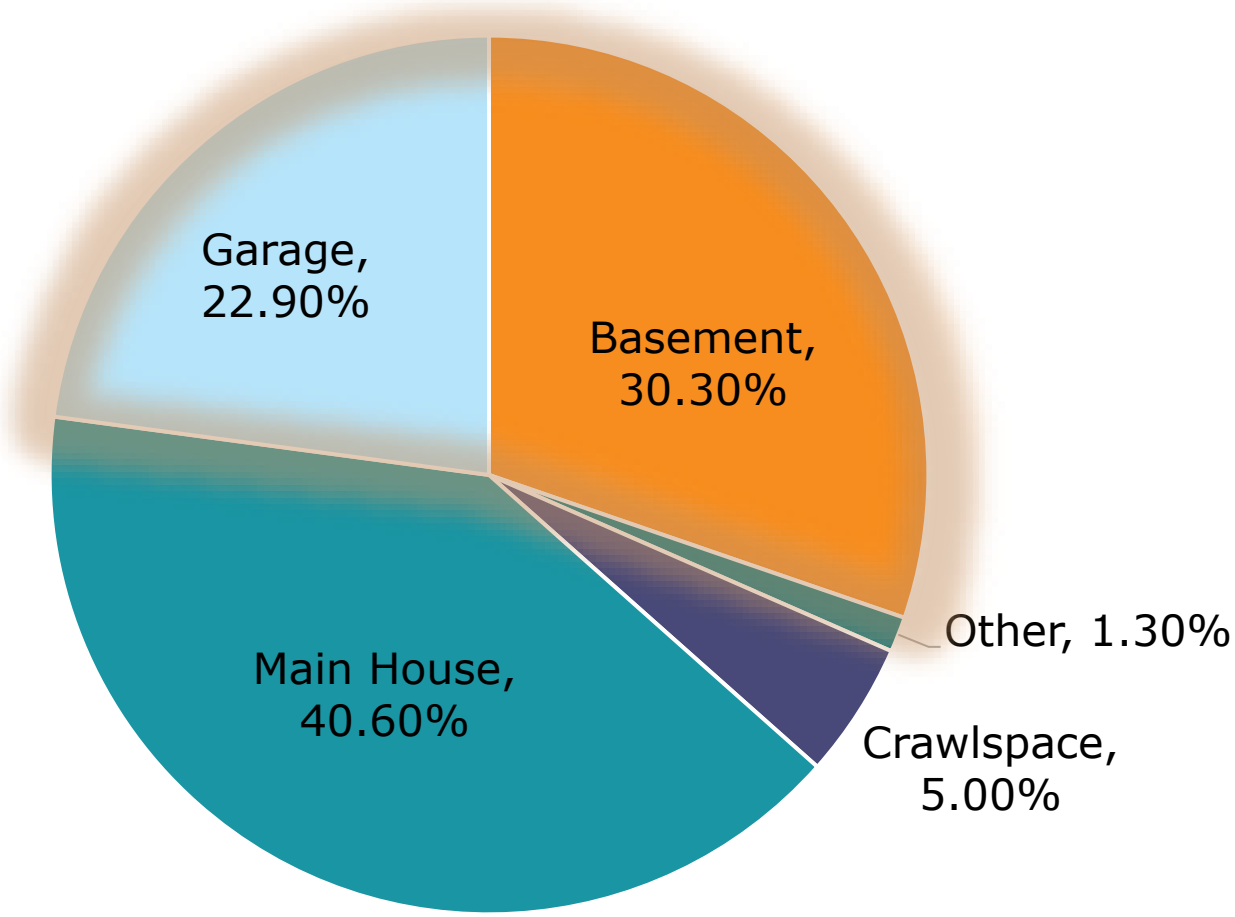
Northwest Electric Water Heater Locations*



*NEEA's Residential Building Stock Assessment II 2016-2017, Table 114

Installation Locations

HOT WATER SOLUTIONS

1. Insulated garage
2. Attic
3. Uninsulated garage
4. Laundry room
5. Heated basement
6. Basement mechanical room
7. Dugout crawl space
8. Closet built around existing water heater
9. Unheated basement
10. Low boy under the sink

- Great!
- Ok
- Avoid

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Installation Considerations: Open Basement

HOT WATER SOLUTIONS

- Generally, basements are *above* minimum volume requirements
- Direct exhaust air away from walls in proximity of unit
- Direct exhaust away from routine activities such as washing machines
- Drain condensate to floor or other drain
- If unit is located near an existing air handler that utilizes a condensate pump to dispose of condensate, the existing pump can additionally be utilized for the condensate produced by EHWHs

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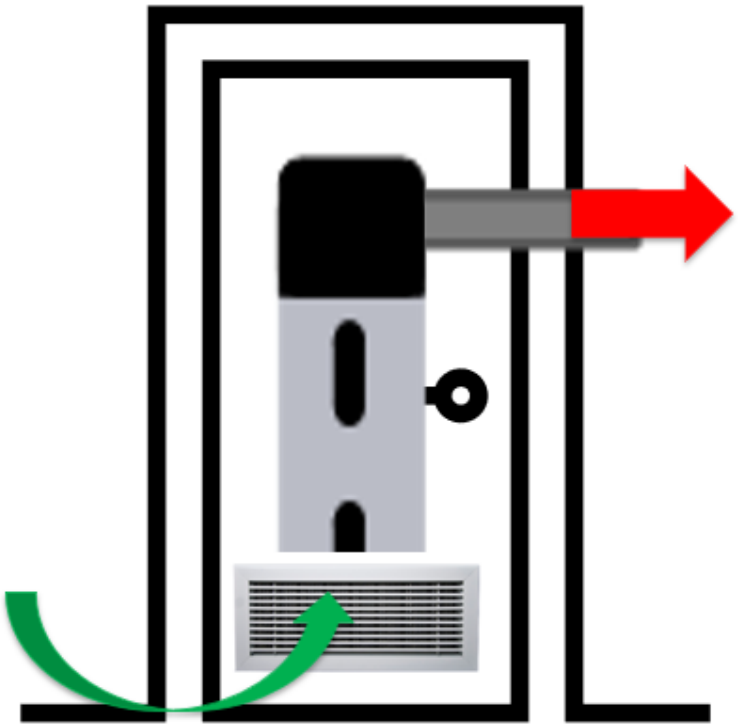
Installation Considerations: Closets in Non-Conditioned Spaces

HOT WATER SOLUTIONS

Water heater located in exterior closet of apartment complex



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Installation Considerations: Garage Installations

HOT WATER SOLUTIONS

- In most scenarios, garages have enough volume to overcome any volumetric constraints
- Direct exhaust air away from walls in proximity of unit
- Drain condensate to floor or other drain
- Install insulation pad

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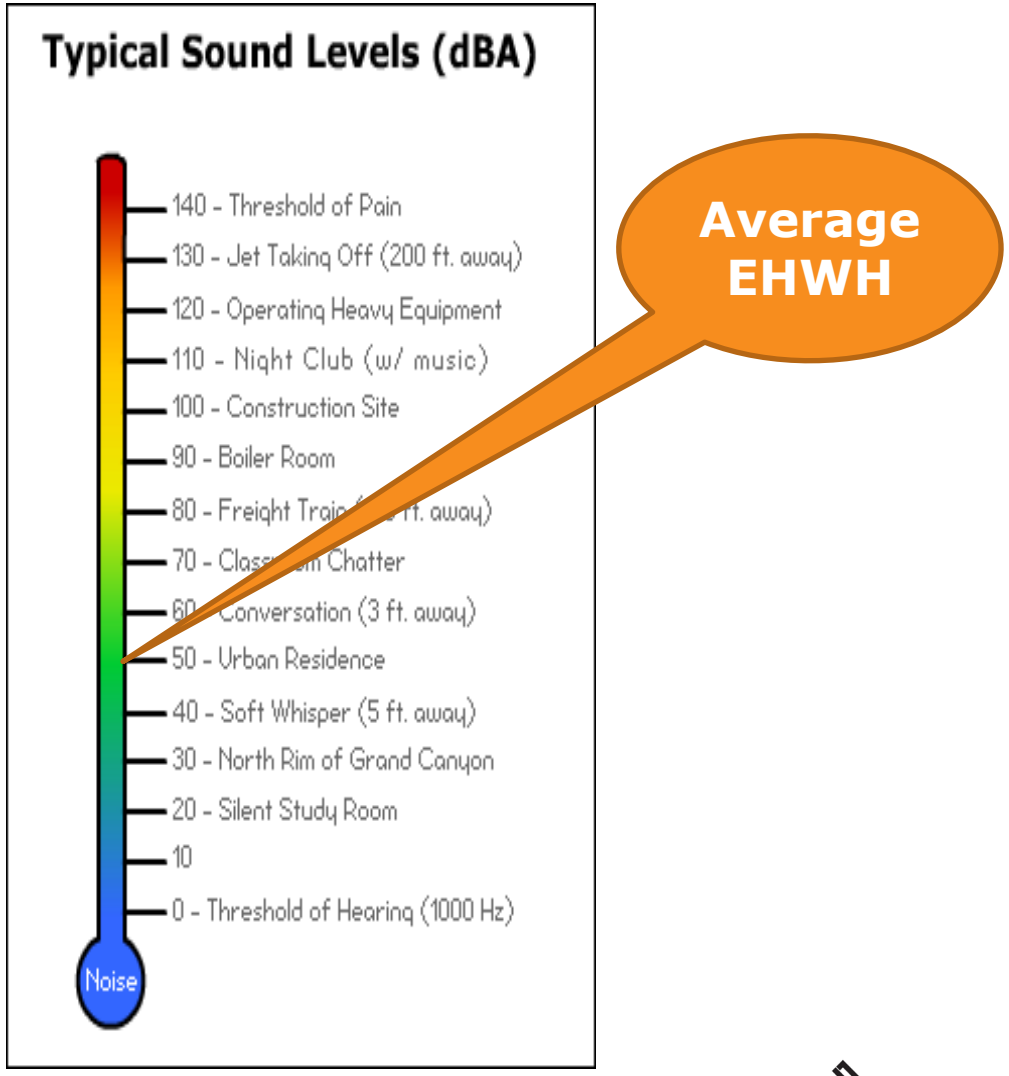
Noise Mitigation = Vibration Isolation

HOT WATER SOLUTIONS

- Heat pump water heaters range in decibel ratings of **45 to 52 decibels.**
  - About the same level as a modern dishwasher.
- The decibel scale is logarithmic.
  - A decibel increase of 10 represents a doubling of perceived loudness.



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Noise Mitigation

HOT WATER SOLUTIONS

Noise level

Sound decibels measured on an 80-gallon EHWH [1]:

53 dBA — one foot straight out from the exhaust port

48 dBA — one foot to the side of the exhaust port

46 dBA — five feet away, at the mechanical room door

37 dBA — four feet to the side of the mechanical room door

For reference, here are other noise levels on this scale:

60 dBA — normal conversation
50 dBA — rainfall
40 dBA — refrigerator hum
30 dBA — soft whisper

Five feet away from the tank measured at around the noise level of a refrigerator hum.

[1] Allison Bailes, 2021, Energy Vanguard, "Living With a Heat Pump Water Heater", Living With a Heat Pump Water Heater - Energy Vanguard

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Noise Mitigation = Vibration Isolation

HOT WATER SOLUTIONS

Neoprene washers or stand-offs are used to anchor seismic straps.

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Noise Mitigation = Vibration Isolation

HOT WATER SOLUTIONS

Example: Isolation pads are an option to further reduce noise and vibrations between EHWH and two walls.

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Noise Mitigation

HOT WATER SOLUTIONS

Low-Noise Tips for Installation:

- Choose the right location for installation
- Don’t put in high occupancy areas where the noise will become bothersome to the homeowner

Seismic strapping considerations:

- If installing in an area that requires seismic strapping, the vibration from the tank will travel through the wall and echo

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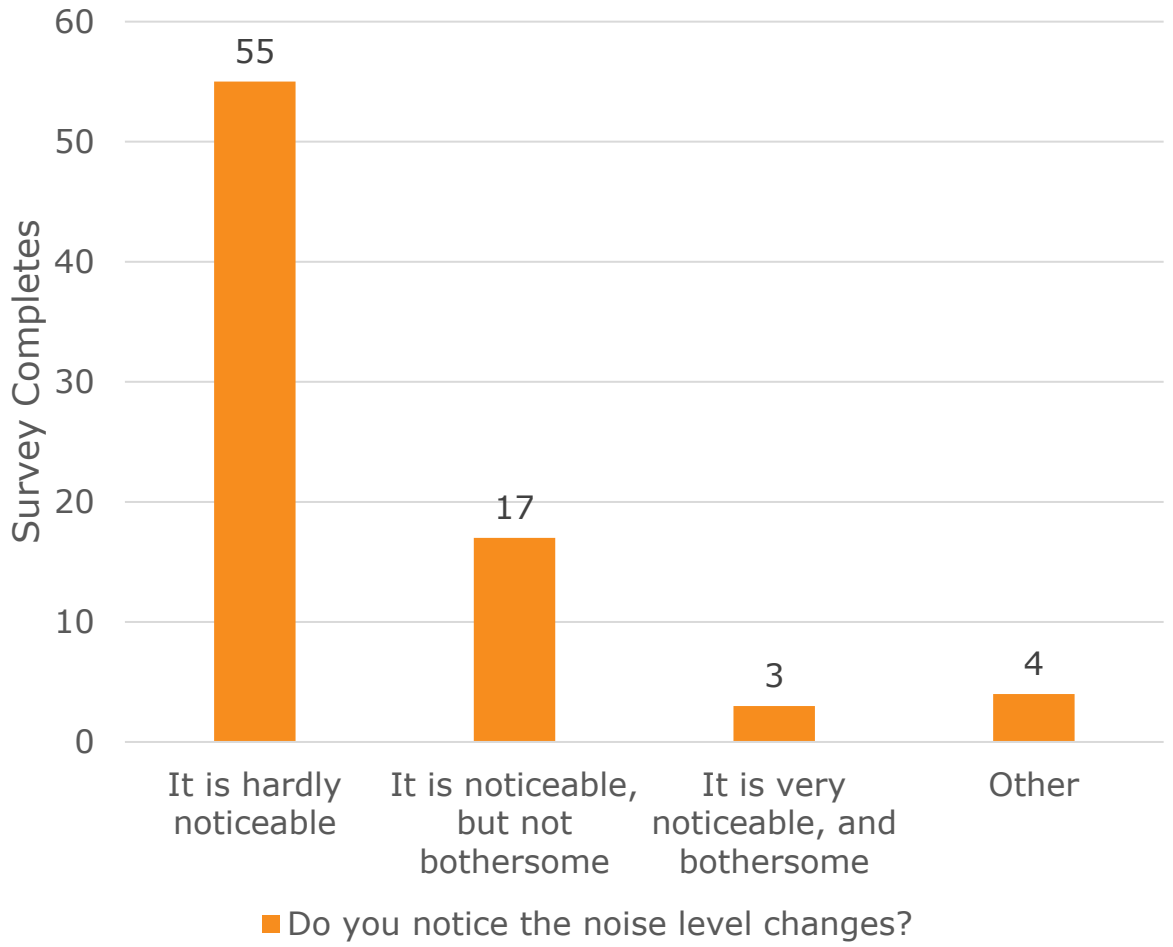
Consumer Satisfaction

Noise level

70% of homeowners indicated the noise from their EHWH is *hardly noticeable* [1]



[1] Dan Cautley, Kevin Gries, Dianna Cacko, and Justin Margolies, 2021, "Installed Performance of Heat Pump Water Heaters in a Cold Climate"

Case Study: White Salmon Install

HOT WATER SOLUTIONS

Background

- Garage Install
  - Garage is well insulated, and stays above 35ºF, except in extreme conditions
- Owner rents house on Airbnb on weekends
  - Wants to ensure guests do not run out of hot water
- Owner wants ability to control settings remotely
- Seismic strapping will be required

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Case Study: White Salmon Install

HOT WATER SOLUTIONS

Tank Selection

- Large enough to meet the needs of the Airbnb guests
- Top or side plumbing *not* a consideration; lots of room for both options in the garage
- Ducting orientation *not* critical since none will be utilized in installation
- Tank equips homeowner with ability to change operation modes and water temperatures remotely

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Case Study: White Salmon Install

HOT WATER SOLUTIONS

Leak Detection

- Peace of mind for the homeowner
  - Tank equipped with ability to sense water pooling in the drain pan

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Case Study: White Salmon Install

HOT WATER SOLUTIONS

Expansion Tank

- House served by a municipal water supply
  - Pressure reducing valve placed at the entrance of supply piping
- Expansion tank was required by code and to meet the conditions of warranty

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Case Study: White Salmon Install

HOT WATER SOLUTIONS

Tempering Valves

- Whole house tempering valves are a good way to effectively increase the tank size.
  - For every 10 degree increase in temperature, it's the equivalent of increasing the tank size by 10 gallons

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Case Study: White Salmon Install

HOT WATER SOLUTIONS

Condensate Drain

- Condensate was pumped and drained to washing machine vent

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Case Study: White Salmon Install

HOT WATER SOLUTIONS

Vibration Isolation

- To minimize noise vibration, foam pipe insulation was installed between wall of garage and tank *before* cinching down the seismic strapping

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Manufactured Homes and Other Space Limited Installations

HOT WATER SOLUTIONS

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Manufactured Home Installations

HOT WATER SOLUTIONS

Site Selection

Breaker size and exhaust orientation can determine tank selection

Cost

Price is higher than site-built garage install:

- $300 to $700 more excluding electrical
- Upgrading electrical can add $350 to $500

Consumer Acceptance

High levels of consumer satisfaction

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Manufactured Home Installations

HOT WATER SOLUTIONS

Typical Installation Sequence

Screening	Tank Selection	On-site planning	Drain and remove existing tank/ closet alterations
• Breaker size • Closet location/size • Approval to alter closet • Floor damage	• Breaker size • Size of household • Back or side vented	• Piping runs • Detailed ducting or louvering planning	• Drain/remove tank • Closet alteration

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Manufactured Home Installations

HOT WATER SOLUTIONS

Typical Installation Sequence (Continued)

Ducting and louvering	Placement of EHWH	Plumbing	Commissioning
• Cut in holes for ducts/louvers • Install duct adaptors if needed • Drain pan installation	• Lift tank into place • Orientation of tank to optimum position • Connect ducting to tank	• Connect hot cold pipes • Fill tank • Connect PT valve, drain pan and condensate lines	• Wire and energize tank • Check for leaks • Observe start up sequence

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Manufactured Home Installations

HOT WATER SOLUTIONS

Common obstacles when installing an EHWH in manufactured homes:

- Low amp breaker on water heater circuit
- Alterations to utility room closets often necessary
- Limited space requires creative piping
- Installation pad required to raise tank level above existing plumbing
- Exhaust duct adaptor requires modifications or is unusable in tight scenarios

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Manufactured Home Installations

HOT WATER SOLUTIONS

Helpful materials to have on hand

Inside Pipes:

- Stainless steel flex connector
- PEX piping
- Existing polybutylene piping
- 24-in drain pan
  - Metal pans (as opposed to plastic) can be molded to fit a specific space

Outside Pipes:

- Condensate drain line
- PT valve discharge
- Drain pan drain line

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Manufactured Home Installations

HOT WATER SOLUTIONS

Example of cutting vents on a double ducted installation

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Manufactured Home and Other Space Limited Installations

HOT WATER SOLUTIONS

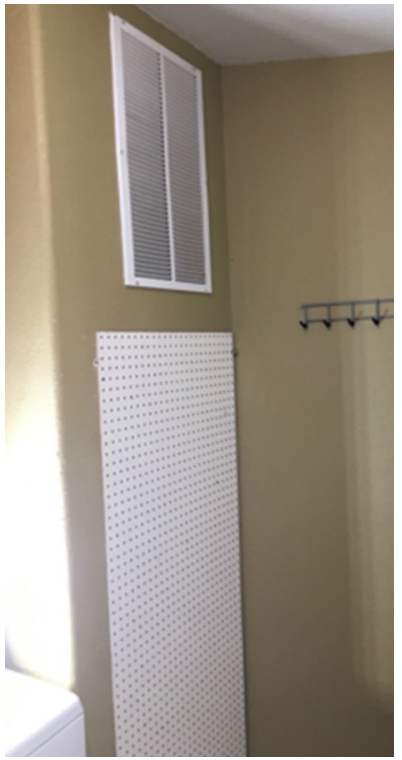
Methods to overcome restricted spaces in manufactured homes or other space limited installations are the same as typical installation scenarios:

- Double venting
- Inside to inside ducting
- Inside to outside ducting
- Louvered doors/vents

Double venting

Inside to inside ducting

Inside to outside ducting



Louvering

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Tank Selection Criteria

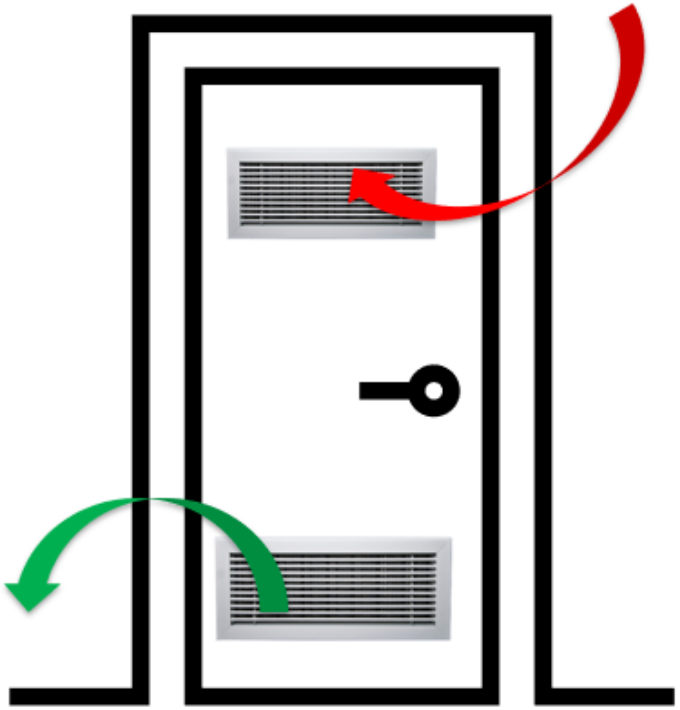
HOT WATER SOLUTIONS

Attribute	Rheem 30 amp	Rheem 15 amp	Bradford White	A. O. Smith Voltex	A. O. Smith Voltex AL
Breaker Requirement	30 amp	15 amp	25 amp	30 amp	30 amp
Exhaust	Right Side	Right Side	Back Side	Right Side	Top
Hot/Cold Plumbing Connections	Side	Side	Top	Side	Top or Side
PT/Condensate Connections	Front	Front	Side	Side	Front
Compressor Cutout Temperature	37ºF	37ºF	37ºF	45ºF	37ºF
Best Suited For:	30 amp breaker, side exhaust air	15 amp breaker/side exhaust air	25 amp breaker/rear air discharge	30 amp breaker, side exhaust air	30 amp breaker, good fit for small closets due to top exhaust and intake
Other Notes	Depending on model, features such as app and water leak detection may be a plus	Depending on model, features such as app and water leak detection may be a plus	Top plumed hot and cold-water connections are not a benefit when hot/cold piping is from the floor	High compressor shut temp will impact saving in double ducting installs	Equipped with water leak detection technology and smart app connectivity

Installation Considerations: Interior Closet

HOT WATER SOLUTIONS

- Will dimensions of tank fit into existing space?
- High *and* low louver cut into the door
- Add louver to door and duct the exhaust to adjoining space
  - Avoid directing tank exhaust to places routinely occupied
  - If a duct adaptor is required, will the extra space requirement + ducting fit in space?



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Material Check In

HOT WATER SOLUTIONS

An important consideration to make when installing an EHWH in a manufactured home is:

A. The size of the installation space

B. The existing breaker size

C. Both options A and B

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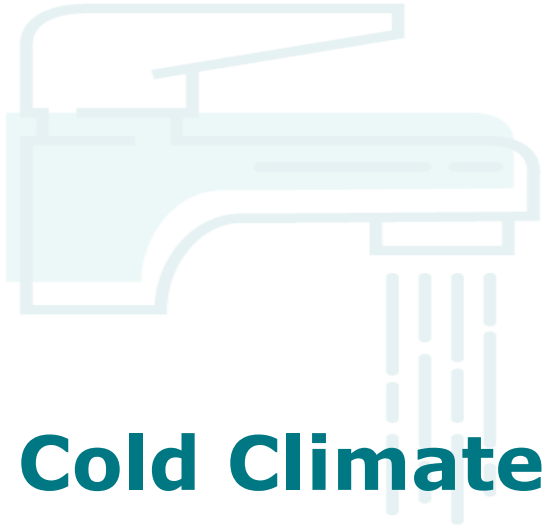

Cold Climate Installations

HOT WATER SOLUTIONS

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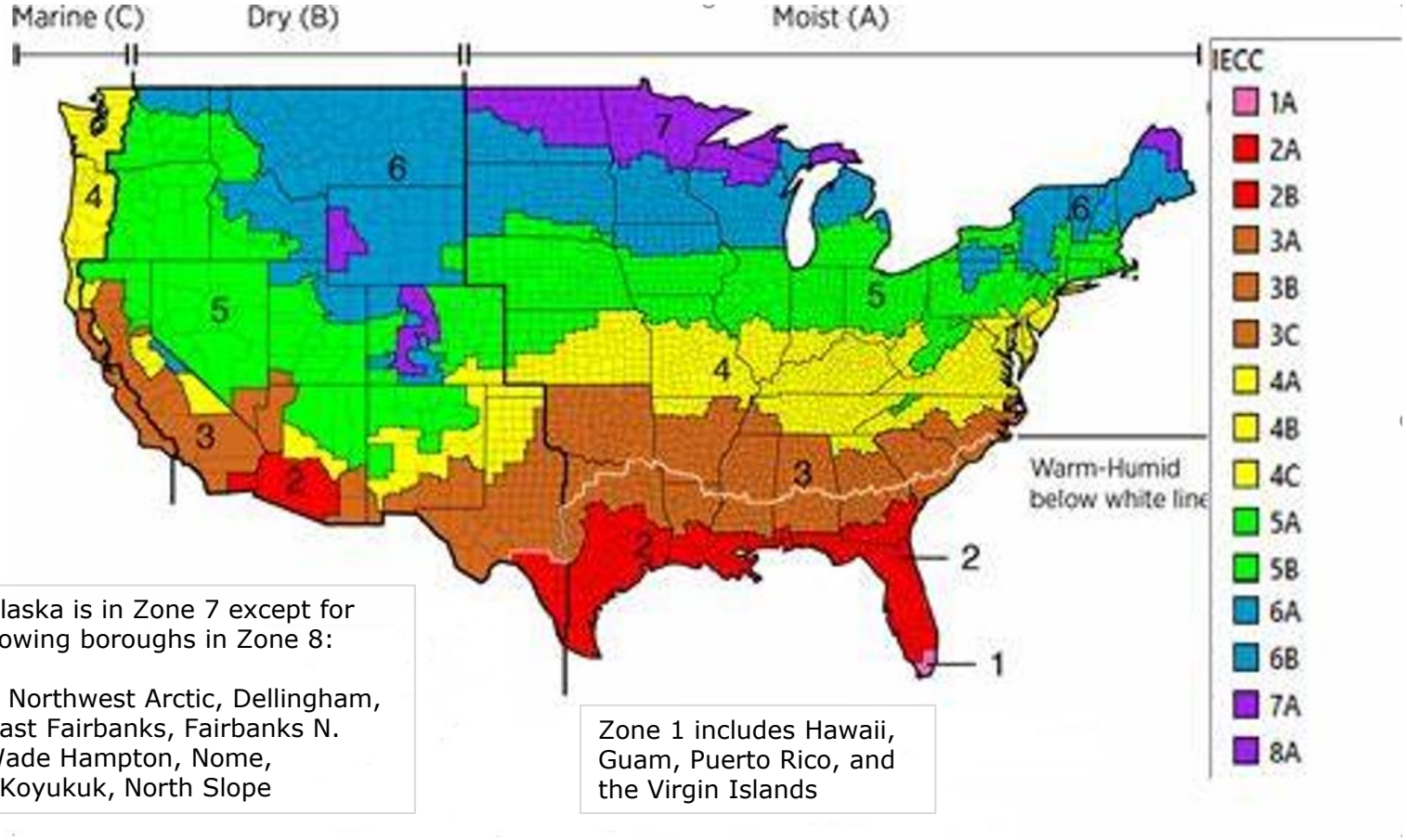
Cold Climates Zones

If a consumer lives in a "cold climate", or climate zones 6 and 7 (as indicated by blue and purple on the map), basements are excellent locations for tank installations. Ducting using outside air would result in long periods of operation as a standard tank and decrease energy savings.



All of Alaska is in Zone 7 except for the following boroughs in Zone 8:

Bethel, Northwest Arctic, Dellingham, Southeast Fairbanks, Fairbanks N. Star, Wade Hampton, Nome, Yukon-Koyukuk, North Slope

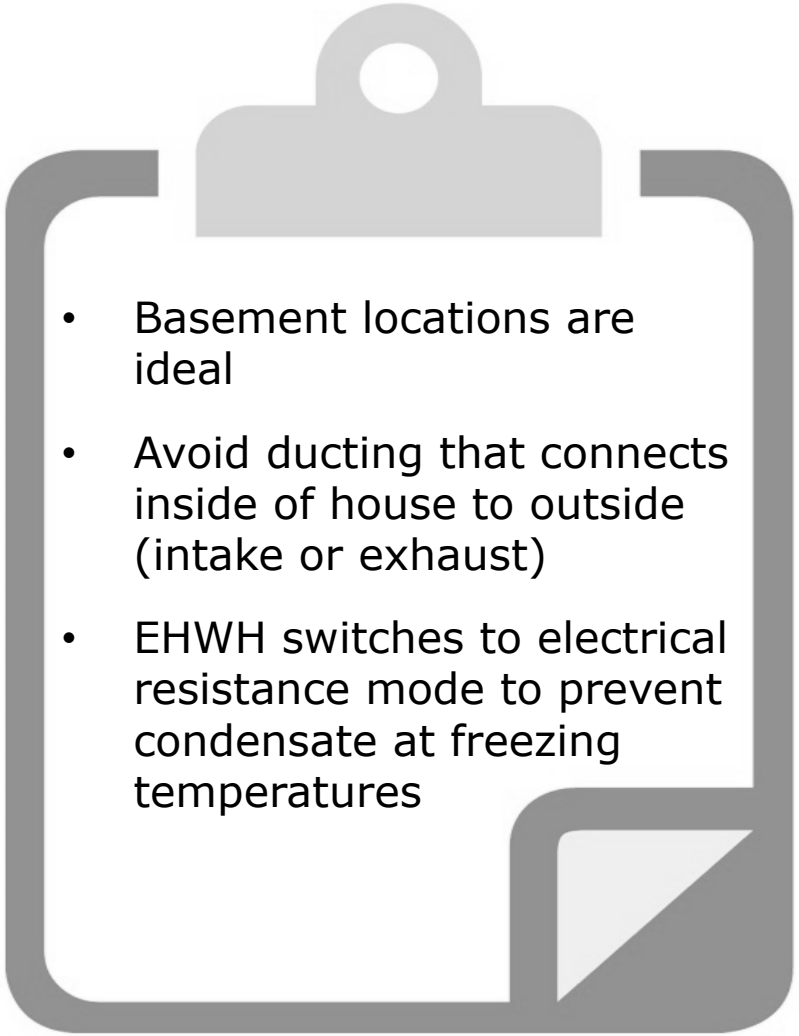
Zone 1 includes Hawaii, Guam, Puerto Rico, and the Virgin Islands

IECC Climate Zones (homerenergy.com)

Cold Climate Considerations

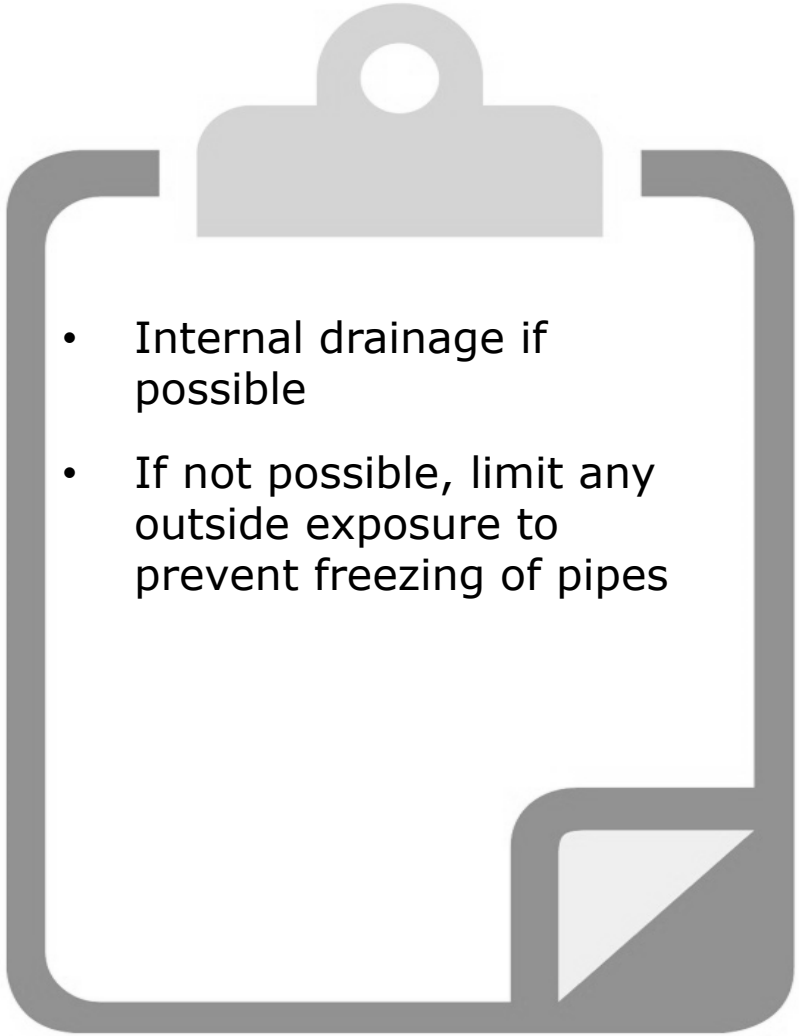
HOT WATER SOLUTIONS

Performance



- Basement locations are ideal
- Avoid ducting that connects inside of house to outside (intake or exhaust)
- EHWH switches to electrical resistance mode to prevent condensate at freezing temperatures

Condensate



- Internal drainage if possible
- If not possible, limit any outside exposure to prevent freezing of pipes

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Cold Climate Considerations

HOT WATER SOLUTIONS

Modeled scenario	Heat Pump EF	Hybrid EF	Weighted Average EF[22]
DOE test conditions	3.02	2.37	2.92
Low usage, low temperature lift	2.74	2.16	2.68
Medium usage, low temperature lift	3.08	2.39	3.01
High usage, low temperature lift	3.21	2.47	3.13
Low usage, high temperature lift	2.23	1.89	2.19
Medium usage, medium temperature lift	2.55	2.15	2.50
High usage, high temperature lift	2.68	2.24	2.62

[1] Dan Cautley, Kevin Gries, Dianna Cacko, and Justin Margolies, "Installed Performance of Heat Pump Water Heaters in a Cold Climate"

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Consumer Satisfaction

HOT WATER SOLUTIONS

In territories of Maine, or climate zones 6 and 7, the following feedback was received by EHWH owners:

- **93% of survey respondents reported being *very satisfied*, or *somewhat satisfied*, with their EHWH [1]**
  - **78%** of those respondents had their EHWHs installed in unheated basements
  - **16%** were installed in heated basements

For climate zones 4 and colder, unconditioned basements result in the *highest* energy savings [2]

- If unavailable, infrequently occupied spaces such as conditioned basements, utility closets and laundry rooms can offer a *next best* option

Basements in Maine, or climate zones 6 and 7, maintain temperatures of around 55ºF.

- **Cut off temperatures for all EHWH brands are below 55ºF, meaning the compressor will *not* be triggered to turn on with ambient temperature factors alone.**

[1] West Hill Energy and Computing in partnership with Lexicon Energy Consulting, Ridge & Associates and Analytical Evaluation Consultants, "Efficiency Maine Trust Heat Pump Water Heater Initiatives Impact Evaluation", [2] Sarah Widder, Cadeo Group LLC, Ben Larson, and Ecotope, Inc., "The HPWH Handbook: Optimum Installation Practices and Answers to Lingering Research Questions"

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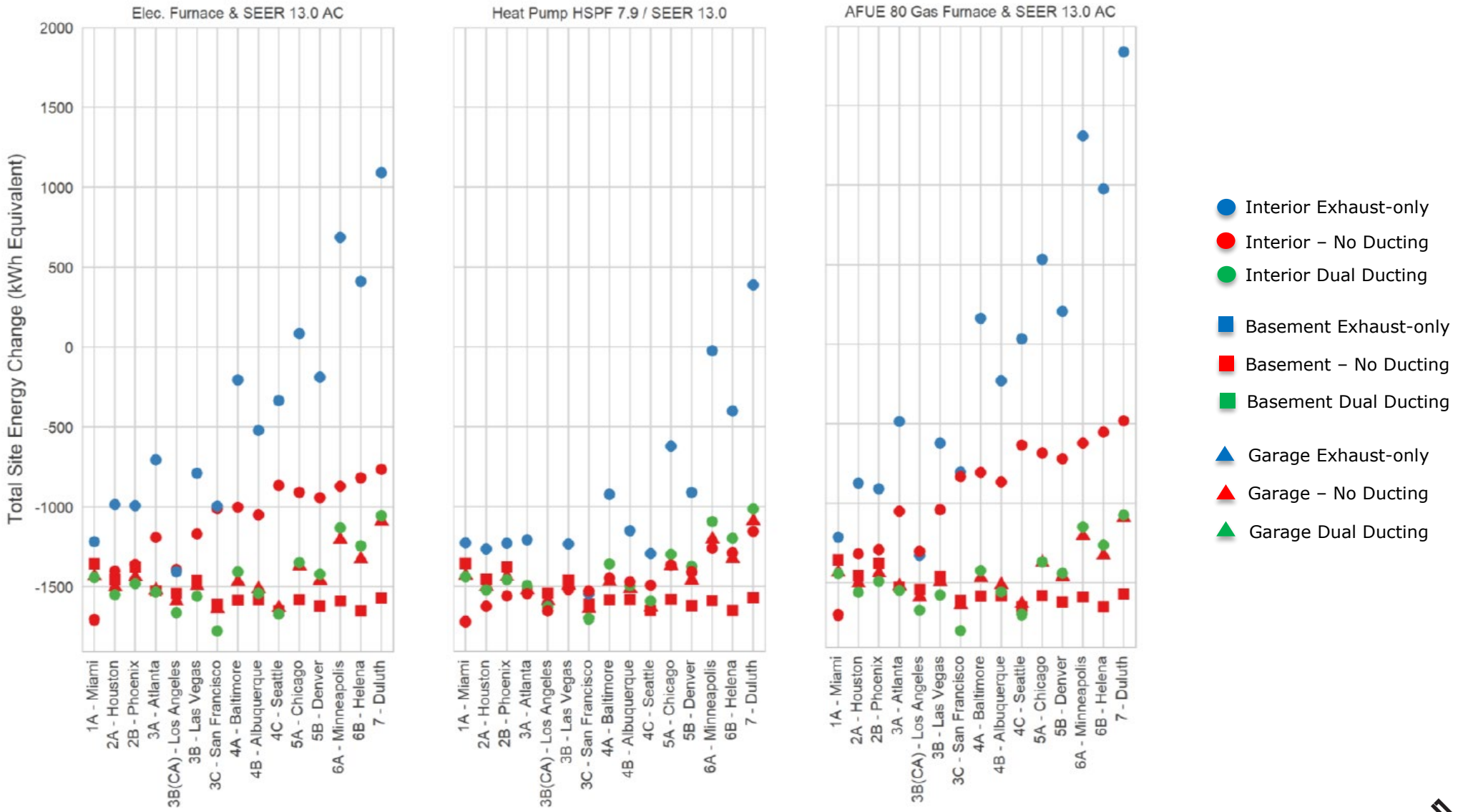
Exhaust-Only Ducting Energy Savings Comparison

HOT WATER SOLUTIONS



*Research conducted by Sarah Widder, Cadeo Group LLC, Ben Larson, and Ecotope, Inc in "The HPWH Handbook: Optimum Installation Practices and Answers to Lingering Research Questions"

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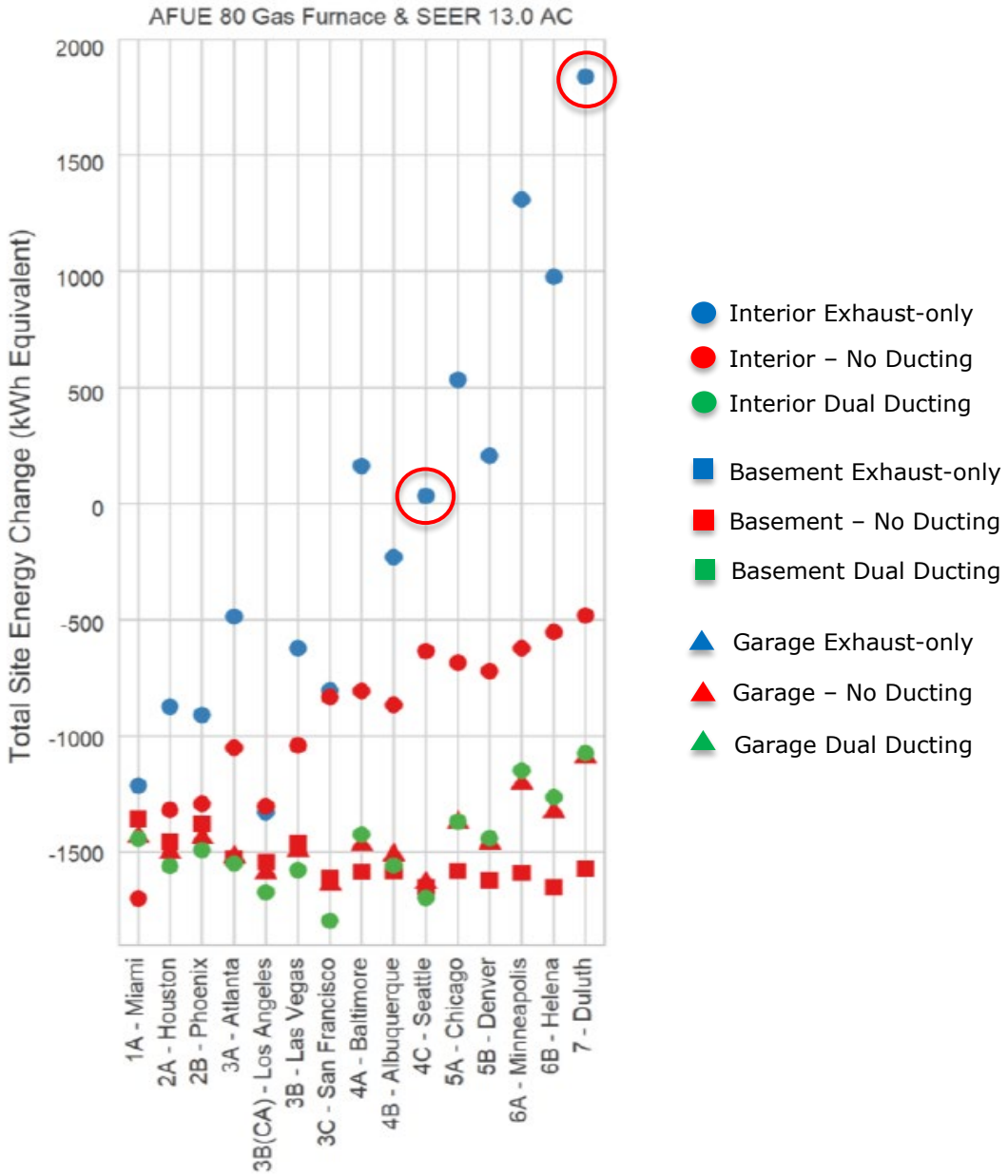
Exhaust-Only Ducting Energy Savings Comparison



Cold Climate Case Study

HOT WATER SOLUTIONS

EHWH Installation Case Study: Victor, Montana

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Cold Climate Case Study

HOT WATER SOLUTIONS

Overall view of the installed EHWH

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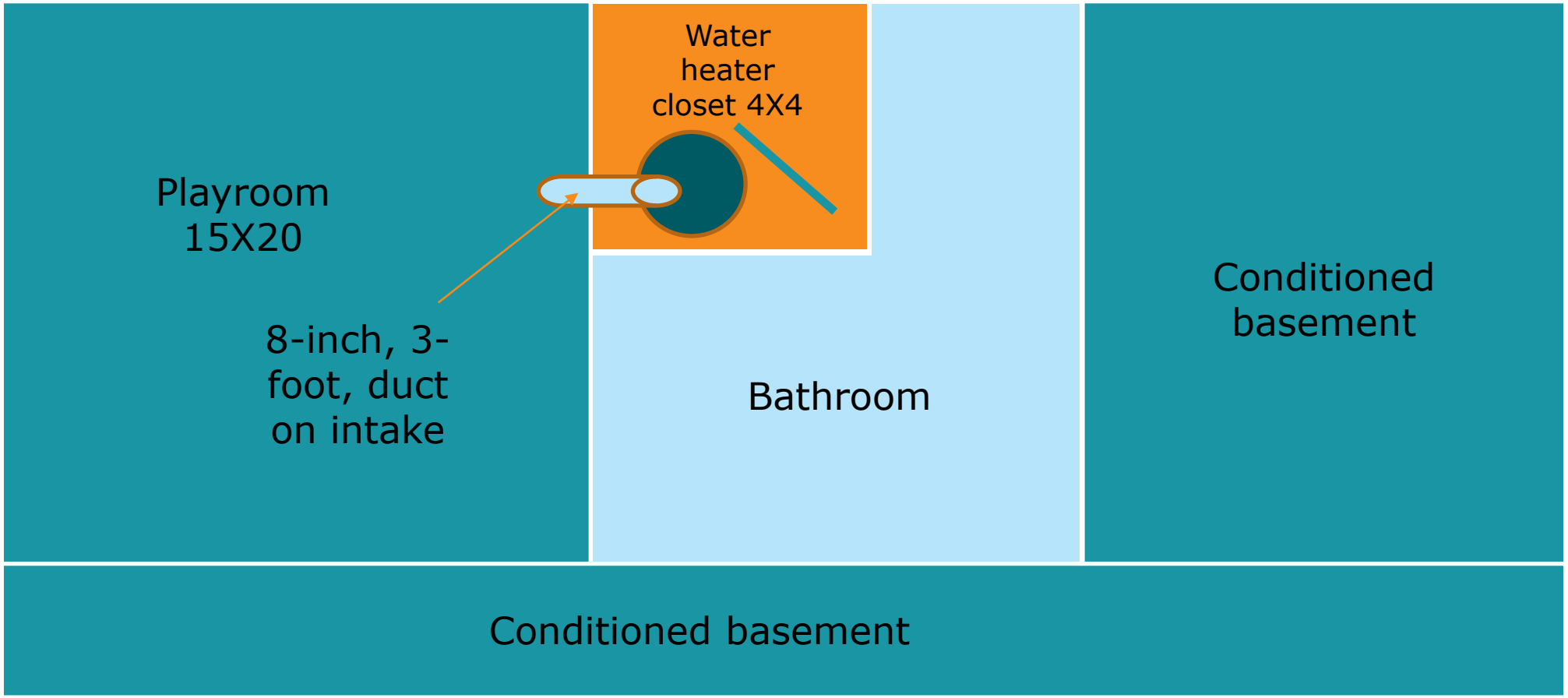
Cold Climate Case Study

HOT WATER SOLUTIONS

Overall layout



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Cold Climate Case Study

HOT WATER SOLUTIONS

Technical view: 3 feet of flex, one 90° bend, one 8 to 6 reducer and a 6-inch intake grille - within duct limits

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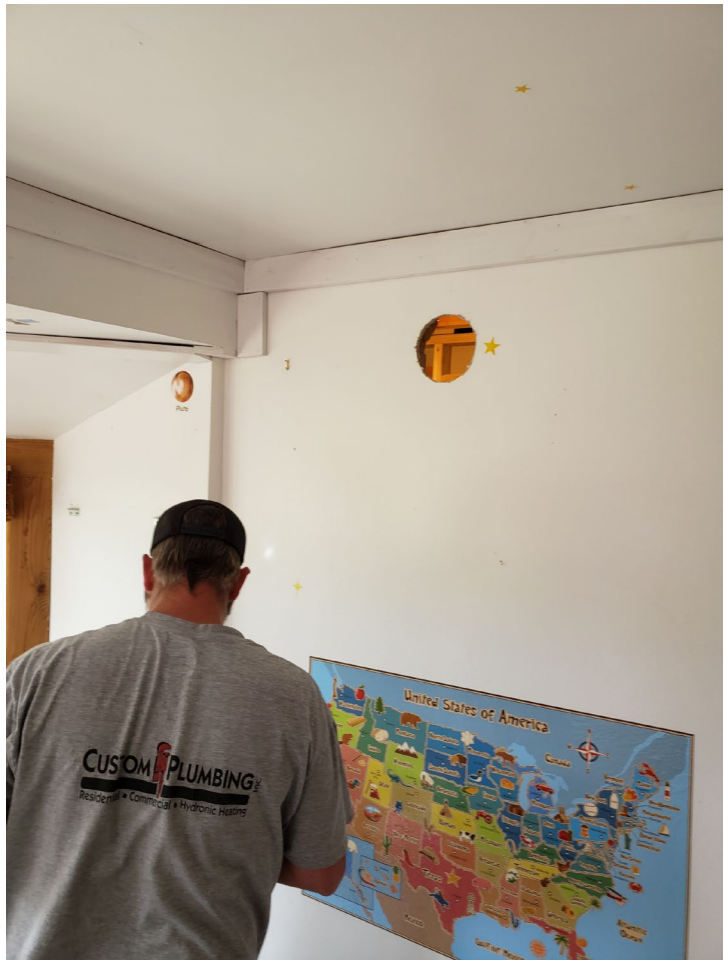
Cold Climate Case Study

HOT WATER SOLUTIONS

6-inch hole for intake duct from playroom.



Intake grille in playroom.

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Material Check In

HOT WATER SOLUTIONS

In cold climates, if ducting is required, what is the least preferred method?

A. Inside to inside ducting
B. Outside to outside ducting
C. Inside to outside ducting (ducting exhaust side to outside)

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Introduce Differences Between Standard Electrics and EHWHs

HOT WATER SOLUTIONS

Prepare your customers for the changes they will experience when switching from a standard electric to an electric hybrid water heater.

Item	Standard Electric	Electric Hybrid Water Heater
Noise Level	None	While operating, similar decibel level to a modern dishwasher
Maintenance	Check for leaks Replace anode as required	Check for leaks Replace anode as required Clean filter as required
Wi-Fi Connectivity	None	App available on certain models
Lowering or Raising Water Temperature	Involves turning power off to unit, unscrewing access panels	Done with the touch of a button
Size	Standard	Taller than a standard unit

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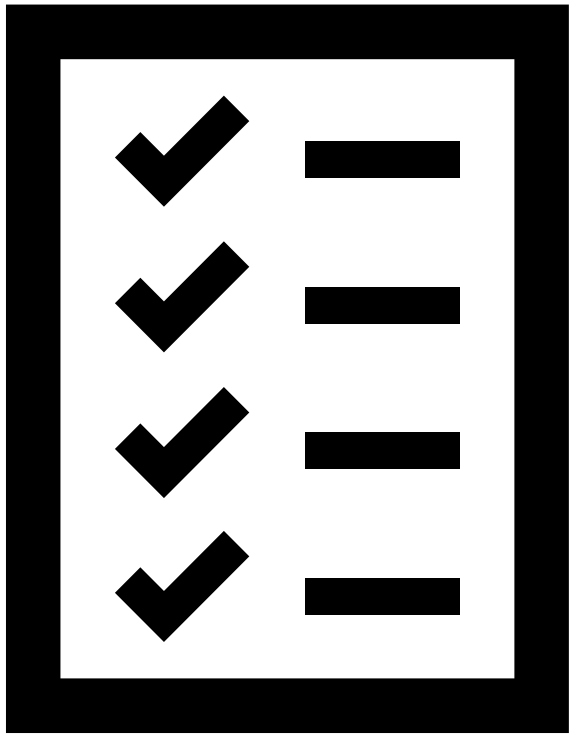
What Customers Want: Choices

HOT WATER SOLUTIONS

- Presenting more than one choice is a reliable and professional service to offer a customer
- “Less is more” is not an adage you’re likely to find in marketing.
  - When it comes to selling goods, conventional wisdom affirms that more is indeed more — offering a greater array of product options increases the likelihood customers will find what they need and buy the product. [1]



[1] The Stanford Business Insights, May 2016

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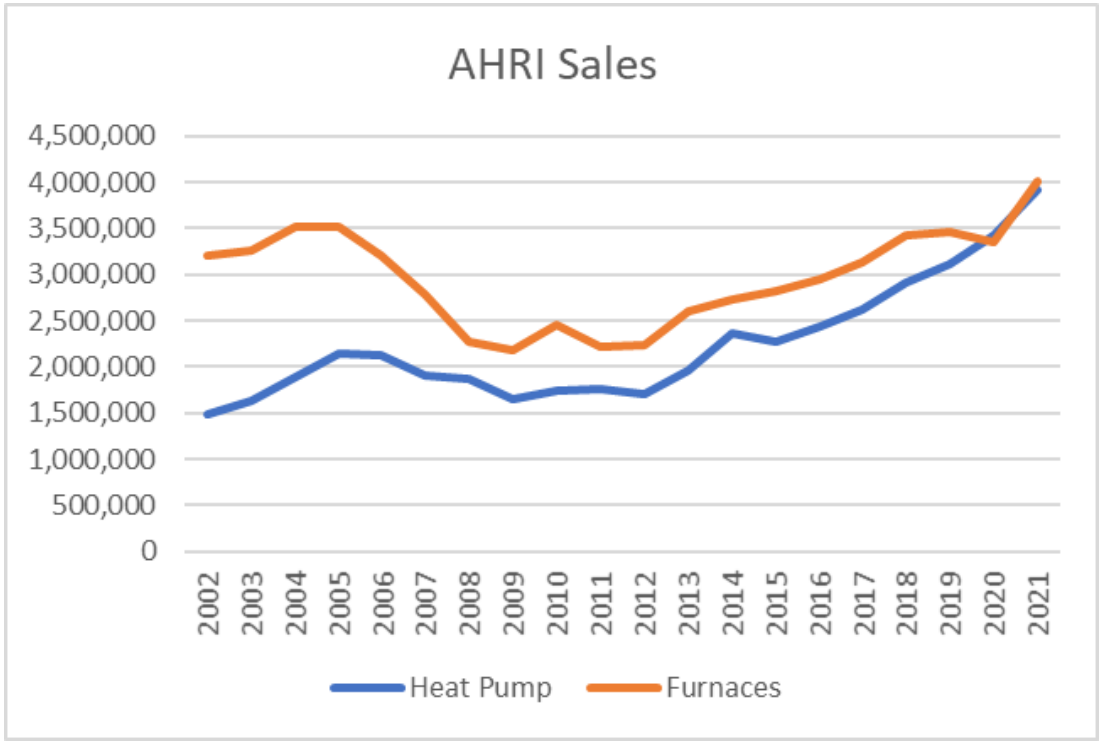
Heat Pump Technology Growth

HOT WATER SOLUTIONS

- The HVAC industry saw for the first time in 2020, heat pump sales exceeded furnace sales
- Federal policy changes will eventually require shift to EHWH technology
- State Building Codes
- Tax credits
- Local government and utility incentives



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Replacement Opportunities

HOT WATER SOLUTIONS

Details found in latest NEEA Market Progress Evaluation Report [1].

Most EHWH purchases for existing homes are planned replacements.

The replacement market opportunity is strong in the Northwest— across the four-state region, 23% of all homeowners currently own a water heater that is over 10 years old:

TABLE 17: WATER HEATER AGE BY STATE AND REGION

Water Heater Age	Total	OR[a]	WA[b]	ID[c]	MT[d]	Urban[e]	Rural[f]
n	*411*	*140*	*137*	*70*	*64*	*275*	*136*
Less than 1 year	4%	4%	4%	4%	10%	3%	9%
1 to 5 years	43%	36%	44%	51%	44%	46%	33%
6 to 10 years	27%	25%	27%	26%	33%	26%	30%
More than 10 years	23%	31%[c,d]	22%[d]	19%[a,d]	8%[a,b,c]	22%	24%
Don't know	3%	4%	2%	0%	5%	2%	4%

When onsite assisting a consumer with another service, check the age of the existing water heater and suggest an early replacement to avoid emergency replacement scenarios.

*Research prepared by Monica Nevius, Jared Powell, Melissa Meek, "Northwest Heat Pump Water Heater Market Progress Evaluation Report #6"

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Growing Your Plumbing Business

HOT WATER SOLUTIONS

According to Service Titan, the number 1 way to grow your plumbing business is to…

Embrace Smart Technology

- Today's consumers utilize technology to control everything on their smartphones — from regulating their home's indoor air temperature to creating a grocery list.

- Today's homebuyers, many of whom grew up with smartphones, are not only extremely tech savvy, but also environmentally conscious.

- Consumers actively seek service providers who use high-tech solutions, such as water leak detection, to prevent unexpected water damage.

ServiceTitan®

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Proactive Service

HOT WATER SOLUTIONS

Planned replacements are always better than emergency replacements – next time you are onsite assisting a customer with another job, ask them how old their current water heater is.

An old tank is not only inefficient, but also a liability.

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Consumer Talking Points

HOT WATER SOLUTIONS

It's too expensive…

60% savings and rebates

I'm not sure these are Reliable…

10-year warranty

The technology is too new…

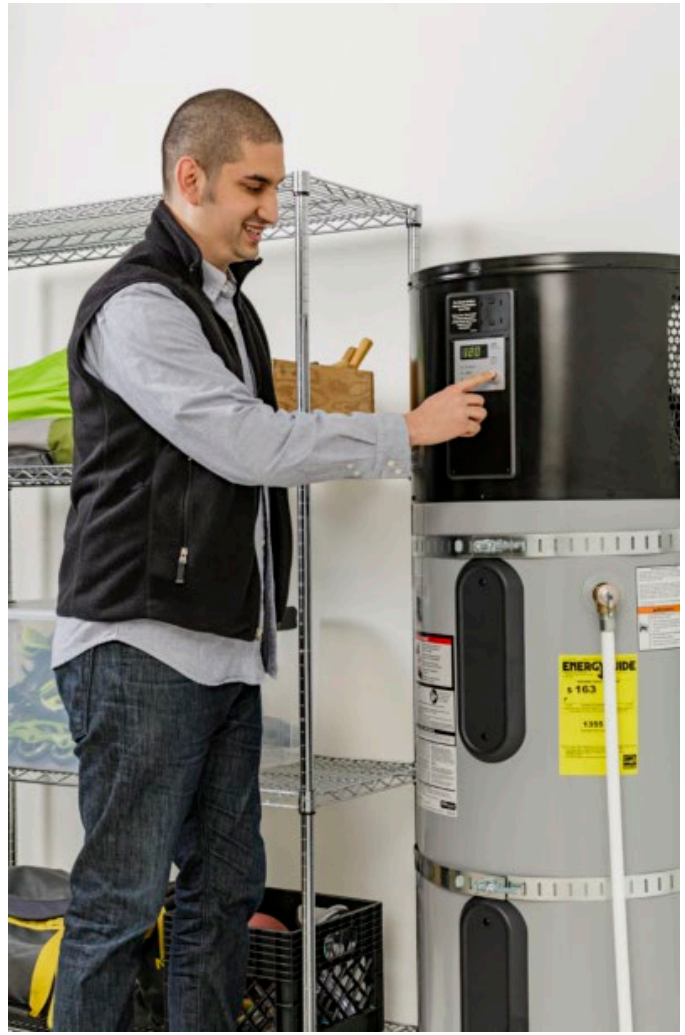
Heat pump technology has been around for over 60 years

I don't want to run out of hot water…

Same delivery as a standard tank

My old water heater works just fine…

It's costing you $ every month



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Best Sales Lines From Contractors

HOT WATER SOLUTIONS

- “It’s the only tank that can pay for itself.”
- “Your tank is ten years old; you can avoid repairs - replace now.”
- “It’s like your (fill in the blank) smart phone, smart thermostat, connected TV… it’s from this century.”
- “My boss put one in, and she loves it!”
- “They wouldn’t have a 10-year warranty if they didn’t have great products.”
- “Boy, you must really love your utility!”
- “My electrical bill reflects the saving every month”

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Contractor Checklist

HOT WATER SOLUTIONS

- ✓ Get training from your manufacturer if you haven't already
- ✓ Source product and pricing at a local distributor
- ✓ Gather local rebate details
- ✓ Ensure all staff are ready to talk about the benefits and details of EHWHs
- ✓ Print best practices guides for installations and homeowner guides for consumer education

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Manufacturer Contact Information & Resources

HOT WATER SOLUTIONS

Manufacturers and sales representatives are available to support you with any questions regarding specific product features and offer sales & training resources.

A. O. Smith

- Support – (877) 552-0010
- Training - A. O. Smith Training Resources
- Sales Representatives - A. O. Smith Sales Representative Resource
- Distributors - A. O. Smith Distributor Resource

Bradford White

- Support – (800) 523-2931
- Training – Bradford White Training Resource
- Sales Representatives – Bradford White Sales Representative Resource
- Distributors - Bradford White Distributor Resource

Rheem

- Support – (800) 621-5622
- Training – Rheem Training Resource
- Sales Representatives – Rheem Sales Representative Resource
- Distributors – Rheem Distributor Resource

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Resources

Utility EHWH Programs

- Utility Rebate Programs

Hot Water Solutions Consumer Resource Center

- Consumer Resource Center

Hot Water Solutions Partner Resource Center

- Partner Resource Center

Manufacturers

A. O. Smith

- https://www.hotwater.com/

Bradford White

- https://www.bradfordwhite.com/forthepro

Rheem

- https://my.rheem.com/

Thank You

HOT WATER SOLUTIONS

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