

How to Achieve Climate Action Goals at Home

City of Piedmont -Community Workshop

Electric Heat Pump technology

Water and Space Heating

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Community Energy Services Corp





CESC is a 501(c)(3) community-based organization that has delivered energy, environmental, and home repair services to Bay Area residents since 1986.

General Contractor #751533

Mission

CESC promotes resource conservation and safety by providing building improvements and education where the Bay Area lives and works.

CESC Programs

For homes

- Home Repair Programs
 - Berkeley/ Oakland
 - San Leandro
- Residential energy efficiency
- Seismic Safety Services
- Healthy Homes: asthma abatement
- Electric Heat Pump Water heater project

For businesses

- East Bay Energy Watch Program



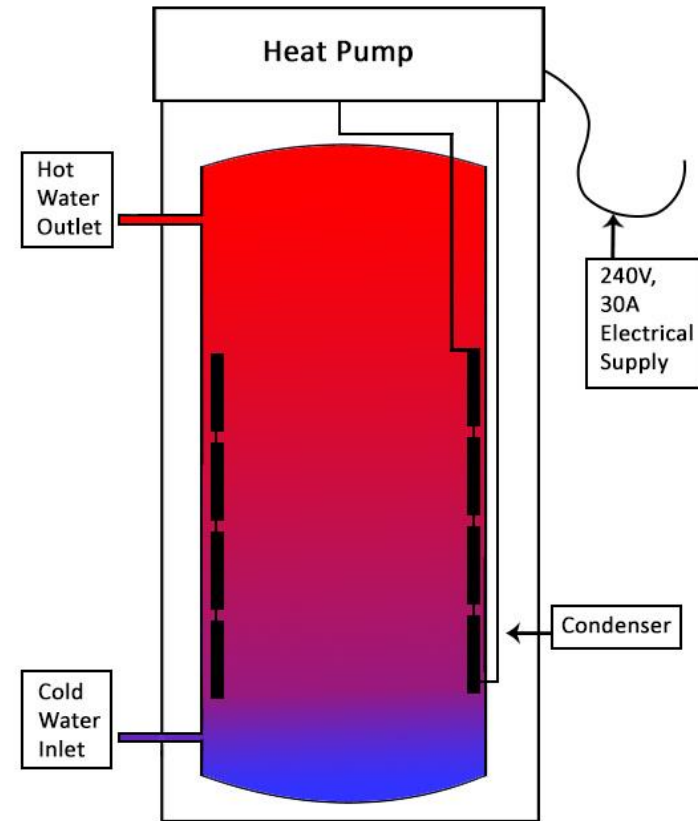
Today's Learning Objectives & Outline

By the end of this session you will...

1. Understand the **fundamentals of heat pump water heaters (HPWHs)**
2. Understand the **fundamentals of heat pump space heating**
3. Understand if the **technology is a good fit for your home**

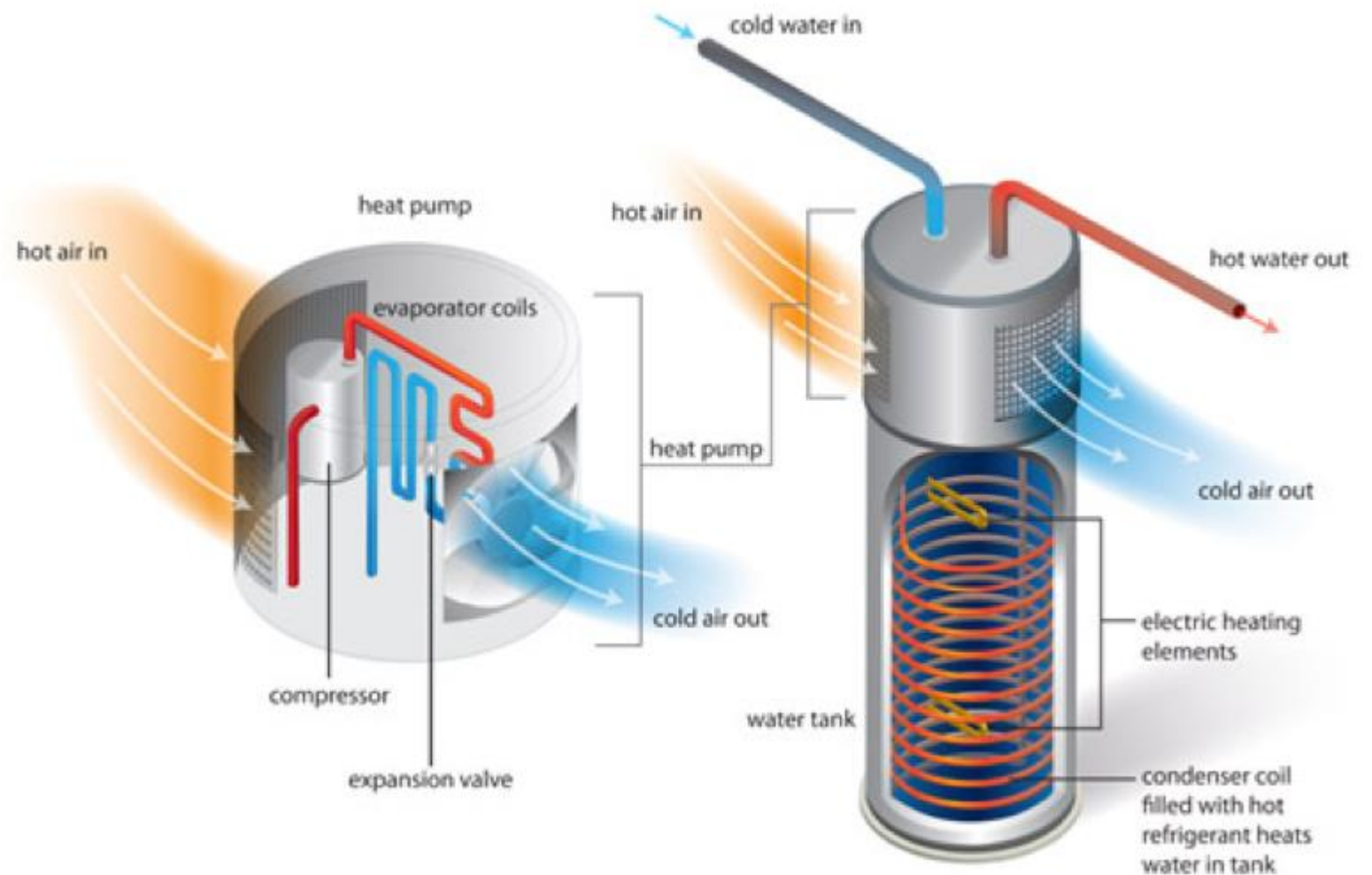
Introduction to HPWHs

- Electric water heaters
- Employ storage tanks
- Have high efficiency heat pump and resistance elements
- Controls maximize heat pump use to increase efficiency
- Use resistance elements when high capacity required



How HPWHs work

- HPWHs use electricity to move heat from one place to another instead of generating heat directly.
- A refrigerator working in reverse: a HPWH takes the heat from surrounding air and transfers it to water in an enclosed tank.



The Current Market

■ Manufacturers

- Common: A.O. Smith, Rheem, Bradford White, Stiebel Eltron
- New to Market: Sanden

■ Common characteristics

- Storage tanks: 40 – 80 gallons
 - Expect higher storage volumes enabling more heat pump operation
- Heat pump capacity: Typically ~ 1.3 kW
 - Sanden unit is unique: ~3 kW
- Resistance element capacity: Typically 4 – 5 kW
 - Sanden unit is unique: No resistance elements

Brief History of HPWHs

- **First entered U.S. market in 1970s**
 - Common in Japan,
 - Driven by OPEC oil embargo
 - Products were rushed to market, did not succeed
 - Unreliable, poor control logic
- **Gaining traction again with CA climate goals**
 - High efficiency, low carbon
 - Possible to power with renewable energy
 - Third generation
 - More reliable, better controls

HPWH Installation Requirements

- Still none in Title 24- will be in 2020 T24
- Common manufacturer requirements
 - Most require 240 V, 30A electrical supply
 - Some new products require 240 V, 15A instead
 - Need ventilation
 - 750 – 1000 cubic feet in room OR
 - Vents
 - Best located in hot, or unconditioned spaces

HPWH costs

- Generally, the cost to install a heat pump water heater to replace gas storage WH is between **\$3,000** to **\$7,000**. Several factors affect the cost of HPWH installation, including:
 - Where located, garage/ basement best
 - Electrical wiring costs
 - Ventilation/ venting requirements

Be sure to choose an ENERGY STAR® compliant units!

Good fit for you?

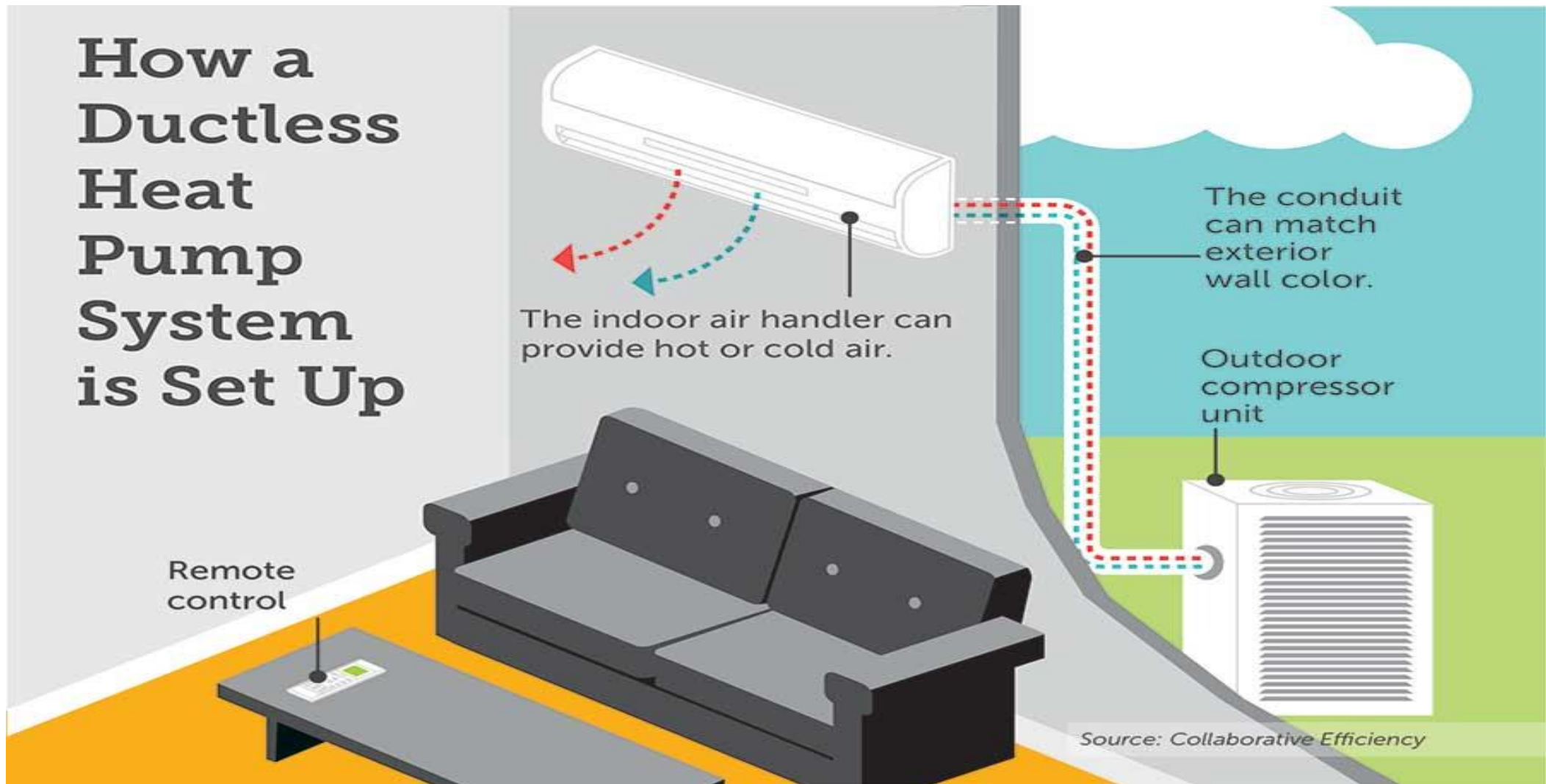
Why Not?

- California has expensive electricity, and cheap gas
- More expensive up front cost
- If low hot water use, simple payback not reasonable
- Current building code and utility energy rates favor gas for heating

Why?

- If solar PV- HPWH provides another electrical appliance
- Lower GHG emissions from electricity
- 3-5 times more efficient than traditional gas
- Pathway to a Net Zero Energy Home

Heat Pump system



Heat Pump Space Heating

- Heat pumps can both move heat from the cool outdoors into your warm house and move heat from your cool house into the warm outdoors.
- Heat pumps can provide equivalent space conditioning at as little as one quarter of the cost of operating conventional heating or cooling appliances.
- For climates with moderate heating and cooling needs, heat pumps offer an energy-efficient alternative to furnaces and air conditioners.
- Design is everything!



Mini-Split system/ ductless

- Air-source heat pumps are also available in a ductless version called a mini-split heat pump.
- Two components -- an outdoor compressor/condenser and an indoor air-handling unit. The main advantages of mini splits are their small size and flexibility for zoning or heating and cooling individual rooms.
- Manufacturers: Mitsubishi/ Fujitsu/ Daikin/ LG



Ducts vs. ductless

- Mini splits have no ducts, so they avoid the energy losses associated with the ductwork of central forced air systems. Duct losses can account for more than 30% of energy consumption for space conditioning, especially if the ducts are in an unconditioned space such as an attic.
- Ducted systems can provide air filtration
- The indoor air handlers can be suspended from a ceiling, mounted flush into a drop ceiling, or hung on a wall.
- Some people may not like the appearance of the indoor part of the system.

Costs

- The price to purchase a ducted heat pump and have it installed runs on average **\$5,300**; cost can go well over **\$10,000** depending on the brand, energy efficiency, labor warranty, and other features.
- Generally, the cost to install a ductless heat pump is between **\$3,000** to **\$5,000**. Several factors affect the cost of ductless heat pump installation, including:
 - Higher efficiency models cost more than lower-rated units.
 - The number of zones created. Each ductless heat pump unit is paired with individual air handlers meant to serve one area, or “zone.”
 - The difficulty of the installation. Certain applications or setups can cause the ductless heat pump installation to be more complicated

Be sure to choose an ENERGY STAR® compliant units!

QUESTIONS



Image credit: Samo Financial

Thanks!

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<http://www.ebenergy.org/for-homes/electric-heat-pump-water-heater-program/>