



Heat Pump Water Heaters

March 26, 2024

About Green Energy Consumers Alliance

A nonprofit organization based in Massachusetts and Rhode Island with a mission to empower consumers and communities to speed a just transition to a zero-carbon world.



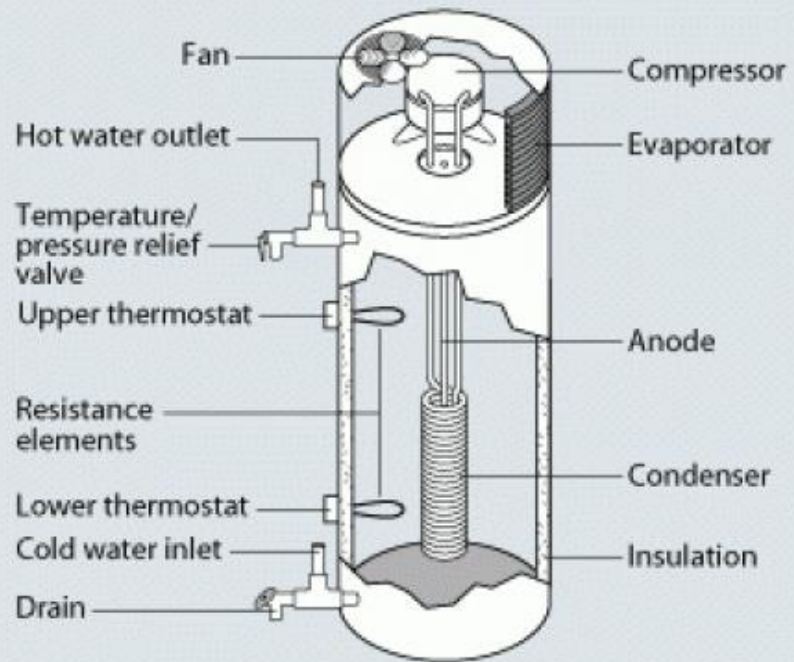
What is a heat pump water heater?

- A HPWH takes the heat from the room and transfers it to the water in the tank.
- 3 times more efficient than electric resistance or gas water heaters.
- Upfront cost higher than for gas hot water before incentives, but savings on energy
- If you take many showers in a row, the system can back up the heat pump with electric resistance
 - Electric resistance should not be needed with normal use
- If ambient temperature falls below 37 degrees, resistance comes on



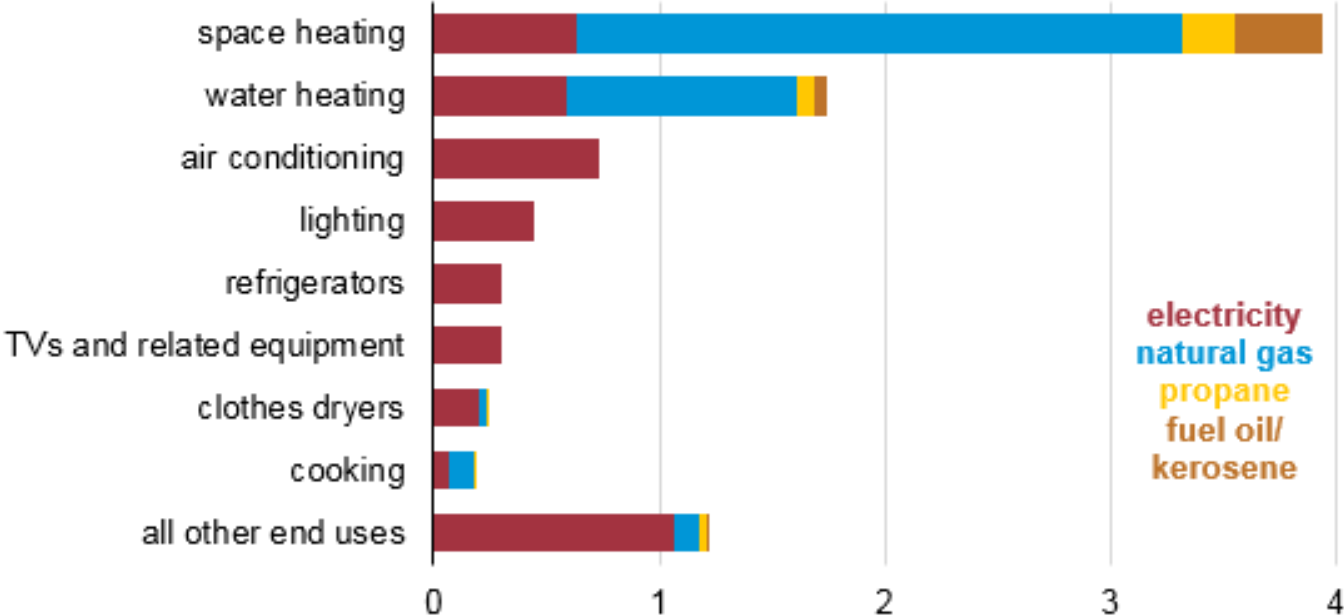


Heat Pump Water Heater



How much energy used to heat water?

U.S. household end-use energy consumption by fuel (2015)
quadrillion British thermal units



**US DOE: 18%
residential
energy use**



Climate Impact of Heating Water with Methane

- 15 MMBtu per household, 18% of total energy use
 - Total Home Energy Use = 88.7 MMBtu
 - Space heating = 45 MMBtu
 - AC = 4
 - Refrigerator = 2.4
 - Other = 18.5
- 15 MMBtu of methane (natural gas) = 0.8 MT of CO₂/year
 - Equivalent to 90 gallons of gasoline



Why switch to a heat pump water heater (HPWH)?

- We all need to electrify space heating, water heating, cooking, and clothes drying
- Heating water with fossil fuels produces about 1 MMT/year of GHG (1/3 of space heating!)
- Electricity supply is getting cleaner every day
- Operating costs are very low
- Federal tax credits and utility rebates make net cost of installation affordable
 - Compared to hot water by gas, oil, propane, or electric resistance
 - Compared to heat pumps for space heating
- Easier, for many, than installing heat pumps for space heating
- Water heaters need replacement every 10-15 years, so plan ahead
- Improves indoor air quality



Virtual Home Decarbonization Consultations

- <https://www.massave.com/en/residential/programs-and-services/decarbonization-consultations#consult-form>
- <https://cleanheatri.com/consultation/> (might be limited to space heating)
- Also look at the Water Heating Calculator
 - <https://www.energymaine.com/at-home/water-heating-cost-comparison/>



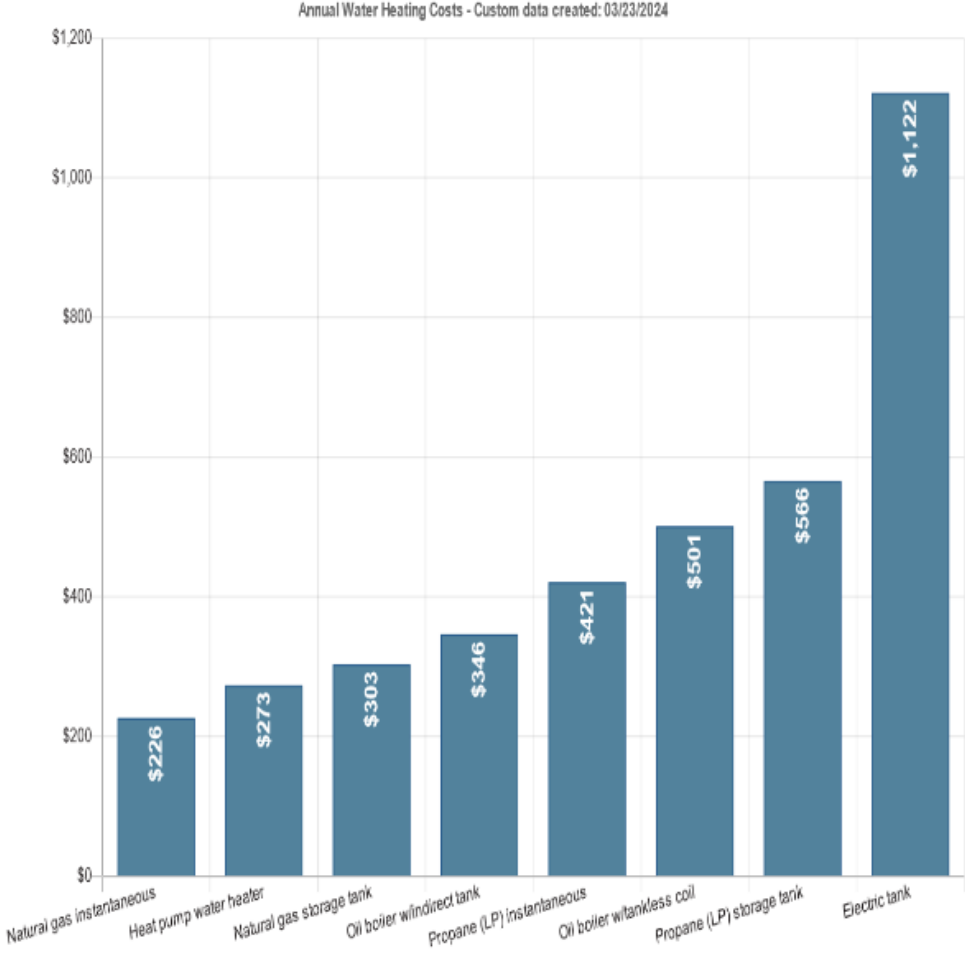
Assumptions Can Vary

- Many websites assume 50-75 gallons / day
- Electricity Rates (supply + delivery)
 - National Grid & Eversource both = 34 cents / kWh until July 31, 2024
 - Municipal Aggregation tends to be less, unless at 100% renewable energy
 - Municipal Utilities are less
- System efficiency
- Fossil Fuel Prices
- Installation Costs
- Tax Credits
- State / Utility Rebates
- <https://www.energymaine.com/at-home/water-heating-cost-comparison/>.



Use the Efficiency Maine Calculator

efficiencymaine.com



Gal/Day: 50

Temperature Rise °F: 70

Cost

	Energy Unit	Cost/Unit	Energy Factor	Annual Cost	10-yr Cost
Heat pump water heater	kWh	\$ 0.34	3.88	\$273	\$2,733
Natural gas instantaneous	therm	\$ 1.91	0.90	\$226	\$2,258
Natural gas storage tank	therm	\$ 1.91	0.67	\$303	\$3,033
Oil boiler w/indirect tank	gal	\$ 3.93	0.87	\$346	\$3,458
Propane (LP) instantaneous	gal	\$ 3.26	0.90	\$421	\$4,212
Oil boiler w/tankless coil	gal	\$ 3.93	0.60	\$501	\$5,014
Propane (LP) storage tank	gal	\$ 3.26	0.67	\$566	\$5,658
Electric tank	kWh	\$ 0.34	0.945	\$1,122	\$11,220

Rebates from Mass Save & Rhode Island Energy

- <https://www.massave.com/residential/rebates-and-incentives/water-heating/water-heaters/heat-pump-water-heaters> (rebates for fossil fuel upgrades end August 2024)
- <https://energy.ri.gov/heating-cooling/clean-heating-cooling-incentives>
- <https://www.rienergy.com/RI-Home/Energy-Saving-Programs/rebate-programs>
- <https://www.rienergy.com/RI-Home/Energy-Saving-Programs/Electric-and-Gas-Water-Heating>



Mass Save Cost Example

Below is a cost example of installing a heat pump water heater.

Average Installation Cost *	\$3,200
Mass Save Rebate	\$750
Federal Tax Credit **	\$735
Net Project Cost	\$1,715



Do you need electrical upgrade?

- Ask a good electrician!
- 120 volt or 240 volt heat pump?
 - 120V HPWHs are now available. They can plug into a shared 120V 15amp circuit. No need for expensive electrical work. They are a less efficient than 240V. UEF must be 2.2 or greater, whereas 240V units must have UEF of 3.3 or greater. Slower recovery time.
- 100 amp or 200 amp service?
- What else in home?
 - Heat pumps?
 - Induction stove?
 - Electric vehicles?
- Inflation Reduction Act tax credit of up to \$600 for wiring upgrade if paired with HP or HPWH

Cool Air, Some Noise, Condensate

- Heat pump blows cool air, which can be unpleasant to those in its path. And during the winter, this will lower the temperature of the room by several degrees. Not a problem in the summer (actually a benefit) and not generally noticeable in the shoulder months. Can be mitigated if next to your heating system.
- 45-50dB are common. 50 dB is as loud as a quiet conversation, a quiet suburb, a quiet office, or a quiet refrigerator.
- Condensate pump and line needed.
- HPWH dehumidify.
- Needs some space, 450-1000 cubic feet.



Manufacturers – Look for the Energy Star Label



- American Standard
- A.O. Smith
- Bradford White
- Rheem or Ruud
- Sanco (split system)

More listed at <https://www.energystar.gov/productfinder/product/certified-water-heaters/>



Energy Star Requirements (Uniform Energy Factor Ratings)



- 240 volt HPWH: > 3.30
- 120 volt HPWH: > 2.20
- Gas-fired Storage: > 0.81
- Gas-fired Instantaneous: > 0.95

https://www.energystar.gov/products/water_heaters/residential_water_heaters_key_product_criteria



Video Worth Watching



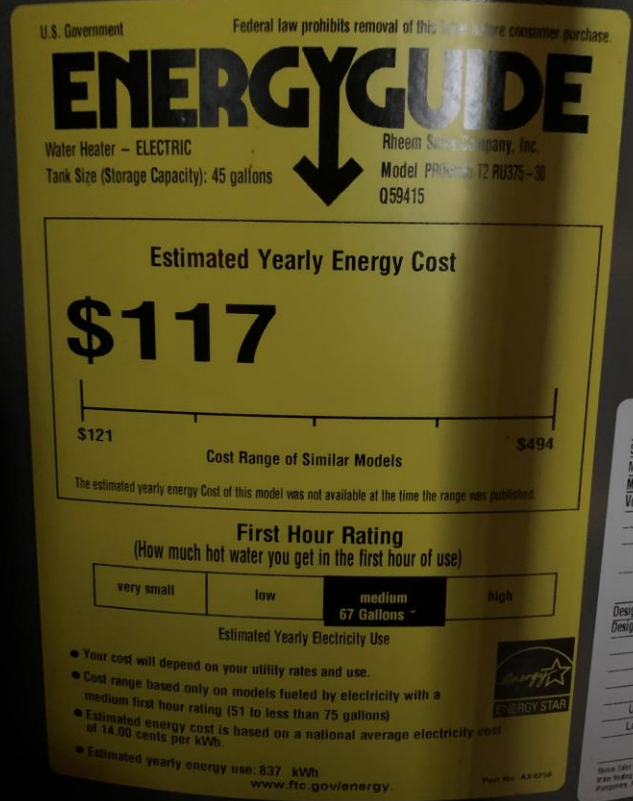
Learn More

- <https://www.energymaine.com/at-home/water-heating-cost-comparison/>
- <https://homes.rewiringamerica.org/calculator>
- <https://goclean.masscec.com/clean-energy-solutions/heat-pump-water-heater/>
- <https://youtu.be/9pBarDSaGKE> (video on previous slide)



Chretien Family HPWH

- Ruud 45 gallon, 240v
- \$5200 installation cost before \$1560 tax credit & \$750 rebate
- 67 gallon first hour rating
- 3.88 Uniform Energy Factor
- Estimated annual usage 837 kWh/year
- 4.5 kilowatts when running on resistance
- 21 amps
- Shifts to resistance when ambient temp. is 37 degrees or less
- < 50 decibels
- Mexico
- 10 year warranty
- *Note: Label shown is based upon 14 cents / kWh*



WiFi & Demand Response Ready



- Comes with app for data collection and control
- Demand Response Ready allows easy connection to a utility program to shift usage to off-peak periods, another way to save money



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MARCH MATCH

Upcoming Events

- Developing A Clean Heat Standard | *April 2 at 12:00 PM & 7:00 PM*
- Electric Vehicles 101 | *April 4 at 7:00 PM*
- Save Money on an EV in Massachusetts | *April 16 at 7:00 PM*
- EV Charging | *April 17 at 12:00 PM*
- Heat Pumps 101 | *April 18 at 12:00 PM*
- Save Money on an EV in Rhode Island | *April 25 at 7:00 PM*

greenenergyconsumers.org/events



Questions?

Larry Chretien | *Executive Director*

Larry@GreenEnergyConsumers.org

