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Heat Pump Water Heaters in California

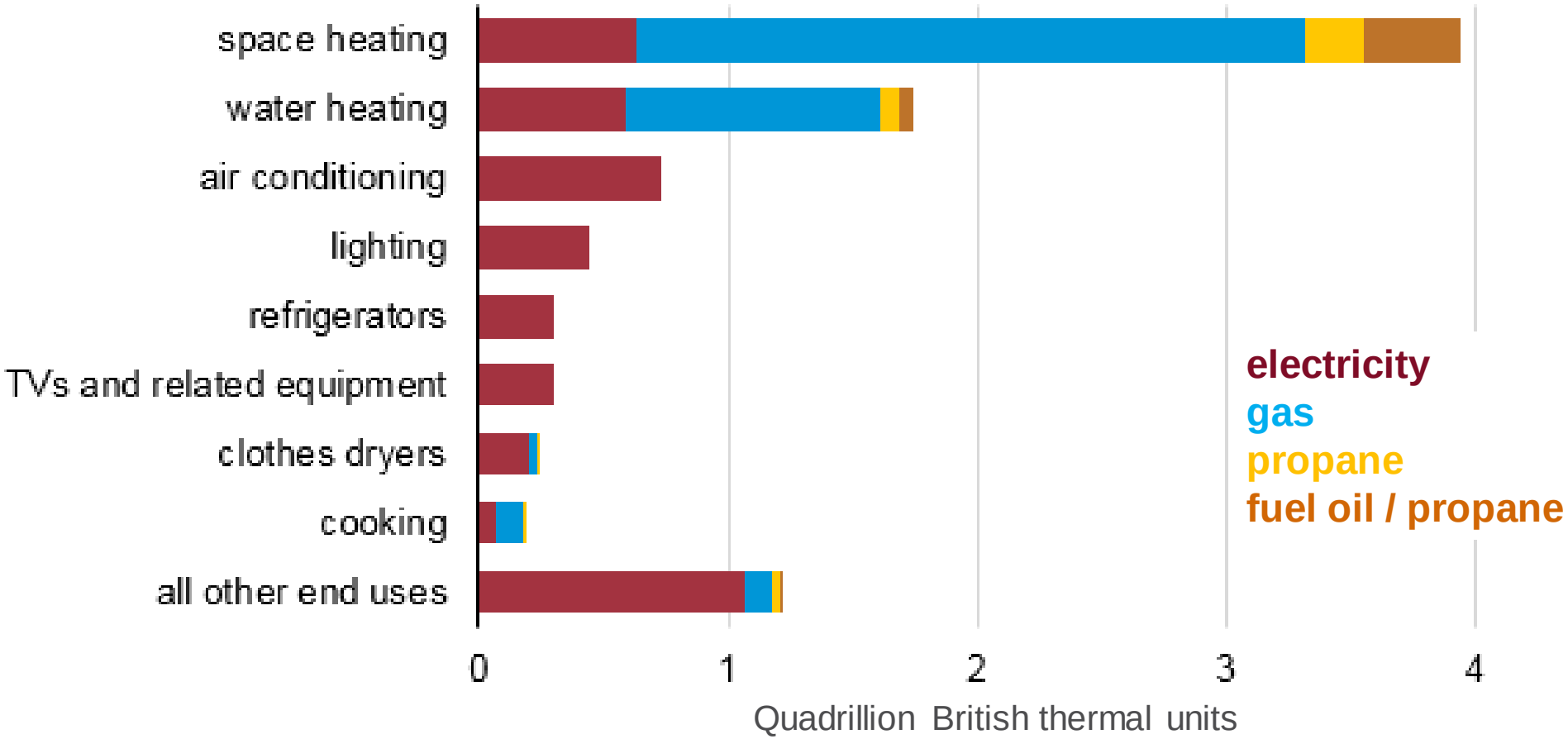
Joseph Wachunas, New Buildings Institute

California Energy Commission

August 30, 2022

Why water heating?

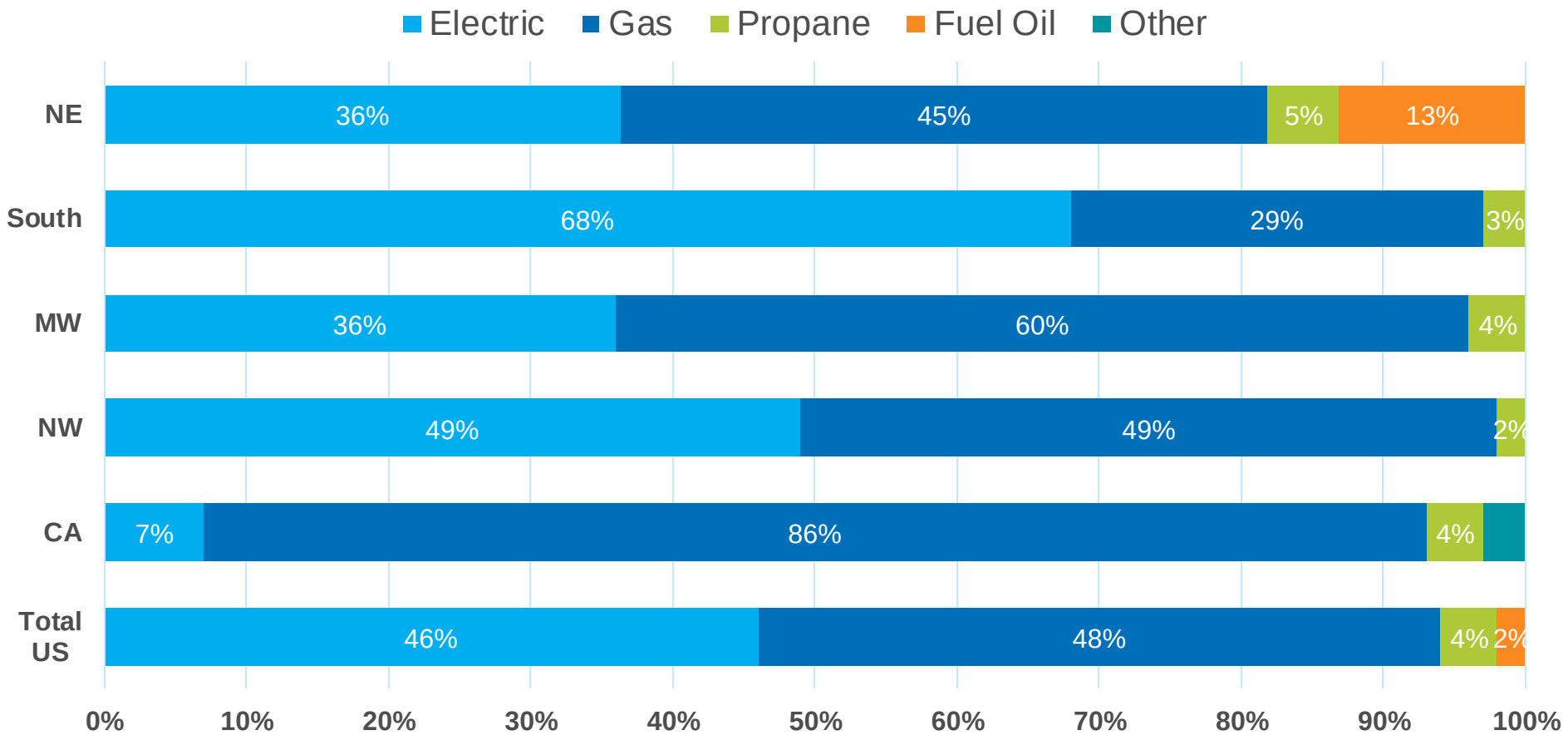
More than 66% of energy use in homes is from space and water heating



Source: 2015 Residential Energy Consumption Survey (RECS)

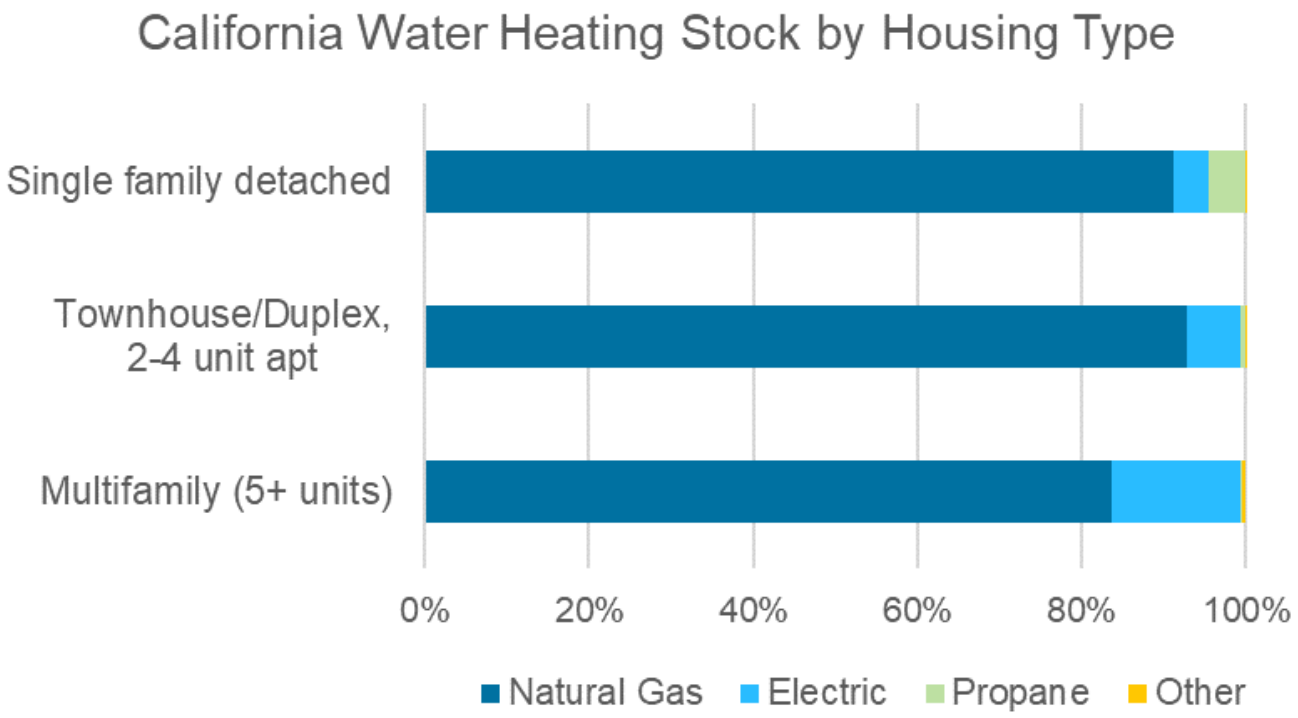
Water Heating Equipment Fuel Type

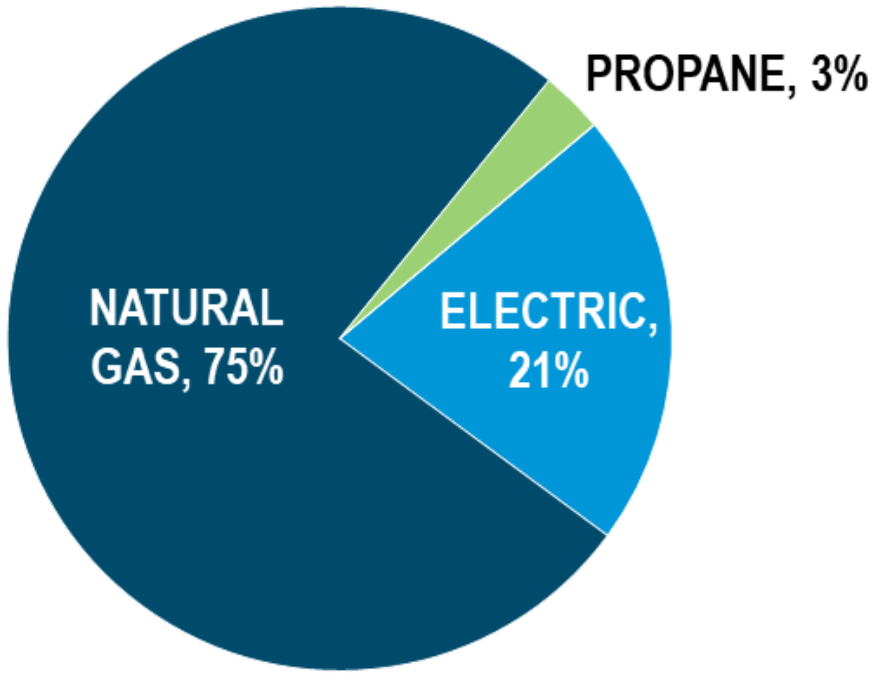
Residential Water Heating Stock by Region



NBI estimates in 2020 are based on data from CA Residential Appliance Saturation Study 2009 and 2015 RECS

California Water Heater Fuel Types





Source: 2019 Residential Appliance Saturation Survey (RASS)

Source: 2020 Residential Energy Consumption Survey (RECS)

AWHI ADVANCED WATER HEATING INITIATIVE™

We could save 100 million tons of carbon emissions every year

Create thousands of good-paying jobs in the building industry

Promote equity through workforce training and local investment

Enable a cleaner, more resilient electric grid

The solution is a piece of equipment that every home needs...

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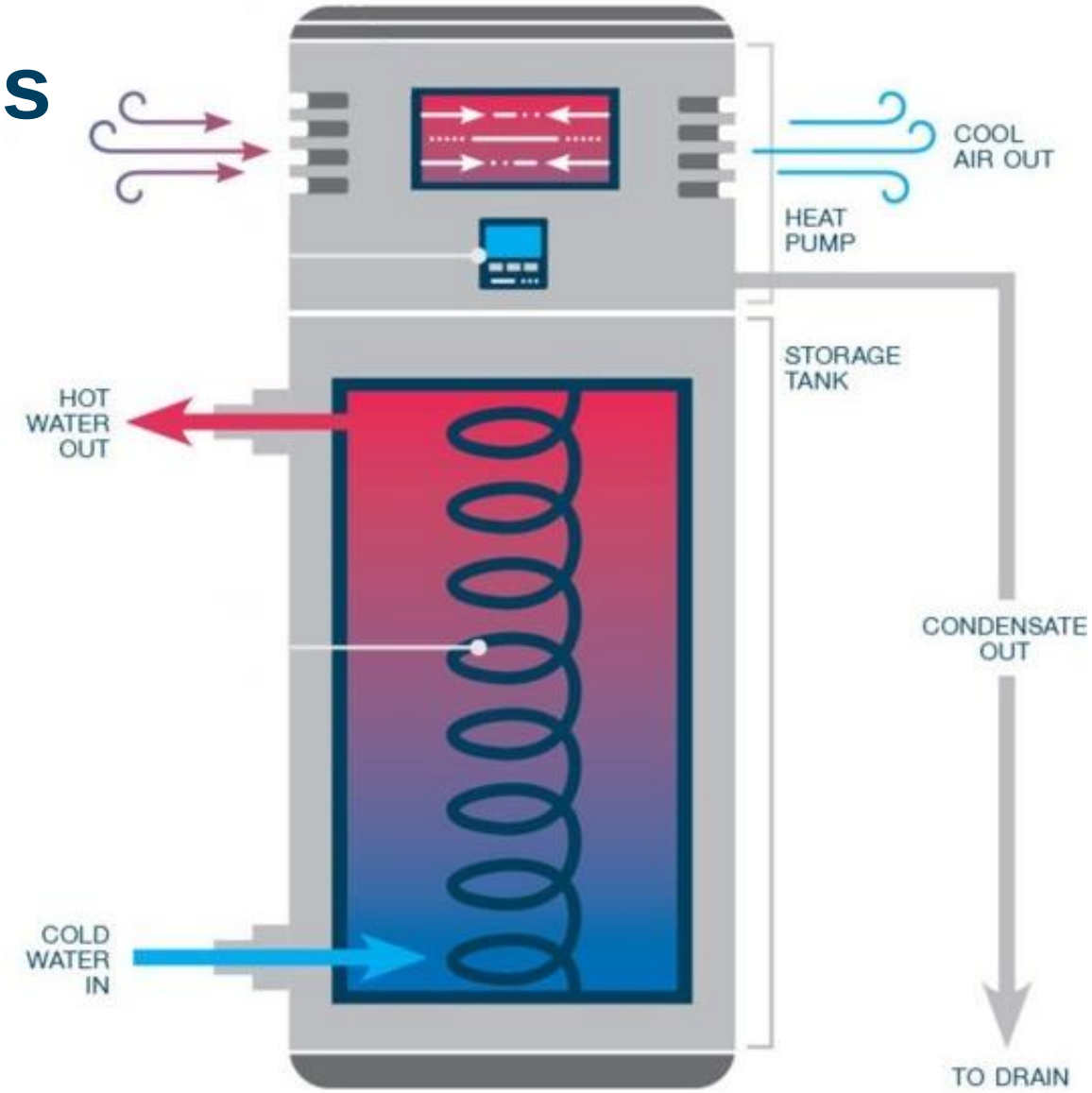
What is a Heat Pump Water Heater?

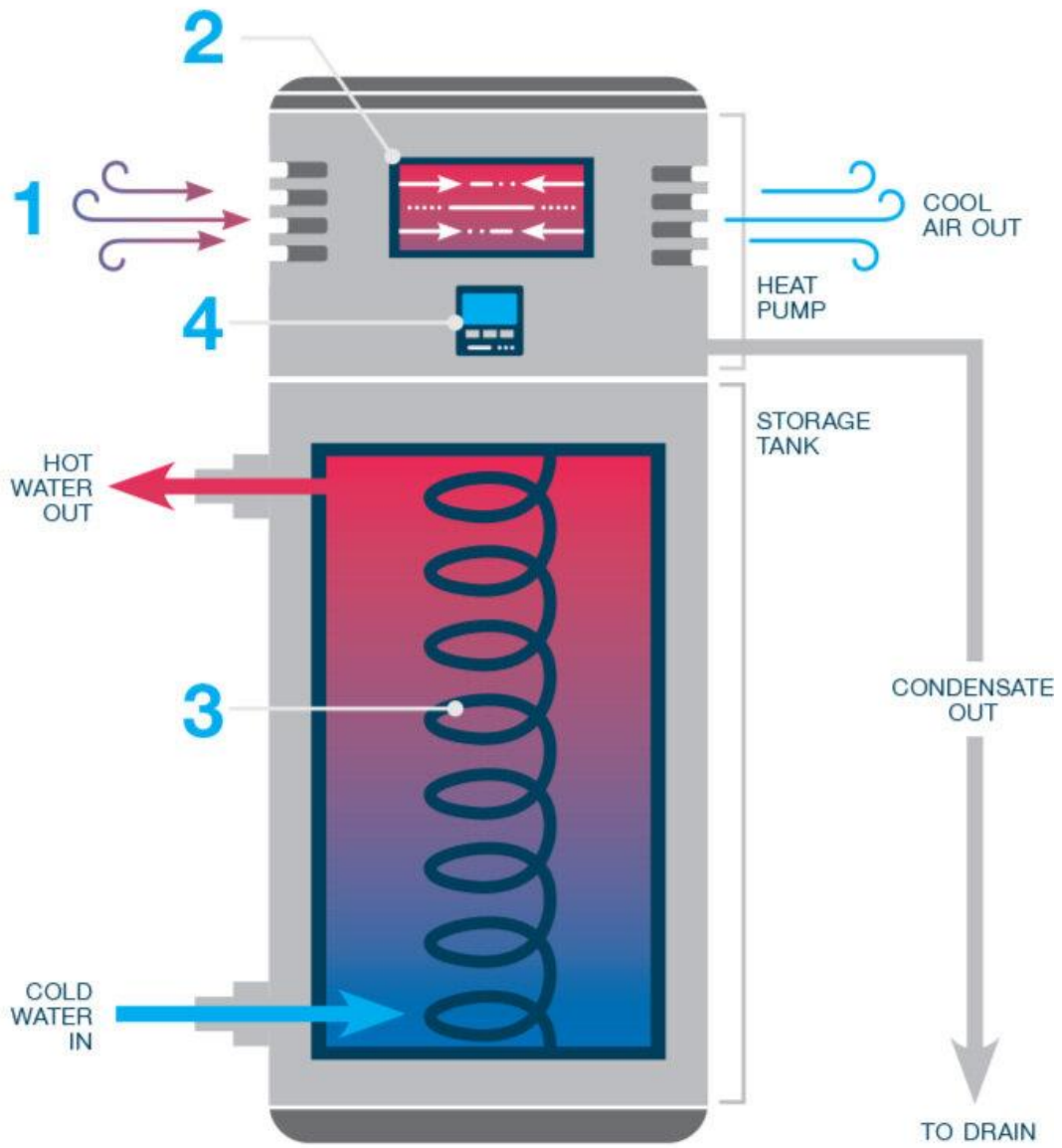
Heat Pump Water Heaters

- Similar technology to a refrigerator, but in reverse
- Very energy efficient
- Higher upfront cost
- Uses refrigerants
- Electrical infrastructure or panel updates may be needed



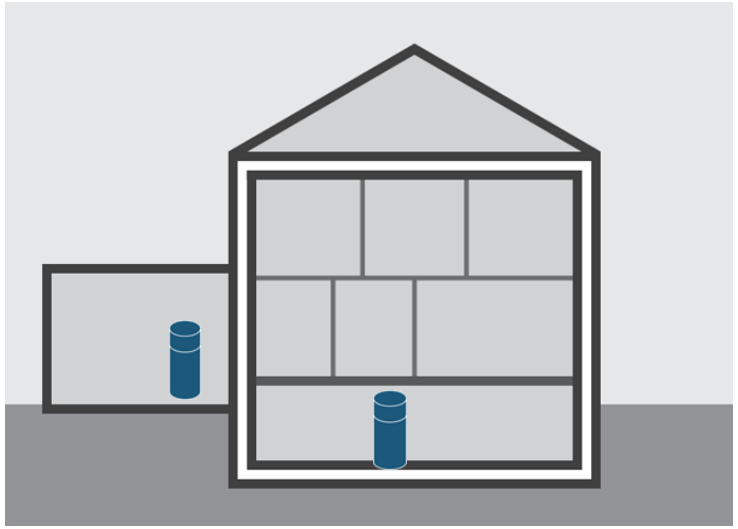
Heat Pump Water Heaters

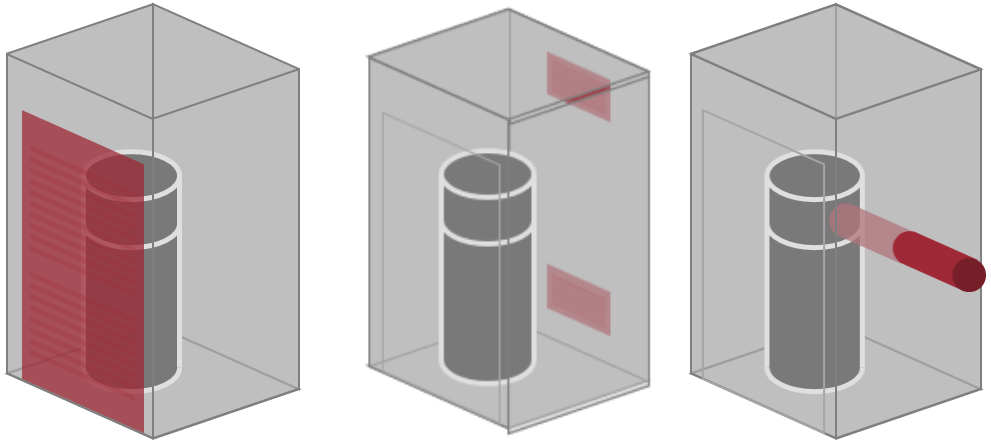
1. Heat pump pulls warmth from nearby air.
2. Warm air is compressed, increasing its temperature.
3. Refrigerant lines transfer heat from water air to water.
4. Smart grid connectivity controls help manage energy use.



Questions and Myth Busting

1. Where to install a HPWH?
2. How much air do they need?
3. Do they cool a space?
4. Are they hard to install?
5. Do they make a lot of noise?





Retrofit Use Cases – Operational Energy Savings

Electric Resistance Water Heater to 240V Heat Pump Conversion

Annual energy savings of 72%

Gas Tank-Style Storage Water Heater to 240V Heat Pump Conversion

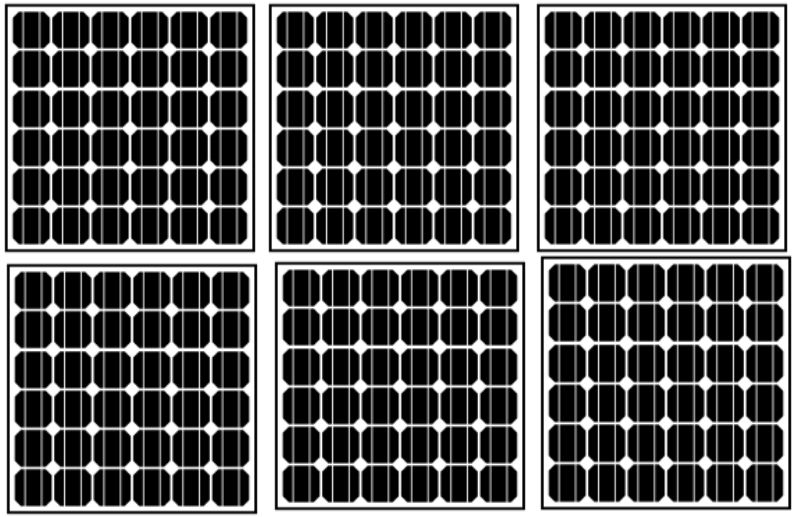
Annual energy savings of 86%

Energy Savings from Heat Pump Water Heaters

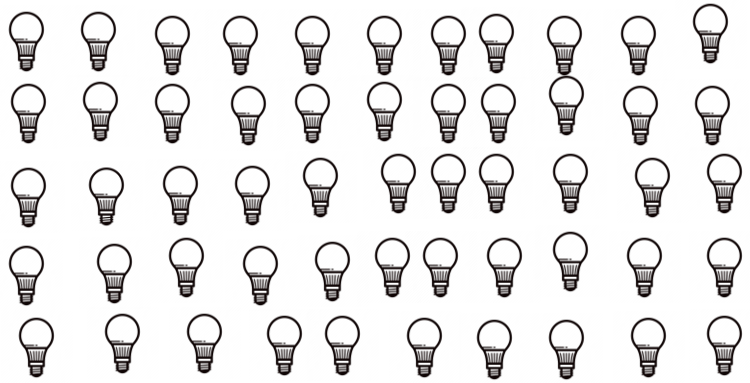
Replacing one electric resistance water heater with a heat pump water heater is equivalent to:

The annual electricity produced by

6 solar panels



The annual electricity saved by replacing **54** incandescent lightbulbs with LEDs



Commercial Heat Pump Water Heaters

- Multifamily buildings may have a centralized domestic hot water (DHW) system instead of a water heater in every unit
- Commercial HPWH use heat pump technology and can replace inefficient existing boilers
- More complex than conventional systems, but offer operational savings and decarbonization

Photo: Ecotope, Inc.

HPWH Technology Updates

240V Heat Pump Water Heaters

Manufacturer	Gallons	Grid Connectivity: CTA-2045 Port	Refrigerant	Type
A.O. Smith	50, 66, 80	Available on certain models	134A	Packaged system, Hybrid (ER* backup)
Bradford White	50, 65, 80	Available on certain models	134A	Packaged system, Hybrid (ER* backup)
ECO_2 Systems (split system)	43, 83, 119	Available on certain models	CO_2	Split system, Hybrid (ER* backup)
Rheem	50, 65, 80	Available on certain models	134A	Packaged system, Hybrid (ER* backup)
Stiebel Eltron	58, 80	Available on certain models	134A	Heat pump

Source: AO Smith

*Electric resistance

120V Heat Pump Water Heaters

- Low-power, plug-in 120V design ideal for low-medium demand
- No expensive panel upgrades
- Emerging technology; field validation study underway in CA
  - **Study is still accepting participants to receive free, 120V HPWH in exchange for 1-year participation in study**
    - SCE or SMUD territory, waitlist for PG&E
    - https://www.advancedwaterheatinginitiative.org/120v-field-study

Source: NBI

120V Heat Pump Water Heaters

Manufacturer	Gallons	Grid Connectivity: CTA-2045 Port	Refrigerant	Market Availability	Type
A.O. Smith	40, 50, 66, 80	Y	TBD	Expected 2023	Packaged
GE	50, 65, 80	Y	134A	Expected 2023	Packaged, Hybrid (ER* backup)
Nyle E8	50, 80	Y	R513A	Available	Split system
Rheem	40, 50	Y	134A	Available	Packaged
	40, 50, 65, 80	Y	134A	Available	Packaged

*Electric resistance

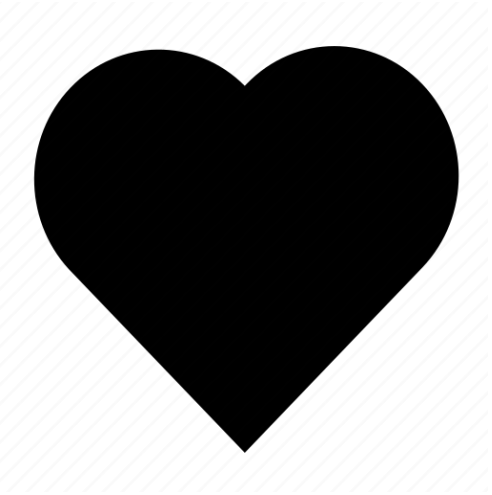
Source: Rheem

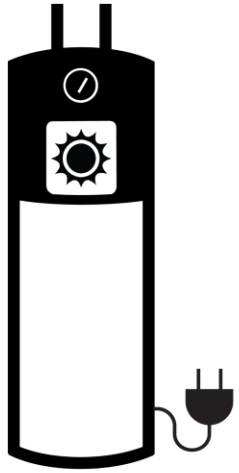
Commercial HPWH

Manufacturer	Grid Connectivity: CTA2045 Port	Refrigerant	Packaged (skid mounted) option?
ECO$_2$ Systems	Available on certain models	CO_2	Water Drop
Nyle	Y	R513A	-
Colmac Waterheat	-	134A, 410A	-
Lync by Watts	-	R744	-
Mitsubishi	Y	CO_2	Origin by Steffes

Source: Mitsubishi

Rebates for HPWH





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Thank you!