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SOUTHERN CALIFORNIA
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Energy for What's Ahead®

Heat Pump Water Heater Technical Guide

AWH
ADVANCED WATER HEATING INITIATIVE™

Credit: Northwest Energy Efficiency Alliance (NEEA) and Hot Water Solutions (HWS)



California is at the forefront of decarbonization policies that reduce use of fossil fuels both on-site and at the source of electricity generation. HPWHs are a powerful solution to support these energy and climate goals.

Credit: NEEA and HWS

Consumers are demonstrating a concern for climate change and poor indoor air quality impacts on health. The State of California is committed to achieve a 40% reduction in greenhouse gas emissions by 2030 and carbon neutrality by 2045.¹ Many local governments in the state have gone further, with commitments to rapidly eliminate fossil fuel combustion in buildings and encourage beneficial electrification that includes a just transition and equity.²

1 <https://www.edison.com/home/our-perspective/pathway-2045.html>
2 https://greenlining.org/wp-content/uploads/2019/10/Greenlining_EquitableElectrification_Report_2019_WEB.pdf

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Disclaimer

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Heat pump water heaters (HPWHs) are a proven technology that can be used as a component of going electric in homes and business. By switching to HPWH technology, installers will be first to meet present and future growing consumer demand. Installers with HPWH experience have an opportunity to dispel misconceptions and give customers the healthier and more efficient options they seek.

Follow the strategies and tips enclosed to utilize current space available with little-to-no redesign needed. Installation of unitary HPWHs is similar to installing standard-tank water. The guide explains benefits of HPWHs and outlines important considerations for the installer.

In California, over 90% of water heating is currently provided by gas water heaters.³ Recognizing California's ambitious climate policies, the hot water heating market is transitioning away from conventional products to high-efficiency, electric heat pump water heaters (HPWHs).

HPWHs are now more available, efficient, and reliable than ever, with many products carrying a 10-year warranty. HPWHs deliver hot water two-to-four times more efficiently than electric resistance or standard gas water heaters. As water heating accounts for roughly 25-40% of home energy use in California,⁴ this appliance can have a significant impact on lifetime energy use and utility costs.

Some benefits of installing HPWHs:

- **HPWHs create business opportunities and jobs for installers:** Installers can be leaders to market, especially for retrofits, to build brand awareness in advance of increasing local policy adoption and consumer demand, and in advance of future programs and T24 requirements.
- **HPWHs are marketable:** Builders that install HPWHs can market this technology as part of a *smart home of the future* because HPWHs are known to improve water-heating energy efficiency, remove on site fossil gas combustion, and reduce carbon emissions while providing customers with connectivity and control features to manage their energy use.
- **HPWHs speed new construction and design:** By not installing gas service, new construction developers avoid construction delays waiting for gas line easement approvals, and avoid making accommodations to locate gas meters in construction plans that meet difficult clearance requirements.
- **HPWHs are an accepted customer choice:** Homeowners care about home energy independence and reducing greenhouse gas emissions.⁵ HPWHs give customers these options, in addition to access to special incentives, rates, tax credits, smart connectivity information and control, and reliability and comfort. Installers can build trust and strengthen consumer-to-installer relationships by offering HPWHs as an option.

3 https://newbuildings.org/wp-content/uploads/2021/02/AWHI_PlaybookAndProgressReport202102.pdf

4 <https://ww2.energy.ca.gov/2019publications/CEC-500-2019-061/CEC-500-2019-061.pdf>

5 http://www.buildingdecARB.org/uploads/3/0/7/3/30734489/bdc_all-electric_survey_report_final_2019-08-1.pdf

Heat Pump Water Heater Features and Benefits

- Significantly reduce operating costs compared to standard electric water heaters and gas storage tank models.
- Prescriptive compliance approach to satisfy Title 24 requirements in new construction.
- Receive financial incentives for qualified products. See the [Switch is On](#) for current opportunities. Federal tax credits may also be available.
- Follow the strategies and tips enclosed to utilize current space available with little-to-no redesign needed.
- The same skills to install an electric-resistance water heater can be used to install a heat pump water heater.
- Avoid the cost of installing a flue to vent combustion gases.
- Eliminate the toxic condensate management associated with gas condensing water heaters.
- Easily set the temperature and change operational modes to maximize efficiency using the digital touchscreen control panel or application. This delivers much more flexibility than standard electric water heaters.
- Minimum 10-year manufacturer warranty on tank and parts.

How It Works:

THE ANATOMY OF A HEAT PUMP WATER HEATER

Standard water heaters require a significant amount of energy to heat water. In contrast, heat pump water heaters use less than half the energy to heat the same amount of water. By extracting warmth from the surrounding air and transferring it to the water inside the tank, heat pump water heaters reduce the amount of energy required to heat the water compared to any conventional water heater.

1

Heat pump pulls warmth from nearby air.

2

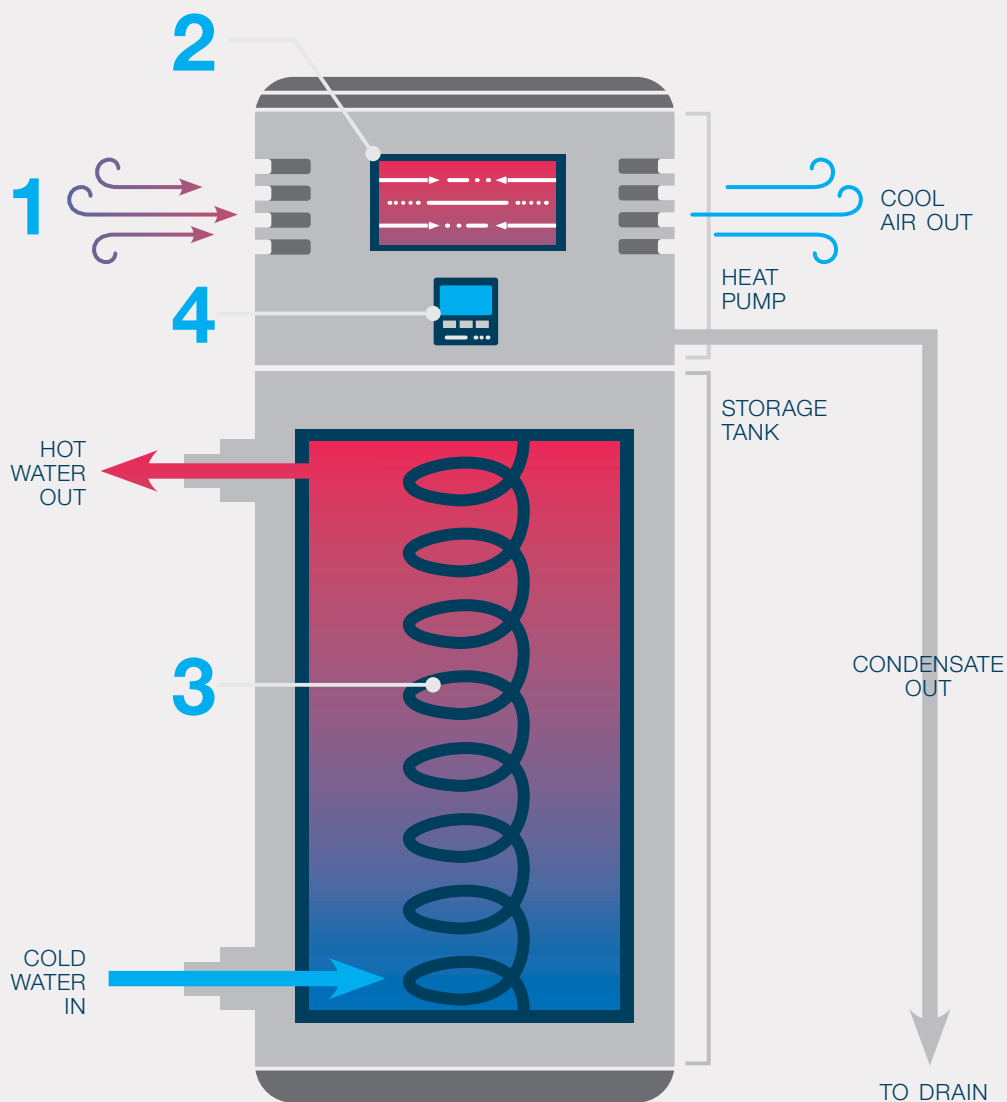
Warm air is compressed, increasing its temperature.

3

Refrigerant lines transfer heat from warm air to water.

4

Smart grid connectivity controls help manage energy use.

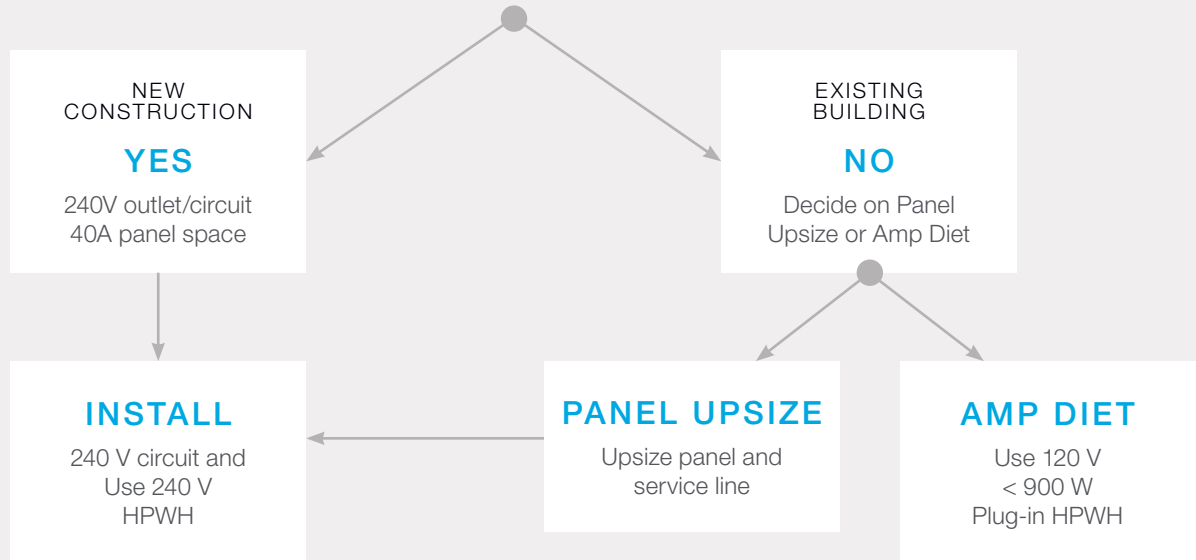


Credit: NBI

Heat pump water heaters have several unique installation requirements in comparison to standard electric or gas water heaters. Below is a quick guide of considerations and best practices for the installer.

Heat Pump Water Heater Installer Flowchart

Does panel have adequate Ampacity for future electrification?



SIZING:

Usage is understood and size chosen will meet needs

Sizing Best Practices

Efficiency first! Install low-flow fixtures in toilet, shower, sinks. Install pipe insulation to conserve hot water.

Can volume of water in piping be reduced if shorter pipes (with no tight bends) are installed?

Understand usage patterns: can owner take advantage of Time of Use rates?

YES

For thermal air-flow best performance:

Pick location:

Ideally in room having > 700 cubic feet of airspace, or having > 2 square feet of vents, through doors or walls or ducting the HPWH to either: crawlspace, garage, attic, laundry or another room

YES

Condensate:

Direct the condensate water by gravity flow or small condensate pump to a plumbing drain, laundry sink, floor drain, washer standpipe or outdoors etc. Unlike in gas water heaters, electric heat pump condensate is benign water requiring no special pipe material.

Location Best Practices

Locate where there may already be waste heat from a furnace or utility room.

Centrally locate to reduce piping length and speed hot water delivery.

Locate away from sleeping areas to avoid noise problems, or in a soundproof room/closet.

Provide good access for future servicing.

If installed in dusty area, change furnace filter more often.

Credit: NBI and AWHI

TITLE 24, PART 6 CALIFORNIA ENERGY CODE

California's Building Energy Efficiency Standards, issued by the CA Energy Commission (CEC), require improved energy efficiency. The aim is to maximize efficiency in the most cost-effective manner for newly constructed buildings, additions to existing buildings, and alterations to existing buildings. These standards include hot water heating updates in Title 24, Part 6.

Check the CEC Building Energy Efficiency Standards on Title 24 with special attention to CEC's compliance resources. In addition to Title 24, be sure to check and follow requirements in your local jurisdiction.

HPWH products on the Northwest Energy Efficiency Alliance Tier 3 and above offer prescriptive compliance with Title 24 equipment requirements for hot water heating. See References for the NEEA Tier 3 Qualified Product list.



Credit: NEEA and HWS

HPWH Design Considerations

SPACE AND LOCATION

For unducted applications, manufacturers typically require access to 700 cubic ft. of air volume in the space where the water heater is installed, along with sufficient space to allow installation and service. For a house with 9-ft. ceilings, this translates to a 9x9 foot room, making the garage an ideal location. Where space is limited, proper airflow can also be achieved through a louvered closet. Louvers should cover 16 square inches at both the top and bottom of the door for inlet and outlet.

Garages are ideal locations, providing ample space for heat pump water heaters. However, if your house is in a colder climate, such as those found in higher-elevation mountain areas, consider possible freezing conditions in the garage and follow standard location practices in your area. Basements, utility rooms, and laundry rooms also offer excellent locations for the water heater. HPWHs should not be located outdoors, unless its enclosed in an outdoor closet. Be sure to consult the manufacturer's installation guide for recommendations specific to your model. For further considerations, reference the FAQ section beginning on page 12.

COOL EXHAUST AIR

Heat pump water heaters exhaust cooler/drier air into their surroundings. Therefore, they should not be located in rooms that are frequently occupied by temperature sensitive activities. When garages are not available, locations with waste heat is available for example, utility/IT, and laundry rooms also serve as excellent locations. Or you could use a louvered door for intake and vent the cooler air into a non conditioned areas like, front hallway or other common space where temperature is not an issue. Do not vent the water heater exhaust air on or near a thermostat it will provide false reading to heat and cooling systems.

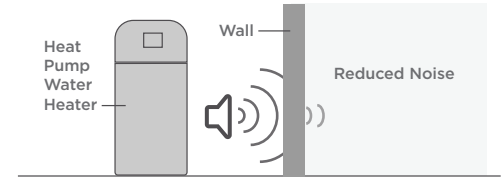
DRAIN WATER HEAT RECOVERY

Drain water heat recovery (DWHR) is a technology that captures shower waste heat from the drain line. DWHR provides roughly a 20 degree lift to the incoming water going to the water heater. It is an effective way to reduce the energy use of the water heater and increase useful stored hot water capacity.

Storage type water heaters with compact hot water distribution system and DWHR are a prescriptive way to meet Title 24 without requiring an increase in photovoltaic system capacity. Hot water heaters on the Northwest Energy Efficiency Alliance’s Tier 3 list do not require the DWHR, since they prescriptively meet Title 24 requirements. See References for more information on DWHR.

SOUND

Heat pump water heaters have a fan and compressor, both of which make a modest amount of noise. Northwest Energy Efficiency Alliance Tier-3⁶ heat pump water heaters emit sound at levels less than 55 dBA. Standing on the other side of a wall or door, the sound level drops to 35–40 dBA, which is quieter than a refrigerator. Still, placing the water heater away from bedrooms and living rooms can help mitigate any potential sound issue. Check with manufacturers for best practices regarding isolation pads, foam, and mounting strategies.



Credit: NEEA

TANK SIZE

First, follow the local plumbing code. For maximum efficiency, upsize the tank by one size over your standard gas or electric resistance tank size. Heat pump water heaters typically come with auxiliary resistance heat elements that can be enabled to meet periods of high-water demand. This operation is less efficient than running the heat pump alone. Upsizing the tank will minimize inefficient resistance heating, allowing the heat pump to do the vast majority of the water-heating work. The Uniform Plumbing Code requires a minimum First Hour Rating. Meeting that minimum and then increasing the tank size as indicated in the following table will reduce energy use.

Upsize the tank by one size over the standard gas or electric resistance tank size to ensure the thermal storage capacity of water heaters for future utility load management programs.

TANK SIZING GUIDELINES

Number of Bathrooms	1 to 1.5			2 to 2.5				3 to 3.5			
Number of Bedrooms	1	2	3	2	3	4	5	3	4	5	6
Uniform Plumbing Code First Hour Rating (gallons)	38	49	49	49	62	62	74	62	74	74	74
Minimum Typical HPWH Tank Size (gallons)	40	40	40	40	50	50	65	50	65	65	65
Up-Sized Tank (gallons)	50	50	50	50	65	65	80	65	80	80	80

CONNECTIVITY AND CONTROLS

Heat pump water heaters can also become part of a connected home with the following features and capabilities:

- Digital control interface
- Wi-Fi connectivity and smartphone app (availability varies by model) to remotely change temperatures, engage vacation mode, and monitor performance
- Leak detection (some models)
- JA13 compliant models equipped with a CTA-2045 port can participate in the “smart grid” to enable more renewable electricity generation

HPWHs can market their homes as smart homes and enable energy and operating cost savings for occupants. Controls allow the heat pump to engage with money-saving options, like time-of-use (TOU) electricity

⁶ <https://neea.org/img/documents/HPWH-qualified-products-list.pdf>

rates, and even money generating opportunities, like utility grid-interactive programs, neither of which are available to natural gas water heaters.

If on a TOU rate, time your water heater to heat up during off-peak times so the HPWH uses the lowest-cost electricity available to heat your water.

Households with a heat pump or other clean technology can enjoy lower energy rates with Southern California Edison's specially-designed Time-Of-Use rate, TOU-D-PRIME rate plan. Visit www.sce.com/tourates to learn more.

Installation Best Practices

Installing a heat pump water heater is essentially the same as installing an electric resistance water heater, so additional trades are not always needed on site. The flow chart outlines particular instances when additional trades might be necessary, for example, if panel upgrades are required.

Installation is simple, with no refrigerant handling required. In addition to following the guidance of product manuals, consider the following best practices:

CLEARANCE AND POSITIONING

- Follow manufacturer specifications regarding water heater clearance and seismic strapping.
- Position the unit so the control panel is facing outward and easily accessible to the homeowner. Make sure all data connection ports are accessible.
- Direct exhaust away from any thermostats if present or within ten feet.
- Ensure the intake air path is sufficiently free and open.
- Make sure that the positioning allows for easy access to inspect the water heater and controls, service the air filter, and drain the tank.

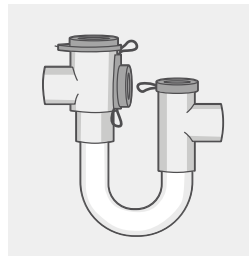
CONDENSATE

Heat pump water heaters produce a benign condensate that must be drained away from the water heater. Unlike condensing gas water heaters, which produce acidic condensate as a combustion byproduct, there are no special piping or handling requirements for heat pump water heaters other than to convey the benign condensate to a drain.

Ensure the water heater is level so condensate properly collects into, and drains from, the condensate collection pan. Do not drain water into safety water pan under the heater as some HPWH have leak detection sensors embedded in the bottom of the heater's housing.

INSULATION PAD

Title 24 requires that you provide a minimum R-10 foam pad under the heat pump water heater to minimize unnecessary heat loss through the bottom of water heater. This is a best practice regardless of floor type, and R-10 foam pads are readily available at plumbing supply center.



Credit: NEEA



Credit: NEEA and HWS

CONDENSATE TIP # 1

For added utility, consider draining the condensate outside to irrigate the landscape. For additional benefit to the homeowner, install the condensate drain with a p-trap and a tee port opening so the homeowner can periodically flush the condensate line with vinegar or similar cleaning solution.

CONDENSATE TIP # 2

Condensate pumps, commonly paired with air conditioners, can be used to drain the condensate produced by a heat pump water heater. A single pump may often be used for both the air conditioner and the heat pump water heater.

CONDENSATE PIPE ROUTING TIPS BY WATER HEATER LOCATION

Above Grade (e.g., garage)

- Install to ensure drain line won't freeze (consult installation manual for best practices)
- Laundry and/or sink drain

Below Grade (e.g., basement)

- Pump to outside
- Drain to floor drain, laundry sink and/or p-trap to plumbing line

SEISMIC STRAPPING

As with other water heaters, your local code may require seismic strapping. When installing, use rubber standoffs when attaching straps to the wall to minimize the vibration and transfer of sound to rest of house.

DRAIN PAN

If installing on a floor susceptible to water damage, install a drain pan to guard against any problems from future leaks. Connect the outlet from the pan to suitable drainage in accordance with your local code.

NO STAND NEEDED

Electric storage water heaters, including heat pump water heaters, do not need to be raised off the floor with a stand. Most electric heat pump water heaters are taller than electric storage water heaters. However, they have a larger tank size, and their connections are in different places. Make sure there is space above and around the heater to accommodate the variations for the models you are considering.

PIPE INSULATION

To improve the system performance overall, insulate all the hot water piping. It is more important to make sure the pipe insulation is continuous than it is to increase the wall thickness or R-value of the pipe insulation. Title 24 requires one inch of pipe insulation. This includes R-7.7 insulation for the first five feet of cold pipes from the storage tank, all hot water piping between $\frac{3}{4}$ -1 inch, and hot water piping less than $\frac{3}{4}$ inch if it is: associated with the hot water recirculation system, buried below grade, or traveling from storage tank to kitchen fixtures or to another storage tank. Exceptions apply, including in alterations where unexposed piping does not need to be insulated.

TANK INSULATION

Unfired tanks are required to be insulated. Most HPWH have internal insulated tanks. A label on the exterior of the tank will show the R-value, which must be at least R-16 to meet Title 24 requirements for internal insulation in an unfired tank.

HEATED WATER CIRCULATION (TEMPERATURE MAINTENANCE)

Do not use a continuously operated circulation pump. If pipe runs to fixtures are too long, use an on- demand, sensor, or occupant-activated pump to circulate just enough water to prime the loop with hot water. Connect the return pipe of the circulation loop to the cold inlet of the water heater—this will guide the cooler returning water to pool at the bottom of the tank so it does not interfere with hot water availability. Continuous circulation is particularly detrimental to heat pump water heaters. It will result in lack of hot water availability and greatly increase energy use. Consequently, never set the circulation system controls to continuous, and advise the homeowner of this requirement.



Seismic strapping.
Credit: NEEA and HWS



Pipe insulation.
Credit: NEEA and HWS

An external thermostatic mixing valve is recommended to increase the storage heat capability of the water heater.

OPERATIONAL MODES

The default for most HPWHs is hybrid operation mode with the supplemental heating elements enabled. Some manufacturers refer to this as “Energy Saver” mode, though switching to the efficiency/economy mode may actually save more. The hybrid mode automatically switches to standard electric resistance heat during periods of high hot water demand. However, most consumers can meet demand and maximize cost savings by using the **heat pump mode only**. Controls make it easy to switch options during times of high-water demand. Consult the manufacturer manual. Some units even have a vacation mode or timer to help save energy when away from home by putting the unit to “sleep.”

AFTER INSTALLATION: SERVICING THE WATER HEATER

After installation, heat pump water heaters require modest servicing. The air filter should be cleaned every 6-12 months, with a more frequent cleaning cadence in high dust locations. The heat pumps in current water heaters are designed like refrigerators to operate as a fully sealed system with no other servicing, so there are no ports to add or remove refrigerant. Like any other water heater, follow the manufacturer’s recommended service requirements including regular maintenance for draining the tank and servicing the anode rod.

Northwest Energy Efficiency Alliance (NEEA) “Tier 3” qualified HPWHs come with a 10-year equipment warranty. The warranty criteria for ENERGY STAR® certified electric water heaters is only six-years on a sealed system, but many manufacturers offer ten-year equipment warranties.

The default mode on most heat pump water heaters is a hybrid of heat pump and electric resistance heat. Even though this default mode is sometimes called “energy saver”, the reality is that most consumers can meet demand and maximize energy and cost savings by using the heat pump only mode. Installers should be sure to modify the settings and show customers how to adjust in case of high hot water demand.

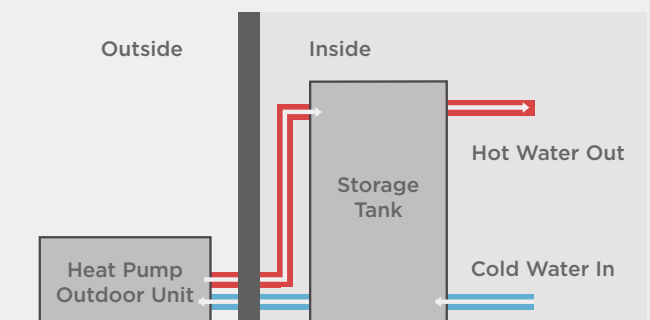


Split-System Heat Pump Water Heaters

Split systems are heat pump water heaters in two parts, with the air-to-refrigerant heat exchanger designed to be located outside. With the heat pump outside, and the tank inside or in a garage, the two components are then connected with piping.

Split systems are useful in a number of design scenarios by offering several advantages, including:

- Some split systems currently on the market use carbon dioxide as a refrigerant, which has an extremely low global warming potential (GWP) compared to conventional refrigerants like R-134a.
- The tank can be in a confined space without access to airflow or a heat source. (Examples of confined or challenging spaces include closets, under stairs, bedrooms, bathrooms, and cabinets under countertops.)
- No cool air is created inside the house.
- The active end of the heat pump is outside the house, reducing indoor noise. The outside unit is well below any noise restrictions by home owners associations (check local codes and HOAs for details).



Code/Inspection Checklists

Based on requirements and best practices, the following checklists provide guidance on verifying the proper installation. These checklists are provided for information only and may not be comprehensive. Consult a qualified professional to ensure all applicable requirements are met:

CODE OFFICIALS/ INSPECTORS, VERIFY:

- The system is a California Title 24 compliant or higher efficiency product.
- Under Title 24's low-rise residential prescriptive approach, HPWHs must comply with one of the following:
 - » Include compact hot water distribution system and drain water recovery system.
 - » In Climate Zones 2-15, increase photovoltaic system by 0.3 kW.
 - » In Climate Zones 1, 16: increase photovoltaic system by 1.1 kW.
 - » NEEA Advanced Water Heater Specification Tier 3 or higher, plus in Climate Zones 1 and 16, increases photovoltaic by 0.3 kW.
- Heat pump storage tank is in garage, exterior closet, or conditioned space, on a rigid surface insulated to R-10 or higher. It cannot be unsheltered.
- Storage tank shall have a minimum R-12 external wrap insulation or minimum internal insulation of R-16 with exterior label showing insulation value.
- Water heater is positioned with clear intake air path, and oriented to minimize exhaust air drafts.
- Water heater is positioned for easy access to the control panel and to change or service the filter.
- Connections to the water heater are located so that the water heater can be easily removed for repair or replacement.
- Condensate safely conveyed to drain or exterior. (Note: unlike in gas water heaters, electric heat pump condensate is benign water requiring no special pipe material).
- Proper wire gauge is used. (Note: Most heat pump water heaters still have full-size resistance elements, so wiring requirements are identical to standard electric-resistance water heaters).
- Temperature and Pressure (T&P) valve is properly plumbed.
- Wiring is grounded with proper gauge.
- Seismic strapping is employed, as required by local jurisdiction.
- Pipe insulation is minimum R-7.7 or local code—whichever is greater.
- Correct spacing is provided around the heat pump (per manufacturer's instructions).
- Heated water circulation systems, if present, are configured to pump only on demand for hot water within the occupancy.
- Pipes are insulated,
- Make-up air volume around the water heater is large enough, or
- Make-up air is provided per the manufacturer's requirements.
- Recirculation loop (if present) returns pipe to cold inlet of water heater.
- Mode of operation is at a minimum of hybrid, and preferably heat-pump only.

HERS-Verified Recirculation Strategies

Several recirculation strategies require verification by a HERS rater and center around demand recirculation. Demand recirculation systems require that the pump operation is initiated just before the hot water draw and is operated by either a manual or sensor control that shuts off the pump due to a rise in pipe temperature. The following are requirements for these systems:

Demand Recirculation: Manual Control (RA4.4.9) – must be in the kitchen and any point of use at least 20 feet away from the water heater. The manual control may be operated by wired or wireless mechanisms but must have a standby power of one watt or less.

Demand Recirculation: Sensor Control (RA4.4.10) – must be in the kitchen, bathrooms, and any point of use at least 20 feet away from the water heater. The sensor mechanism may include motion sensors, door switches, and flow switches, and must have a standby power of one watt or less. With either strategy, the control must shut off the pump in accordance with the following methods:

- After the pump has been activated, the controls must allow the pump to operate until the water temperature at the thermo-sensor rises no more than 10°F above the initial temperature of the water in the pipes or
- The controls must not allow the pump to operate when the temperature exceeds 102°F
- The controls must limit pump operation to a maximum of five minutes following ANY activation

See Residential Reference Appendix RA 3.6.6 for test protocols and Residential Reference Appendix RA 4.4.7 for more information about eligibility criteria.

Frequently Asked Questions

Where do I put the water heater if the home does not have a garage, or if I am concerned about pipes freezing in the garage?

Utility rooms and laundries are great locations for a heat pump water heater. Inside the building, pick a spot that will not be frequented by occupants, and position it away from bedrooms and living spaces to fully mitigate any noise concerns. Heat pump water heaters mildly dehumidify the air around them, so they can be a helpful addition to a root cellar or pantry design.

Can HPWHs be installed outside?

Regardless of where the existing water heater is located, a replacement HPWH may be installed in an attached outdoor closet when using the prescriptive approach. When placed in a closet, airflow must be provided per manufacturer's installation requirements (vents, louvers, etc.).

How big does the space need to be?

The key to successful heat pump water heater operation is to provide enough air for the water heater. You can locate the water heater in a small space as long as there is adequate airflow or it is ducted. This can be achieved by installing a louvered door (including 18 square inches for inlet and outlet, one high and one low, and grills and/or grates) or similar air gaps. In other cases, it may also be possible to duct the intake or exhaust air from or to another location in the house. Be sure to duct the cooler exhaust air to an adjoining space or duct the intake air from a neighboring room, and let the cooler air pool in the water heater closet. **Always remember to duct in and out of the same space because you don't want to depressurize the space. Additionally, it is not a good idea to duct from the garage into the house as this might pull in toxic fumes from fossil gas burning vehicles or appliances.**

What are some known challenges or difficulty install areas and what should I do about them?

- **Wiring** – When retrofitting a new HPWH, the existing electrical connection point may not be close enough to the HPWH. This is rare when replacing electric resistance water heaters, but it may be that the wiring pigtail on the new unit is shorter than the existing one. To remedy this, buy a longer pigtail, and check to make sure it is still within the code length limit. If installing the new water heater in a different location in the home or replacing a propane or natural gas water heater where there may not be an existing electrical service at the location, check the HPWH Installer Flowchart in this document for existing buildings.
- **Pipe Configuration** – On most electric resistance tanks, hot and cold connections are at the top. Minor rerouting may need necessary for HPWH since they often have the cold inlet water low on the tank and the hot water outlet high on the tank. If the routing is more challenging, look for a HPWH model that has both connections at the top.
- **Proximity to Condensate Drain** – HPWHs have a condensate pan that collects the moisture the heat pump extracts from the air. Under high air moisture conditions, the condensate pan will need to be drained. If the water heater is not conveniently placed next to a drain, try reaching

an existing drain via gravity-fed lines, or a low-cost condensate pump. Alternatively, if there is not a drain in the same area of the HPWH at all, it will be necessary to install a condensate pump and pipe through a wall or floor to the nearest usable drain.

- **Condensate Freezes or gets Blocked during drainage to the exterior** – On extremely rare occasions and specifically in colder climate zones, the pipe that drains the condensate may freeze or get otherwise blocked if draining to the exterior. In colder climates install an interior condensate drain line. If draining to the exterior is necessary, install the condensate line at a steep slope with a suitable end cap at the end of the line to prevent blockage at the exit point. If installing where the exterior will be below freezing point for an extended period of time, add a heat trace to operate when outside temperature is below 35°F.
- **Multifamily** – Retrofitting a multifamily in unit HPWH tank can be done if there is adequate space and suitable location as outlined in this document, please refer to Spacing and Location.

The heat pump water heater exhaust air is cool—should I duct it to outside?

HPWH exhausts cooler air to the surrounding if running for more than 3-5 hours/day. While it provides a small amount of free cooling to the home during summer months, they can have 1-2 degrees impact during heating months hence it is ideal to duct the exhaust air outside if the installation location is temperature sensitive.

When should we increase the size of the tank?

Go from 50 up to 65 or from 65 up to 80 to maximize efficiency. It is recommended to go up one size on the water heater if you know the use will be larger than typical, or if there will be more people living in the house than you originally sized for. A larger tank enables the HPWH to spend more of its time in the highly efficient heat pump mode and minimizes the use of the inefficient resistance elements.

Can I use the heat pump water heater to back up my solar thermal water heating system?

Heat pump water heaters can be used in conjunction with solar thermal. Refer to manufacturer's recommendations for installation methods.

What happens to a HPWH in the event of a power outage?

The HPWH will continue to supply the remaining hot water in the storage tank, although it will no longer produce hot water because neither the heat pump nor the resistance heating element will work without electrical power. When power is restored after the outage, the water heater will automatically revert back to the most recent user settings.

How do different NEEA Tiers work and why should I care?

The Northwest Energy Efficiency Alliance (NEEA) has created a specification and test procedures that are suited both for cool and warm climates. The Advanced Water Heating Specification (AWHS) is paired with a Qualified Products List (QPL). The different tier levels range from 1-5 (1 being the lowest performing, and 5 being the highest performing). Higher tiers

mean better performance, quieter operation, less dependency on electric resistance, and more integration with the utility grid. Considerations in choosing a specific tier may include locational challenges, attaining HERS points, and/or Title 24 compliance, which requires NEEA Tier 3 or higher. See References for the NEEA Tier 3 Qualified Product list.

What is the relationship between NEEA Tier 3 and Energy Star?

Energy Star has a longer list of qualified HPWH products beyond the NEEA Tier 3 list. However, not all Energy Star models provide prescriptive approaches to achieving Title 24 like the NEEA qualified product list does.

Are there financial incentive programs for HPWHs?

Financial incentives in California can be found at the [Switch Is On](#).

Additionally, a \$300 tax credit may be available for ENERGY STAR certified electric HPWHs. Learn more [here](#).

Can I duct air to the water heater from the outside and exhaust it to the outside (a.k.a., dual ducting)?

Yes, however, be aware that anytime the outside air is below approximately 40 degrees Fahrenheit, the supplemental resistance heating element may be used, reducing efficiency. Studies show pairing the heat pump water heater with a highly efficient heating system yields similar energy performance to dual ducting.

Will the heat pump water heater reduce the temperature of the room where it is located?

Heat pump water heaters work efficiently by extracting heat from the surrounding air and transferring it to the water inside the tank. In an opposite manner, refrigerators work by extracting heat from inside the refrigerator and transferring it to the kitchen. Just as refrigerators do not make the kitchen noticeably warmer, heat pump water heaters do not typically make the room in which they are located noticeably colder.

If installed inside the house, will the heat pump water heater's energy savings be offset by the extra heating system runtime?

If installed inside the conditioned part of the house, the heat pump water heater will reduce some energy of the cooling system in the summer. HPWHs may use some energy provided by the heating system, however the more efficient the space-heating system is, the better the benefit for the heat pump water heater and the smaller the heating offset. Regardless of space-heating system, the energy savings from the heat pump water heater far exceed any additional energy needed from the heating system, especially in the warm and dry climate in Southern California.

Are heat pump water heaters loud?

Heat pump water heaters have a fan and compressor—both of which make noise. NEEA Tier-3 heat pump water heaters emit sound at levels less than 55 dBA, which is quieter than a typical conversation. On the other side of a wall or door, this drops to 35–40 dBA, which is quieter than a refrigerator.

Can I reduce the sound?

To mitigate heat pump water heater sound levels, locate the unit far away from the most actively occupied areas of the house. Additionally, use vibration dampening standoffs to connect the seismic strapping from the water heater to the wall. Placing the water heater on an insulating pad will also help. Attaching a short duct run, such as a 90-degree elbow, can reduce sound. Finally, insulating the walls between the installation location and occupied spaces of the house can reduce sound levels.

How reliable are heat pump water heaters?

Heat pump water heaters have been available for more than 40 years. Current heat pump water heaters are designed like refrigerators to operate as a fully sealed system with no servicing required. The only additional, regular service needed is to check the air filter every three to six months. Further, NEEA Tier-3 heat pump water heaters come with a category-leading 10-year warranty.

Will the occupants have enough hot water?

Heat pump water heaters have hot water delivery capability that is comparable to or greater than electric-resistance tanks. Follow the tank-sizing guidelines on page 7 if you are new to specifying heat pump water heaters.

When should I go to a bigger tank?

If space, budget, and location allow, a larger tank is always the better choice. This allows the water to be heated during off peak times for future hot water use at a later time. A larger tank size will also rely on the heat pump, rather than using the less efficient, resistance heating element.

What if I need more hot water but can't install a larger tank?

One approach is to install a mixing valve, which allows a higher set point on the water heater. Higher temperatures may result in small tank loss energy penalties. Always consult with local plumbing codes to guide professional installation and fail-safe equipment.

I have a 600 square foot Additional Dwelling Unit (ADU) and I need a heat pump water heater to get the energy credits. Where do I locate the heat pump water heater, and what other installation considerations are there for installing in a small space?

If you are installing a heat pump water heater in a small space, consider installing it in an area that will not be impacted by a modest amount of noise and or cool air while operating (e.g., a kitchen closet with louvered door). Other installation locations to consider may include:

- closet with venting in and out of the structure
- sufficiently large crawl space
- adjacent semi-conditioned garage with enough volume of air (700 cubic feet)

References

Qualified Products:

[Southern California Edison](#)

[ENERGY STAR Qualified HPWH Products](#) (search for all-electric models)

[ENERGY STAR Water Heaters Specification](#)

List of Tier 3 and above products on the [NEEA Qualified Products](#)

[NEEA Advanced Water Heating Specification](#)

General Information:

[About HPWHs](#)

[Drain Water Heat Recovery](#)

[Installation help](#)

[Rebate information](#)

Information on Title 24:

[Energy Code Ace](#)

[2019 Building Energy Efficiency Standards for Residential and Nonresidential Buildings](#)

[2019 Residential Compliance Manual for Water Heating Requirements](#) (see chapter 5)

[Title 24 Water Heating Requirements](#)

Manufacturers:

[AO Smith](#)

[Bradford White](#)

[Rheem](#)

[ECO2 systems](#) (formerly Sanden)

[American](#)



Southern California Edison is one of the largest electric utilities in the United States and a longtime leader in renewable energy and energy efficiency. With headquarters in Rosemead, Calif., SCE serves approximately 15 million people in a 50,000 square-mile area of central, coastal and Southern California. SCE has provided electric service in the region for 135 years.

From how we operate today to how we plan for the future, SCE is committed to protecting the environment as we deliver reliable, affordable power. Over the years, we have engaged millions of Californians in conserving electricity through energy efficiency programs—resulting in lower emissions and improved air quality. To learn more about SCE, visit [sce.com](https://www.sce.com).



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New Buildings Institute (NBI) is a nonprofit organization driving better energy performance in buildings. We work collaboratively with industry market players—governments, utilities, energy efficiency advocates and building professionals—to promote advanced design practices, innovative technologies, public policies and programs that improve energy efficiency and reduce carbon emissions. We also develop and offer guidance and tools to support the design and construction of energy efficient buildings. Learn more at [newbuildings.org](https://www.newbuildings.org).



The Advanced Water Heating Initiative is a collaborative, multi-year market transformation effort of over 50 organizations working to catalyze a rapid transition to high-efficiency, grid-connected Heat Pump Water Heaters (HPWH). Increasing concern over the energy use and greenhouse gas emissions associated with heating water led to the formation of the initiative. The market transformation effort is an initiative of New Buildings Institute (NBI).



Hot Water Solutions is an initiative of the Northwest Energy Efficiency Alliance (NEEA), an alliance of more than 140 Northwest utilities and energy efficiency organizations working to accelerate the innovation and adoption of energy-efficient products, services and practices in the Northwest.