TRI-COUNTY
REGIONAL ENERGY NETWORK
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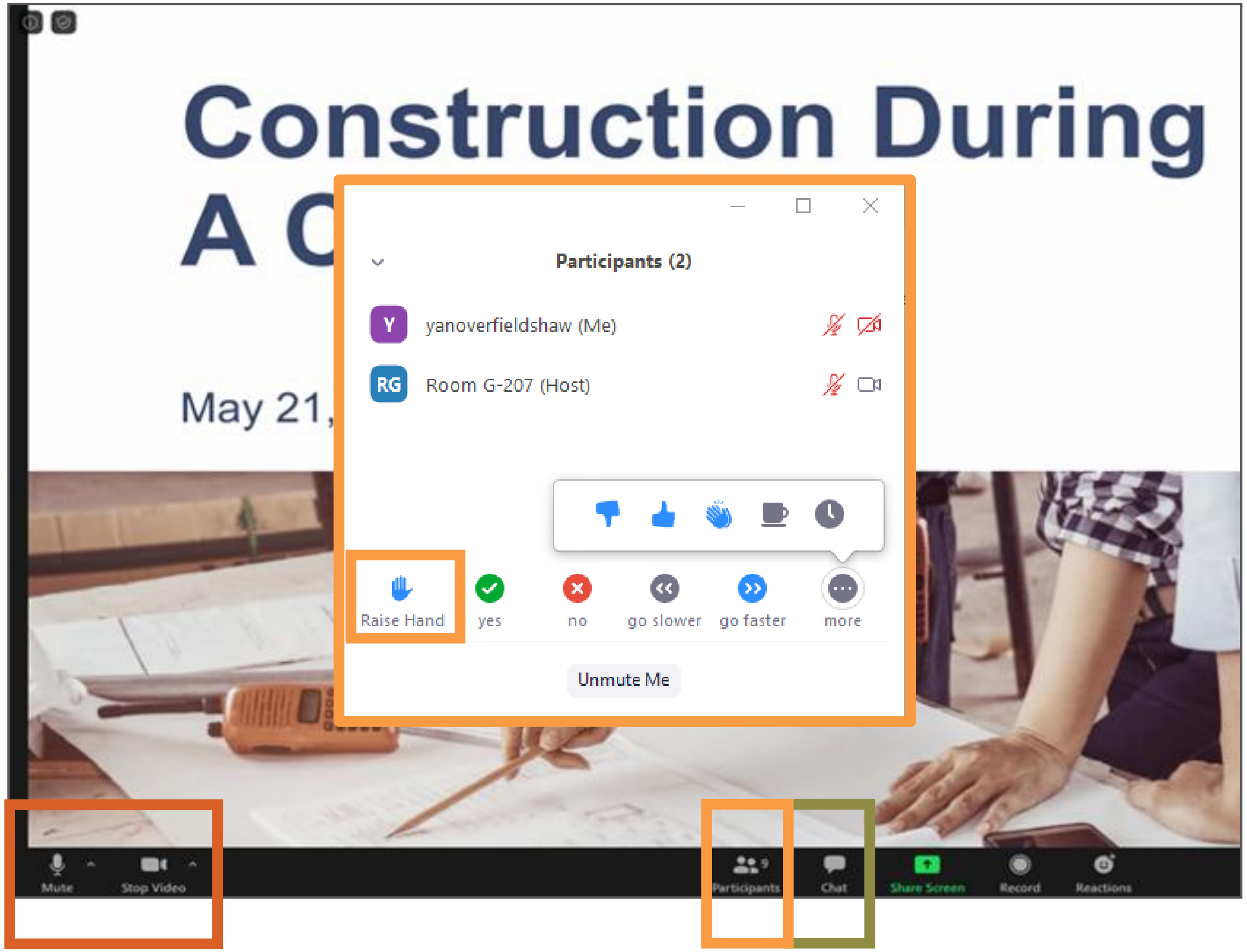
Unitary versus Split Heat Pump Water Heating Systems

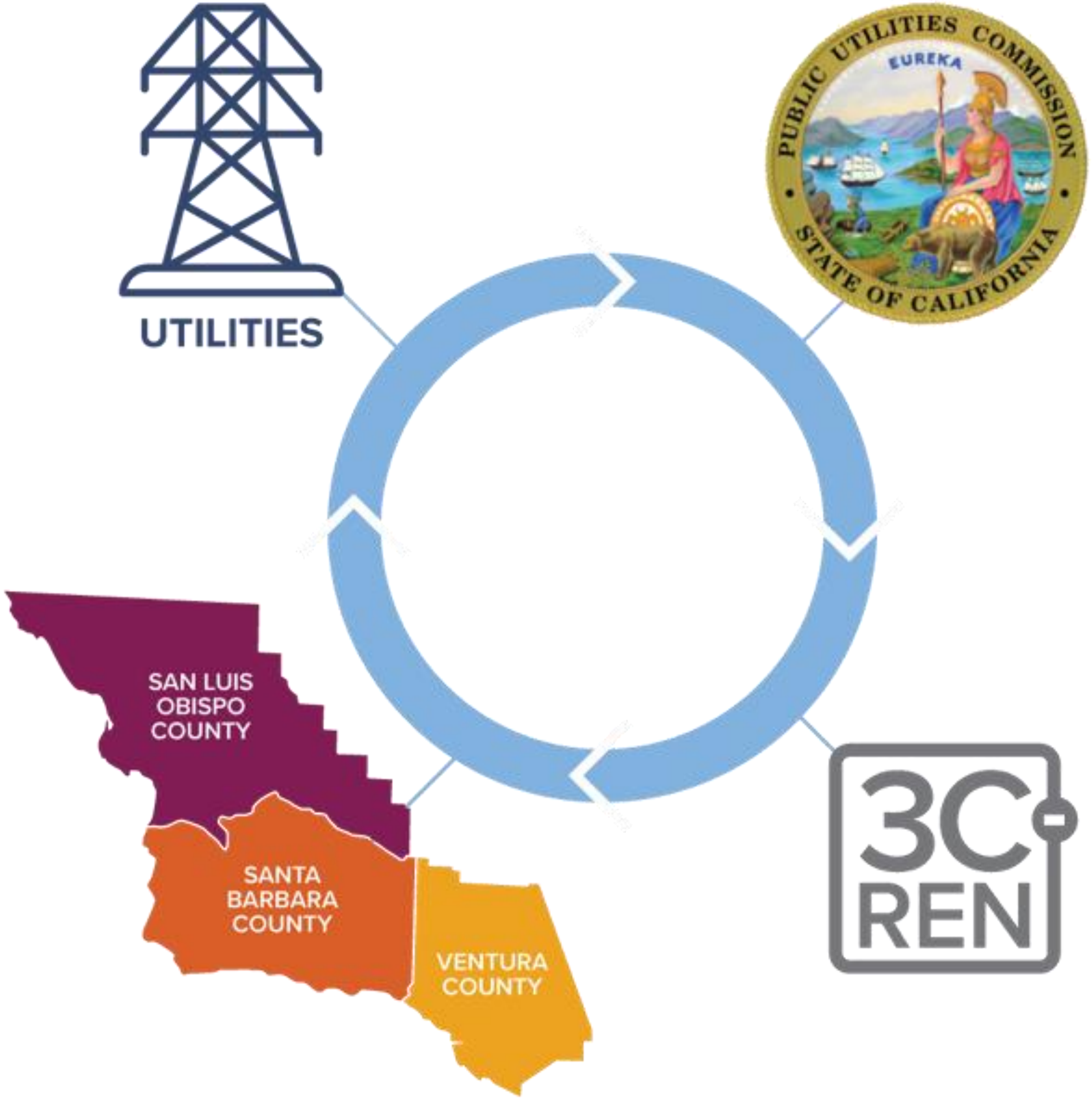
Eric Fenno – Smart Supply Planet

July 14, 2025

Zoom Orientation

- Add an introduction in the chat.
  Be sure full name is displayed.
- Did you call in? Please share first and last name with us.
- Please mute upon joining
- Use the "Chat“ to share questions or comments
- Under "Participant" select "Raise Hand" to share a question or comment verbally
- Session may be recorded and posted to 3C-REN's on-demand page
- Slides/recording are shared after most events
- 3C-REN does **not** allow AI notetakers, unless used to accommodate a disability.





Tri-County Regional Energy Network

3C-REN is a collaboration between the tri-counties

Our programs reduce energy use for a more sustainable, equitable and economically vibrant Central Coast

Our free services are funded via the CPUC, bringing ratepayer dollars back to the region

Our Services

Incentives

HOME ENERGY SAVINGS

3c-ren.org/for-residents
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COMMERCIAL ENERGY SAVINGS

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Contractors can enroll at
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Training

BUILDING PERFORMANCE TRAINING

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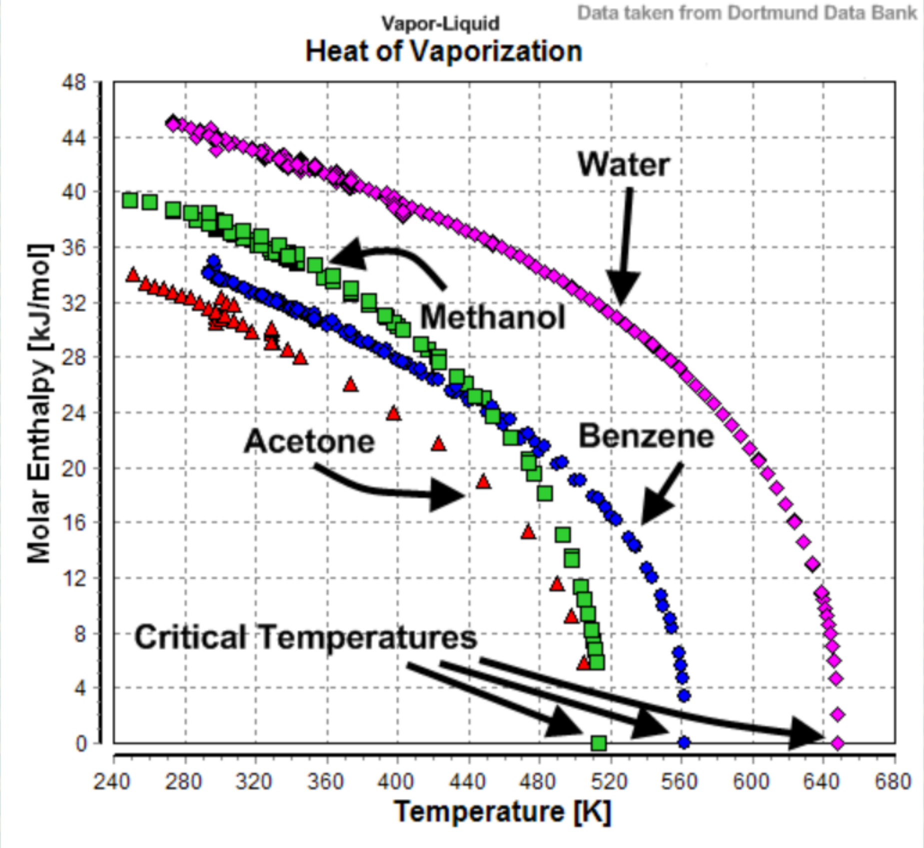
Welcome!

Refrigerants and Heat Transfer

- Refrigerants leverage the Enthalpy of Vaporization – absorb energy when vaporized, release when condensing
- Different refrigerants "like" different conditions
- The Kigali Amendment is driving the phase-out and replacement of some high GWP refrigerants



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Refrigerants

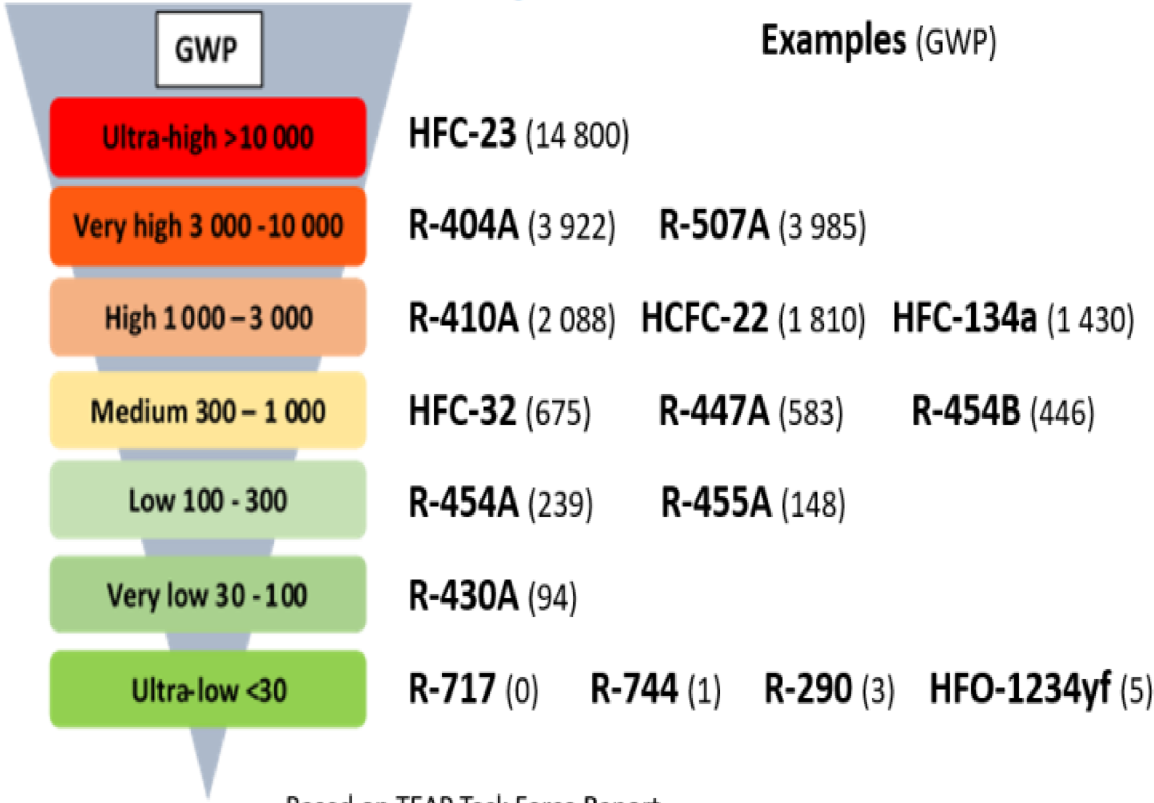
Most Common: 134a (being phased out)

Less Common: 410A (being phased out) and R744(CO_2)

Maybe future?: R290 (propane blend), R32, **1234yf**

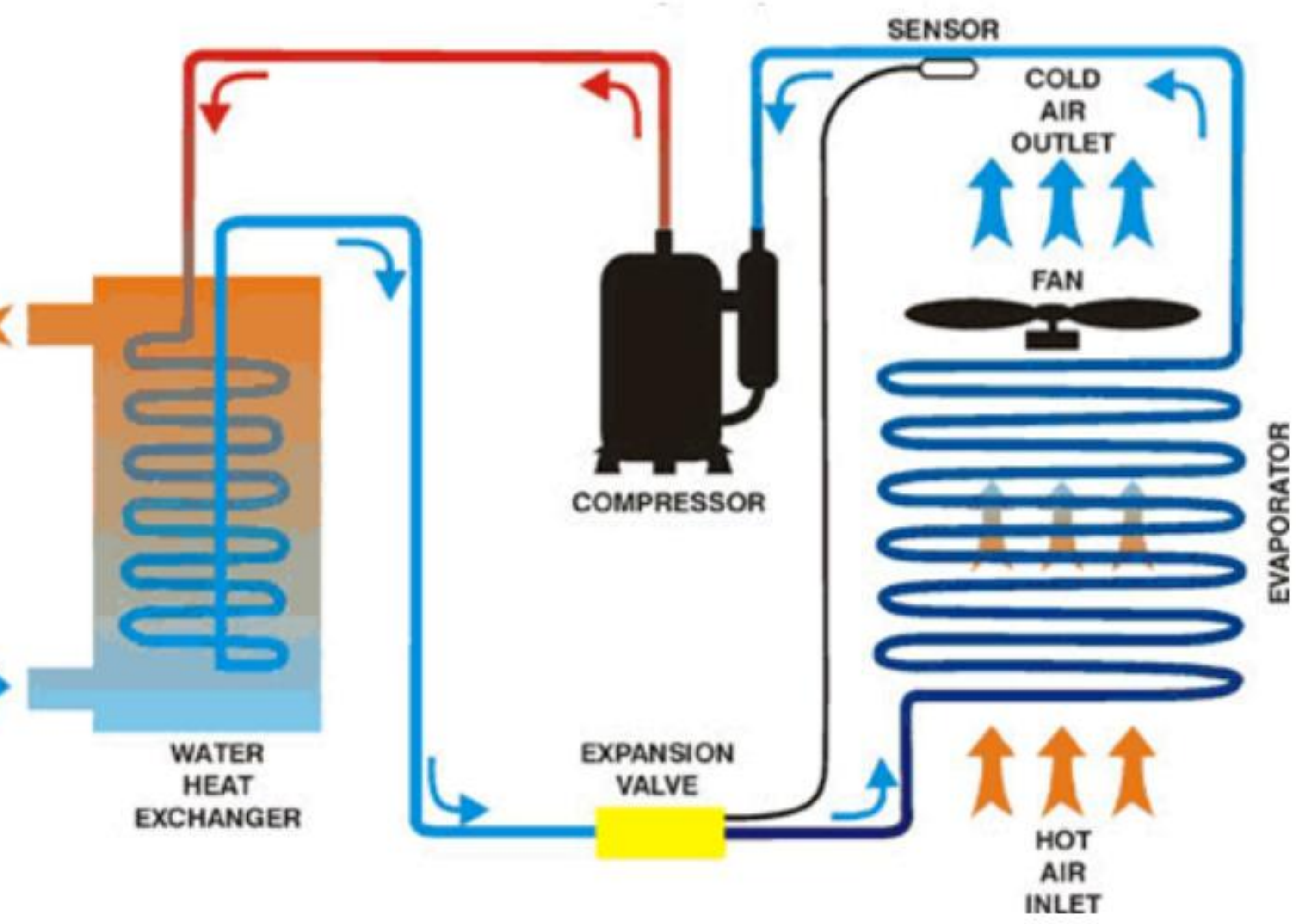
HPWHs are usually monoblocs and do not need charging when installed

Figure 1



Based on TEAP Task Force Report

Heat Pump Operation



Pressure	Modulate pressure in a closed system to force phase change
Vaporise	Vaporise to absorb energy from surrounding air
Move	Move vapor to where we want energy input
Condense	Condense the vapor to release the energy
Reverse?	(real heat pumps can reverse directions, and thus provide cooling. HPWHs are technically not heat pumps)

Metrics

- COP: Coefficient of Production – The ratio of energy input to heat output. A pretty reasonable way to determine energy savings vs electric or gas on average.
- SCOP: Seasonal Coefficient of Production – The COP adjusted to reflect performance in heating season. Not super common in the US, but a better metric for considering energy profile impacts.
- HSPF: Heating Seasonal Performance Factor – SCOP but with BTUs instead of kW.
- UEF: Uniform Energy Factor – Mainly used for comparing equipment, broadly speaking higher UEF == More efficient but doesn't easily translate into energy modeling. See also: SEER/SEER2.

Form Factors

Unitary and Split

Unitary Systems

- Look very similar to conventional water heaters with storage
- Heat pump sits on top of the tank, creating a “unitary” package.
- Typically use conventional refrigerants
- Compact and efficient

Split Systems

Heat Pumps is separate from tank, usually installed outdoors

Only one split HPWH currently available (arguably)

Tanks are large, high temp, high energy storage

Very efficient, aimed at passive house and similar standards

Has an anime mascot which is pretty cool

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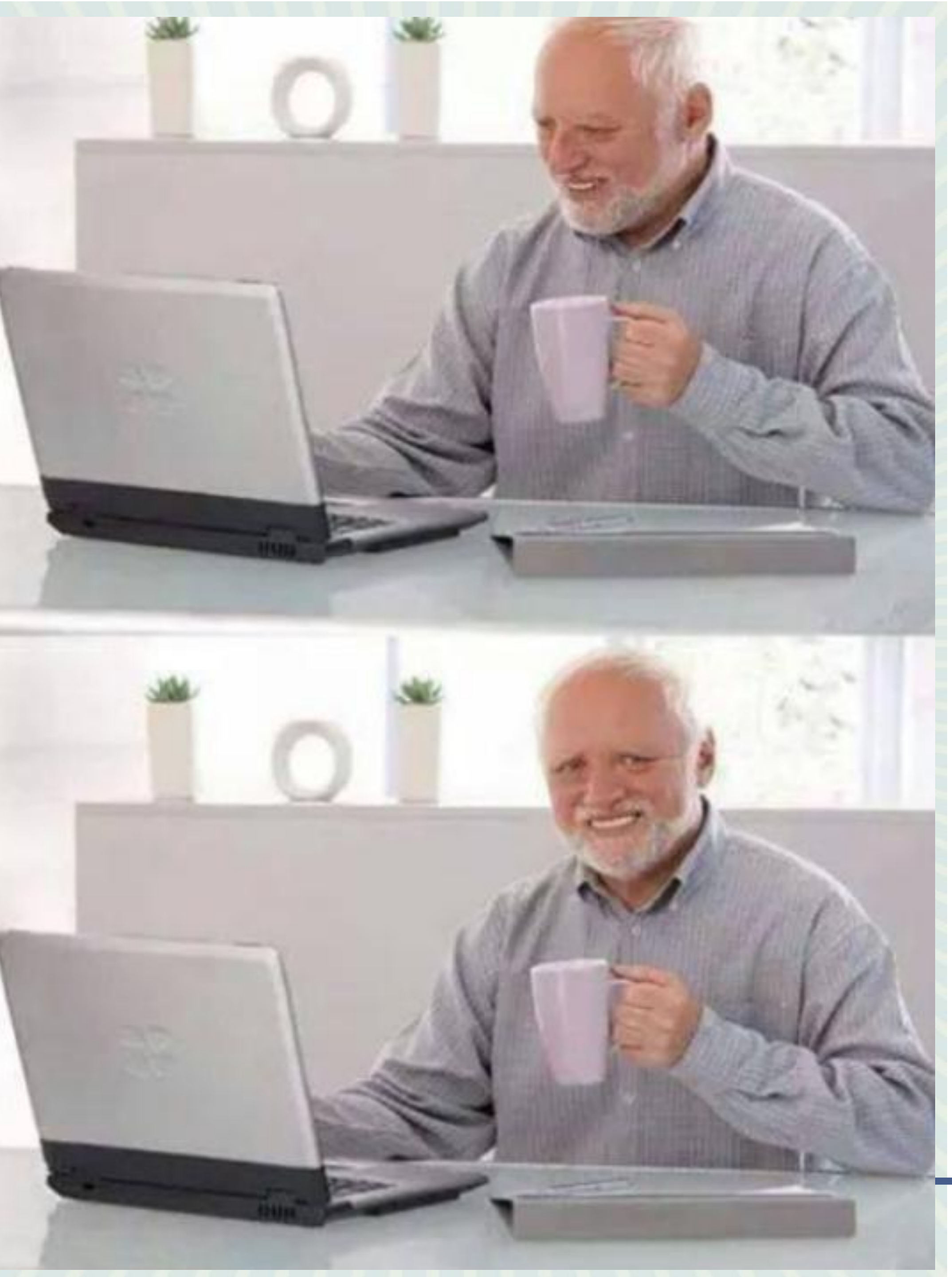

HPWH not-necessarily-truths

“They’re loud!”
-Depends on the model, 50dBA Max

“My heating bill is going to go up!”
It depends on your conditioning system but probably not.

“It will make my house cold”
See above

“They’re slow!”
They can be, sizing is important.

Unitary Advantages

Readily available, big name manufacturers, robust support

Tend to be the most affordable

Wide range of products can fit most projects

Highly programmable, many now have very user friendly UI or app

Most on board with CTA2045, rebate programs

Backup Heat for extreme days or output boosts

Unitary Operation

- Primary – Heat Exchanger – Unit circulates refrigerant through heating coil in tank, slower but efficient
- Secondary – Electric Backup - if the heat exchanger is not keeping up with demand, either because of temp or volume, electric elements kick on and help it get as much hot water out as possible.

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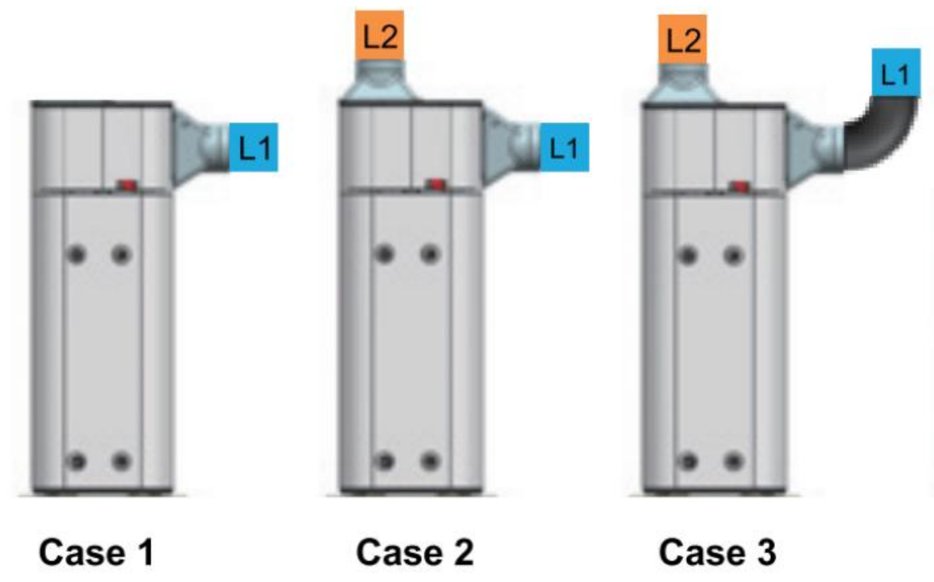
Unitary Challenges

- Unitary systems *need air flow*
- *Have filters -> NEED maintenance*
- Neccesarily produce cold air in manageable but still noticeable volumes
- Occupy space, need more space for appropriate air flow (typically ~700 ft^3, 10’x10’x7’)
- Have fairly limiting operating temps in colder climates (usually 35F-120F)
- Can cause condensation on surfaces if inadequately ventilated

Figure 10: Duct Options.

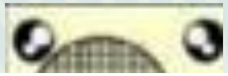


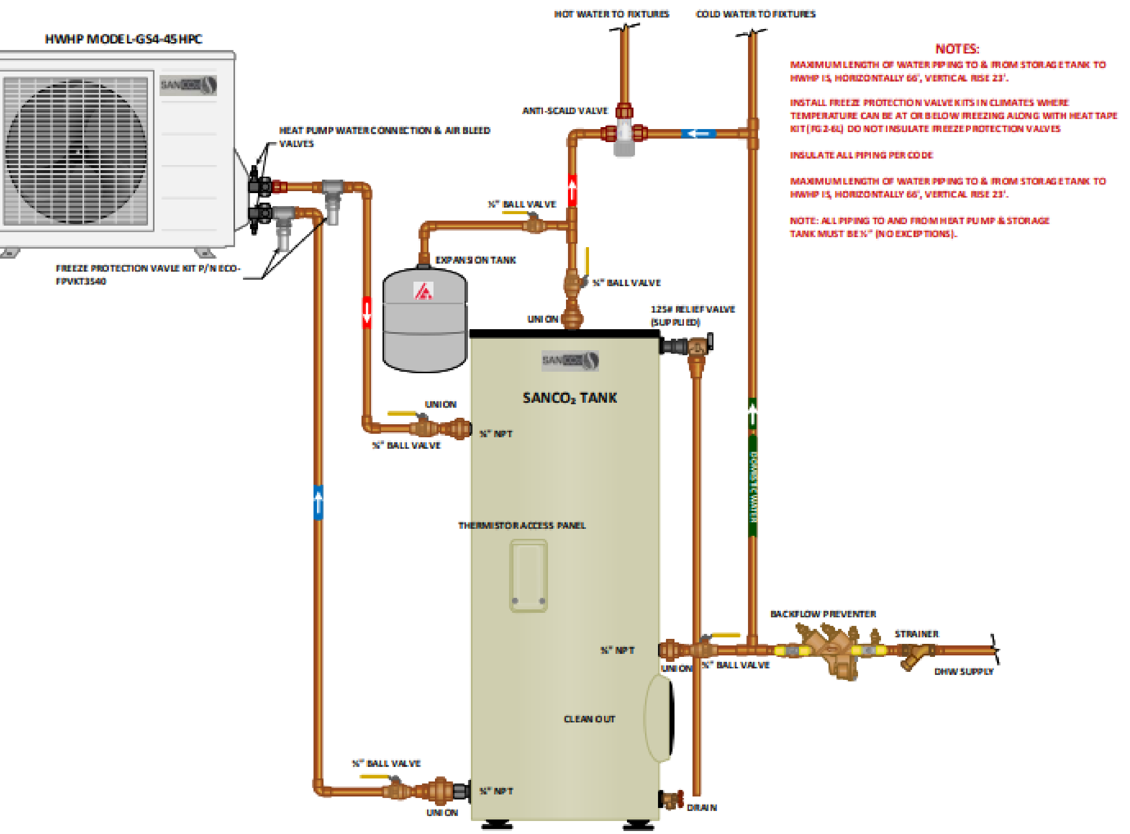
Unitary Systems – Best Practices and Use Cases

Size Correctly, provide air volume, ensure proper temps, install with access, educate your client

Good for: New Construction, most retrofits, energy cost reduction, folks who are used to electric storage tanks.

Suitable install locations: Garages, mechanical rooms, (finished or semi-finished) basements, laundry rooms, or areas that are not intrusive that can be ducted easily.





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Split Advantages

- Very tolerant of ambient temps (work down to -25F)
- High COP (3-5+ at normal ambients)
- Leverage water temp for better storage (140-150F)
- Quiet operation
- Fast recharge (20GPH)
- Eliminate most Quality of Life issues HPWHs can cause
- Can be programmed for time of use rates/renewables
- Fantastic for off-grid projects
- Flexible applications

anime mascot

Split Challenges

- THEY COST MORE
- HAVE *VERY SPECIFIC* OPERATING PARAMETERS
- *DO NOT* TOLERATE MOST CONVENTIONAL RECIRC SYSTEMS (DEMAND-BASED OKAY)
- CAN BE VULNERABLE TO FREEZING DURING POWER OUTAGE
- ALSO OCCUPY SPACE (BUT DON'T REQUIRE AIR AT TANK)

Please don't put timed or continuous recircs on SanCO2s*

pretty please

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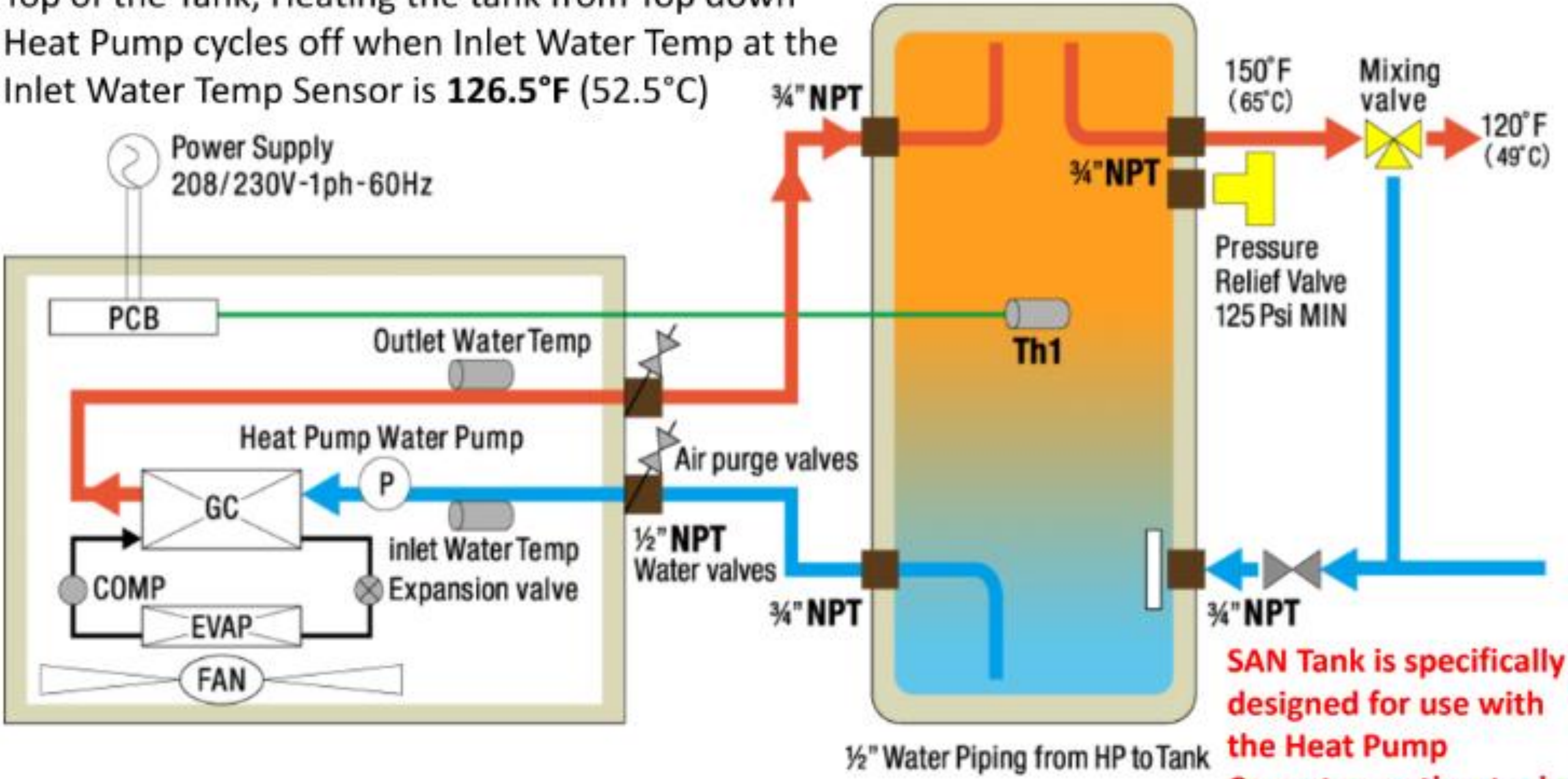
*There is actually a way to do it but it requires a second tank and ideally heat pump, jus use a demand circ instead

Heat Pump pulls cold water from the bottom of the Tank, Heats it to 150°F, returns it to the Top of the Tank, Heating the tank from Top down

Heat Pump cycles off when Inlet Water Temp at the Inlet Water Temp Sensor is **126.5°F** (52.5°C)



SAN Tank is specifically designed for use with the Heat Pump

Cannot use other tanks

Applications and Use Cases

- Tanks are passive (just storage) and well insulated
- Heat pumps are independent, can use multiple for linear scaling
- Can mix/match tanks and heat pumps to meet any need, as budget and space allow
- *very limited* space heating potential (complicated, different class, just call me about it)

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Planning for Split Systems

- Space for the tank
- Consider condensate pathways (particularly for applications with an indoor HP.)
- Ensure adequate airflow
- Plan for a disconnect
- Consider alternatives to recirculation (or demand-based)

Sizing

- HPWHs are not sized like gas water heaters, if replacing gas don't match tank size, go bigger.
- Manufacturers recommend tank sizes based on occupancy.
- Go to 120-130% of your occupant load to cover those days that kids/family/friends are visiting.

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Client Expectations

- Noise levels / Tolerance?
- What is their water use? Higher than normal? Large tub?
- Targeting performance standards? (Passive Haus etc)
- Willing to modify behaviors or not?

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Questions? (And thank you!)