Efficiency Works™

Estes Park | Fort Collins | Longmont | Loveland

# Heat pump water heater training

**Oct. 8, 2025**

# Agenda

- Breakfast
- Efficiency Works reminders
- Heat pump water heater technical training
- Closing remarks

# Before we start

## Safety and reminders

- In case of an emergency
  - Building evacuation
  - Shelter in place
- Restroom locations
- Beverages and snacks

## Meeting logistics

- Conversational throughout
- Big room with lots of people, so please speak up
- We are all coming from different starting points of Efficiency Works program and building science knowledge
  - If you have a question but think it might not be worth asking, it is likely someone else in the room has the same question, so…. ***ASK IT!***

# Platte River and Efficiency Works

Efficiency Works operates as the customer-facing energy optimization program for Platte River Power Authority and its owner communities. This strategic alliance combines Platte River's energy expertise with Efficiency Works' innovative customer programming, outreach, education and program models. Together, we're helping to accelerate progress toward a noncarbon energy future.

Platte River Power Authority

Estes Park • Fort Collins • Longmont • Loveland

Efficiency Works™

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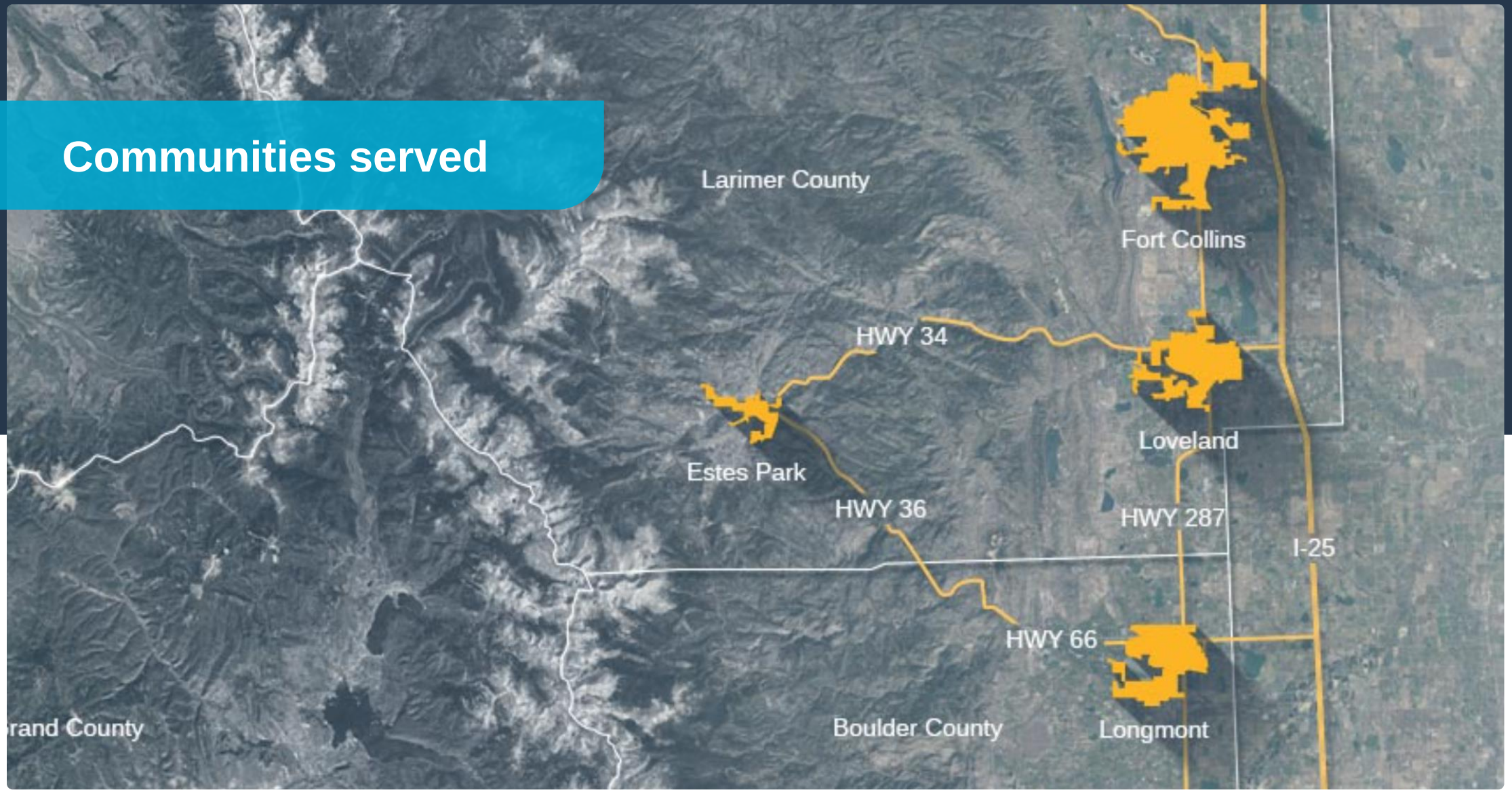
# Communities served

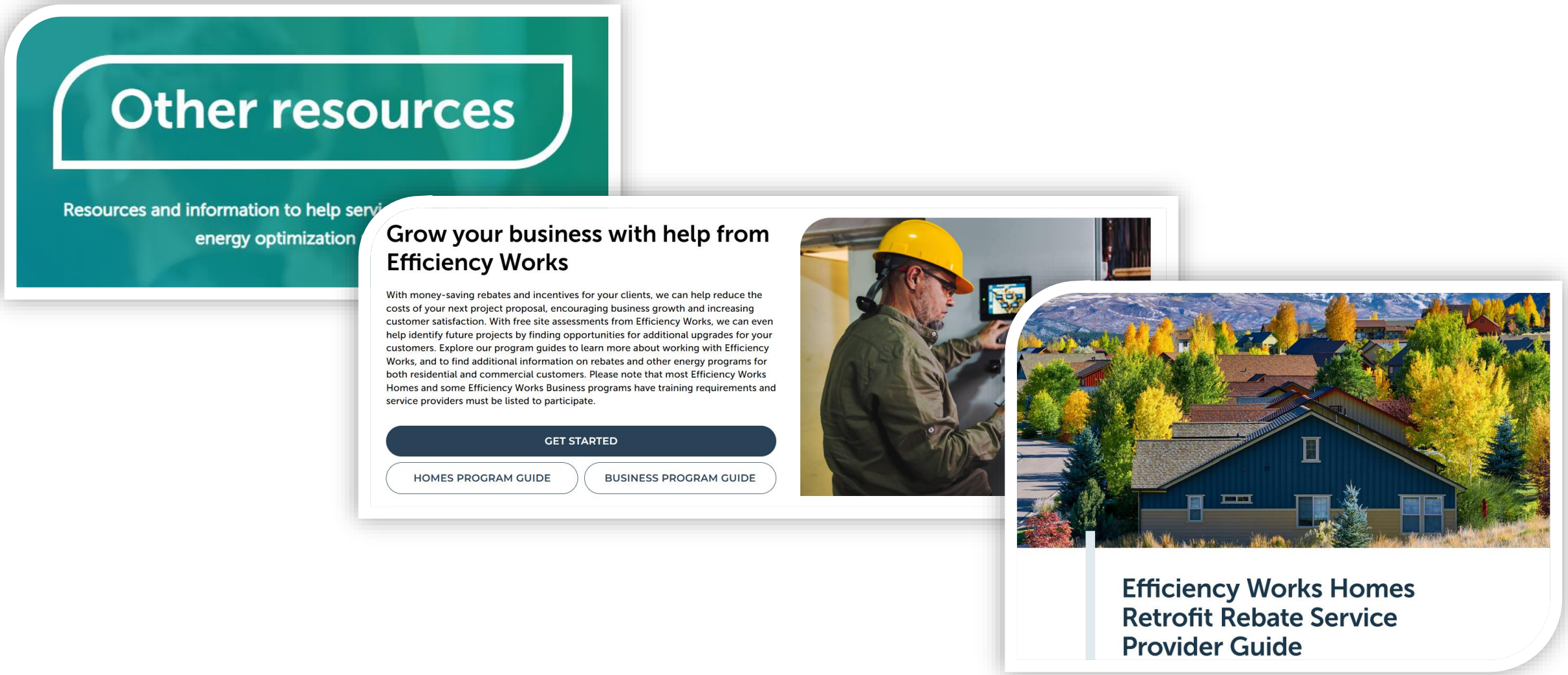


# Efficiency Works Retrofit Rebate program

## Reminders

- Preapproval requirements
  - Projects > $2,500
  - Rental bonus
  - Funds held for 45 days past the listed completion date
- 45-day submission deadline
  - From date of install or signed terms and conditions
- Required documents:
  - Refer to Homes Program Guide

# Service Provider Guide

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# Mentor improvement verification (MIV)

## Details

- What is it?
  - Personal walkthrough of application submittals and additional program inquiries
- Who's it for?
  - New/existing office staff who may be applying for Efficiency Works rebates can request an MIV
  - New/existing technicians who will be conducting the technical aspects for the Efficiency Works application can request an MIV

# Post installation verification (PIV)

## Details

- What is it?
  - Post-installation verification to ensure project measures meet Efficiency Works program criteria
- Who is it for?
  - Customers who recently had an upgrade completed through the Efficiency Works program with a listed service provider
- What occurs?
  - Review of rebated measures against the installation standards documented in the Homes Program Guide
- What are the outcomes?
  - Separate customer and contractor reports
  - Correction notice if installation does not meet minimum requirements

# Efficiency Works listed service provider

## Requirements

- ✓ Complete a minimum of one project in the Efficiency Works Homes program
- ✓ Attend one Efficiency Works Homes training
- ✓ Consistently pass inspections. Field conditions match the application and supporting documents.
- ✓ Uphold the ethics requirements in the service provider application and agreement
- ✓ Renew service provider application and agreement every two years
- ✓ Maintain general liability insurance policy

## Benefits

- ✓ Be listed on the service provider search list
- ✓ Potential referrals and project leads
- ✓ Be the first to know about new program offerings
- ✓ Access to online application status via service provider portal
- ✓ Access to the service provider development grant and other training resources
- ✓ Access to co-branded materials

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# Additional resources

**For listed service providers**

# Service provider development grant

## We want you with us on our journey

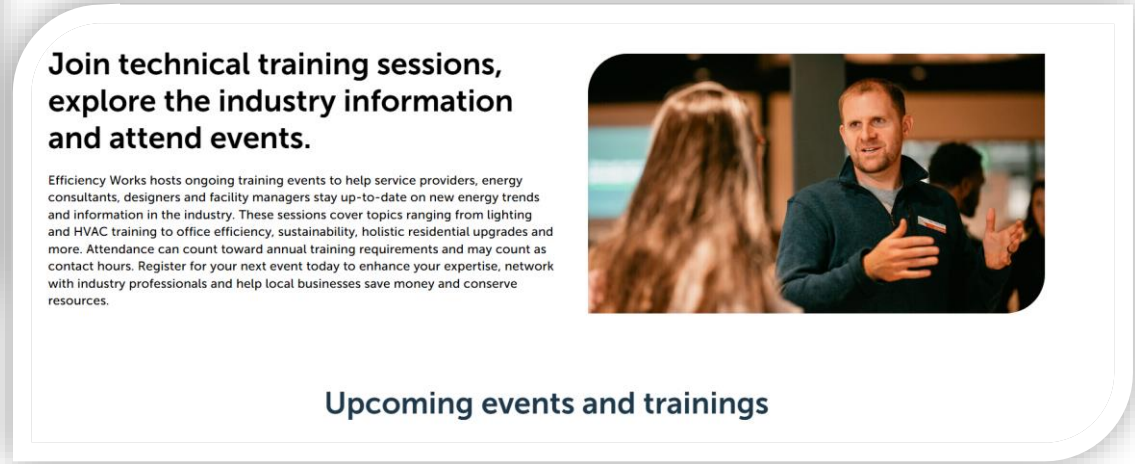
Support to continue your team's growth and skill development within efficiency.

- Up to $2,000 available per service provider per calendar year
- Preapproval is required
- Find an efficiency training and Efficiency Works Homes will help pay for it

| Listed service provider | |
|---|---|
| Annual training maximum: | $2,000 |
| Amount reimbursed for custom training: | 50% |
| Minimum reimbursement: | $75 |

# Trainings and events

## Found on Efficiency Works website

# Service provider training portal

## Free on demand, short videos on selling energy

Year long-license to Selling in six commercial and industrial on-demand sales training

- Industry leading training boiled down into six-minute videos
- Over 100 videos on selling commercial energy upgrades

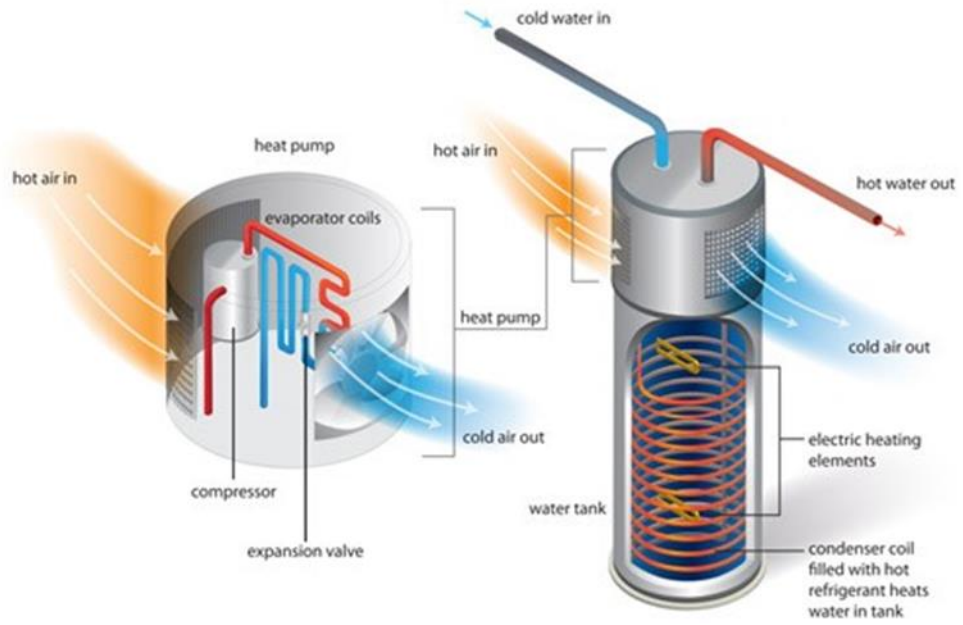
Additional offerings

- 10 live webinars with recordings available throughout the year
- Monthly mastermind coaching calls
- One-on-one proposal reviews with Mark Jewell

# Efficiency Works Retrofit Rebate

## Heat pump water heater rebate

| Measure | Incentive | | Criteria |
|---|---|---|---|
| Heat pump water heater – replacing electric or propane water heater | $600 | Per unit | • ENERGY STAR® certified |
| Heat pump water heater – replacing natural gas water heater | $400 | Per unit | • ENERGY STAR® certified |




# Installing Heat Pump Water Heaters – Avoiding callbacks and increasing customer satisfaction

# Your presenters

Bruce Manclark – Earth Advantage

Dan Wildenhaus – Center for Energy and Environment

# Agenda

The right tank for the job

Common questions

To duct or not to duct

Volume and location considerations

Condensate management

Recirculation systems

Apps and Modes of Operation

Minimizing noise and comfort issues

Electrical requirements

How they work!

# Special Thanks To…











KNAUF INSULATION
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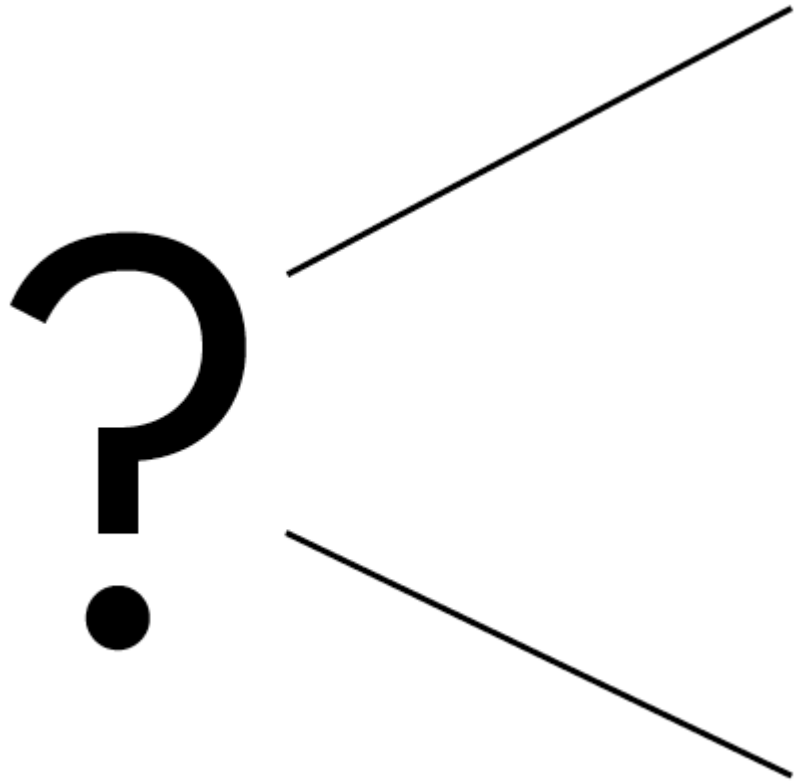
# Common questions asked



Do Heat Pump Water Heaters work in Colorado?

Will the homeowners have enough water?

Is my home right for a HPWH?

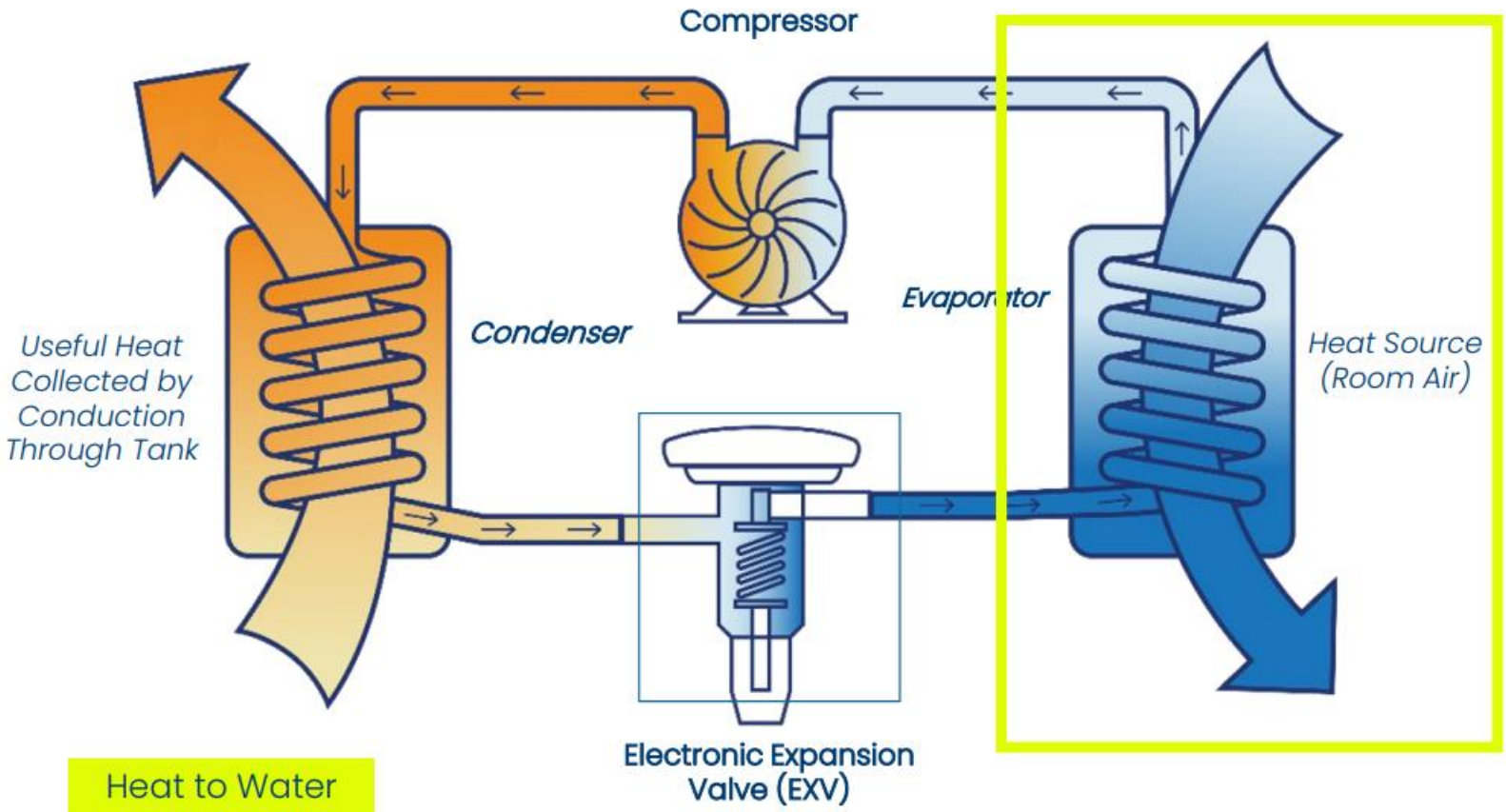
Do I need to duct the HPWH?

Is the technology ready to scale?

Do I need to upgrade electrical?

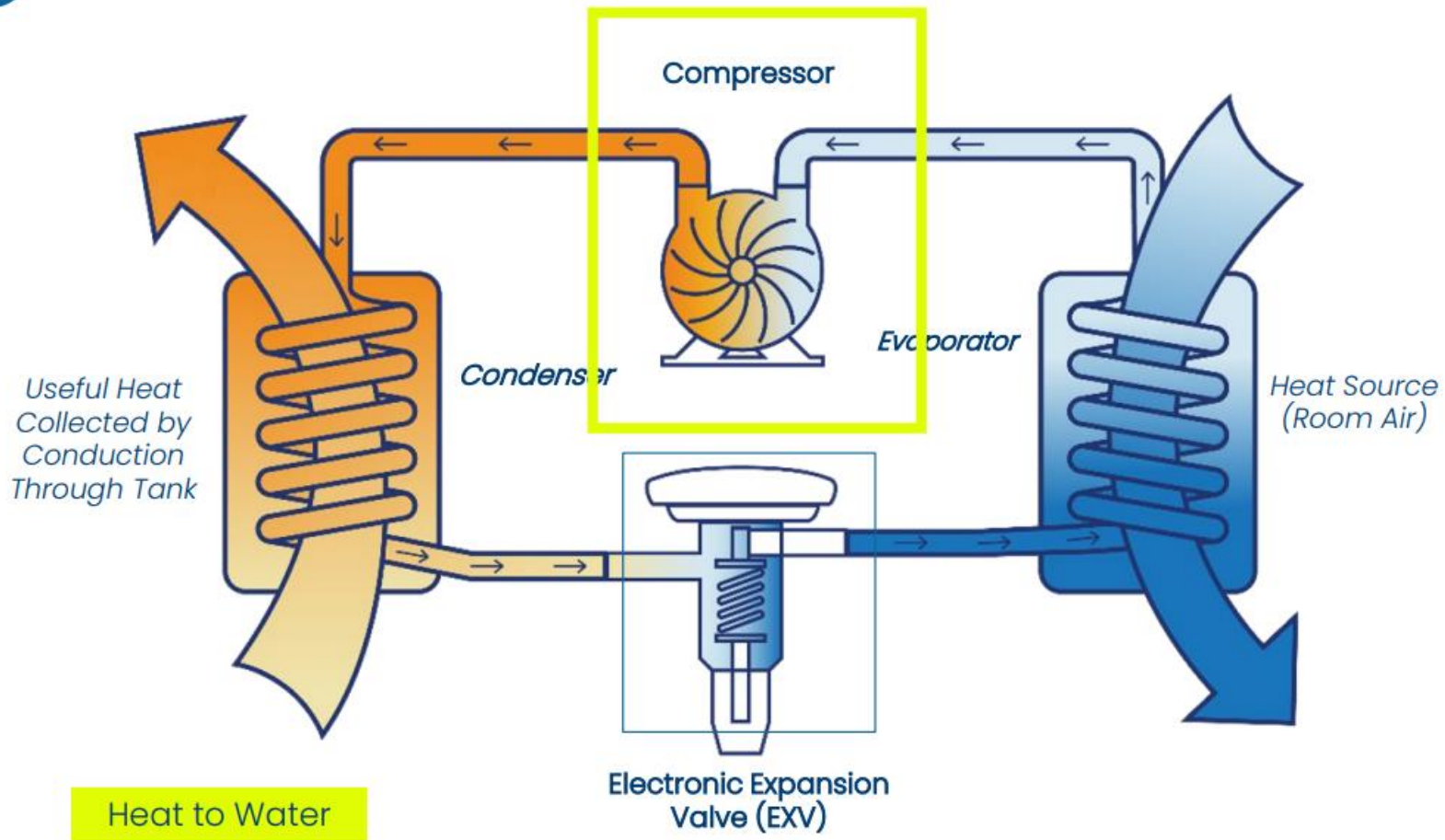
Aren't HPWHs noisy?

# Product Overview: How a Heat Pump Works



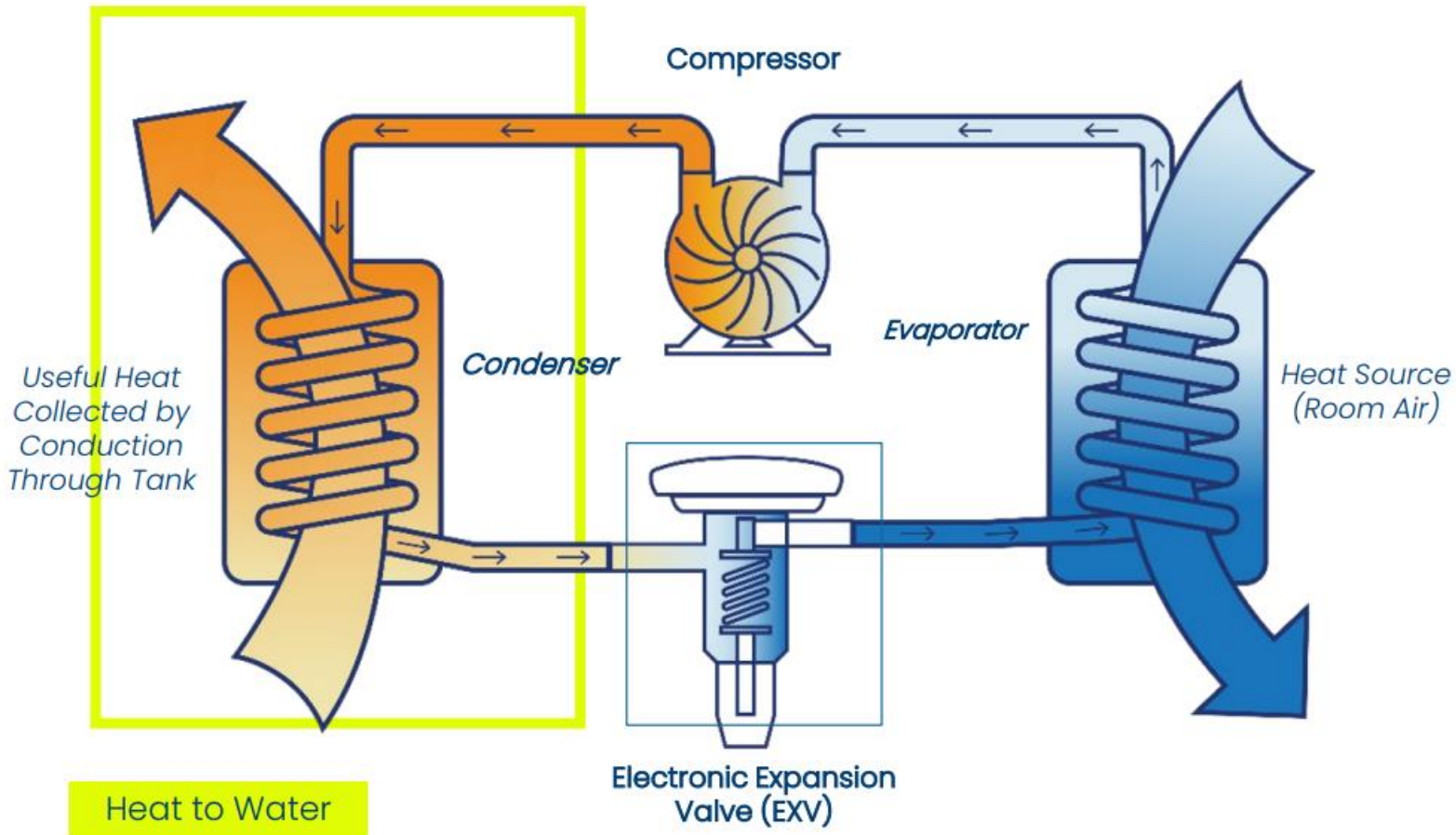

HOT WATER SOLUTIONS

# Product Overview: How a Heat Pump Works




HOT WATER SOLUTIONS

# Product Overview: How a Heat Pump Works




HOT WATER SOLUTIONS

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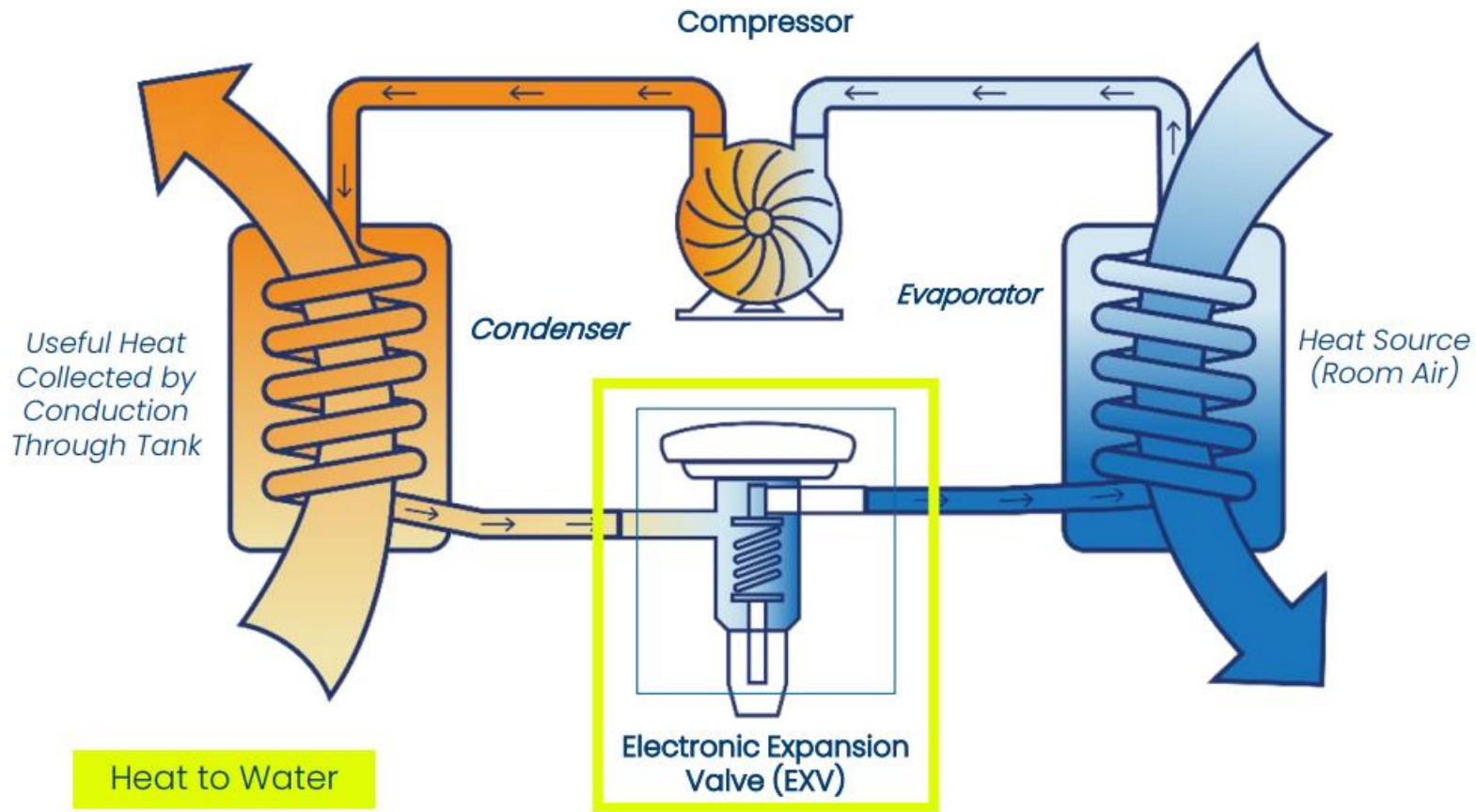
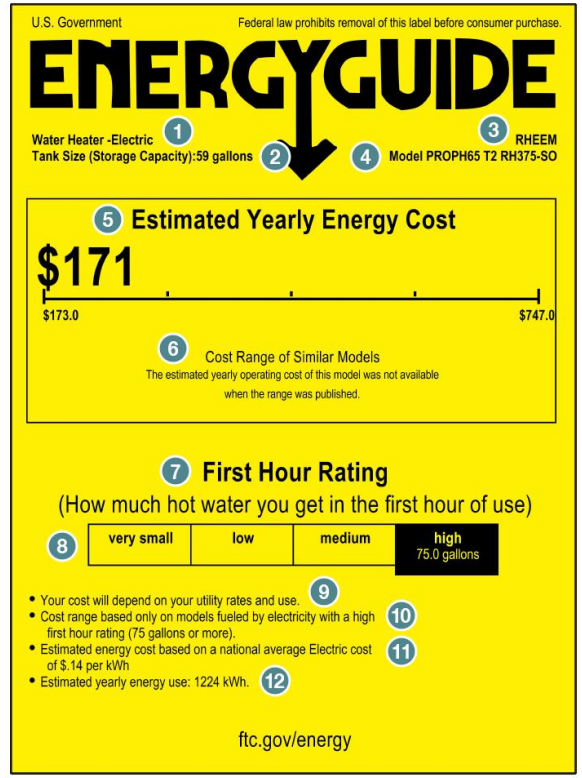



HOT WATER SOLUTIONS

# UEF Uniform Energy Factor

**The ratio of useful energy output from the water heater to the total energy input over a typical usage cycle.**
In simpler terms, it measures **how efficiently a water heater converts energy into hot water**. The higher the UEF, the more efficient the unit is.




•HPWHs typically have **UEF ratings between 2.0 and 4**, much higher than conventional electric resistance water heaters (which are usually around 0.90).

**How UEF Is Tested**
UEF is determined using DOE's **standardized test procedures**, which simulate different usage patterns:
•**Very Small**: 10 gallons/day
•**Low**: 38 gallons/day
•**Medium**: 55 gallons/day
•**High**: 84 gallons/day

•Set draw patterns over a 24 hour period

# C.O.P. Coefficient of Performance

COPs are a point in time measurement or a long time average. Not a standard test procedure

COP = Useful heating output / Electrical energy input

# Summary of Current Test Procedure

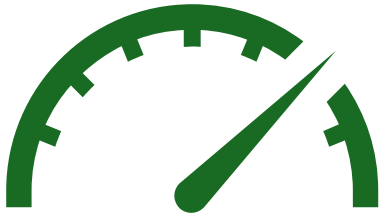
- The current DOE test procedure consists of two main components:

First Hour Rating or Max GPM

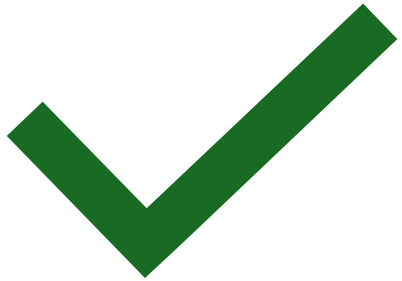
24-hour Simulated Use Test

- The FHR (storage units) or Max GPM (instantaneous units) dictates the draw pattern for a given water heater, which then governs how the 24-hour simulated use test is carried out, ultimately resulting in a UEF rating.
  - Draw patterns are designed to simulate the different usage patterns water heaters are subject to in the field based on delivery capacity.
  - **UEF ratings** capture energy consumed during both active heating and standby modes of operation, and the same efficiency descriptor is **applied to all water heaters used in residential applications**. (42 U.S.C. 6295(e)(5))

# Sizing: First Hour Rating



First Hour Rating (FHR) can be defined as a quantity used to determine a tanks performance abilities during the first hour of operation. It is mostly defined by tank size — the larger the tank the higher the rating, with slight variations in each brand.



EHWHs typically have **higher** first hour ratings than standard tanks in certain operating modes.

**Average First Hour Rating (Varies Based to Brand)**

| Heater type | 50-Gallon | 65 or 66-Gallon | 80-Gallon |
|---|---|---|---|
| EHWH | 65-67 | 75-79 | 84-89 |
| Standard Electric | 62 | N/A | 80 |

# Product Compatibility: Sizing Considerations

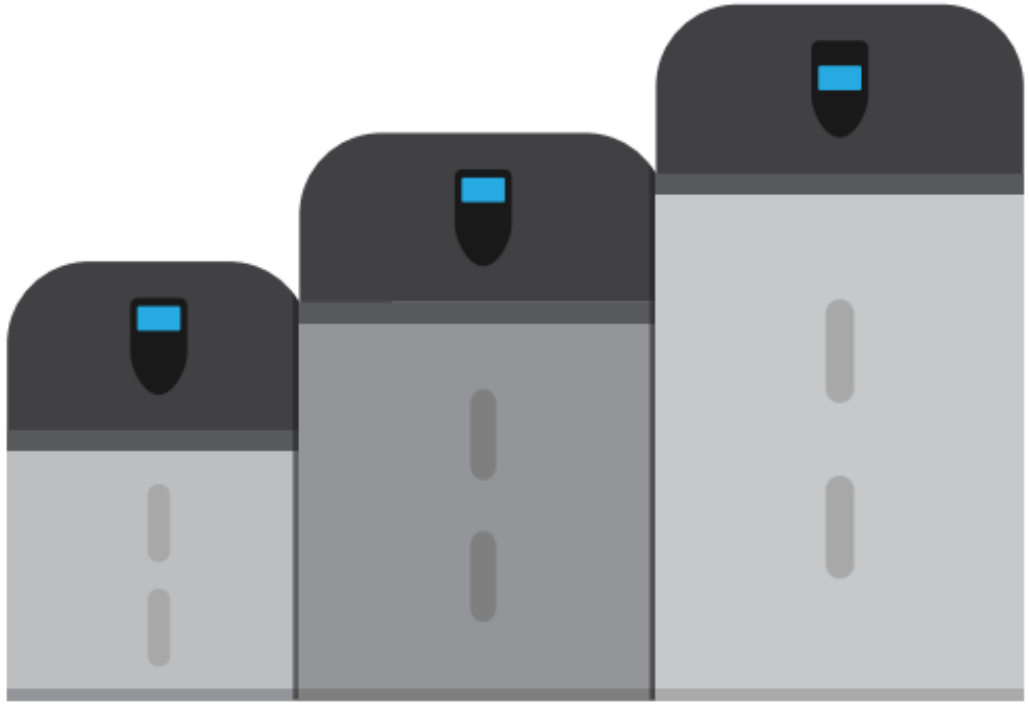
**The Right Tank for a Household**

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 households hot water usage by considering the number of bedrooms and bathrooms in the house.

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 — size an EHWH tank for efficiency, and size up.



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

# How to Deal with Concerns or Complaints of not enough hot Water

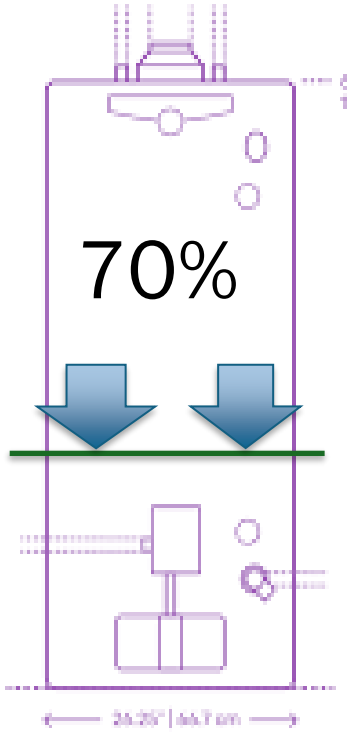
All Vertical Tank Type Water Heaters have 70% usable Hot Water:

-50 Gallon = 35 Gallons Usable

-66 Gallon = 46 Gallons Usable

-80 Gallon = 57 Gallons Usable

Electric Water Heaters have never been about recovery. They are storage vessels intended to have adequate amounts of hot water dependent upon usage. Endless hot water expectations are not reality.




Dilemma:

-Code Requirement mandates installers set Water Heaters to 120F to protect against scalding.

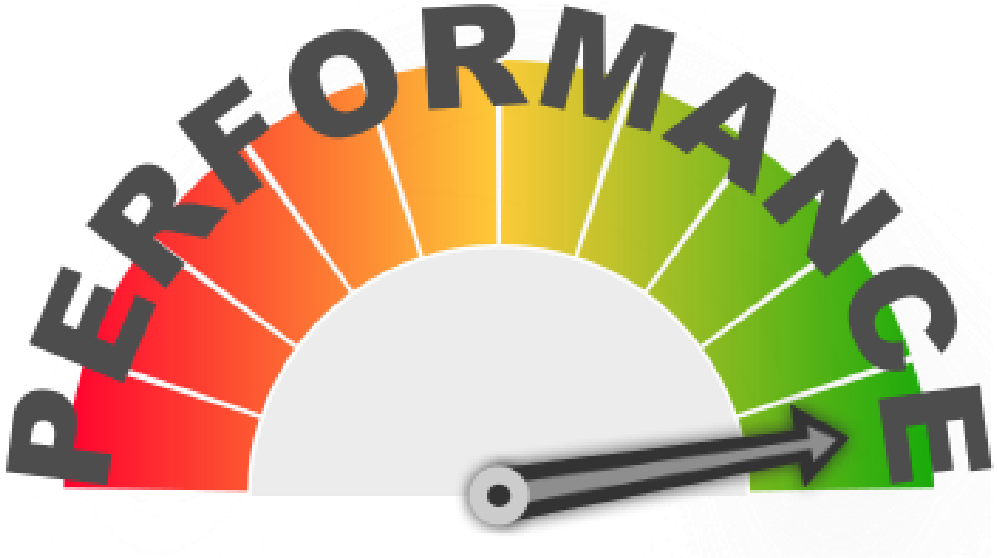
-Mix Factors at these temps combined with lower than expected amounts of usable hot water create upset customers that simply want more. Be proactive and discuss these issues.

-Consumer always has the option of turning up the water heater on their own. Caution them that by doing so, the risk of scalding to children or the elderly must be averted by utilizing a thermostatic mixing valve.

# Quick Chart for increasing deliverable Hot Water

| Minutes of Showertime based on 105F Shower Temp and 45F Cold | | |
|---|---|---|
| 2.5 GPM | 120F Set (.80 mix) | 140F Set (.63 mix) |
| | 2.0 GPM (2.5 x.8) | 1.6 GPM (2.5x.63) |
| 50 Gal Tank (35 Usable) | 17.5 min | 21.9 min |
| 66 Gal Tank (46 Usable) | 23.0 min | 28.8 min |
| 80 Gal Tank (56 Usable) | 28.0 min | 35.0 min |
| | | |
| Minutes of Showertime based on 105F Shower Temp and 45F Cold | | |
| 1.75 GPM | 120F Set (.80 mix) | 140F Set (.63 mix) |
| | 1.4 GPM (1.75 x.8) | 1.1 GPM (1.75x.63) |
| 50 Gal Tank (35 Usable) | 25.0 min | 31.8 min |
| 66 Gal Tank (46 Usable) | 32.9 min | 41.8 min |
| 80 Gal Tank (56 Usable) | 40.0 min | 50.9 min |

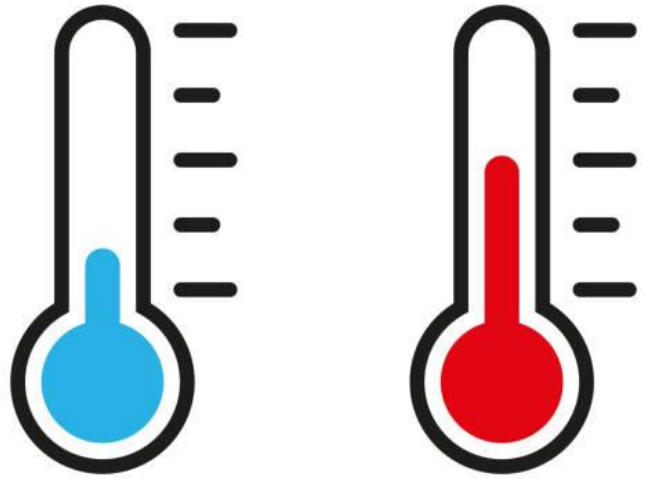
# What defines performance of a HPWH?




- Usage patterns
- Total usage
- Incoming water temperature
- Incoming air temperature for compressor
- Tank size

# Understanding average incoming water temperature

- National Average = 52ºF
- Front Range Average = 51ºF
- Western Slope Average = 52ºF



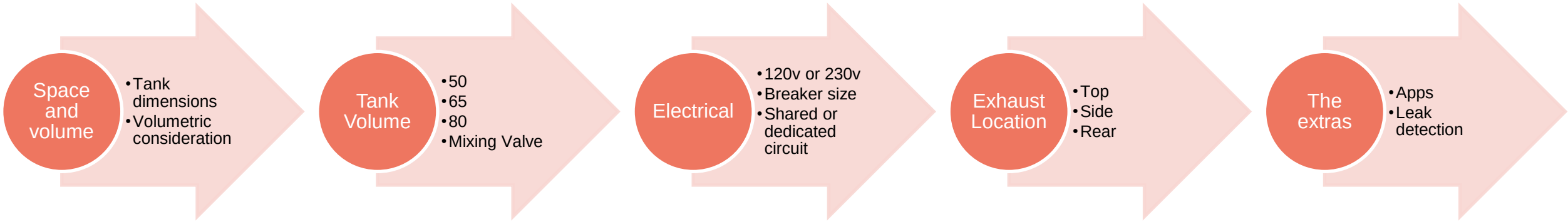
https://hydroflow-usa.com/City-temperature-map/

# Think Features: Not Models

- **Select the best fit  tank for the house.** Don't fit the house to the tank

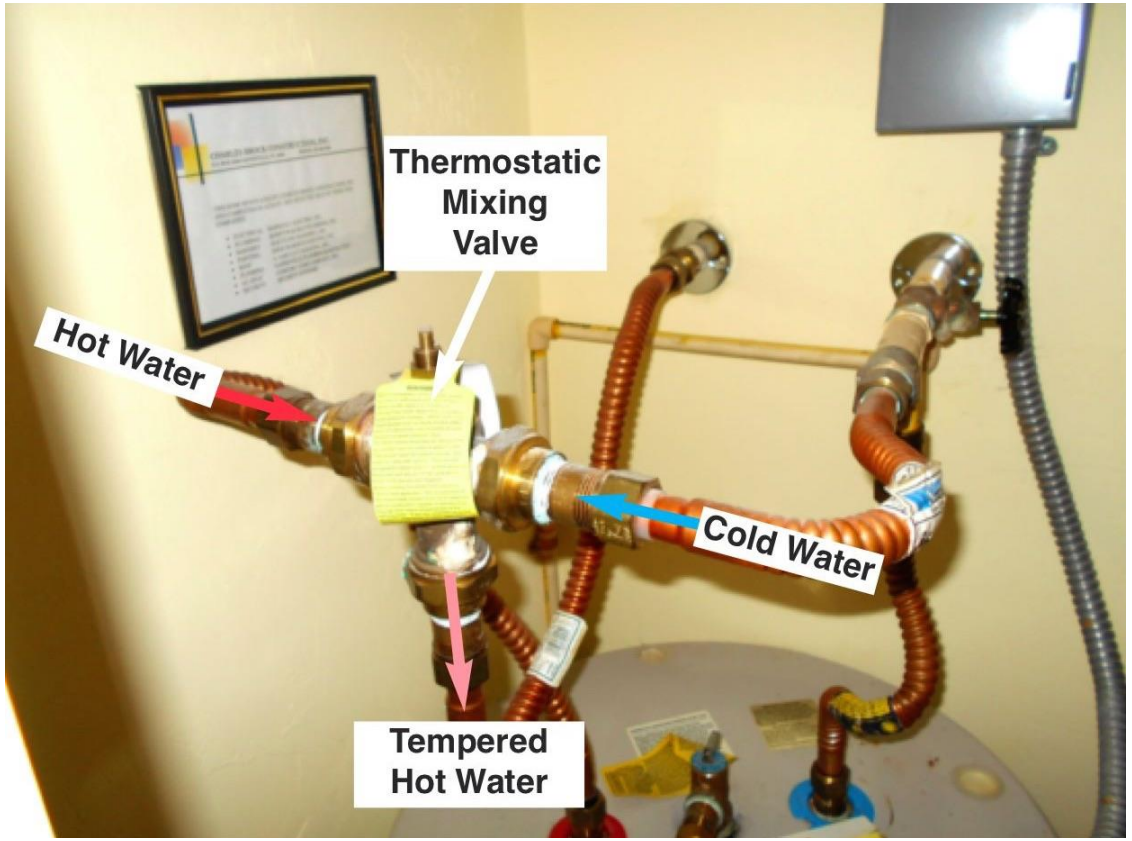
- Models shown in this presentation are representative of the tanks on the market today, focus is on the features and attributes, not a specific model

# Primary Tank Selection Criteria



# Solutions

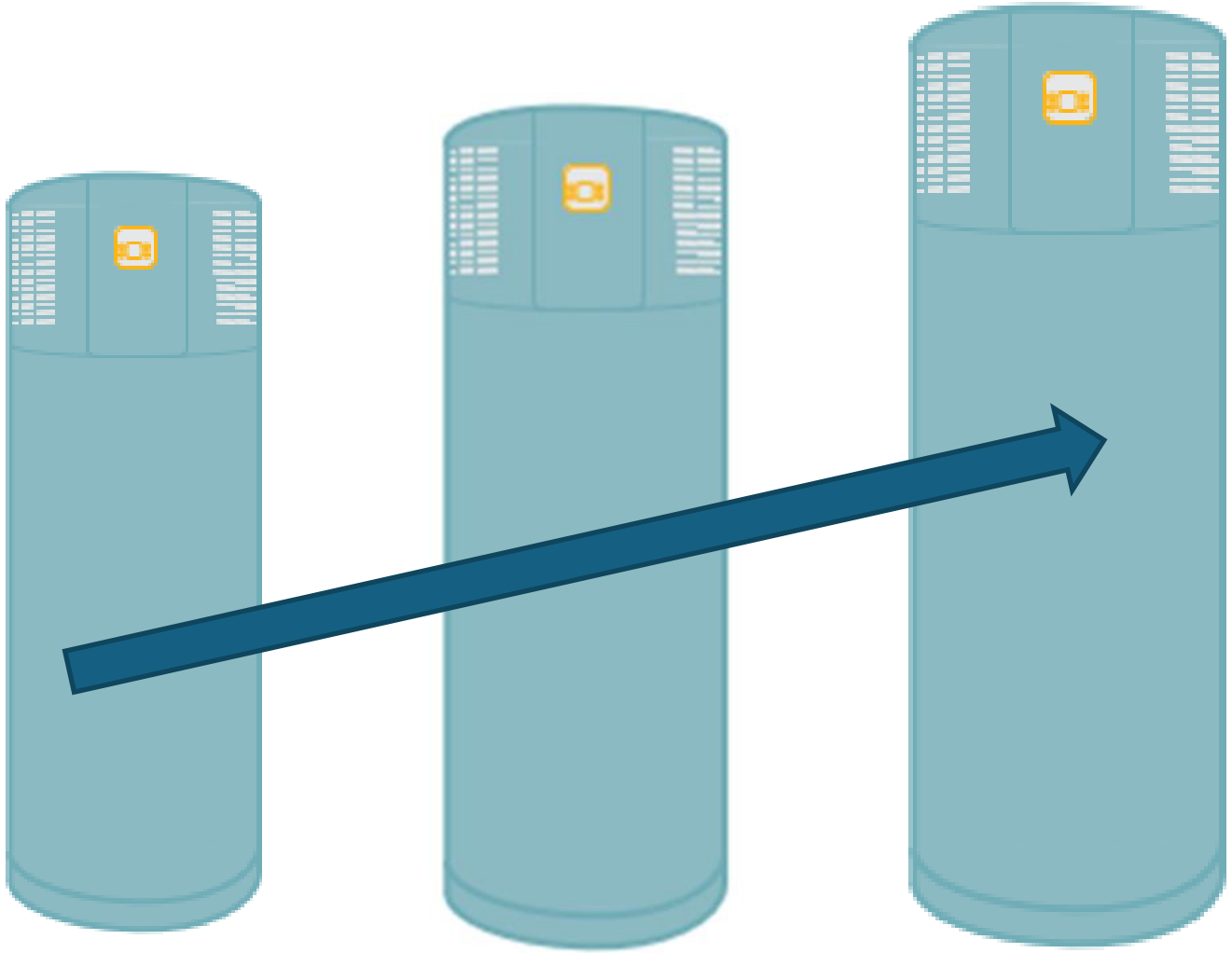
- Increase to upper range for product and then temper down




*https://www.howtolookatahouse.com*

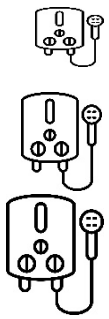
# Solutions

- Don’t be afraid to install larger tanks



# General recommendations for success!

*Rough sizing guestimator*



| Tank Size (gallons) | # or Occupants |
|---|---|
| 50 | 2-3 |
| 65/66 | 2-4 |
| 80 | 3-6 |

*Consider going up a size when…*

- Going from gas storage unit to a HPWH
- House includes children or teenagers
- Occupancy likely to change within 5 years

*Setting expectations through estimations*

| | HPWH | Gas tank | ER tank |
|---|---|---|---|
| **Showers** - # consecutive showers delivered | 2.75 – 3.25 | 3.5 | 3.25 |
| **Efficiency (UEF)** – The higher the better! | 2.9+ | 0.61 – 0.70 | 0.92 – 0.95 |
| **First Hour Rating** - # of gallons hot water delivered in first hour | 66 | 68 | 65 |
| **Recovery Rate** – Gallons a heater can raise by 90ºF in one hour | 29 | 40 | 22 |
| **Average Warranty** in Years | 10-12 | 6-10 | 6-10 |

# Clearance Requirements

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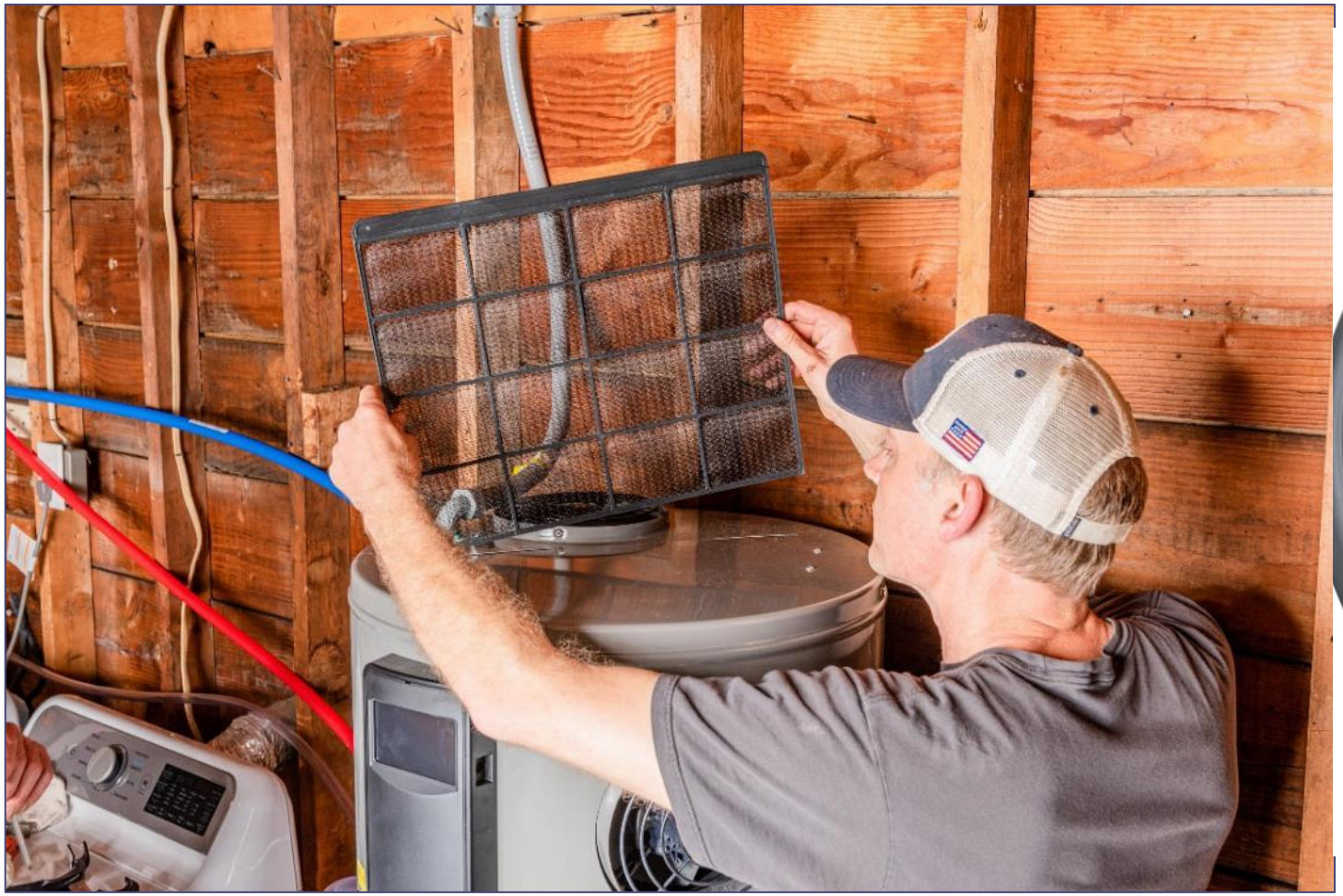
Make sure there is adequate room to remove and clean filter (recommended 6-inch clearance).

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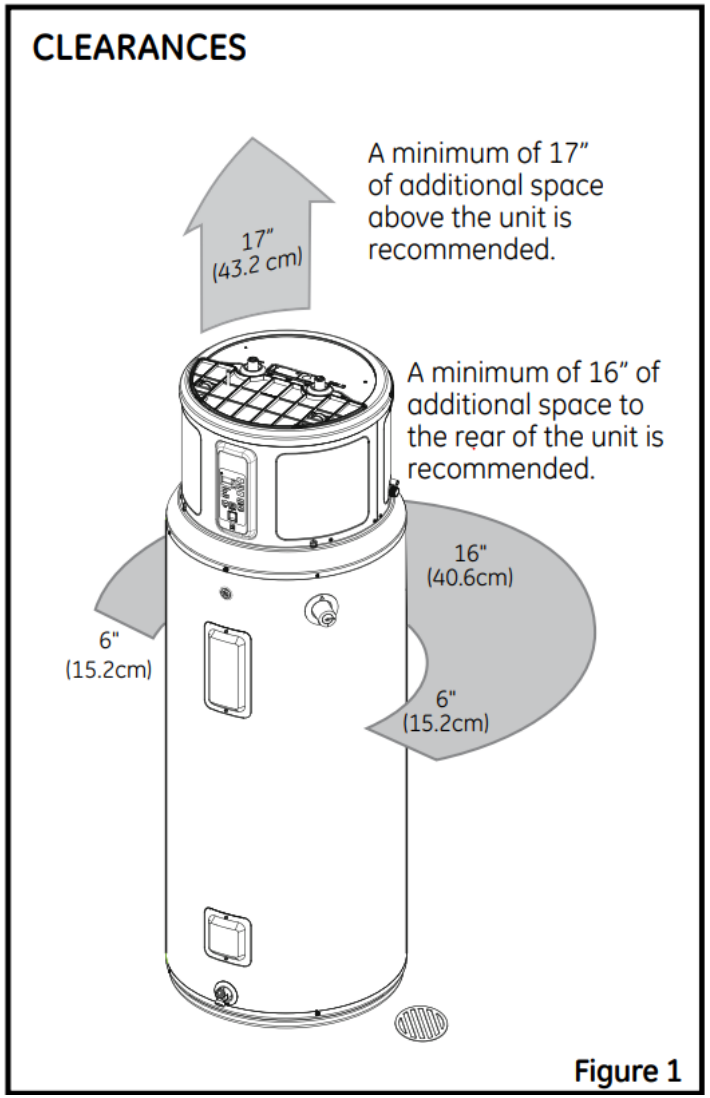
# Ducting: Additional Clearance

If ducting is required, allow extra space for duct adapters and any duct work.



# Space Requirements & Solutions Summary

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- 6-inch clearance on top of HPWH needed for filter cleaning.
- No clearance from wall required.
- ~450 to 700 $ft^3$ of space required for efficient functionality.
- Louvers and venting can be used to overcome space requirements.
- Keep venting simple (inside to inside is best).
  - Use tension ties.
  - Cover all exposed metal parts on exhaust ducting.
  - Do the math.
- Determine if any extra venting parts are required.
  - Parts may need to be ordered separately.
- Don’t exhaust air directly against solid surfaces or where people spend a lot of time.

# Condensate Drainage Options

**Condensate Drainage locations:**

- Floor drains
- Sink drains
- Outside
- Laundry tubs
- Washing machine vent

- **Tank must be level for drain pan to drain properly.**

**Can you spot what is wrong with this install?**

# Condensate: “T” the Condensate Line

**A “T” connector allows for easy cleanout of the condensate line — a code requirement.**

# A. O. Smith Condensate Detail

HOT WATER SOLUTIONS

- A. O. Smith has a barbed fitting to final hose drainage system.
- This was in response to people overtightening the PVC condensate line and cracking the drain pan.

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# Condensate Drainage

Consider where condensate will flow - **do *not* run condensate drainage:**

- On sidewalks, or any walking surfaces/areas subject to freezing temperatures
- Directly into sewer line

# Condensate Quantity + Pumps

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- Amount of condensate produced depends on the amount of moisture in the air.
- Average production of about 2 quarts per day.
- An existing AC condensate pump can handle extra load.
- A 2-gallon per minute pump is sufficient.
- If installed in basement, double the available lift.
- Don’t terminate to walkways, driveways, or against foundation

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# Condensate Management Summary

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- Condensate *only* produced when compressor is running.
- Condensate is *not* acidic.
- A. O. Smith tanks can be wired to condensate pump to protect from failed condensate pump.
- Follow applicable code for condensate line and drainage.
- Installing a “T” connector rather than elbow at the start of the condensate line allows the line to be cleared of blockages and maintained.

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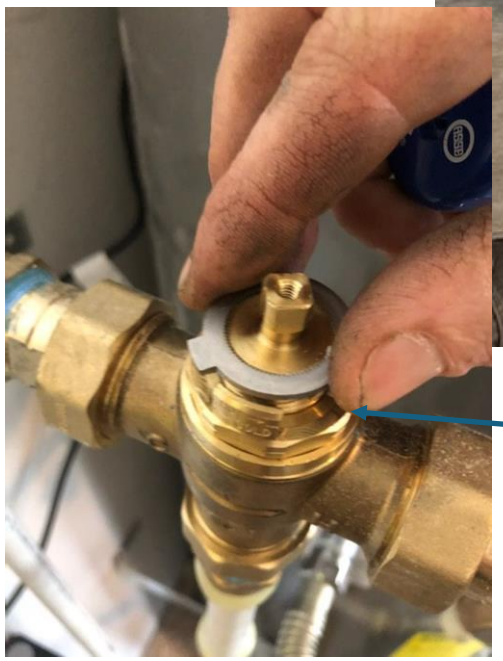
# Tempering Valves

- 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

## 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


# Brand Naming Convention

Different operational modes can be selected via the HPWH control panel, or app with some models. The differences in the naming of the modes, by brand, are outlined below.

| Manufacturer | **Manufacturer Naming Convention** | | | | |
|---|---|---|---|---|---|
| | Allows only the compressor to operate | Allows elements to engage | Allows elements to engage earlier in the cycle | Electric elements only | Vacation |
| **A. O. Smith** | Efficiency | Hybrid | --- | Electric | Vacation |
| **Rheem** | Heat pump | Energy Saver | High Demand | Electric | Vacation |
| **Bradford White** | Heat pump | Hybrid | --- | Electric | Vacation |

# Operational Modes

In **Efficiency Mode** (A. O. Smith) and **Heat Pump Mode** (Bradford White and Rheem) the heat pump handles all of the water heating to maximize energy efficiency. Recovery in this mode will take longer but will a use fraction of the energy compared to if the water were to heat using the electric elements only.

If the ambient conditions leave the heat pump’s operating range, the controls will seamlessly disable the heat pump and turn on the backup electric elements to protect the heat pump while still producing hot water. Once the ambient conditions are back in the safe range the controls will resume standard Efficiency Mode operation.

# Operational Modes

In **Hybrid Mode** (A. O. Smith and Bradford White) and **Energy Saver Mode** (Rheem), the primary means of heating is the heat pump which *moves heat* instead of creating heat. The heat pump (compressor) draws between 300-500 watts of power, depending on manufacturer, and can heat the tank up to 120° to 140°, dependent on manufacturer, just like standard electric water heaters.

Should the heat pump need help, as a result of nearly draining the tank with long showers for example, one of the backup heating elements will turn on for faster reheating of the tank.

Hybrid Mode/Energy Saver Mode is the default and recommended mode. It prioritizes the use of the compressor over the heating element and allows for faster recovery time than Efficiency Mode/Heat Pump Only Mode

# Operational Modes

The **Electric Mode** operates the same as any standard electric tank and uses only the heating elements without help of the heat pump. This is the least efficient operating mode.

This mode is intended for temporary use only and by default the water heater will automatically revert to Hybrid Mode or Energy Saver Mode operation after 48 hours in Electric Mode to ensure high efficiency heat pump operation.

# Operational Modes

**Vacation Mode** is used when you will be away from the home for an extended period and hot water is not needed. In this mode, the unit will drop the water temperature, which varies by brand, and will use the most efficient heating mode to conserve energy while the heater is sitting idle.

You can choose a duration, dependent on manufacturer, after which the water heater will resume normal operation. This allows the homeowner to save energy while they are away but come home to a full tank of hot water.

# Bradford White Control Panel

**Display:** Displays the current temperature or the number of days for vacation mode.

**Heat Pump (only):** Utilizes heat pump only.

**Hybrid:** Utilizes heat pump and can switch to electric heating element as needed.

**Electric (only):** Utilizes electric elements only, Stops the fan, the heat pump and the flow of cool air.

**Vacation:** Use this mode for periods away from home.

**Mode:** Press this button to toggle through the modes.


**Arrow Pad**: Moves the arrows to manually change the water temperature or to select days for Vacation Mode.

**Enter:** Press to confirm selections.

**Filter:** The red LED indicates that filter needs cleaning. Press and hold to reset.

# Bradford White Common Error Codes

| Fault Code | Condition | Check |
|---|---|---|
| F3 | Compressor failure | Use Service Mode to manually cycle compressor on/off. |
| F9 | Lower heating element failure | Check element and wiring connections. Use service mode to cycle element and check current draw. |
| F10 | Upper heating element failure | Check element and wiring conditions. Use Service Mode to cycle element and check current draw. |
| F14 | Dirty filter LED is on and alarm will sound | Clean filter. |
| F20 | Condensate drain pan blocked. Tank will operate in Electric Only Mode | Check main drain. Check sensor is in correct position. Check level of tank. |

To access active error codes, put system in **hybrid** mode and select enter – if there is a current error code, it will be displayed.
If you want to access error code history, select the **filter** mode.

# Anti-Leak Technology

HOT WATER SOLUTIONS

- Detects any water leak – large or small, internal or external.
- Integrated leak detection cable port to the right of the lower cavity cover.
- Keep sensor dry or unit will not turn on.

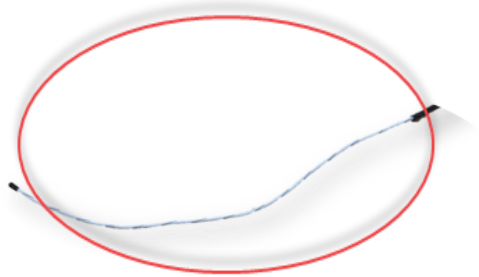
*Integrated leak detection available on Voltex AL with Anti-Leak Technology models only

neea

# LeakGuard

HOT WATER SOLUTIONS

- Detects any water leak – large or small, internal or external.
- Integrated leak detection cable behind lower cavity cover.
- Absorbent leak detection wick around base of unit provides 360° protection.
- Either built into the bottom of the tank or installed as a separate sensor.
- Keep sensor dry or unit will not turn on.

*Integrated leak detection available on Proterra with LeakGuard models only

neea

# Hot Water Without The Wait

- Hot water recirculation systems offer the homeowner a desirable amenity  that if designed correctly can save water and energy

# Control the Recirculation Pump: It must be On-Demand

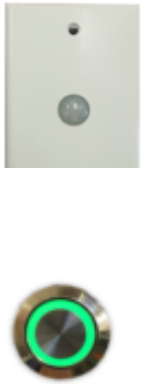
HOT WATER SOLUTIONS


ACT D'Mand Recirculation Pump


Auto Hot Recirculation Pump

Bluetooth Actuators

Hard Wired Actuators





- Available for retrofits
- Push Button or motion sensor
- Bluetooth actuators that provide feedback when the pump is activated

# Hot Water Recirculation Systems and HPWHS. Can they play well together?

**Technical Service Department**
Technical Service Bulletin
1-800-432-8373
**HeatPump Water Heater w/ Recirculation**

The Rheem Heat Pump water heater uses proprietary software to ensure the water heater operates at peak efficiency. This water heater uses an algorithm to determine when the unit should begin a heating cycle. A typical heating cycle is caused due to a sudden drop in temperature in the bottom of the tank when hot water is being used since the incoming water temperature is much cooler than the water in the tank. Due to software program on this water heater, considerations must be made when installing a heat pump water heater in conjunction with a home recirculation system as the inlet water temperature may not be cool enough to activate a heating cycle

Due to the wide variety of applications and the variability in installation and performance of these systems, Rheem cannot and does not specifically recommend the Rheem Heat Pump water heater for use with recirculation systems. We can provide the following guidance that you can use to determine if the Rheem Heat Pump water heater will perform in your specific application:

# The Solution: Minimize Run Time with On Demand Controls

The first option: Unplug the pump, Ask the homeowner first!

The Second Option: Install an on-demand controller:

**Not a timer: Results in long run times**

**Not a “smart” controller:  They also result in long run times**

# Proven Savings

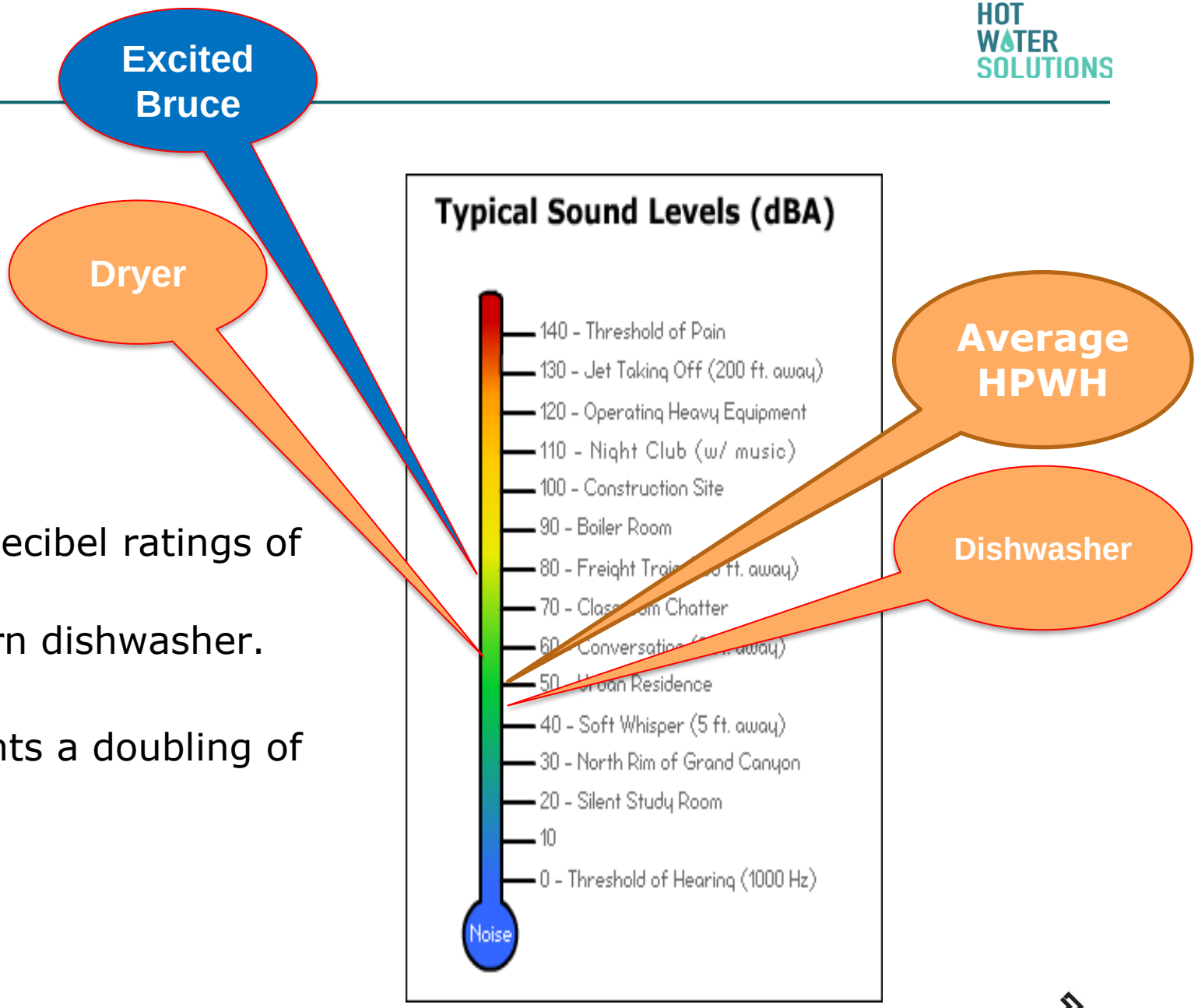
Water Savings from installing a hot water recirculation system have showed savings of 3,000 gallons per year (NRDC; City Of Palo Alto*

* As compared to house with no recirculation system

Energy savings from a well-designed hot water circulation system have proven to save 4,000 kWh or 150 therms per year (NRDC, City of Palo Alto*

* As compared to uncontrolled system with a standard gas or electric tank

# Noise



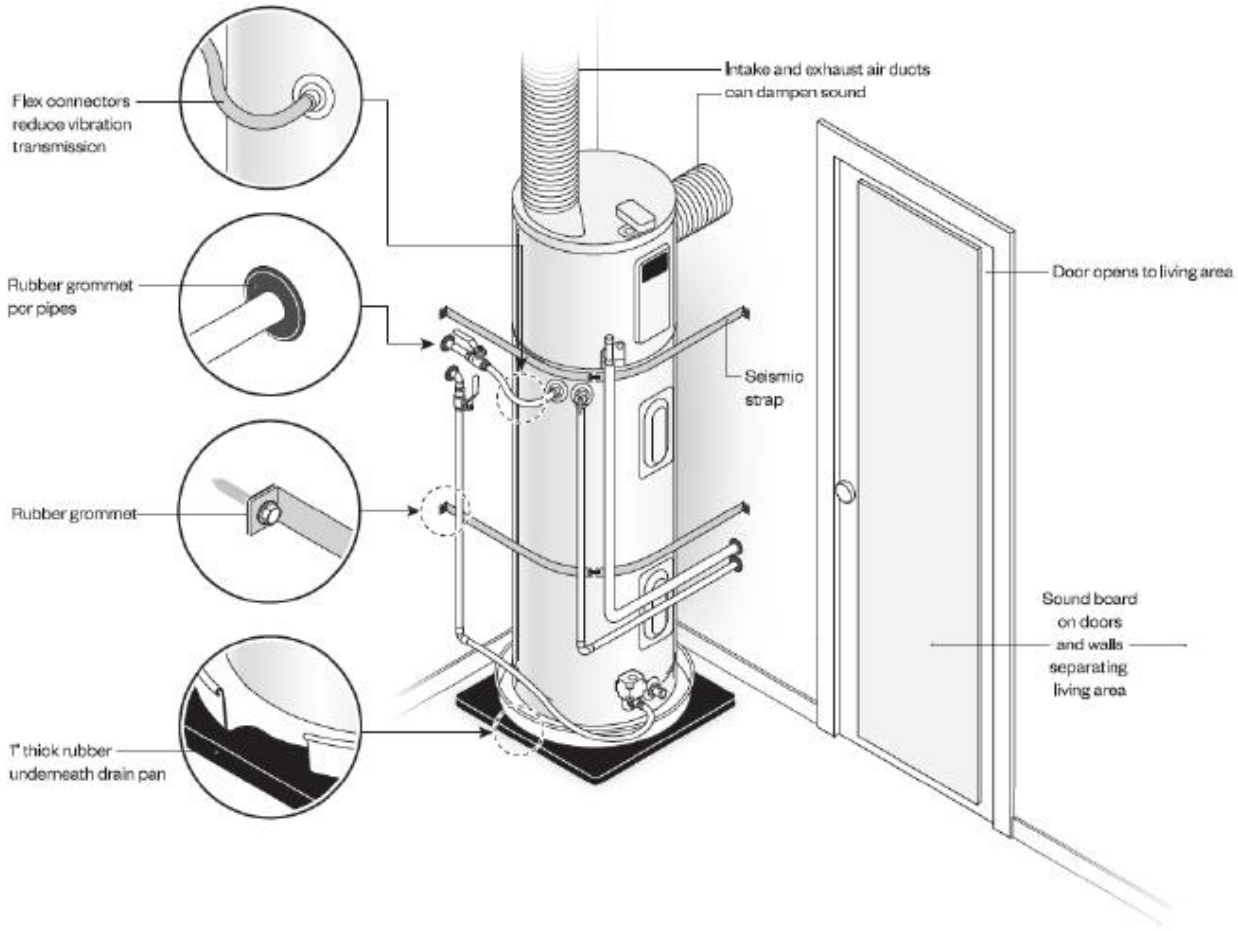

- Heat pump water heaters range in decibel ratings of **45 to 52** decibels.
  - About the same level as a modern dishwasher.
- The decibel scale is logarithmic.
  - A decibel increase of 10 represents a doubling of perceived loudness.

# Noise Mitigation

**Low-Noise Tips for Installation:**

- Educate customers!
- Choose the right location for installation
- Don’t put in high occupancy areas where the noise will become bothersome to the homeowner
- Foam or rubber pad beneath HPWH
- Use sound dampening materials around plumbing penetrations and duct connections
- Insulate any ducting used
- Consider insulating walls when installing in closets

Figure 4: Strategies for Noise Mitigation




Graphic credit: RHA

# Noise Mitigation = Vibration Isolation

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

# Noise Mitigation = Vibration Isolation

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

# Noise Mitigation = Vibration Isolation

Piping insulation installed between a tank and the wall to minimize vibration and noise.

# Are standard 240v HPHWs the only choice?

## Current and New Technologies

SANCO2 HEAT PUMP WITH 43, 83, AND 119 GALLON TANKS

- Standard 240v HPWH
- 120V/15A HPWH
- Cold climate HPWH (Split-Type)

- Electrical Capacity Requirements
  - Standard
    - ✓ 240-Volt, 30-Amp
  - New simplified models
    - ✓ 120-Volt, 15-Amp

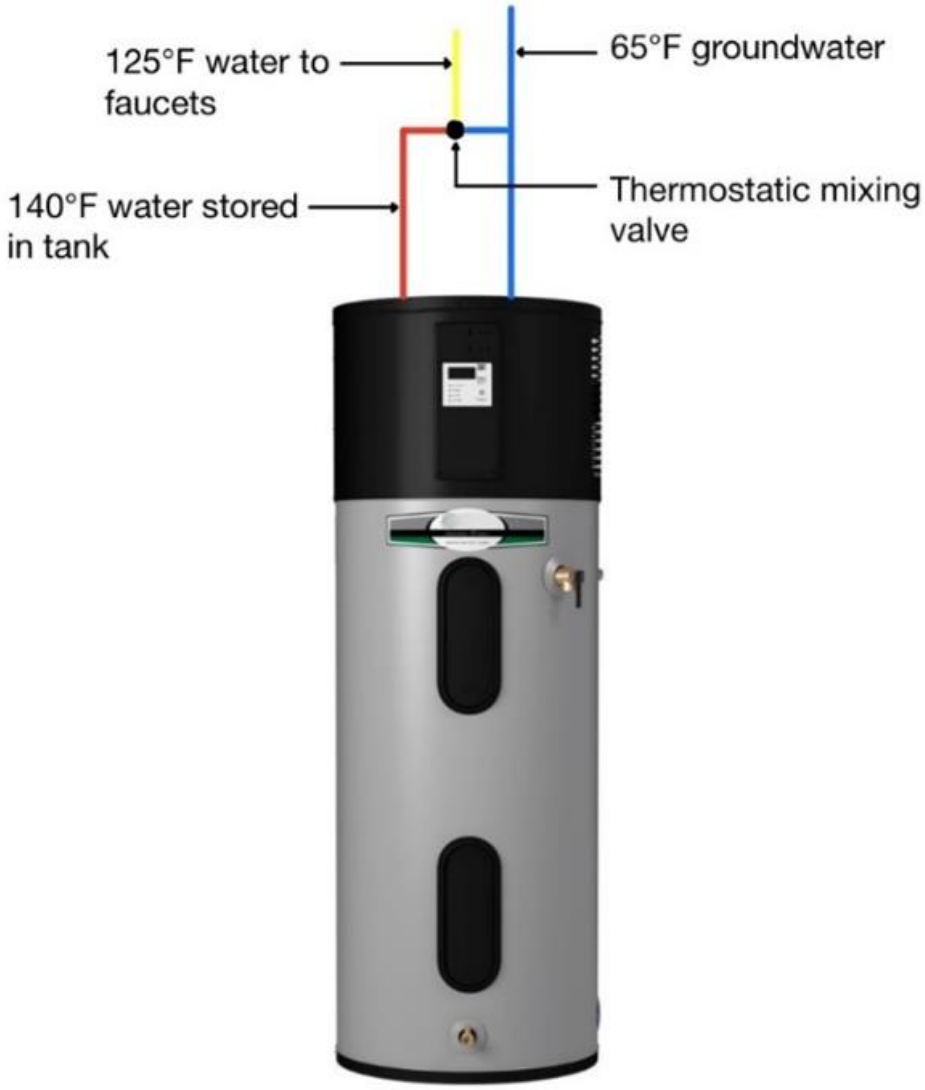
- Cold climate HPWH
  - Extract heat from outside the house
  - Effective down to -25°F (-31°C)

# What is a 120-volt HPWH?

Operates on a **120-volt, 15-amp circuit**

Usually has a **thermostatic mixing valve** (TMV)

Trades power for **increased thermal storage**




Hot water storage tank


Final Report | December 22, 2022

# 120-Volt Heat Pump Water Heaters

Prepared for Focus on Energy

slipstream

# THE BASICS:

**More Stored Energy**

- Larger Tank Size
- Built in Thermal Mixing Valve

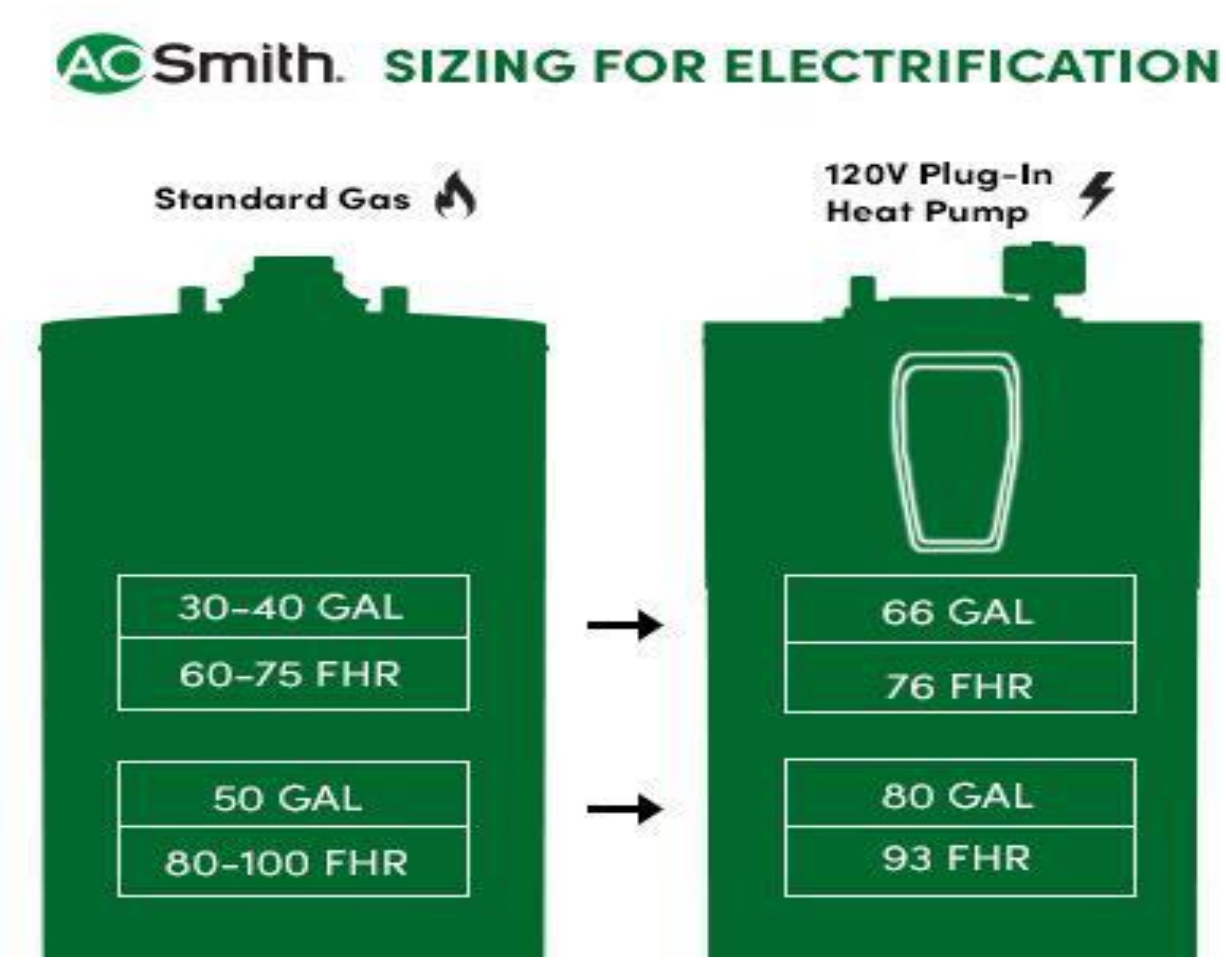
**Bigger Compressor**

- Split System
- Larger compressor on one piece system

**Reduced Hot Water Use**

- Low flow fixtures

# What AO Smith recommends: Going up 2 sizes




When converting from gas to electric

# Rheem: Dedicated and Non dedicated

Rheem

The new degree of comfort.®

PERFORMANCE **PLATINUM™**
**Plug-in Heat Pump with HydroBoost (120V Shared Circuit)**

**Efficiency**
- Up to 3.5 UEF reduces operating cost
- ENERGY STAR® certified
- Title 24 Compliant (JA13 Ready)

**Performance**
- Delivers hot water more efficiently than most standard electric water heaters
- Ambient operating range: 37-145°F is widest in class, offering more days of HP operation annually; designed to meet Northern Climate Spec (NEEA Tier 2)[2]
- Integrated HydroBoost mixing valve maximizes output performance

**Easy Installation**
- Easy access side connections
- Factory installed plug-in power cord – plugs directly into a standard wall outlet
- Easily replaces a standard gas water heater

**Integration**
- Demand Response Ready – Built-in CTA-2045 Port allows easy connection to Utility programs
- LED Screen with built-in water sensor alert with audible alarm[1]
- Integrated EcoNet® WiFi-connected[2] technology and free mobile app gives users control over water heater, allowing for customizable temperature, vacation settings, scheduling, energy savings and system monitoring at home or away.
- LeakGuard™ and LeakSense™ Ready — Easily add leak detection and prevention with leak sensor and shutoff valve upgrade kit

**Operation Modes**
- Heat Pump
- Vacation/Away: 2-28 days (or placed on hold indefinitely)

**Plus...**
- Premium grade anode rod extends the life of the tank
- 3/4" NPT water inlet and outlet; 3/4" condensate drain connections
- Incoloy stainless steel resistor elements
- Easy access, top mounted washable air filter
- 2" Non-CFC foam insulation
- Enhanced flow brass drain valve
- Temperature and pressure relief valve installed
- Design certified to NSF/ANSI 372 (Lead Content)

**Warranty**
- 10-Year limited tank and parts warranty
  See Residential Warranty Certificate for complete information

Units meet or exceed ANSI requirements and have been tested according to D.O.E. procedures. Units meet or exceed the energy efficiency requirements of NAECA, ASHRAE standard 90, ICC Code and all state energy efficiency performance criteria.

[1]Available with select models. [2]WiFi broadband internet connection required.


**Plug-in Heat Pump with HydroBoost (Shared Circuit)**
40, 50, 65 and 80-Gallon Capacities
120 Volt / 1 PH
Electric

LEED Points = 3

**See specifications chart on back.**

Rheem

The new degree of comfort.®

Water | Residential Electric
ProTerra Plug-in Heat Pump
(Dedicated Circuit) Water Heaters

**ProTerra™ Plug-in Heat Pump (Dedicated Circuit) is the most efficient water heater available**

**Efficiency**
- Up to 3.0 UEF reduces operating cost
- ENERGY STAR® rated

**Performance**
- Ambient operating range: 37-140° F is widest in class designed to meet Northern Climate Spec (Tier 2)

**Easy Installation**
- Easy access side connections
- Factory installed plug-in power cord, direct plug-in
- Easily replaces a standard gas water heater

**Integration**
- LED display allows easy control and system monitoring with alerts and audible alarms[1]

EcoNet®

- Integrated EcoNet® WiFi-connected[2] technology and free mobile app gives users control over water heater, allowing for customizable temperature, vacation settings, energy savings and system monitoring at home or away
- LeakGuard™ and LeakSense™ integration ready

**Operation Modes**
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- Vacation/Away: 2-28 days (or placed on hold indefinitely)

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**ProTerra Plug-in Heat Pump (Dedicated Circuit)**
40 and 50 Capacities
120 Volt / 1 PH
Electric

LEED Points = 3

BUILT IN MIXING VALVE

**/ HALF THE VOLTAGE, HALF THE HOT WATER? NOT! /**

# Dedicated circuit model requires a greater volume. It’s a one-ton compressor

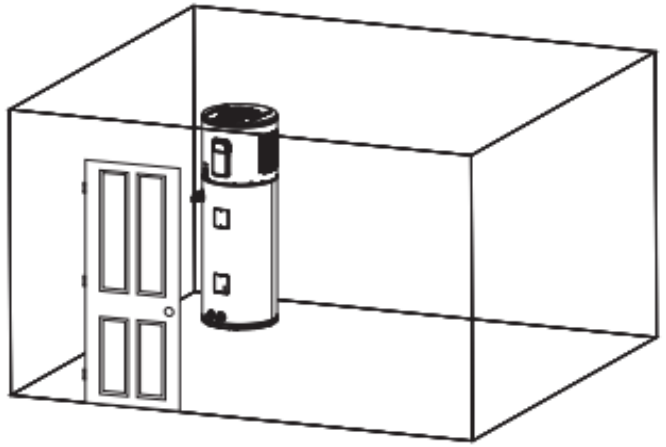
**Plug-in Heat Pump (Dedicated Circuit) Water Heater Installation Guidelines to Provide Optimal Efficiency**

**All volume is cubic feet.**

**Not Ducted**

Room size: Larger than 1200 ft² (e.g. 12' x 10' x 10').

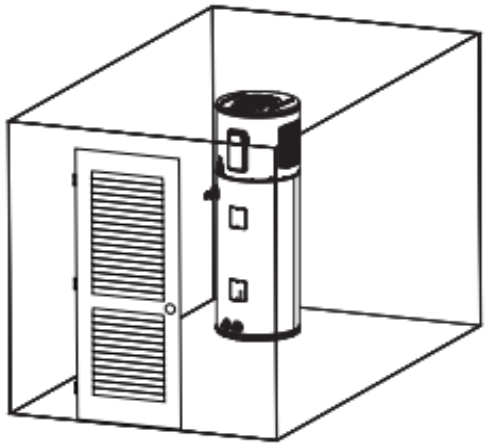
Requirements: No additional ventilation needed.



**Not Ducted**

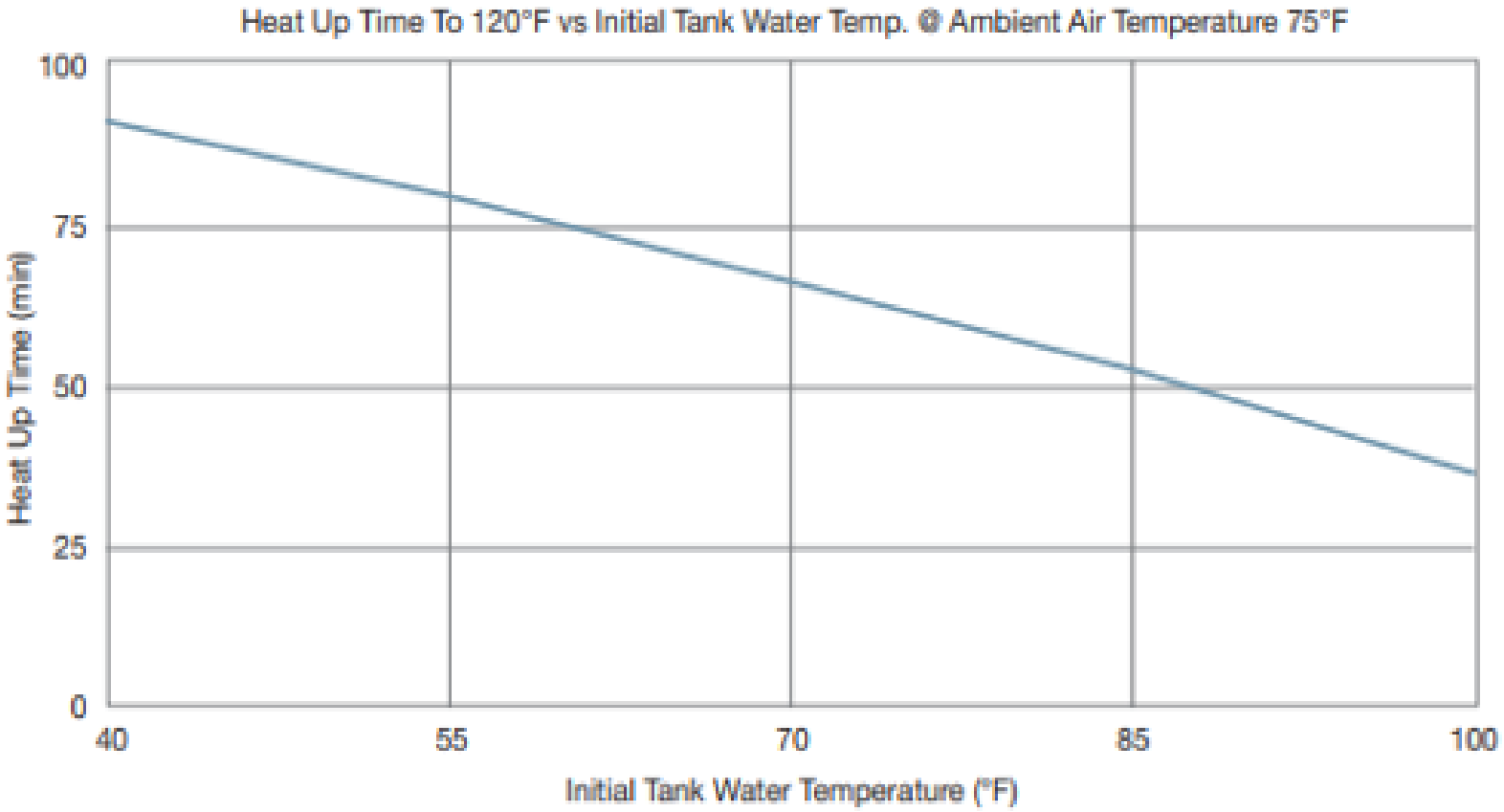
Room size: 400 ft² (e.g. 5' x 8' x 10') to 1200 ft³ (e.g. 12' x 10' x 10').

Requirements: Full louvered door OR two louvers top and bottom. 2.9 ft² minimum louver area.



1,200 cubic foot minimum

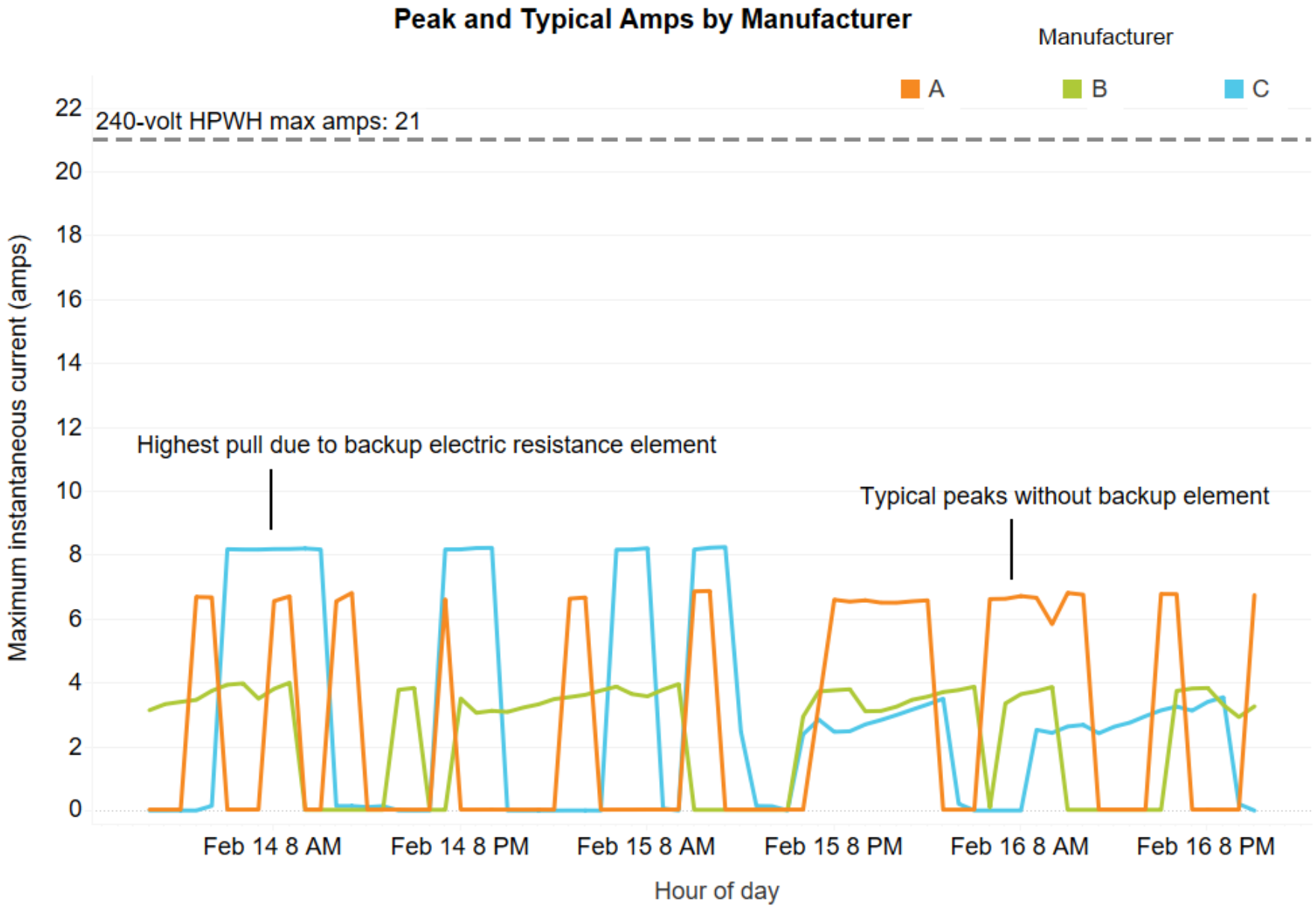
# TIME to temperature: Rheem dedicated circuited



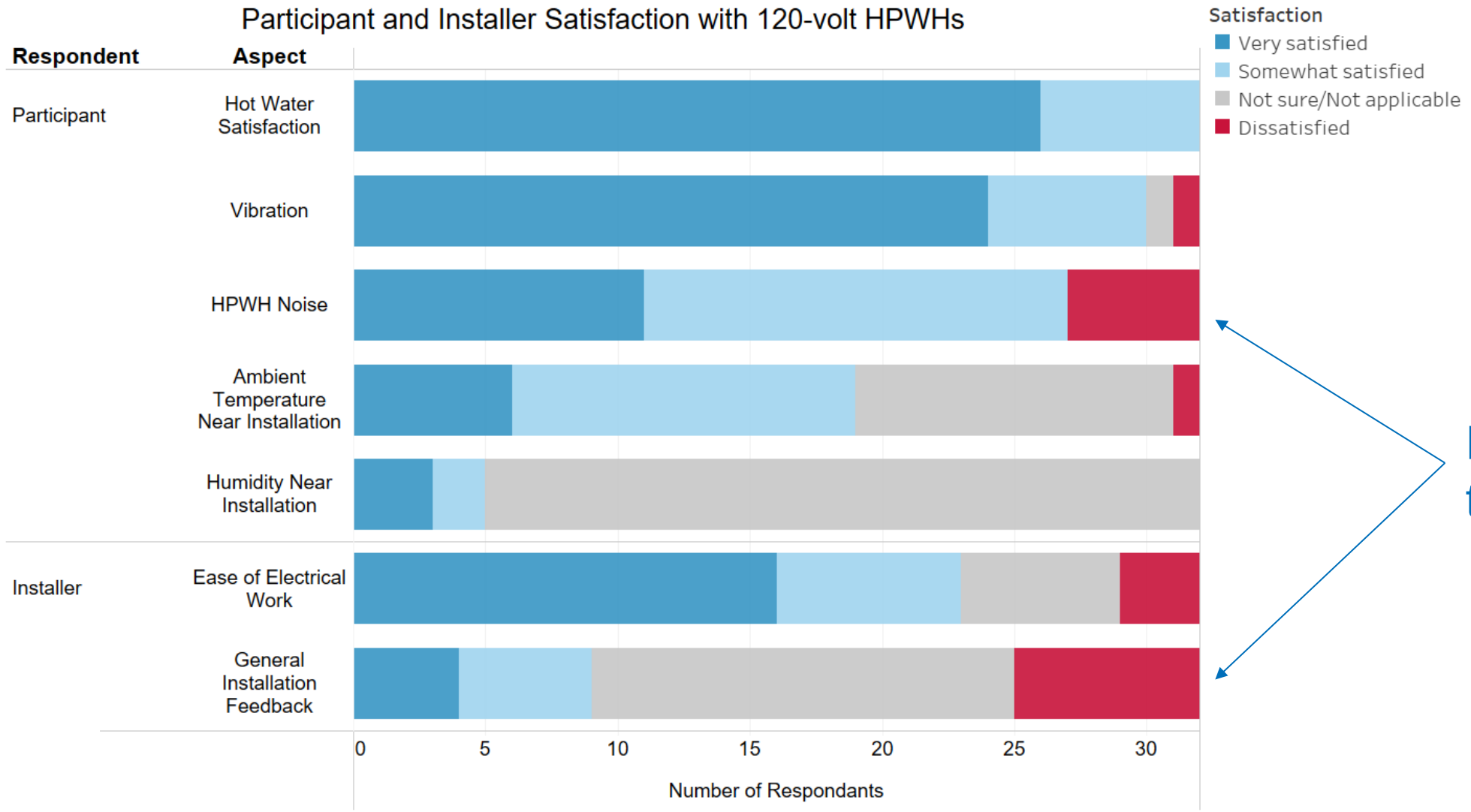

/ HALF THE VOLTAGE, HALF THE HOT WATER? NOT! /

# 120-volt HPWHs are truly low amperage units!

AO Smith Models have 900 watt element

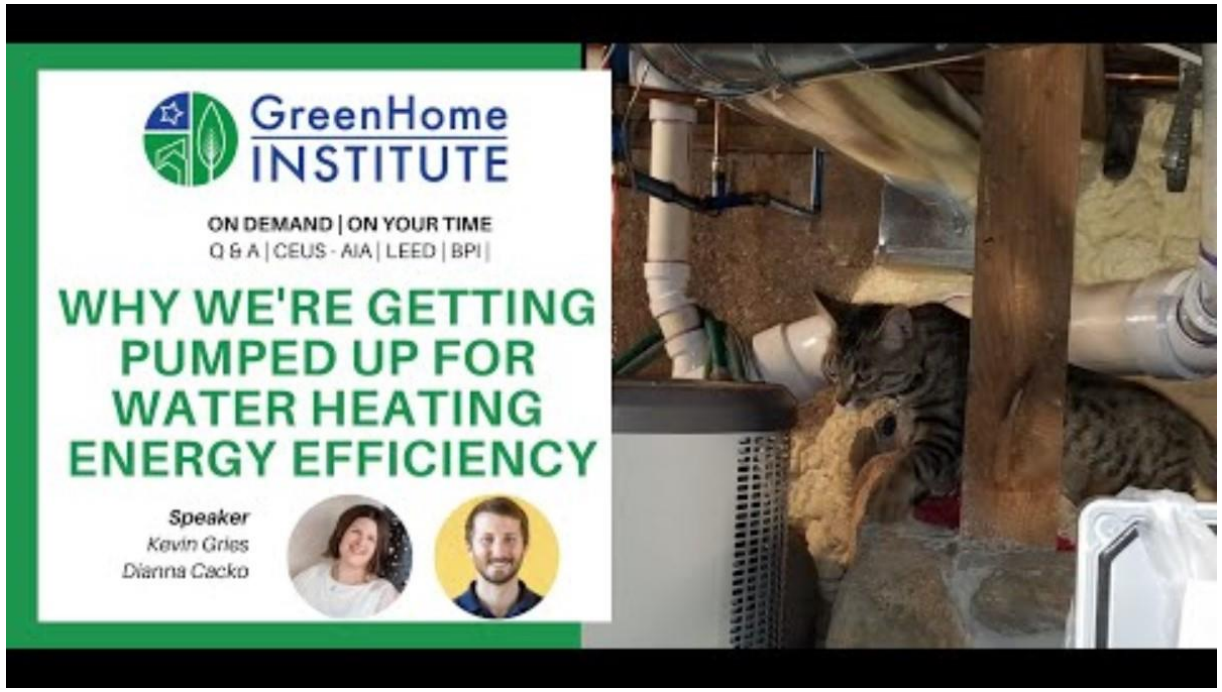


# Participants were happy with HPWH performance




Key barriers to address

# HPWHs in Cold climates study




https://slipstreaminc.org/research/heat-pump-water-heaters-cold-climates

slipstream

**SATISFACTION**

Survey respondents were overwhelmingly satisfied with their heat pump water heaters. Figure 22 shows that almost all respondents reported high satisfaction with their HPWH. These encouraging results suggest that HPWHs are well-received by homeowners in MECA member utilities' service territories.

"Very happy with cost savings and how quiet it is. The rebate was a big plus."
– Cloverland member

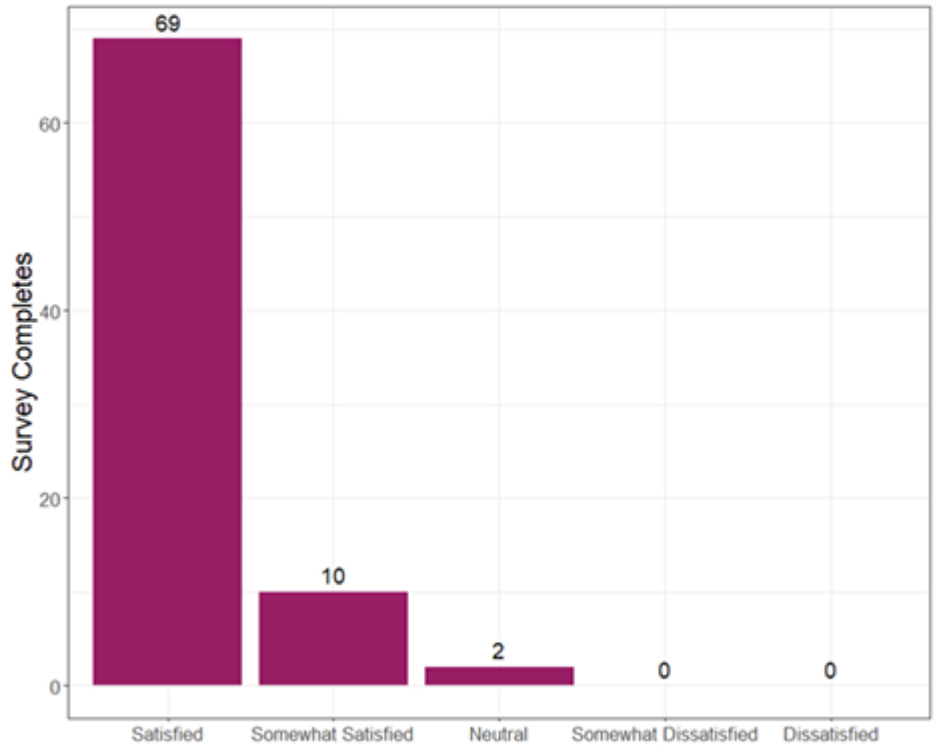



Figure 22. Satisfaction with HPWH

# Answers to the participant survey: participants were satisfied or very satisfied

| Question | Average Score | Notes |
|---|---|---|
| 1: Overall satisfaction | 4.7 out of 5.<br>5 being very satisfied | |
| 2: Satisfaction with water temp | 4.7 out of 5.<br>5 being very satisfied | 7 participants increased temp |
| 3:Supply of hot water | 4.9 out of 5.<br>5 being very satisfied | |
| 4: Do you run out of hot water more or less than pre retrofit? | 1.3 out of 5.<br>1 being the best score | Tank size did increase in two cases |
| 5: How much of an issue is the noise? | 1.5 out of 5.<br>1 being the best score | Most noticed the noise, but not bothered by it |
| 6:How much of an issue is the cold air from the exhaust | 2. out of 5.<br>1 being the best score | All the installs directed exhaust air to usually unoccupied areas |

# And The Answer Is..

Modeling for conditions that approximate DOE test conditions and assuming no electric resistance operation yielded model-specific energy factors of 2.85 to 2.94, lower than manufacturer's rated UEF in each case, a difference we cannot readily explain. Modeling comparison of HPWH models to an electric resistance water heater with an energy factor of 0.95, assuming a relatively cool basement temperature typical of the upper Midwest and 50 gallons per day of hot water use, showed annual energy savings of 2040 to 2,640 kWh, with annual operating cost savings (at a constant rate of $0.125/kWh) of $255 to $330.

# HPWHs and Space Heat Interaction

**1-2.1 degrees** temperature impact during heating months

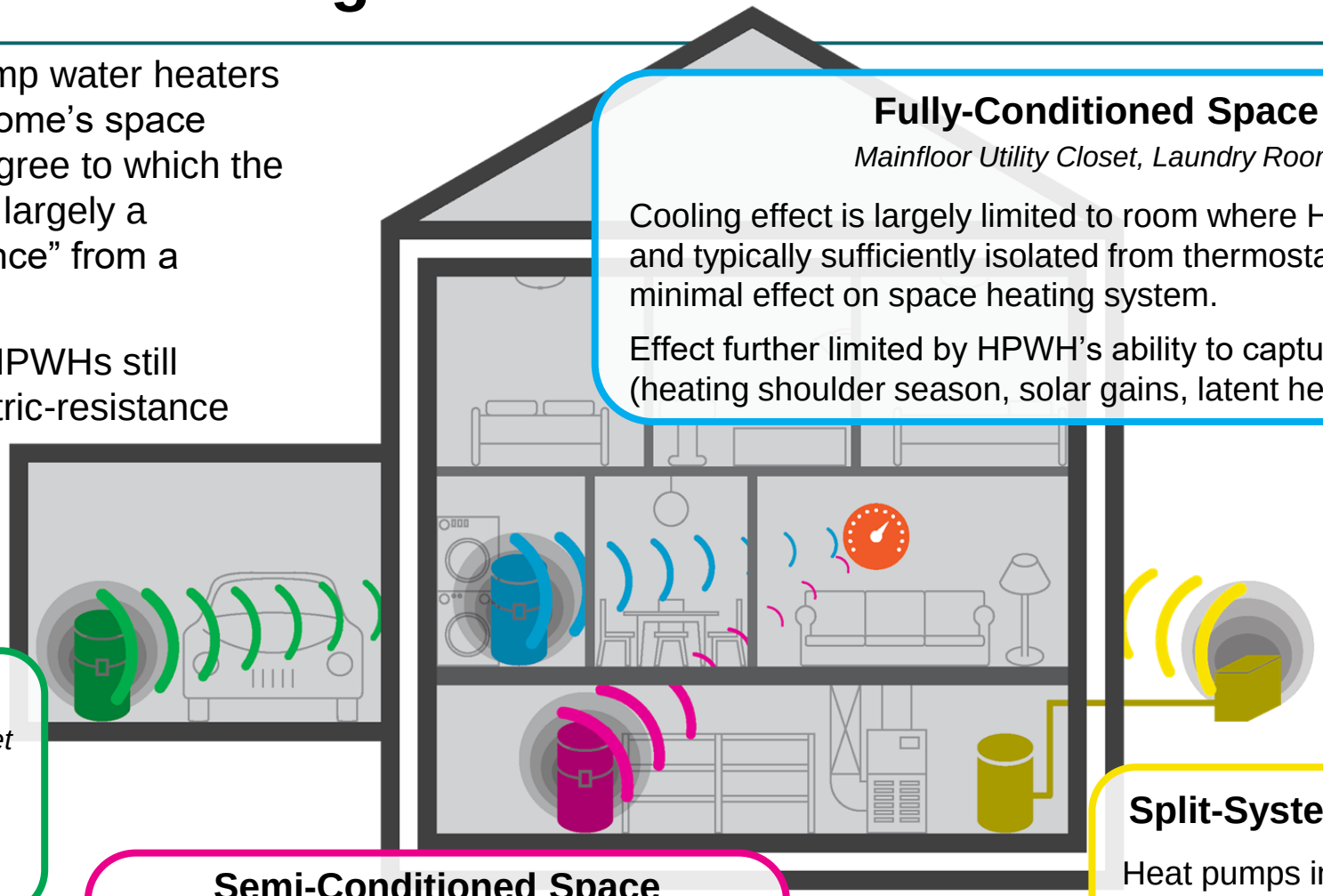
Effects are felt **only when the unit is running**, 3-5 hours/day

Only impacts installs in conditioned space; **not garage or basement**

# HPWH-Space Conditioning Interaction

Research finds that heat pump water heaters add little to no burden to a home's space conditioning system. The degree to which the HPWH affects the system is largely a function of its "thermal distance" from a thermostat.

In any installation location, HPWHs still significantly outperform electric-resistance water heating efficiencies.



### Fully-Conditioned Space

*Mainfloor Utility Closet, Laundry Room*

Cooling effect is largely limited to room 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).

### Non-Conditioned Space

*Garage, Attic, Exterior Storage Closet*

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

### Semi-Conditioned Space

*Basement*

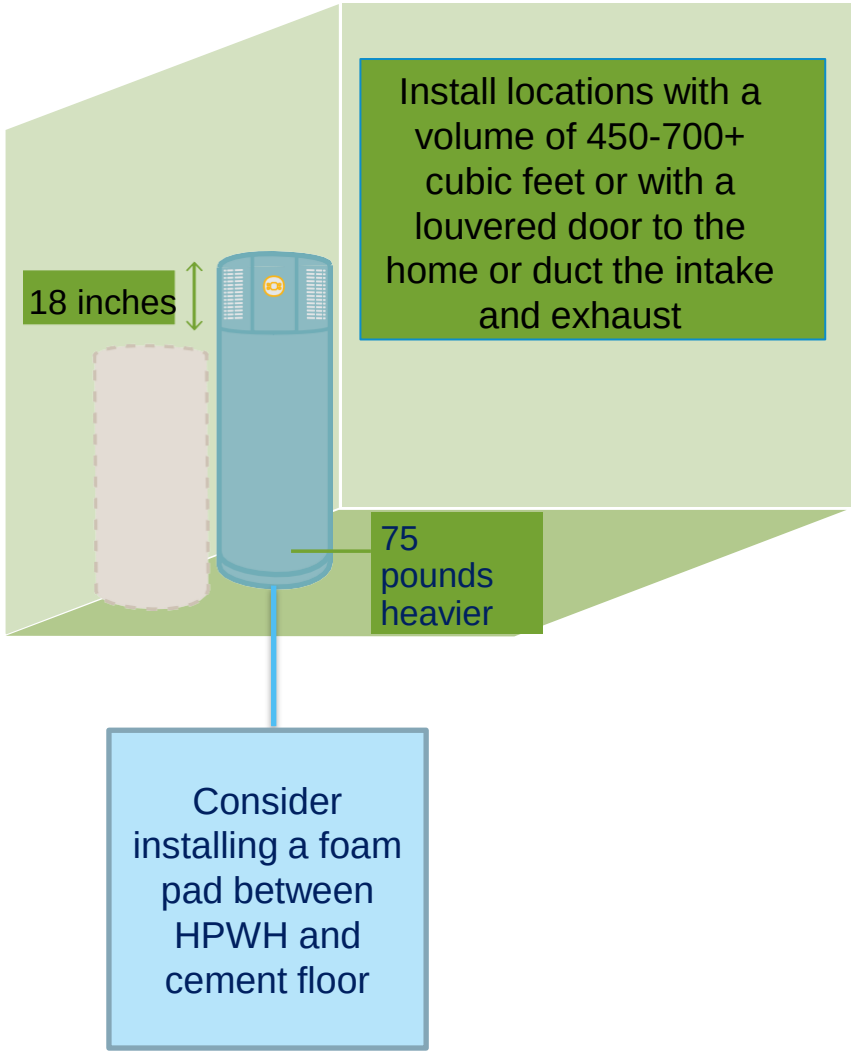
In spaces within insulated building envelope but not actively heated, feedback to space heating system is limited even further than in fully conditioned spaces.

### Split-System HPWH

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

# General recommendations for success!

*Location, location, location…*




*A la modes…*

**Hybrid or Energy-Saver mode:** This is typically the best combination of efficiency and performance. The heat pump does most of the heating with small boosts from resistance elements when needed.

**Heat Pump or Efficiency mode:** For homes with two people or fewer, or less than average water use. This mode relies solely on the heat pump.

# Heat Pump Water Heaters in Small Spaces

Larson Energy Research

Funded by

Larson Energy Research

www.larsonenergyresearch.com

ben@larsonenergyresearch.com
206-552-9725

Funded by

neea

*Numbers included in presentation based on 2022 laboratory research conducted by Larson Energy Research and Cascade Engineering Services.*

*Report to be published on neea.org in September.*

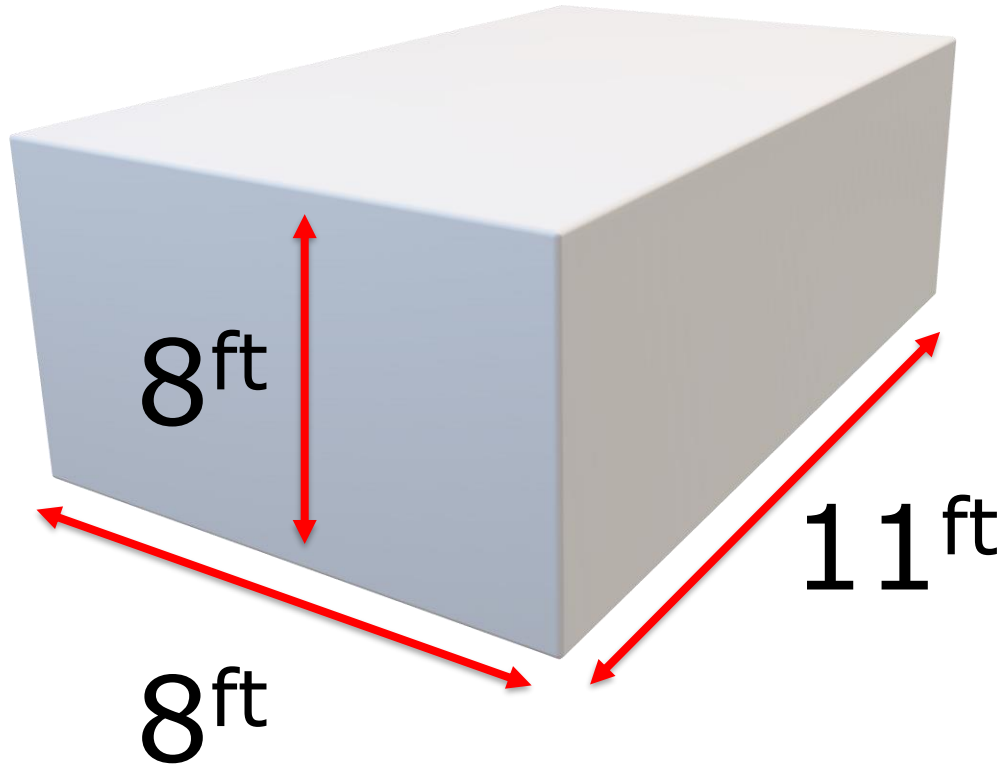
*Recording of results presentation available at:*
*https://attendee.gotowebinar.com/recording/6111602821382383631*

# Average 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. If it is, you must follow duct length rules.

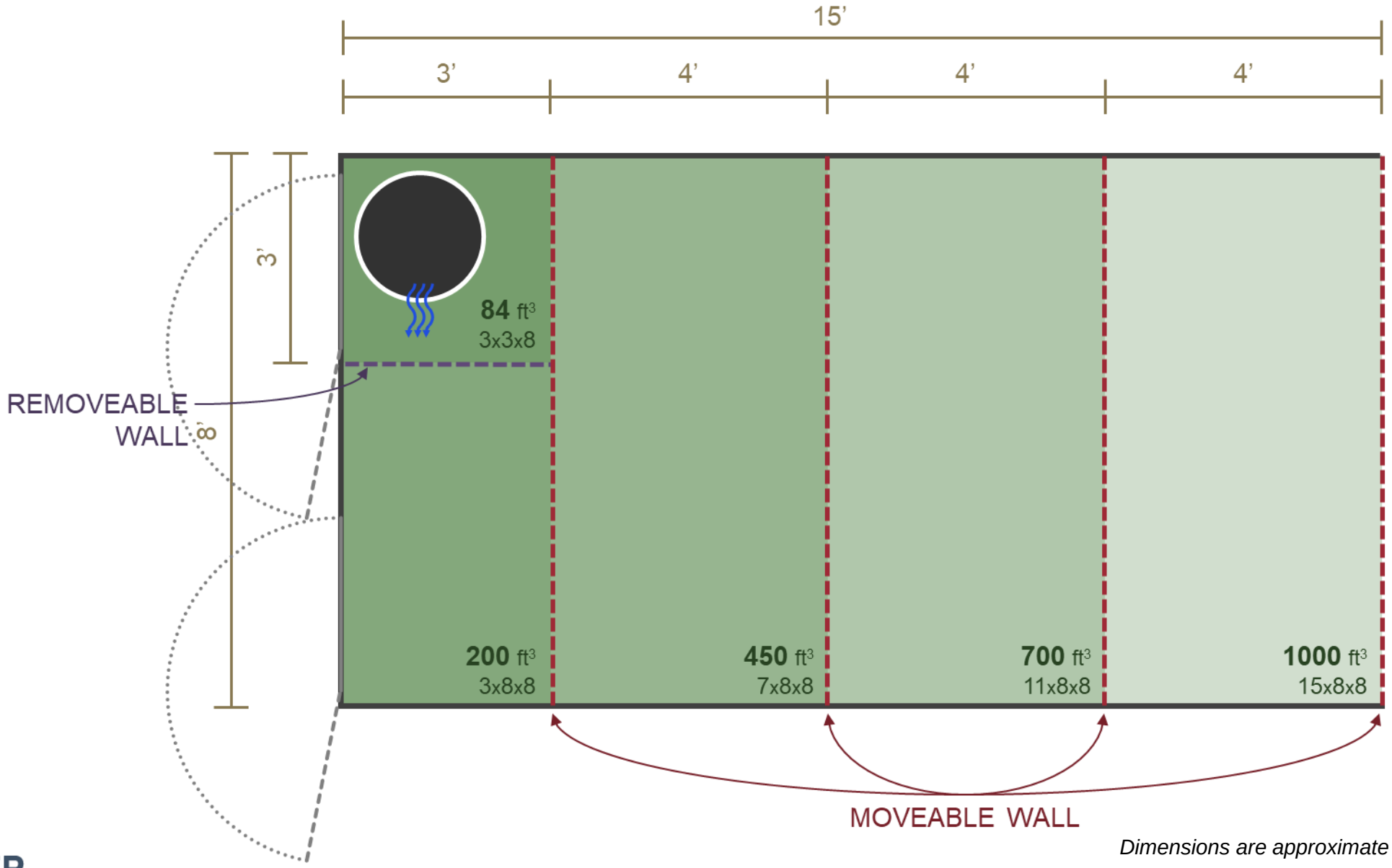
**Example 8 x 8 x 11=704 cubic feet**




neea

# Amazing Shrinking Room

# Amazing Shrinking Room




*Dimensions are approximate*

# Baseline Tests

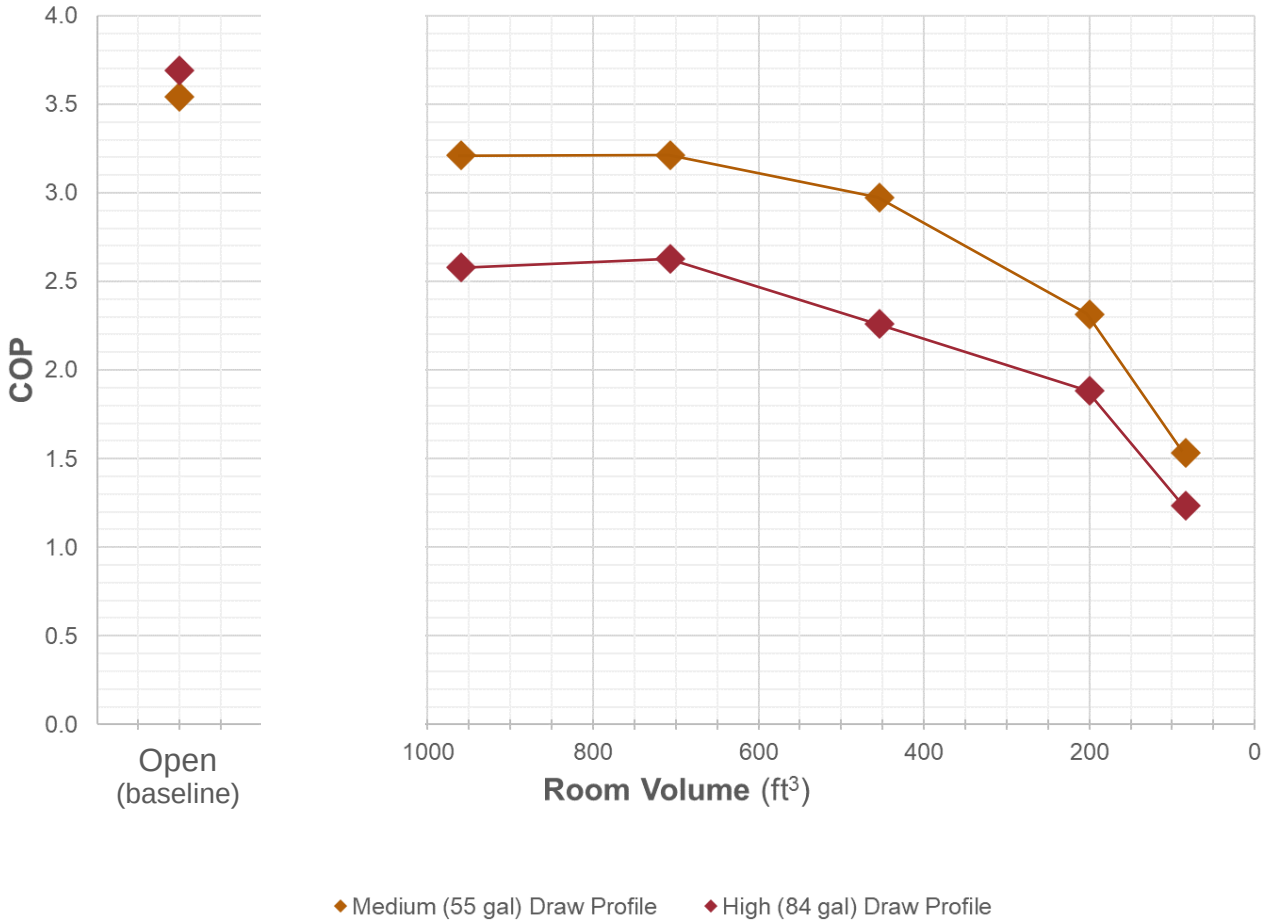
**Interior, 1000 ft$^3$ size**

**Interior, 72 ft$^3$ size**


**Exterior**

# Amazing Shrinking Room


# As installation room volume decreases, so too does efficiency.




Even with install spaces of 450 $ft^3$, HPWHs are likely to use less than a third the energy of an ER water heater.

Lifetime cost benefit of HPWH over other technologies depends on many factors. Installation site conditions – including room size – are the most significant, controllable variables.

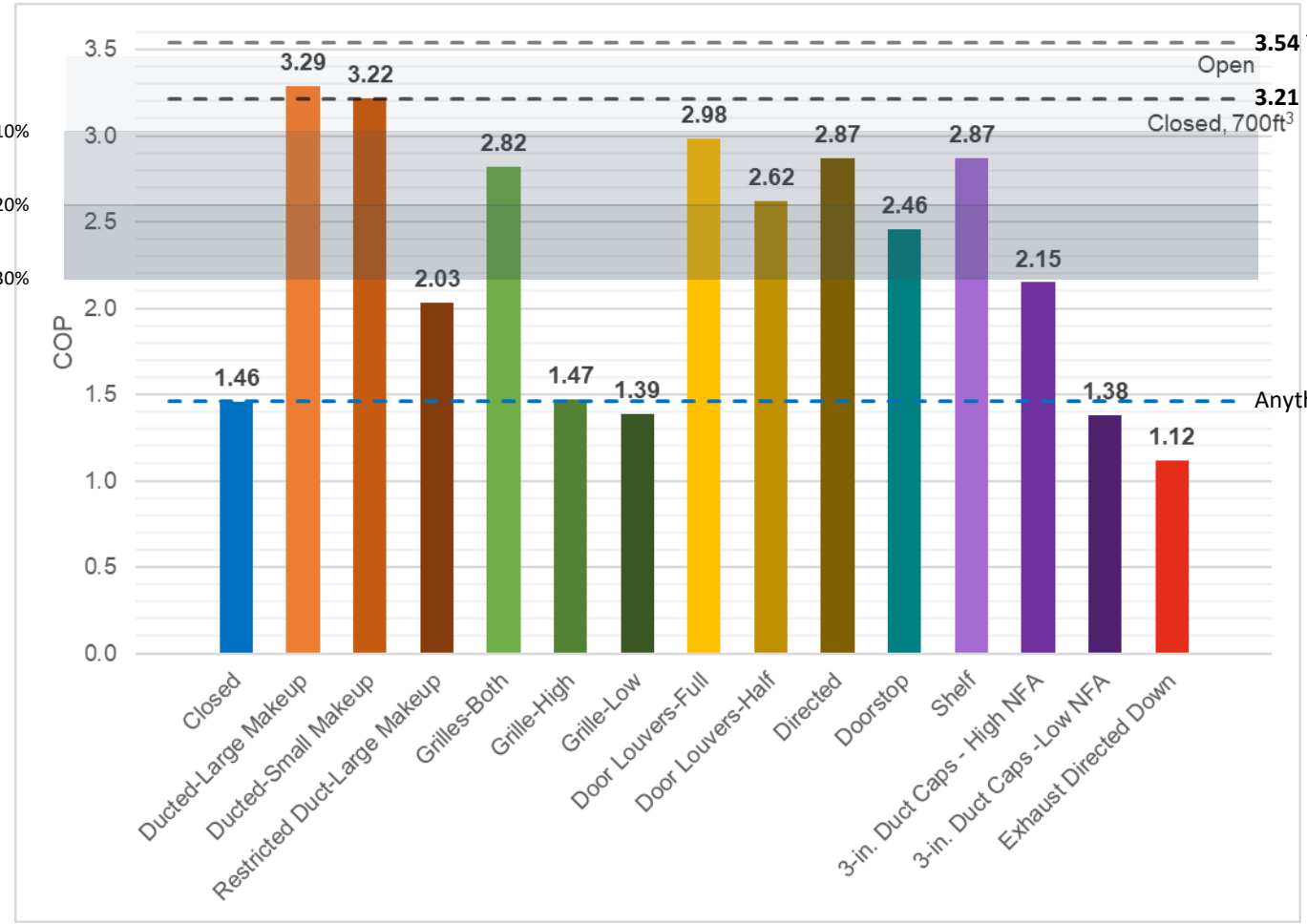
# Volumetric Constraint Testing

| Room Volume Testing | High Draw Profile | | | | | | Medium Draw Profile | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Open | 1000 | 700 | 450 | 200 | 72 | Open | 1000 | 700 | 450 | 200 | 72 |
| **COP** | **3.69** | **2.58** | **2.63** | **2.26** | **1.88** | **1.24** | **3.54** | **3.21** | **3.21** | **2.96** | **2.32** | **1.46** |
| **Total energy used (kWh)** | **3.60** | **5.34** | **5.07** | **5.85** | **6.87** | **10.83** | **2.41** | **2.65** | **2.66** | **2.92** | **3.70** | **5.57** |
| ...by ER (kWh) | 0.00 | 1.52 | 1.46 | 2.60 | 4.23 | 9.43 | 0.00 | 0.00 | 0.00 | 0.00 | 1.25 | 3.79 |
| ...by HP (kWh) | 3.60 | 3.82 | 3.61 | 3.25 | 2.64 | 1.40 | 2.41 | 2.65 | 2.66 | 2.92 | 2.45 | 1.77 |
| **Total minutes of recovery** | **599** | **657** | **637** | **620** | **598** | **497** | **396** | **450** | **452** | **509** | **468** | **433** |
| ER operating minutes | 0 | 28 | 27 | 48 | 78 | 174 | 0 | 0 | 0 | 0 | 23 | 70 |
| HP operating minutes | 599 | 656 | 634 | 600 | 537 | 344 | 396 | 450 | 452 | 509 | 445 | 366 |
| Intake temp, avg (F) | 65.9 | 53.9 | 53.3 | 51.3 | 46.0 | 43.4 | 66.4 | 54.8 | 53.9 | 48.1 | 47.0 | 40.8 |
| Exhaust temp, avg (F) | 50.8 | 41.3 | 41.3 | 39.7 | 35.7 | 36.9 | 51.3 | 42.0 | 41.8 | 36.9 | 36.8 | 33.9 |

[1] Larson Energy Research, "HPWH Performance in Small Spaces *Lab Testing Update*"

# Amelioration Method Assessment

## COP measured, with 72 ft³ space and medium draw profile

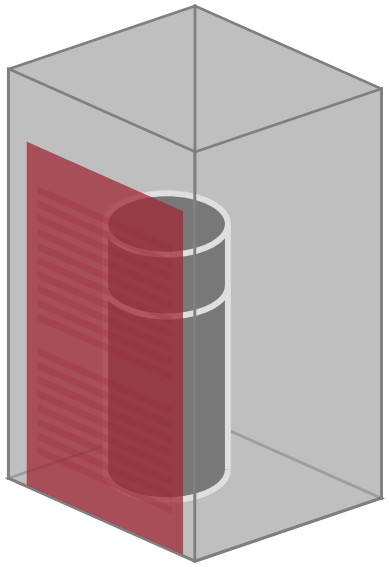



**3.54** Tested upper limit in open space

**3.21** Implied acceptable COP by manufacturer install requirements

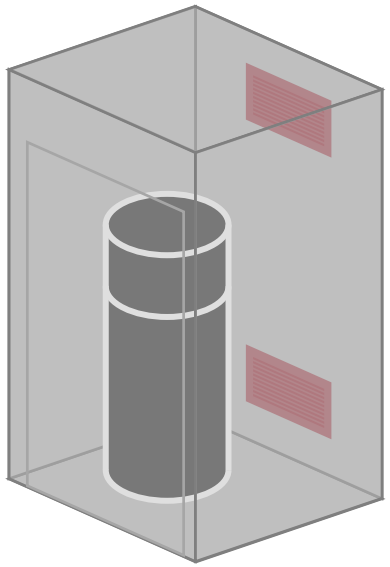
Anything below this line is worse than doing nothing.

# When the only available installation location is a small space, steps can be taken to increase available thermal resource.



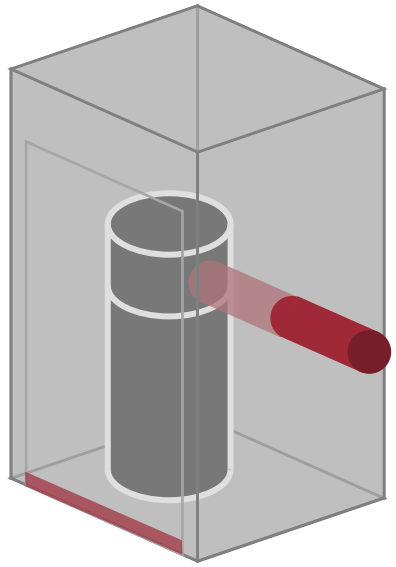
Louvered Door

**COP 3.1**



Wall Grilles

**COP 3.2**



Ducting

**COP 3.3**

Methods of improving make-up air availability differ in both effectiveness and cost.

Best solution dependent on site factors.

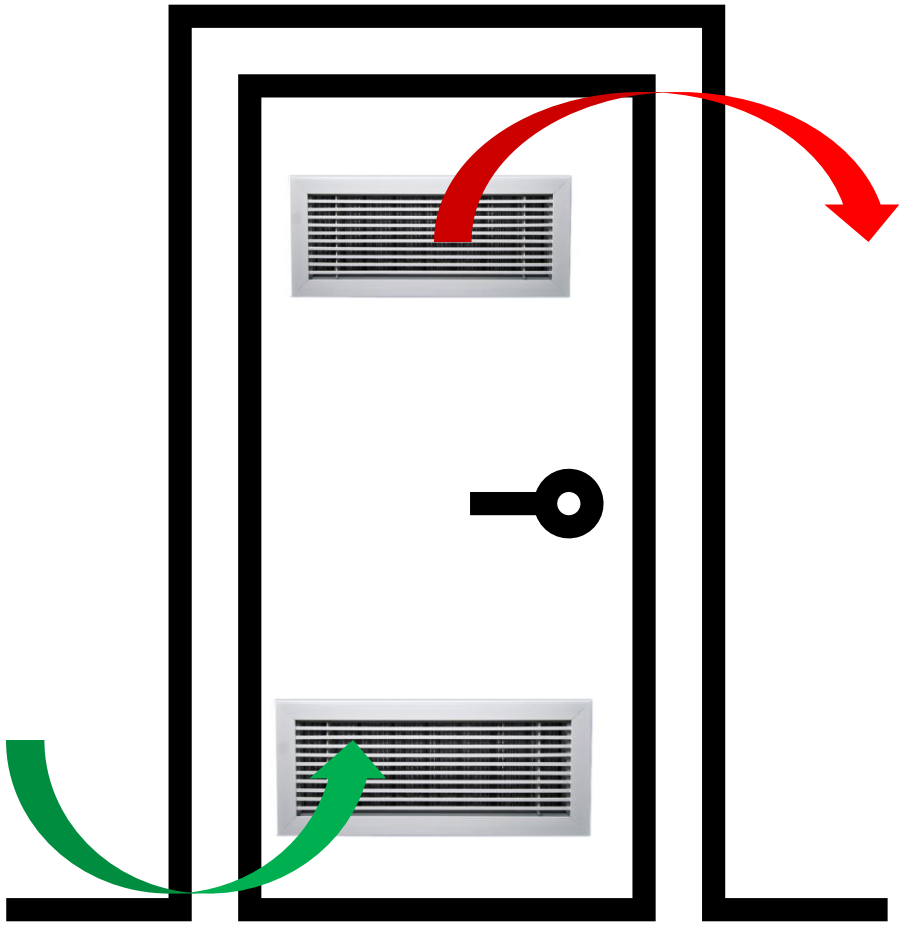
Electric Resistance

**COP 0.9**

# Takeaways

- Ideal HPWH install: garage or basement
- If necessary to install inside house, rooms as small as 450 $ft^3$ (7’ x 8’ x 8’) allow reasonable efficiency
- For smaller spaces, do the following to achieve good efficiency
  - Louvered doors or wall grilles with net free area > 300 $in^2$
    *Openings both high and low critical to success*
  - Duct to adjacent space inside the house
    *Provide for adequate make up air*

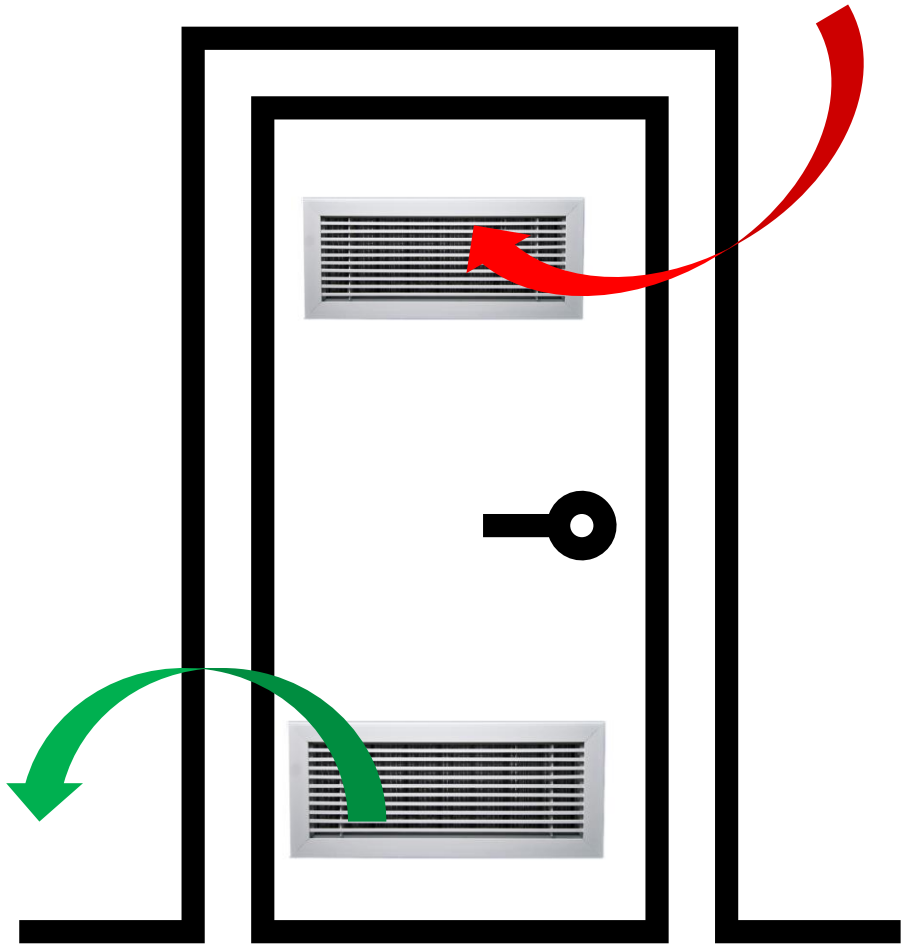
# Louvering: Standard Electric Water Heater in a Closet



The heated air in the closet is lighter than the air in the room and raises to the top of the closet and exits out the upper vent.

As the heated exits through the upper vent, cooler, room air is drawn into the lower vent.

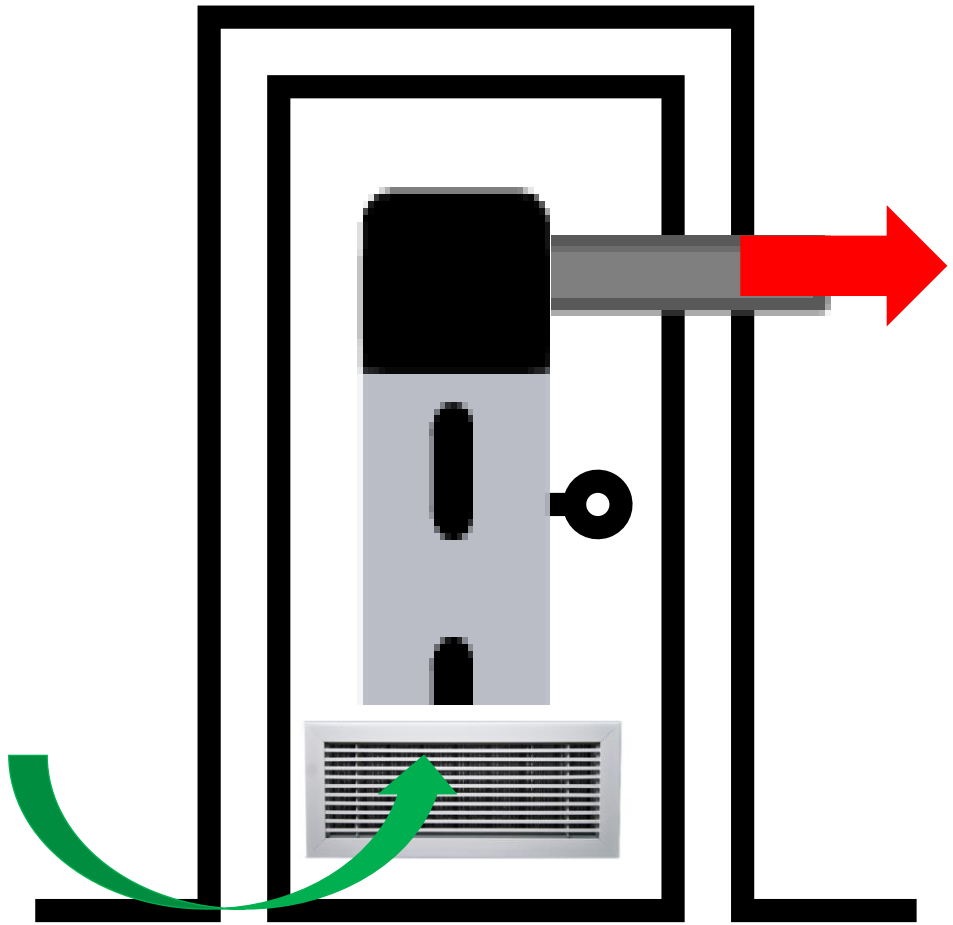
# Louvering: Buoyancy with an EHWH Located in a Closet



The warmer air in the room is drawn into the upper vent and is cooled and exits out the lower vent.

The cooler air produced by the HPWH drops to the lower part of the closet and exits out the lower vent.

# Louvering: Intake and Exhaust Ducting in a Closet



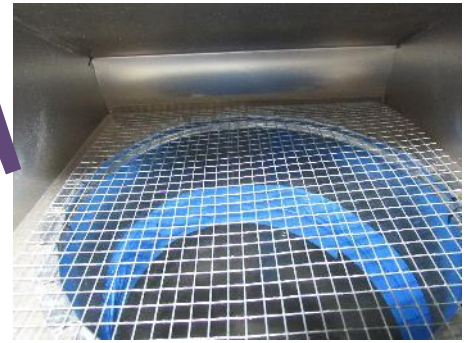
The fan exhausts air in the surrounding zone

As the exhaust air is pushed out of the closer, room air enters the closet through the louver in the door

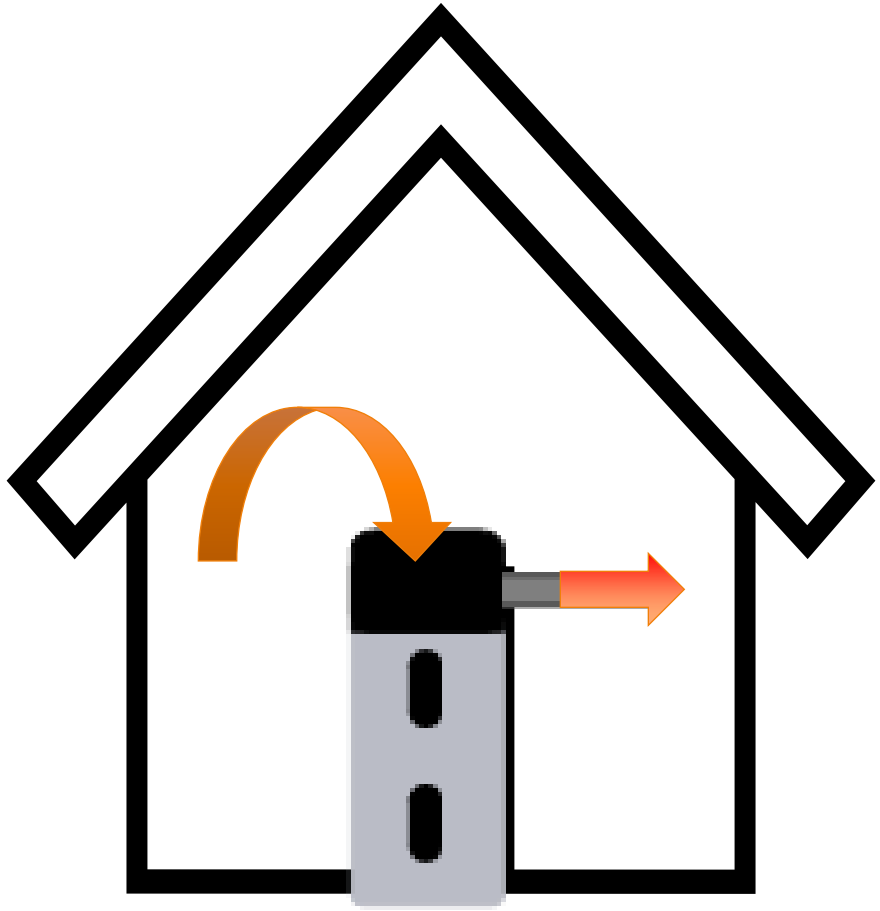
On an outside closet whats the best option?

# Exterior Closet Exhaust Ducting


| Outdoor T | Water Heater | Airflow (CFM) | Airflow (% of free) | COP |
|---|---|---|---|---|
| 50 F | HPTU | 70 | 45% | 1.2 |
| 50 F | ProTerra | 145 | 76% | 2.6 |
| 50 F | ProTerra | 112 | 58% | 1.9 |

# Inside to Inside Ducting

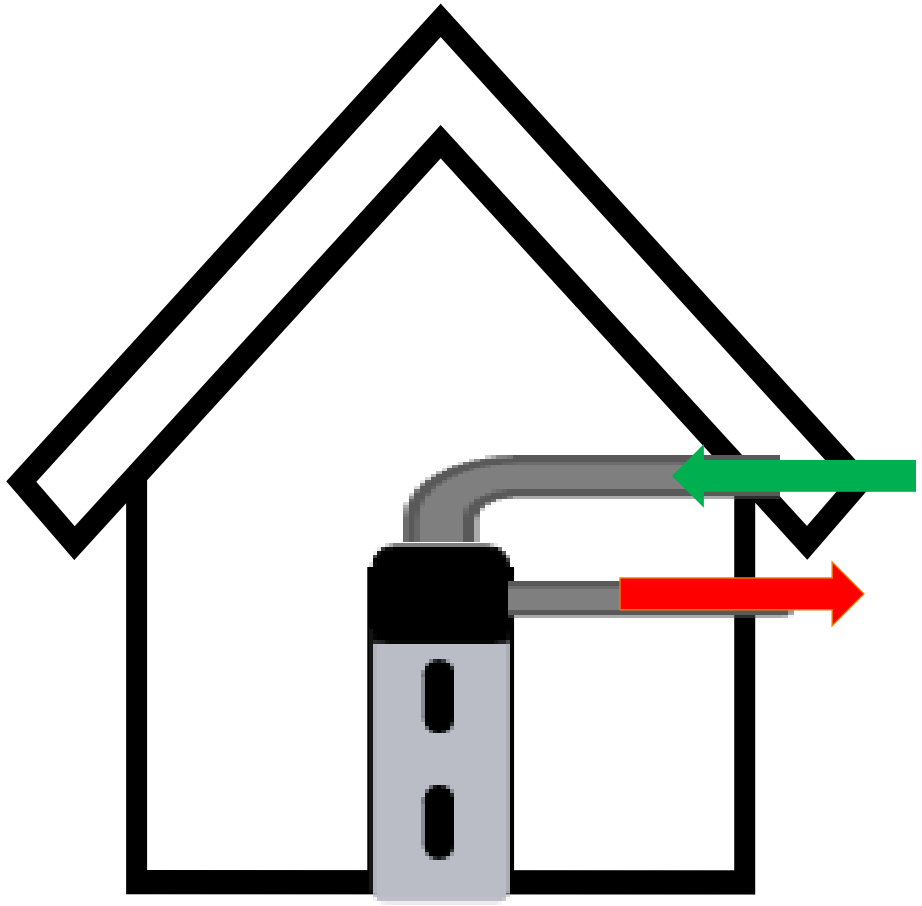


**Recommended Method**

Takes air from the inside of the house and vents the air to another space in house.

It is important for the homeowner's temperature comfort *not* to exhaust the cooler air to places occupants spend considerable amounts of time like the family room.

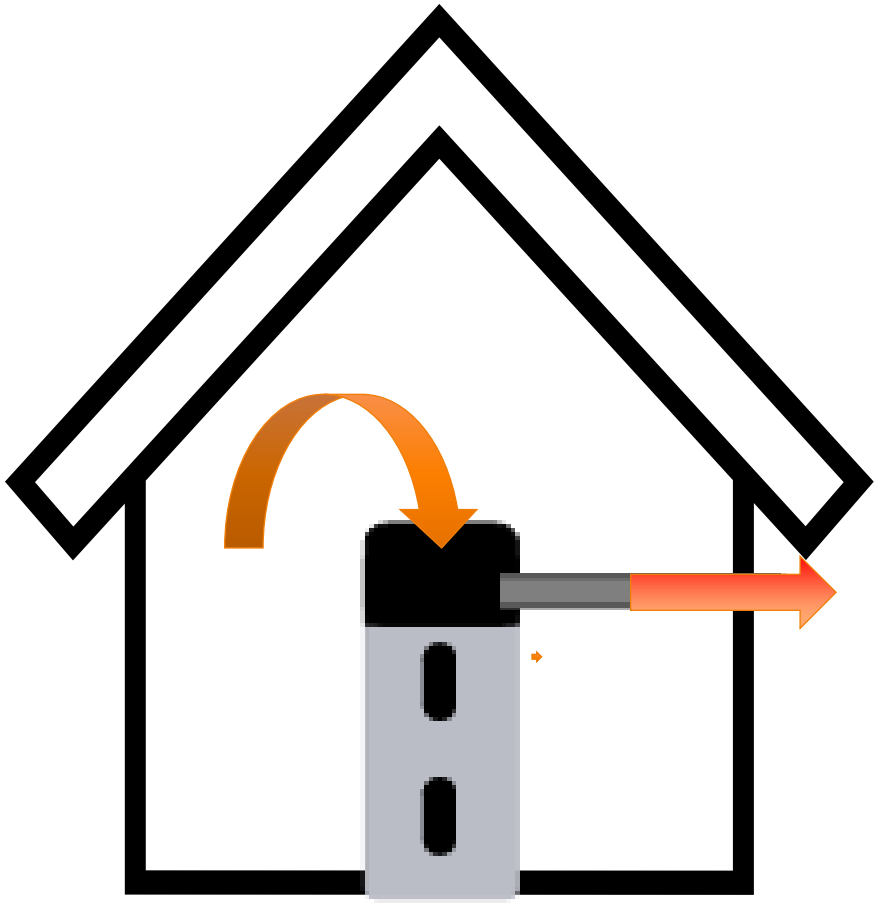
# Outside to Outside Ducting



In this case the intake air is taken from outside and the exhaust air is vented to the outside.

Avoid this in cold climates as the outside air temperature is below the compressor operating range for long periods of time. This results in the HPWH operating in electric only mode, reducing product efficiency and energy savings.

# Inside to Outside Ducting: Exhaust Only

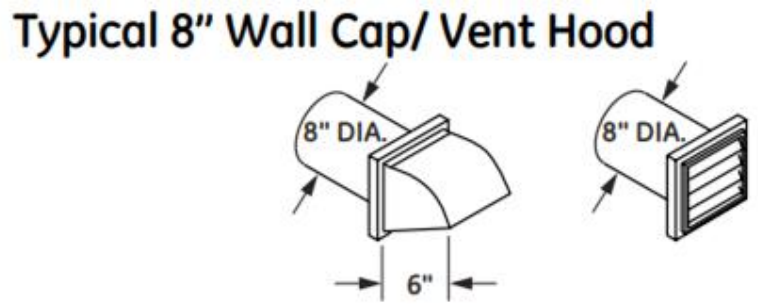


***Least* Preferred Method**

It may cause depressurization that can lead to back drafting of combustion appliances.

This method also increases the home's infiltration/exfiltration and can significantly increase the house's heating energy usage.

# Bradford White Ducting: Maximum Duct Runs




| Insulated Flexible 8" Ducting | | |
|---|---|---|
| # of 90° elbows/bends | Equivalent straight duct length | |
| | Internal Installation - Vented inside ONLY NO Wall Cap/Vent Hood | Outside Installation – Vented outside with Wall Cap/Vent Hood |
| 0 | 100 | 70 |
| 1 | 87 | 57 |
| 2 | 74 | 44 |
| 3 | 61 | 31 |
| 4 | 48 | 18 |

*Source: Bradford White's 2016 AeroTherm ducting manual*

**Tools and Materials Needed**

- 8 inch Insulated Flexible Ducting*
- Ducting Support Hangers*
- Exterior Wall Vents for Inlet & Outlet*

* Materials sold separately.

# A. O. Smith Ducting

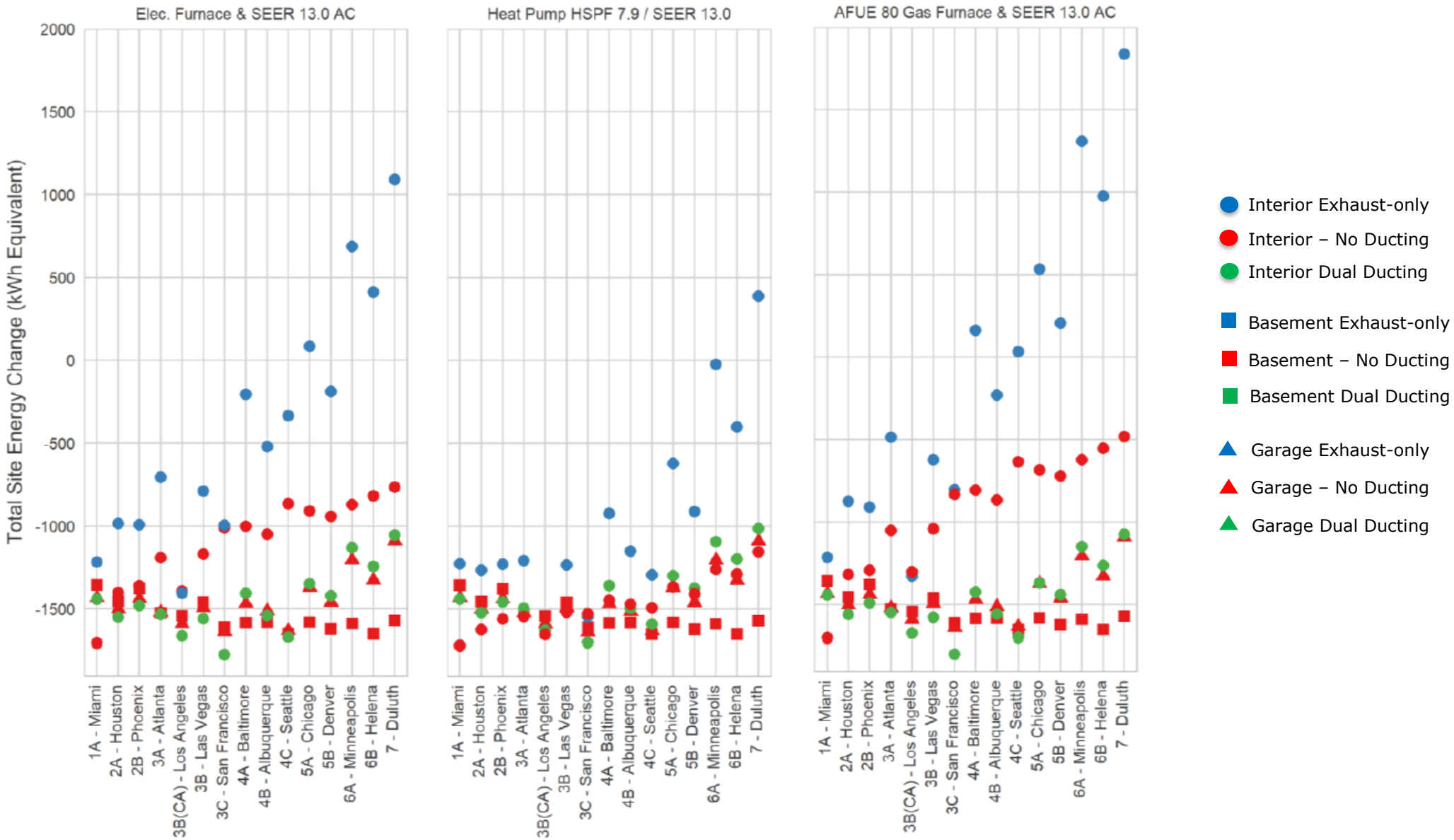
Equivalent length (EL) is 50 feet — combined inlet and/or outlet ducting but does not need to be equal in length.

- e.g., 30/20- total 50 feet.

| Description | # of elbows | EL | Voltex | Voltex AL |
|---|---|---|---|---|
| Total Equivalent Length Allowed | 2 | | 50 feet | 100 feet |
| Length of Duct Work | | | 20 feet | 20 feet |
| Elbows/Flexible Bends (EACH) [Maximum Allowed] | 2 | 5 feet | 10 feet | 10 feet |
| 8 inch Ul certified termination for ducting outside (EACH) | 1 | 5 feet | 5 feet | 5 feet |
| 8 inch register for ducting inside (EACH) | 1 | 5 feet | 5 feet | 5 feet |
| Rodent Screen (Must be greater than 83% open area) (EACH) | 1 | 1 feet | 1 feet | 1 feet |
| Balance | | | 9 feet | 59 feet |

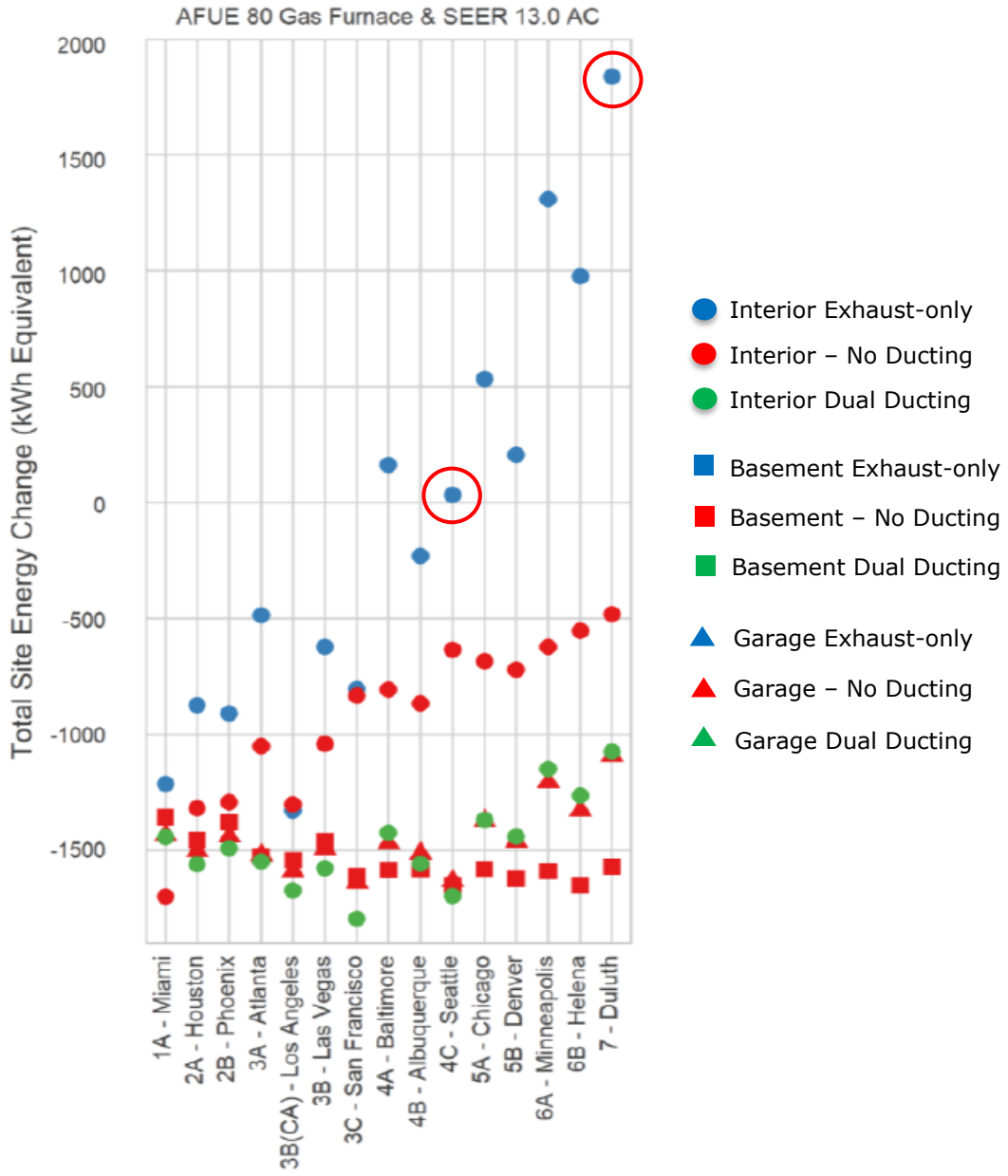
*Source: A. O. Smith's 2012 Installation Instructions and Use & Care Guide*

# Exhaust Only Ducting Energy Savings Comparison




*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"

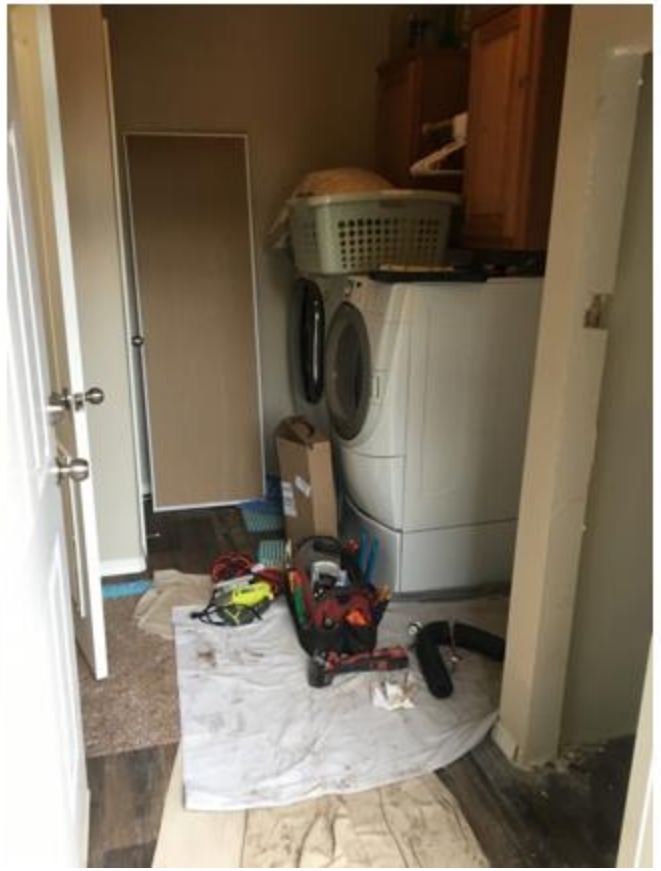
# Exhaust Only Ducting Energy Savings Comparison

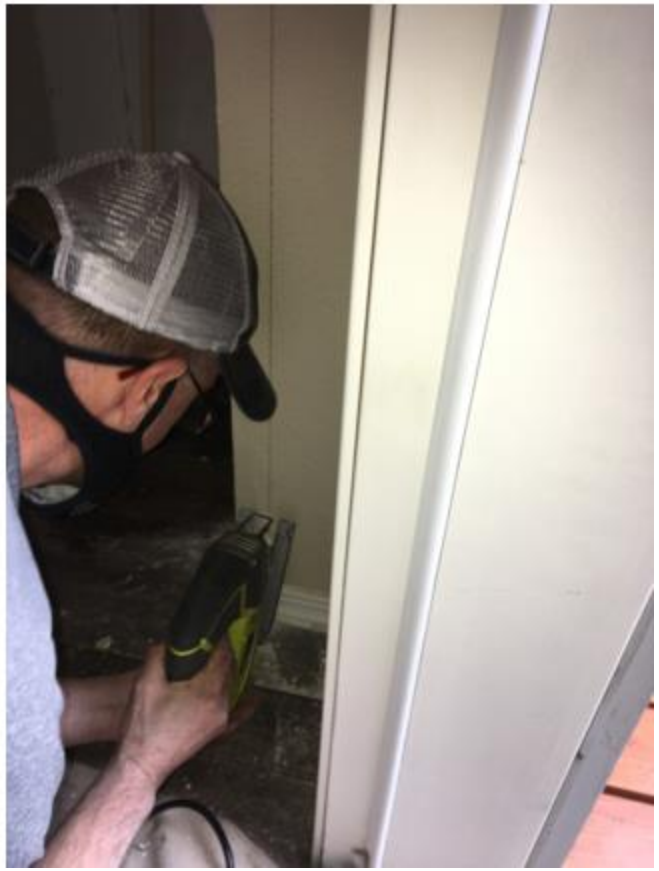



# Heat Pump Water Heater in Manufactured Home: “Quick Learnings” Demonstration Project

# Obstacles and Opportunities of Installing HPWHS in Manufactured Homes: An Introduction

# Typical Utility Room Closet Location With Tank Removed and Closet Alteration Being Made






# Space Was always Limited Requiring Careful Piping Layout

# Use of Installation Pad to Raise Tank level Above Existing Plumbing

Exhaust Duct Adaptor For A.O. Smith: The Adaptor is 5 inches Thick Making it Unusable In Very Tight Situations

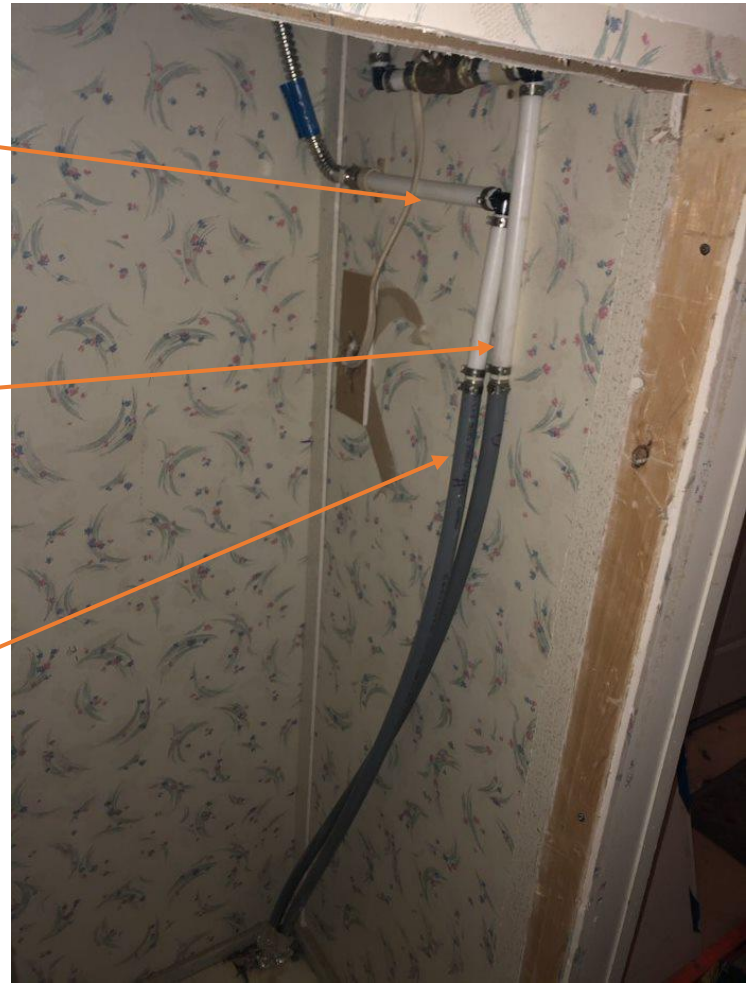
Example of particle board failure as a result of a leaking tank without a drain pan. This site was not accepted into the study

# Example of Connecting Various Piping Types: Must Have Well Stocked Truck

Stainless Steel Flex Connector

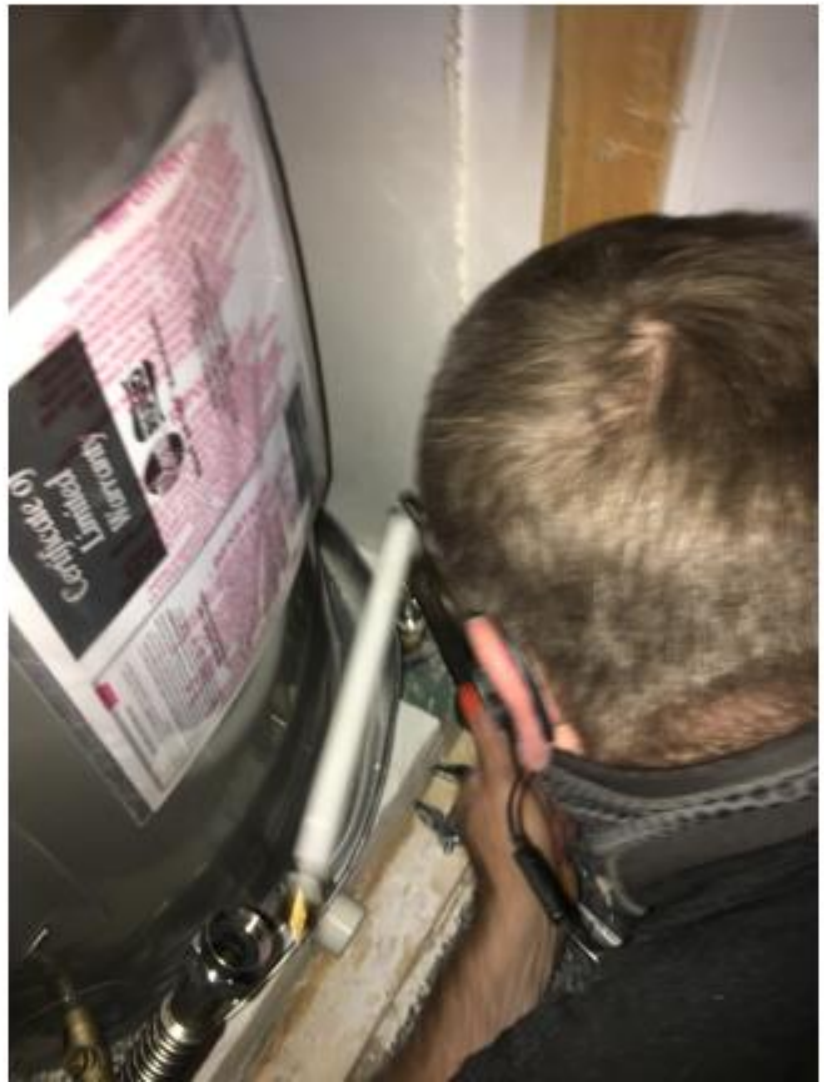
PEX Piping

Existing Polybutylene Piping

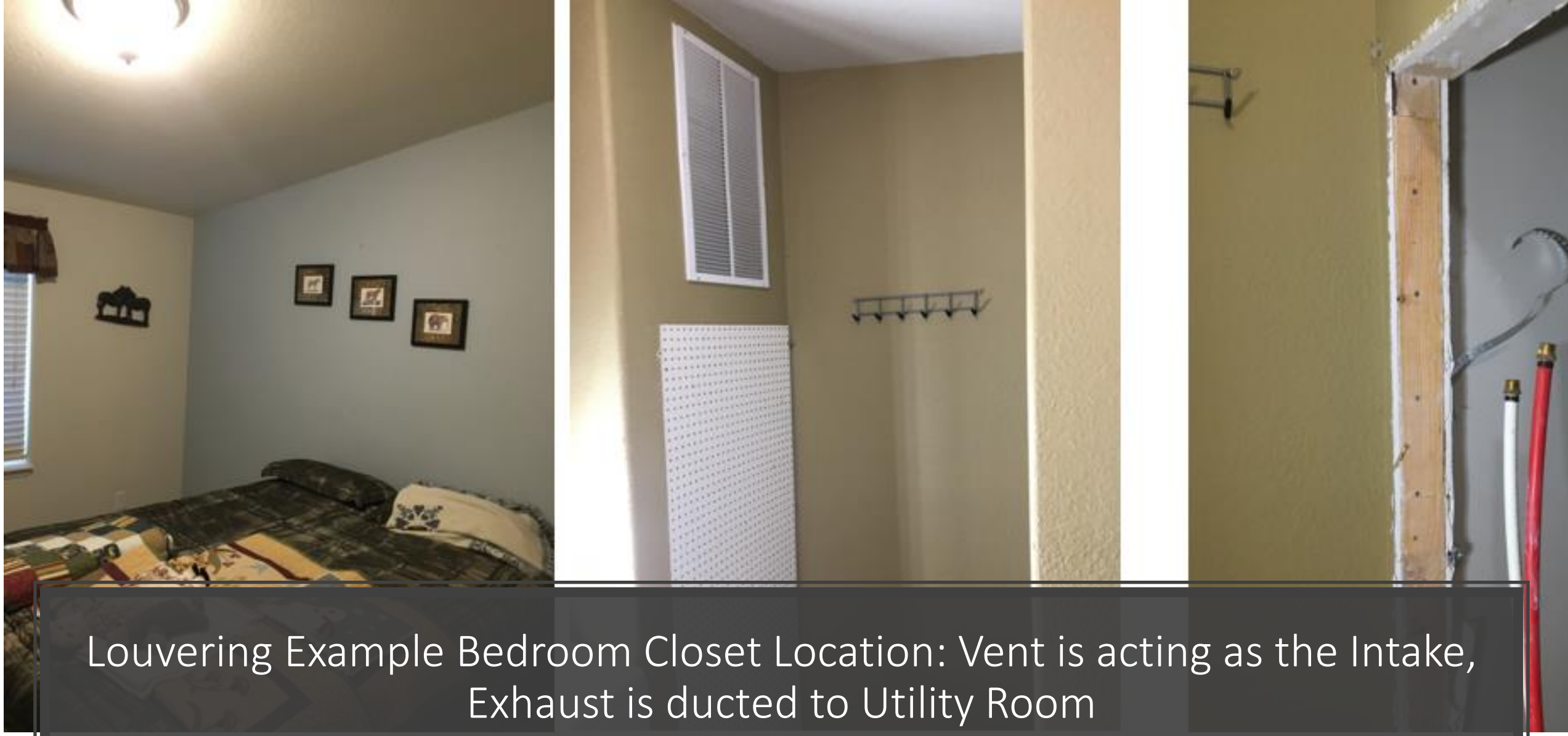


24 Inch Drain Pan. Metal Pans Were Used Rather Than Plastic Because They could be Shaped to Fit

# Shut off installed on water line, connection made to flex.



# Inside to Inside With Closet Removal: Exhaust Air Was Discharged To Behind the Refrigerator In Adjoining Kitchen



# Louvering Example Bedroom Closet Location: Vent is acting as the Intake, Exhaust is ducted to Utility Room

# Draining the Tank With a Transfer Pump

# Tank Model Attributes

| Attribute | Rheem 30 Amp | Rheem 15 Amp | Bradfordwhite | A0 Smith |
|---|---|---|---|---|
| Breaker requirement | 30 amp | 15 amp | 25 Amp | 30 Amp |
| Exhaust | Right Side | Right Side | Back Side | Right Side |
| Hot/cold plumbing connections | Side | Side | Top | Side |
| PT/ condensate connections | Front | Front | Side | Side |
| Compressor cutout temperature | 37F° | 37F° | 37F° | 45F° |
| 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 |
| Other Notes | Depending on model, features such their app and water leak detection may be a plus | Depending on model, features such their app and water leak detection may be a plus | Top plumbed 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 |

# Tank Selection Results

| Tank Type | Number installed | Comments |
|---|---|---|
| **AO Smith** | 1 | Homeowner installed 30-amp breaker |
| **Rheem 15-amp** | 1 | Two-person household |
| **Rheem 30-amp** | 1 | Homeowner installed 30-amp breaker |
| **Bradford White** | 12 | |

# Tank Attribute Overview

HOT WATER SOLUTIONS

*All attributes below vary depending on specific brand and tank.*

**Tanks sizes**

- Heights range from 57 – 70 inches, diameters range from 20 - 27 inches
- Volumetric range from 50 gallon, 65 and 66-gallon, 80-gallon

**Amperage and breaker requirements**

- Range from 15 – 30-amp requirements

**Operating ranges**

- A. O. Smith Voltex, 45ºF to 120ºF
- A. O. Smith Voltex AL, 37ºF to 120ºF
- Bradford White, 35ºF to 120ºF
- Rheem, 37ºF to 145ºF

**Connections**

- Top or side plumbed

**Exhaust**

- Rear, right-side, or top

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# Specifics by Brand

HOT WATER SOLUTIONS

| Item | Bradford White – New AeroTherm model* | Rheem | Rheem – 15 amp | A. O. Smith Voltex | A. O. Smith Voltex AL |
|---|---|---|---|---|---|
| **Volumetric Constraints** | 700 $ft^3$ | 700 $ft^3$ | 700 $ft^3$ | 450 $ft^3$ | 450 $ft^3$ |
| **Clearance Requirements** | 8 inches for filter: Don't block exhaust air. 50-gallon units requires 2" clearance | 8 inches for filter: Don't block exhaust air | 8 inches for filter: Don't block exhaust air | Don't block exhaust air | Zero on back and sides |
| **Expansion Tank Requirements** | Required | Required | Required | Required | Required |
| **Duct Adaptor Required** | Required | Required | Required | Required | No, built in |
| **Max Length of 8" Duct Flex** | 100 equivalent lineal feet | 125 equivalent lineal feet | 125 equivalent lineal feet | 50 equivalent lineal feet | 100 equivalent lineal feet |
| **Grounding Requirement** | Required | Required | Required | Required | Required |

Check recent manufacturer product sheets for most up-to-date information. Manufacturers are currently evaluating their space-requirement recommendations, be sure to check with individual manufacturers on latest installation guidance (updated as of 8/18/2022)
*The new Bradford White AeroTherm (Tier 4 model) is expected to be available to the market in 2023 – above product details represented are subject to modification.

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# Specifics by Brand (cont.)

HOT WATER SOLUTIONS

| Item | Bradford White (new AeroTherm model*) | Rheem – 30 amp | Rheem – 15 amp | A. O. Smith Voltex | A. O. Smith Voltex AL |
|---|---|---|---|---|---|
| **Breaker and Wire Size Requirements** | 25 amp | 30 amp | 15 amp | 30 amp | 30 amp |
| **Exhaust Discharge** | Rear | Right | Right | Right | Top |
| **Operating Range** | 35°F to 120°F | 37°F to 120°F | 37°F to 145°F | 45°F to 120°F | 37°F to 120°F |
| **Notes** | Good fit for manufactured homes and homes with 25-amp brakers | | No element | | |

Check recent manufacturer product sheets for most up-to-date information. Manufacturers are currently evaluating their space-requirement recommendations, be sure to check with individual manufacturers on latest installation guidance (updated as of 8/18/2022)
*The new Bradford White AeroTherm (Tier 4 model) is expected to be available to the market in 2023 – above product details represented are subject to modification.

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# Modes & Troubleshooting

HOT WATER SOLUTIONS

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# A. O. Smith Common Error Codes

HOT WATER SOLUTIONS

| | Display Shows | Indication | Corrective action |
|---|---|---|---|
| * | ECC | Heat pump compressor is not functioning | Contact a qualified person to service the unit. |
| * | ECF | Heat pump compressor is starting/stopping frequently | 1. If the compressor is running and fan is not operating, call residential technical support.<br>2. Clean the air filter. See "Air Filter Maintenance" section of manual.<br>3. Check installation location against recommended confided space requirements. |
| | EPL | Power supply voltage is too low. | Check for loose electrical connections, refer to "Power Cycling the Unit" in the manual. |
| * | ECC | Heat pump compressor is not functioning | Contact a qualified person to service the unit. |

*There may be an audible alarm associate with this error. To cancel the audible alarm, press any button on the UIM.

Installation Manual can be found here and educational videos for each error code can be found on A.O. Smith University

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# 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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# Tank Selection Criteria

HOT WATER SOLUTIONS

**Space Constraints**
- Will tank fit into space
- Include side plumbing
- Include duct adaptors if required

**Sizing**
- Household size
- High usage spa tubs
- Possible use of whole house tempering valve

**Water Connections**
- Top-plumbed
- Side-plumbed

**Electrical**
- Amperage of breaker
- Wire size

**Ducting (If Required)**
- Right exhaust
- Back exhaust
- Top exhaust

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# Manufacturer Resource Links & Contact Information

HOT WATER SOLUTIONS

## A. O. Smith

https://www.hotwater.com/

- Support – (877) 552-0010
- Training - https://university.hotwater.com/contact/
- Sales Representatives - https://www.hotwater.com/where-to-buy/trade-professionals/
- Distributors - https://www.hotwater.com/where-to-buy/search/
- User Manuals - https://www.hotwater.com/resources/product-literature/instruction-manuals/residential-electric/
- Spec Sheets - https://www.hotwater.com/resources/product-literature/spec-sheets/residential-electric-(uef)/

## Bradford White

https://www.bradfordwhite.com/forthepro

- Support – (800) 523-2931
- Training – https://www.bradfordwhite.com/training/
- Sales Representatives – https://www.bradfordwhite.com/rep-locator/
- Distributors - https://www.bradfordwhite.com/resources-for-professionals-wholesaler/
- User Manuals & Spec Sheets - https://www.bradfordwhite.com/documentation/usa/residential/tank-type-gas

## Rheem

https://my.rheem.com/

- Support – (800) 621-5622
- Training – https://www.rheemacademy.com/
- Sales Representatives – https://www.rheem.com/find-a-pro/
- Distributors – https://www.rheem.com/find-a-pro/
- User Manuals & Spec Sheets - https://www.rheem.com/products/residential/water-heating/heat-pump-water-heaters/

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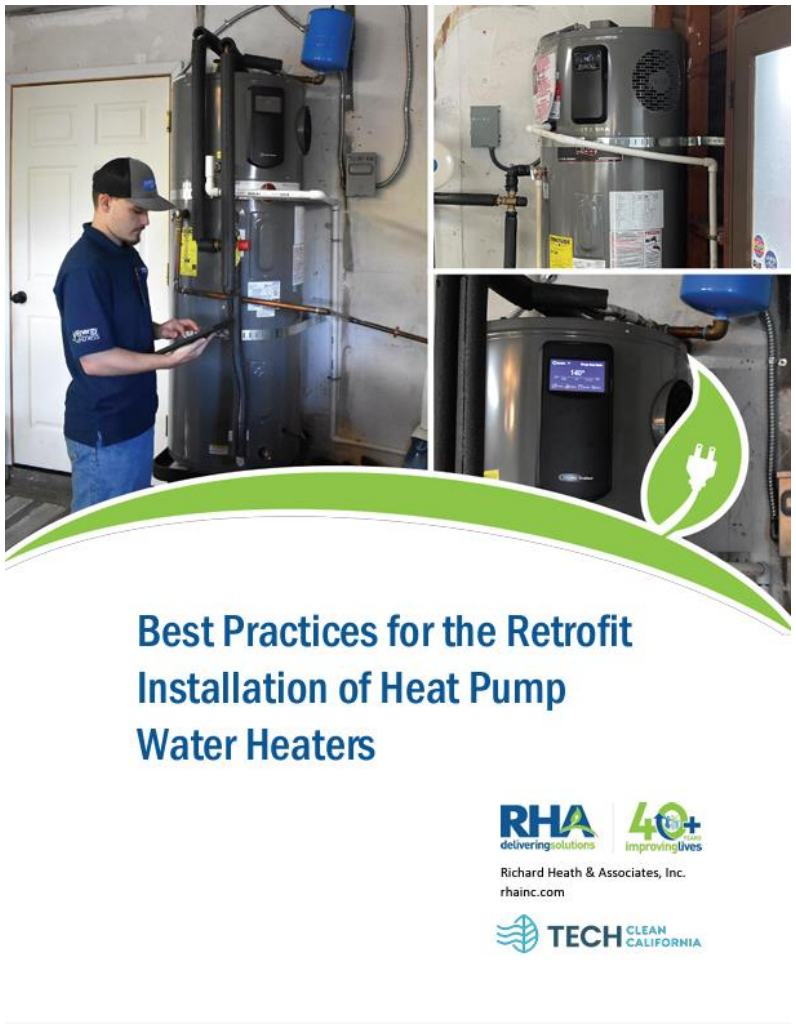
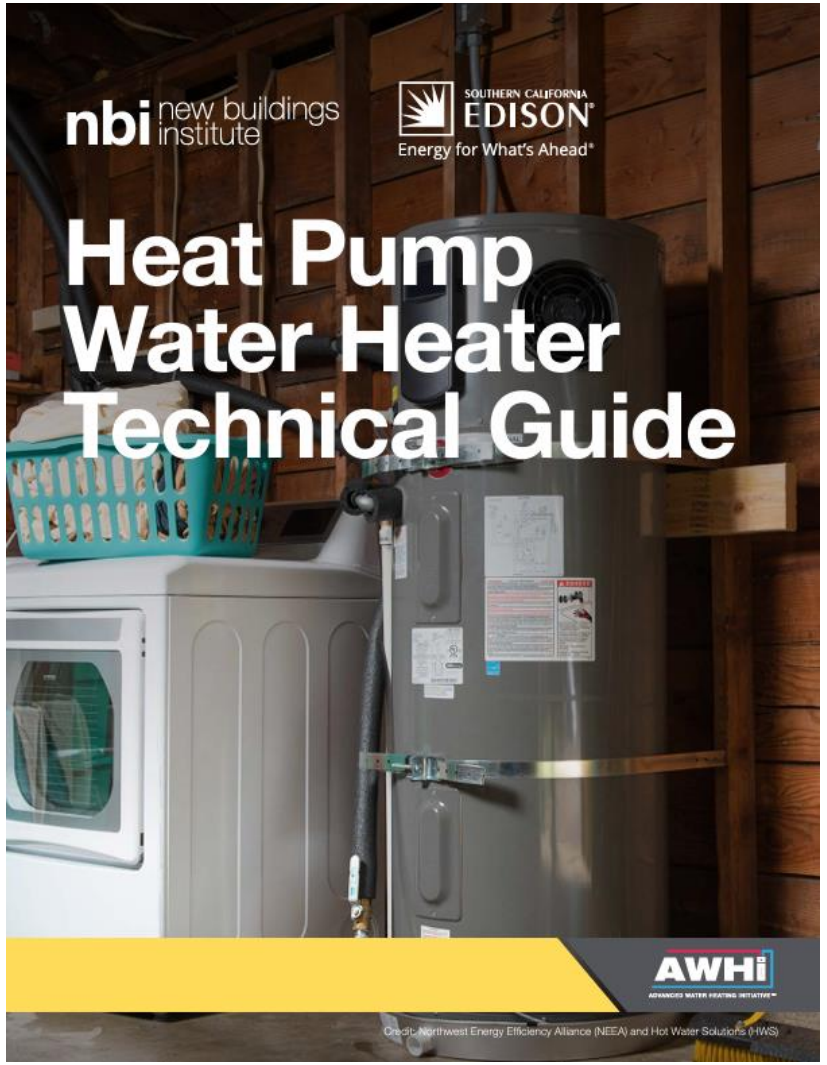
# Great guides




[Best Practices for the Retrofit Installation of Heat Pump Water Heaters - RHA]



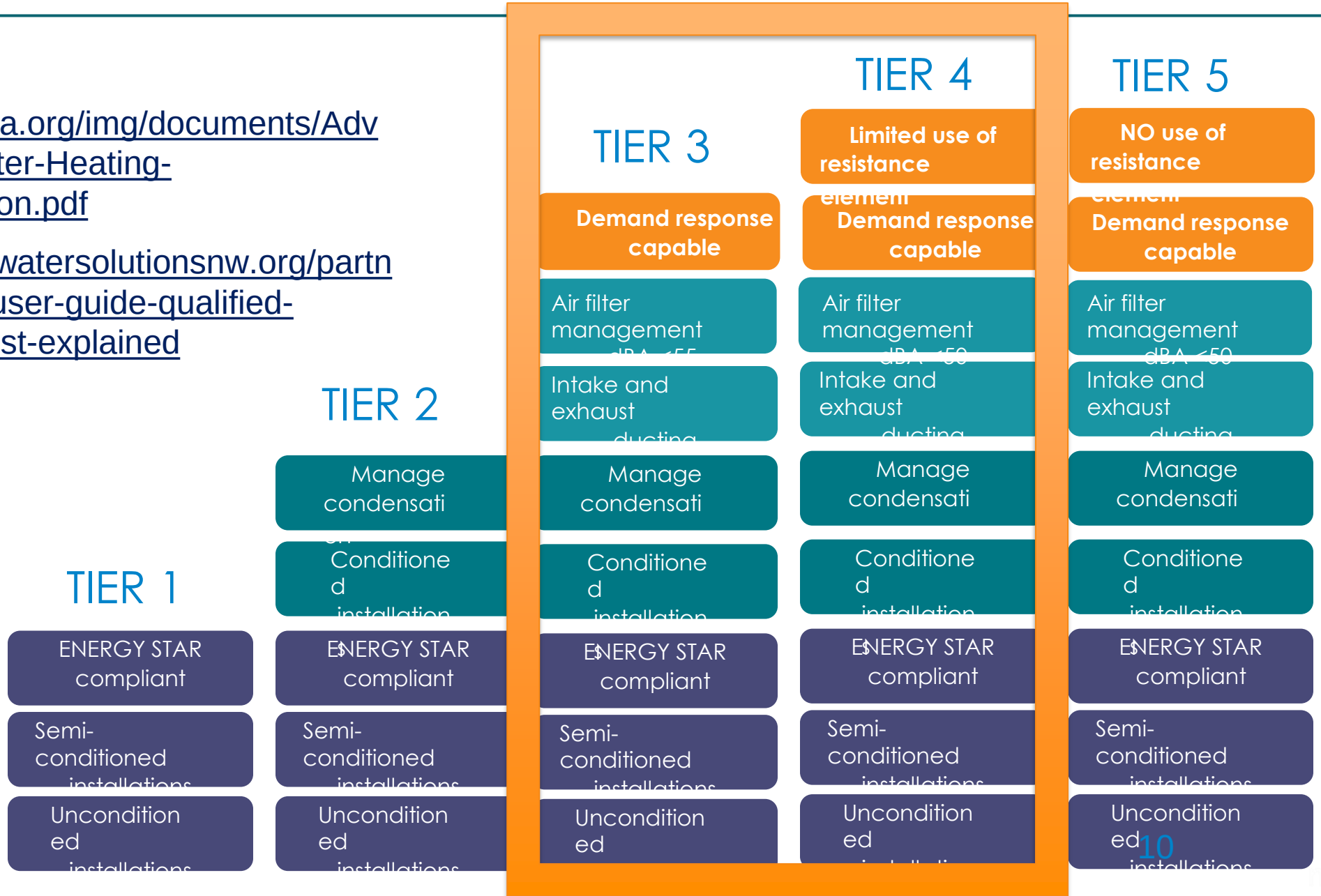

[HPWH Technical Guide - NBI and SCE]

# Product Tier Overview

HOT WATER SOLUTIONS

https://neea.org/img/documents/Advanced-Water-Heating-Specification.pdf

https://hotwatersolutionsnw.org/partners/news/user-guide-qualified-products-list-explained



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# ENERGY STAR®
# Heat Pump Water Heaters

## Overview and Value


Image credit: Hot Water Solutions

# ENERGY STAR HPWH Certification Criteria

| Criteria | ENERGY STAR Requirements | |
|---|---|---|
| **Uniform Energy Factor (UEF)** | **Integrated HPWH** | **UEF ≥ 3.30** |
| | **Integrated HPWH, 120 Volt/15 Amp Circuit** | **UEF ≥ 2.20** |
| | **Split-system HPWH** | **UEF ≥ 2.20** |
| First Hour Rating | FHR ≥ 45 gallons per hour | |
| Warranty | Warranty ≥ 6 years on sealed system | |
| Safety | UL 174 and UL1995 or UL 60335-2-40 | |
| Lower Compressor Cut-Off Temperature (Reporting Requirement Only) | Report ambient temp below which the compressor cuts off and electric resistance only operation begins | |

## Features:

- **120V** retrofit ready "plug-in" models help avoid costly electric panel upgrades
- **Split systems** are suitable for a wide range of applications, including multifamily
- Optional **Connected** criteria to verify Demand Response functionality

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# Resources:

## ENERGY STAR Heat Pump Water Heaters


Image credit: Hot Water Solutions

# ENERGY STAR HPWH Product Sales & Marketing Team

**Access to tools** that increase education/awareness of HPWH

- ✓Product/Installer/Retailer Finder
- ✓Data sheets/Selling and Purchasing Guides
- ✓"Ask The Expert" Articles and Newsletters
- ✓National Outreach and Media Options
- ✓**Workforce Training** and Education Assets

**Access to Industry Partnership Network**

- ✓Department of Energy (DOE)
- ✓Manufacturers Action Council
- ✓Utilities and their third-party implementers
- ✓Retailers (national/regional)
- ✓Home Builders

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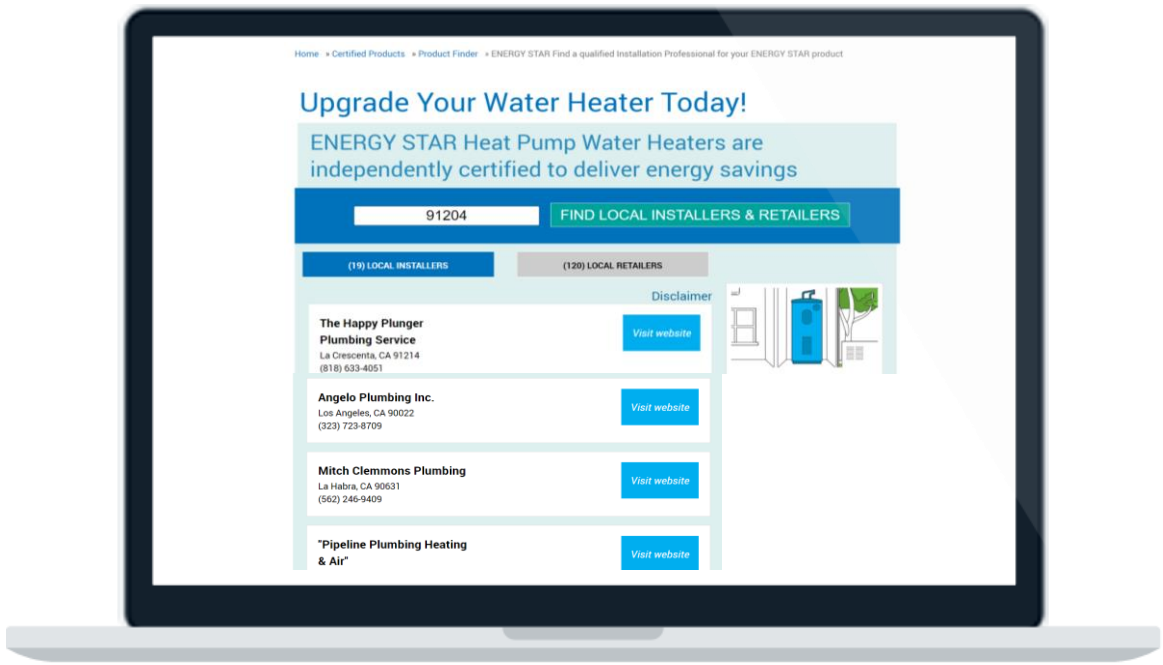
# Tools & Resources: HPWH Installer Finder

- Overcomes difficulty finding installers who carry and will install HPWHs
- The ENERGY STAR HPWH Installer Finder provides customers with nearby contractors who have completed manufacturer sales and product training
- The installer finder is supported by:




energystar.gov/productfinder/water-heater-installers/

# Fact Sheets and Buying Guides

- **Overcome lack of consumer and trade ally awareness** about the technology and its viability
- The ENERGY STAR certified HPWH fact sheet and sales guide demystifies the technology for:
  - ✓ Installers and Product Advocates
  - ✓ Retail Sales Associates
  - ✓ Program Outreach Staff


www.energystar.gov/marketing_materials

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# Water Heater Promotion Materials

## Objectives

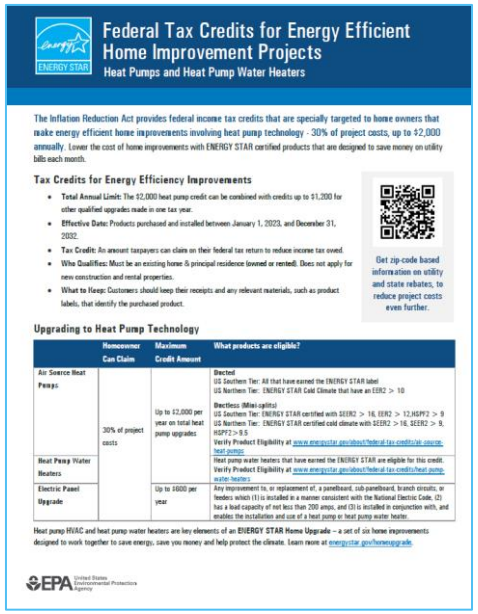
- **Educate consumers** about ENERGY STAR certified water heaters and associated tax credits and rebates: **Clean Energy Future Campaign**
- Encourage consumers to **proactively replace** their old water heaters

## Audience

- Markets with **active rebate programs**

## Tactics/Assets:

- **Display Banners**
- Partner toolkit including a broad array of marketing materials: https://www.energystar.gov/products/tools_resources/home-savings-tool-fact-sheet
- **Build Show video** featuring Matt Risinger
- **More contractor facing materials** coming!



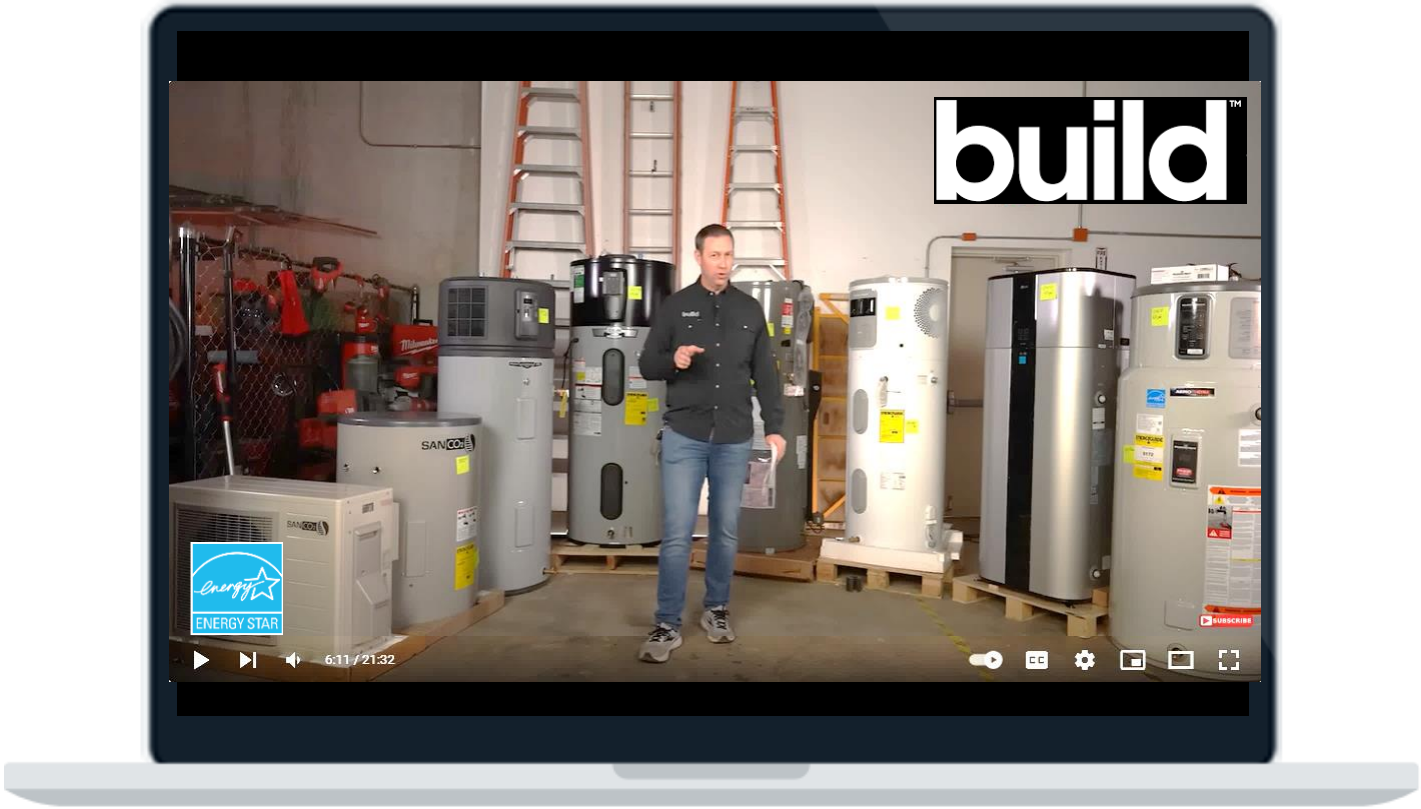

Tax Guidance


Web Ad

# The Build Show  video w/ Matt Risinger

ENERGY STAR teamed up with Matt Risinger at **The Build Show** this year to compare different water heater types and explain how ENERGY STAR certified HPWHs can save households hundreds of dollars on energy costs each year.

**Find it here**




**2M+ channel subscribers**

# SANCO2 Split System

SANCO2

As a highly energy-efficient alternative to the traditional electric or gas water heater, our unique system saves money, reduces greenhouse gas emissions and eliminates the production of carbon monoxide.

The SANCO$_2$ heat pump water heater system consists of two parts. The heat pump unit, where the hot water is produced, using the $CO_2$ refrigerant to extract heat from the ambient air, and the 43, 83 and 119 gallon storage tank.

**43 Gallon Tank**
69-Gallon
first hour delivery

2 to 4 people

**83 Gallon Tank**
121-Gallon
first hour delivery

5+ people

# SANCO2 Features

## Superior Features

Highest First Hour Rating of any residential electric water heater (Resistance and Heat Pumps) provides more hot water.


Simple installation: only plumbing connections are required to connect storage tank and heat pump.


Faster recovery from a hot water draw at 20+ GPH of 150°F water to the top of the tank.

Heat pump will make hot water below -25°F to 114°F ambient temperature.


Highest real world efficiency: 80% savings over electric resistance water heaters and 40%+ over a hybrid HPWH.


Longest and most comprehensive warranty on the market.


Most environmentally friendly water heater on the market: $CO_2$ refrigerant has a low global warming potential.


NEW! Demand Response (DR) controller remotely alters performance based on utility pricing program

# Available emberH20 Heat 120v

*Specification subject to change as models are refined*

**Embertec emberH20 Heat 120v 42g** (no boost)

- UEF 2.7 (ESTAR 2.2)
- COP 4.6
- FHR 49 (ESTAR 45)
- CTA-2045 * *next production run*
- WiFi
- ENERGY STAR
- UL Listed

**Embertec emberH20 Heat 120v 75g** (no boost)

- UEF 3.5 (ESTAR 2.2)
- COP 4.6
- FHR 64.9 (ESTAR 45)
- CTA-2045 *next production run
- WiFi
- ENERGY STAR
- UL Listed


Heaps of Hot Water and Heaps of Savings

**Additional Features**

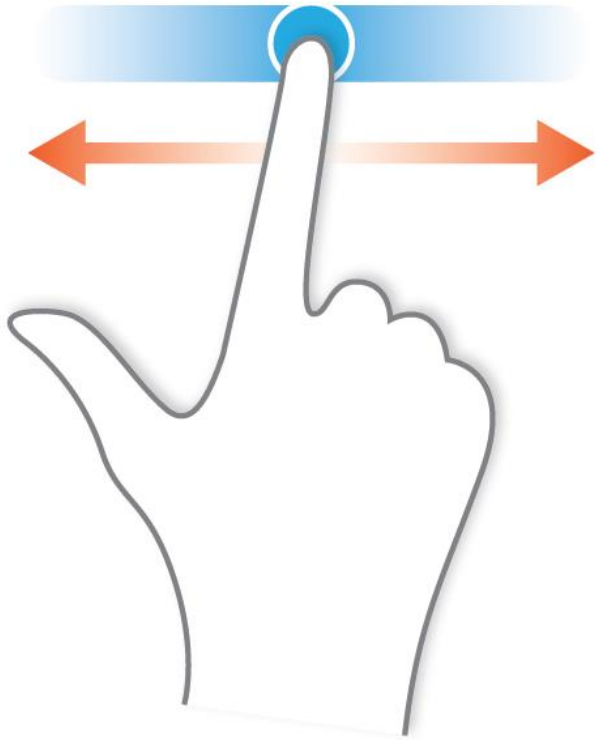
- JA13 Compliant (next production run)
- R134A converting to 513A
- Functional operating temperature 7F to 122F
- Demand Response Capable
- Vacation Mode
- Widely used App Platform
- Super heat to 140°
- Adjustable Mixing Valve
- Refrigerant runs through wall
- Sealed **SwiftConnect** Lock Ref Hoses
- No HVAC Tech needed
- 10 yr limited warranty
- Eliminates installation barriers of tower unit

/ HALF THE VOLTAGE, HALF THE HOT WATER? NOT! /

# Newer Features Hitting The Market

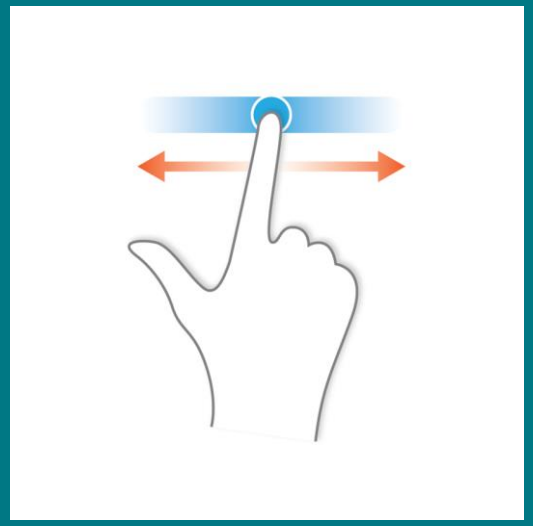
# Newer Features Hitting The Market

# TankTinder!

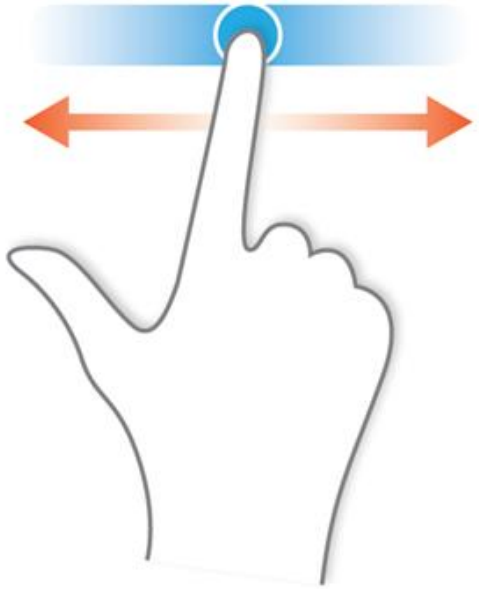



*Wikimedia Commons*

# 20 amp circuit available & 120-volt HPWH

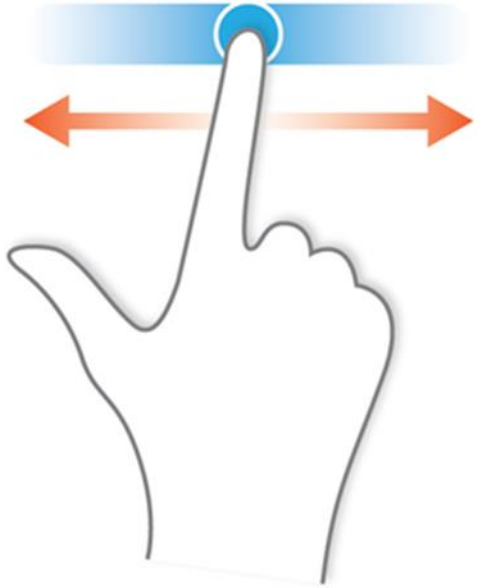


# Existing water heater located in crawlspace

HOT WATER SOLUTIONS

# Homeowner wants a recirculation pump



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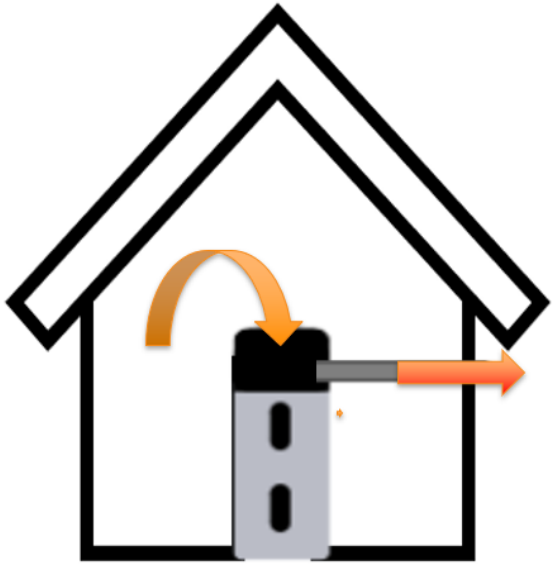
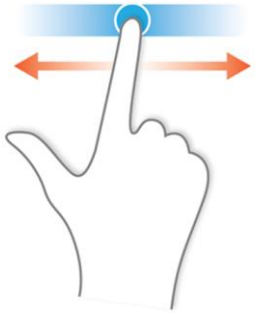
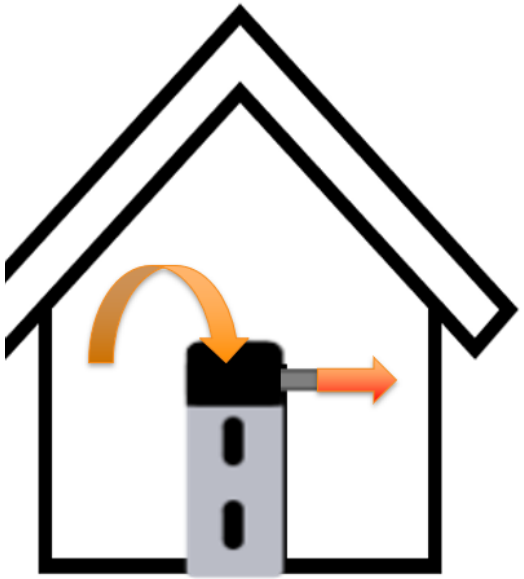
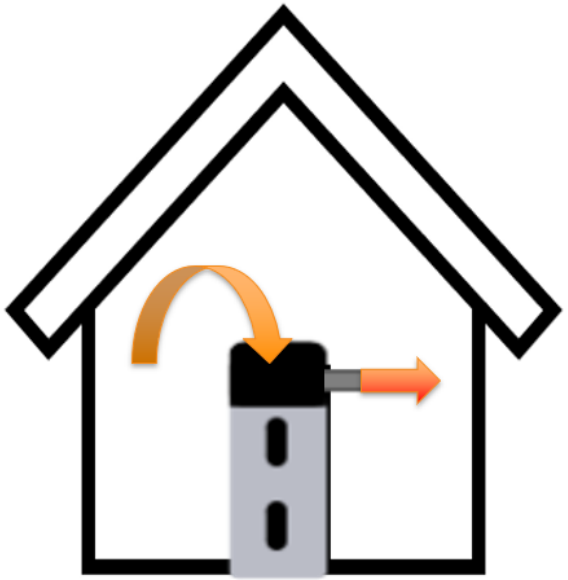
# Water heater in a tight room

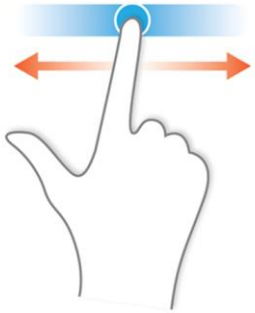



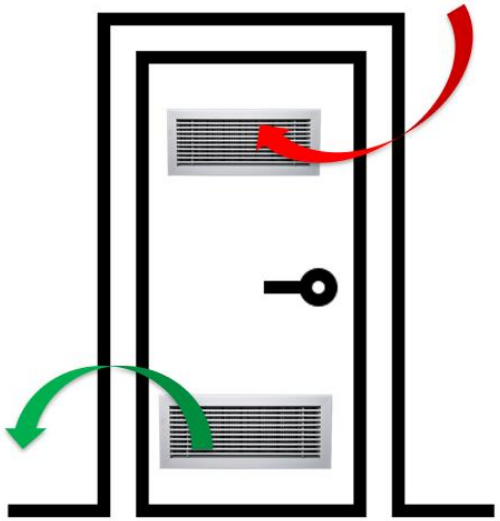




# Water heater in a tight room 2

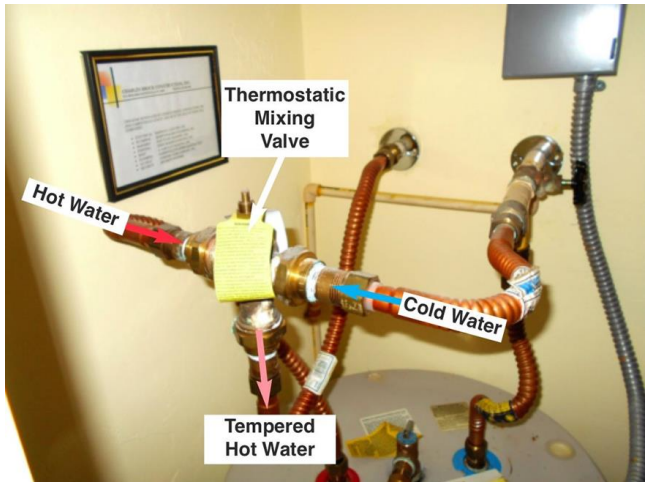



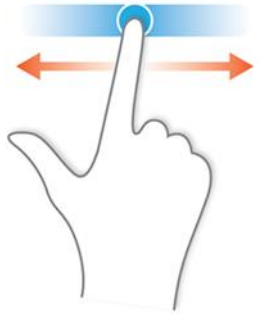


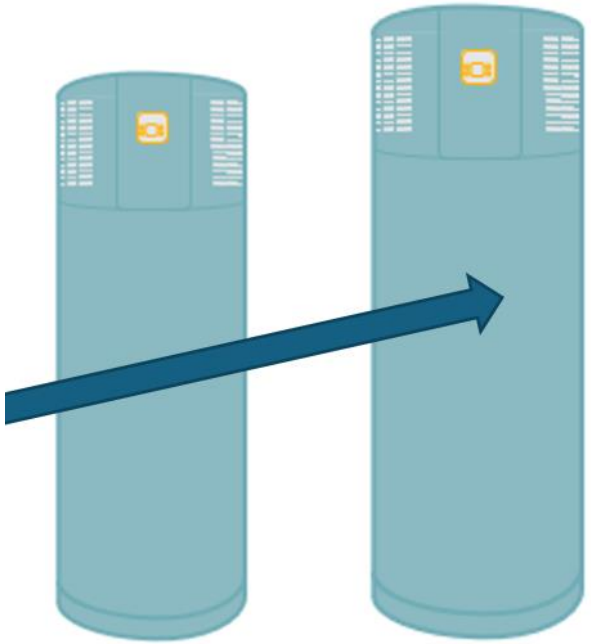


HOT WATER SOLUTIONS

# A lot of residents, including teens!





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# Thank you

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