



TRI-COUNTY  
REGIONAL ENERGY NETWORK

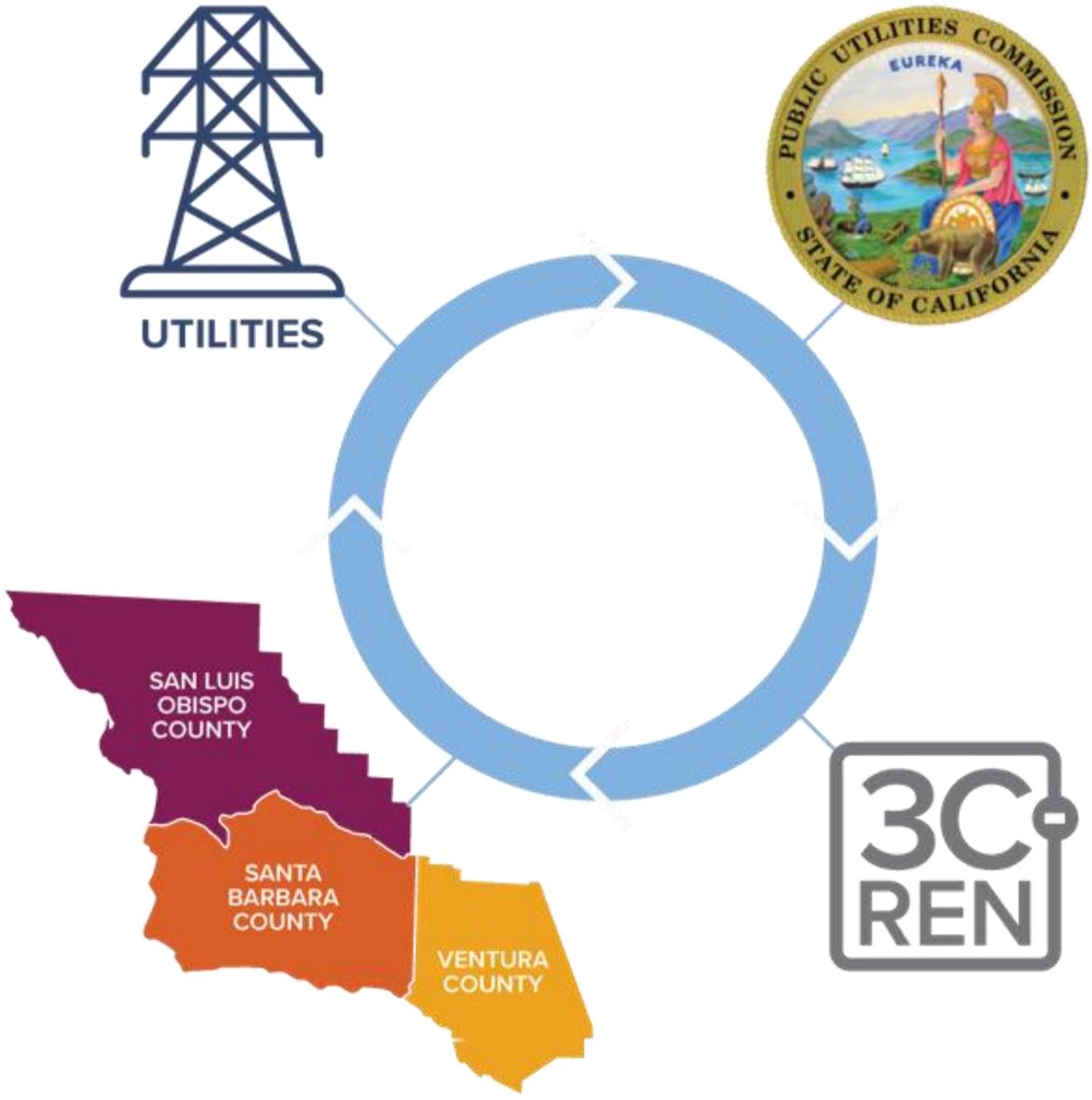
SAN LUIS OBISPO • SANTA BARBARA • VENTURA

# Unitary vs Split Heat Pump Water Heating Systems

*Eric Fenno - Small Planet Supply*

January 29, 2026





# 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](https://3c-ren.org/for-residents)  
[3c-ren.org/multifamily](https://3c-ren.org/multifamily)



**COMMERCIAL  
ENERGY  
SAVINGS**

[3c-ren.org/commercial](https://3c-ren.org/commercial)

Contractors can enroll at  
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## Training



**BUILDING  
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TRAINING**

[3c-ren.org/events](https://3c-ren.org/events)  
[3c-ren.org/building](https://3c-ren.org/building)



**ENERGY  
CODE  
CONNECT**

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View past trainings at  
[3c-ren.org/on-demand](https://3c-ren.org/on-demand)

## Technical Assistance



**AGRICULTURE  
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**ENERGY  
ASSURANCE  
SERVICES**

[3c-ren.org/assurance](https://3c-ren.org/assurance)

# Welcome!

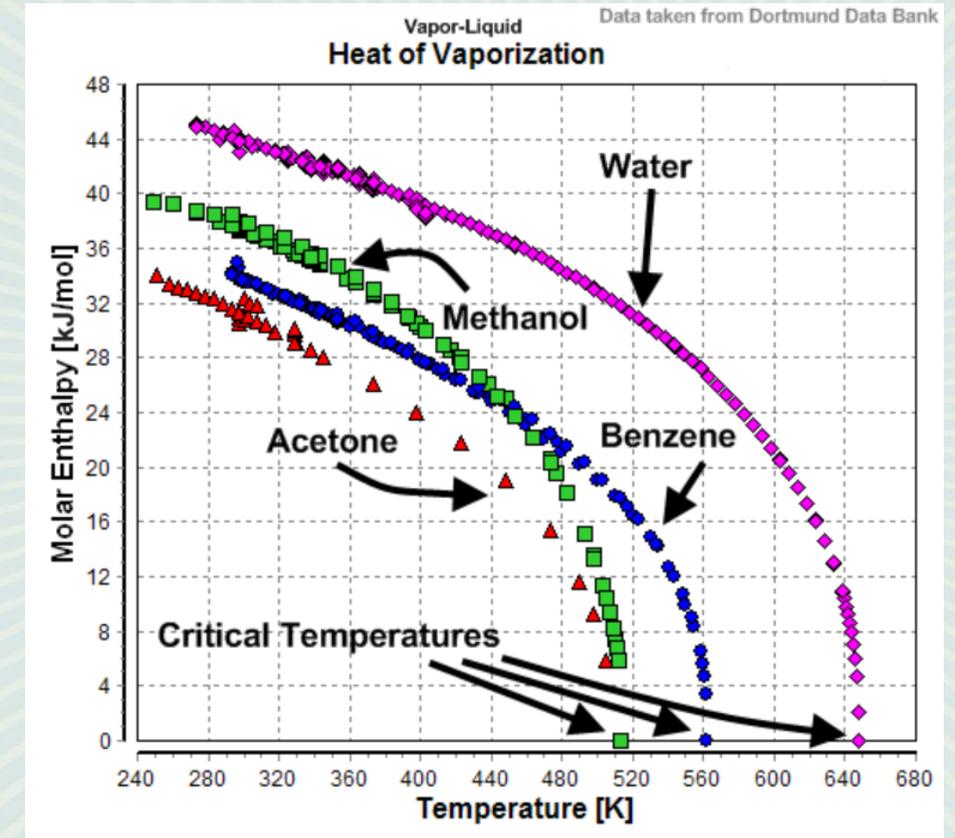


VS



# 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



# Refrigerants

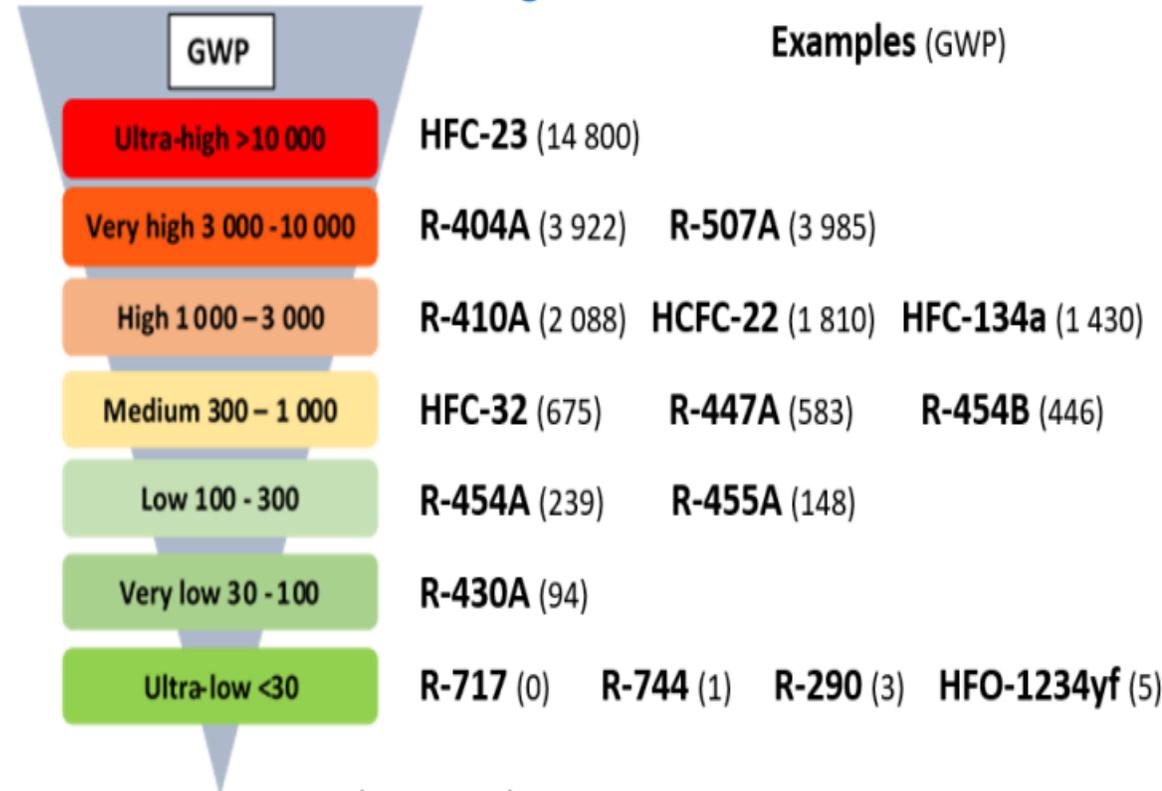
Most Common: 134a (being phased out)

Less Common: 410A (being phased out) and R744(CO2)

Maybe future?: R290 (propane blend), R32, **1234yf**, **R-513a**

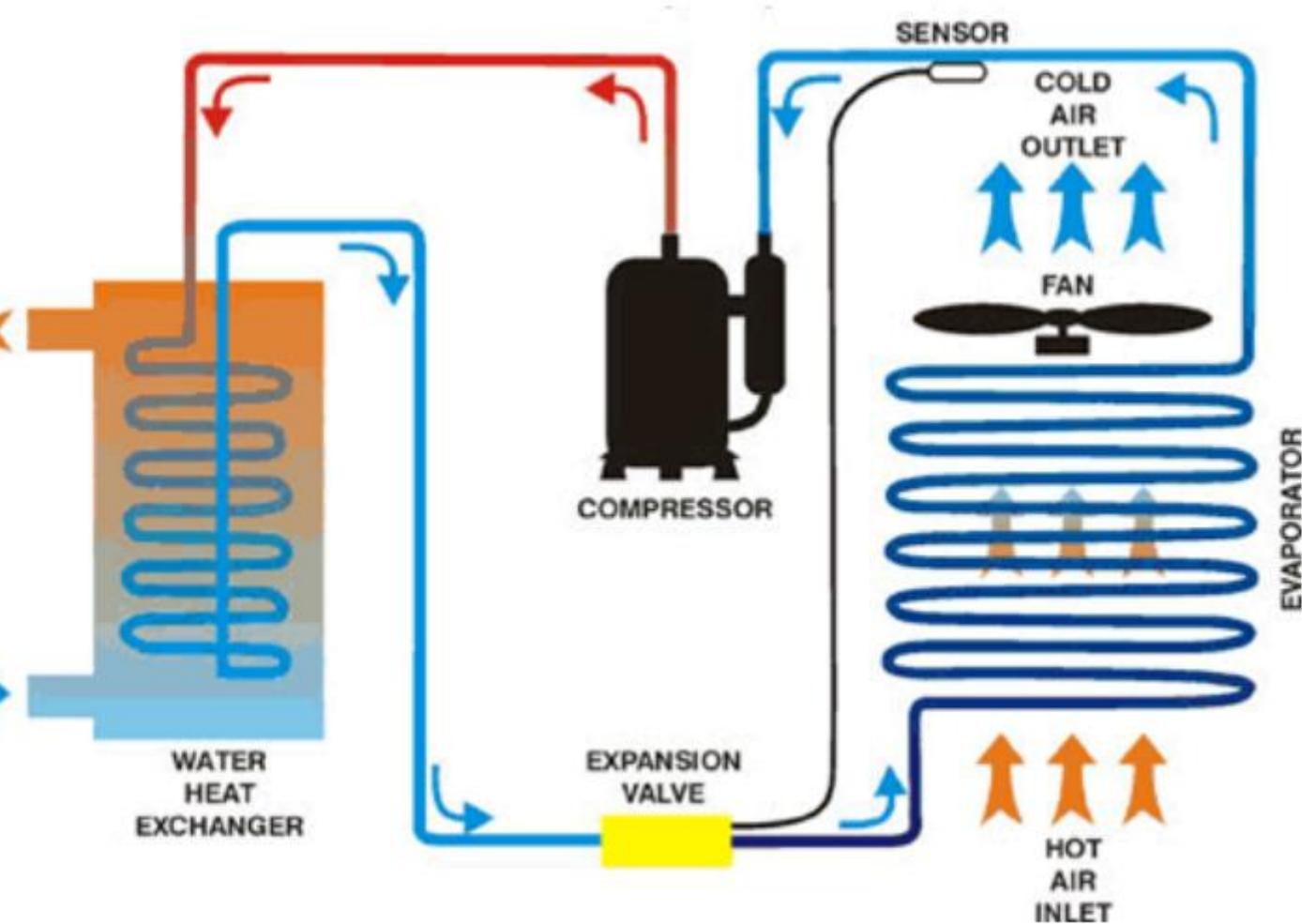
HPWHs are usually monoblocs and do not need charging when installed

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

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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

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Heat Pumps is separate from tank, usually installed outdoors

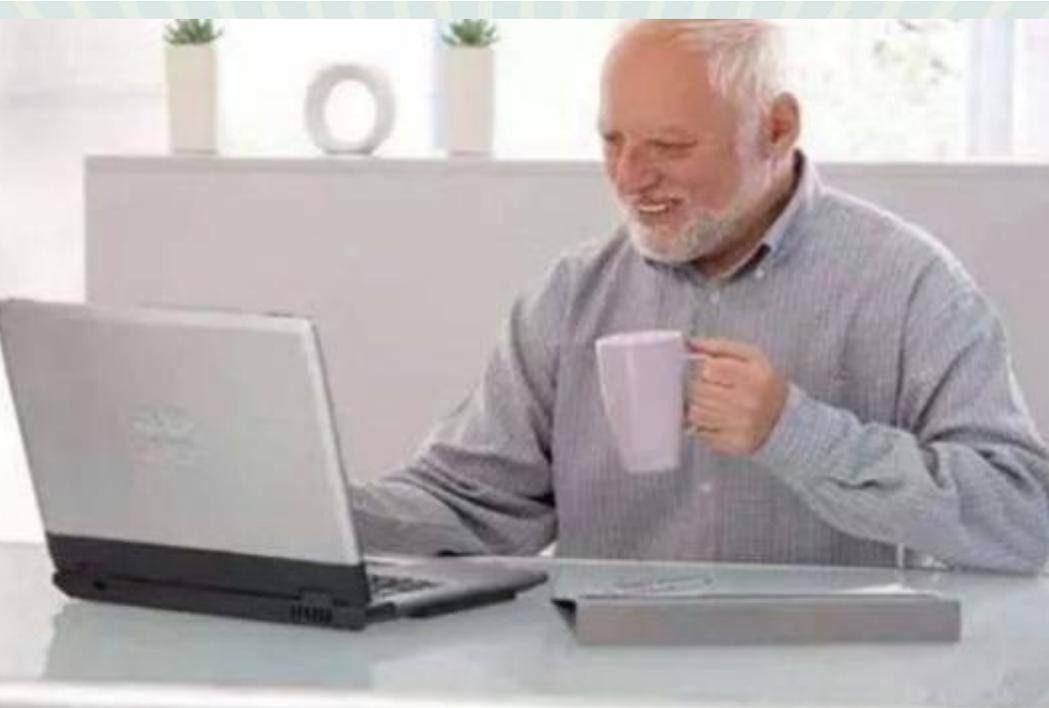
Now up to TWO different models available on the market

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





# HPWH not-necessarily-truths

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“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.

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# Unitary Advantages

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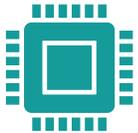
Readily available, big name manufacturers, robust support



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

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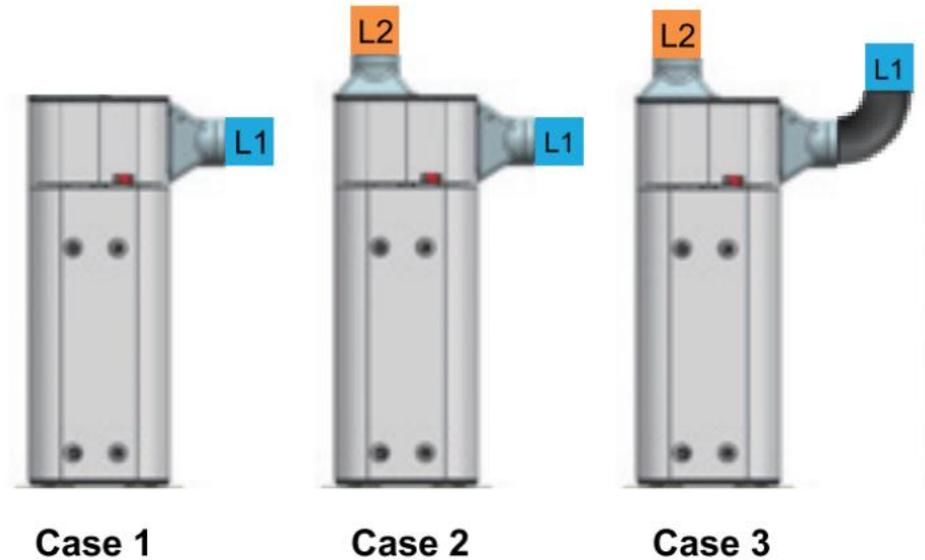


- Primary – Heat Exchanger – Unit circulates refrigerant through heating coil in tank, slower but efficient
- Secondary – Electric Backup - if the heat exchanger is not keeping up with demand, either because of temp or volume, electric elements kick on and help it get as much hot water out as possible.

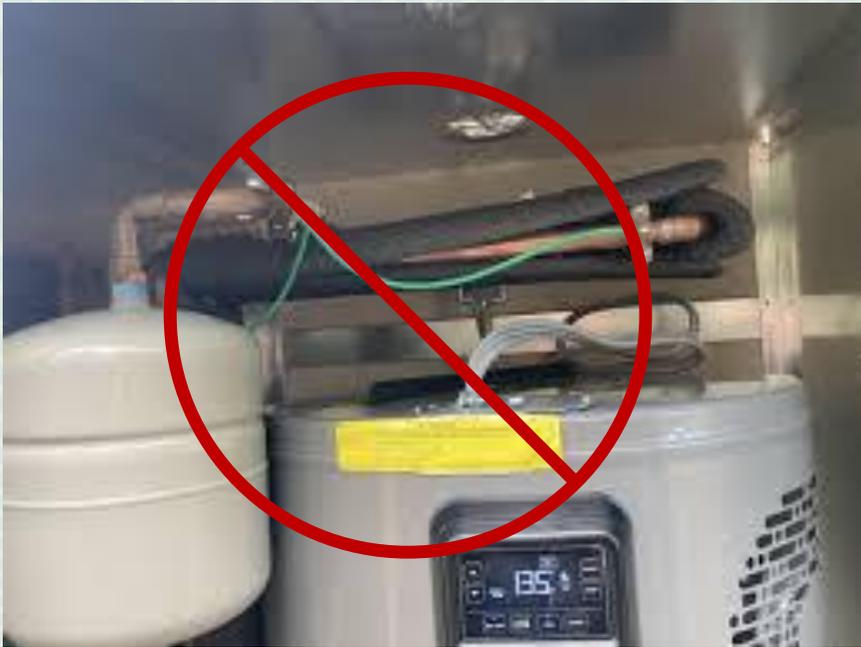
# Unitary Challenges

- 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<sup>3</sup>, 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.







# 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 or  
recircs on  
sanCO<sub>2</sub>s\*

pretty please



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

# 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)

# 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)



ALL PLANET  
JPLY

PLAN IT WITH THE PLANET IN MIND

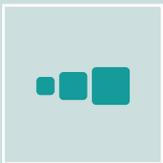
# Sizing



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.



# Client Expectations



Noise levels / Tolerance?



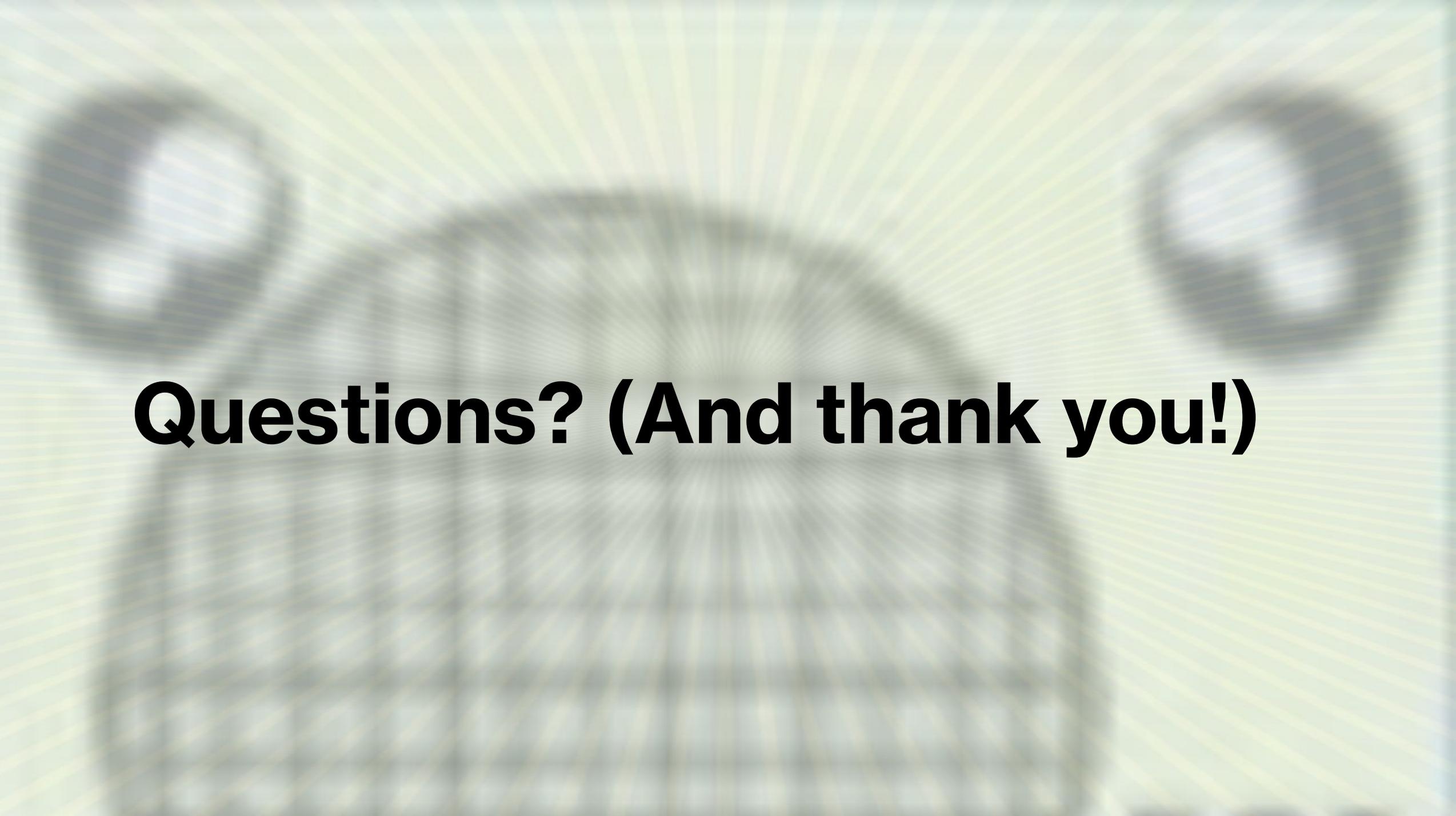
What is their water use? Higher than normal? Large tub?



Targeting performance standards? (Passive Haus etc)



Willing to modify behaviors or not?

The background of the slide is a blurred image of a person's face, possibly a woman, with a grid pattern overlaid on it. The text is centered in the middle of the image.

**Questions? (And thank you!)**

# Questions about Title 24?

3C-REN offers a *free* Code Coach Service



Online:  
[3c-ren.org/code](https://3c-ren.org/code)

Call:  
805.781.1201

Energy Code Coaches are local experts who can help answer your Title 24 Part 6 or Part 11 questions.

They can provide code citations and offer advice for your res or non-res projects.

# Closing



## Continuing Education Units Available

- Contact [itzel.torres@venturacounty.gov](mailto:itzel.torres@venturacounty.gov) for AIA LUs

## Coming to Your Inbox Soon!

- Slides and recording

## Upcoming Courses:

- [2025 Energy Code in Practice: Single Family Residential \(2/4\)](#)
- [2025 California Energy Code & Passive House \(2/10\)](#)
- [Builder's Perspective: Heat Pump Water Heaters \(2/18\)](#)
- [2025 Energy Code in Practice: Single Family Additions and Alterations \(3/10\)](#)
- [Ask the Experts: Load Calculations \(3/12\)](#)
- [Contractor Power Hour with Electrify My Home \(3/20\)](#)



# Thank you!

More info: [3c-ren.org](https://3c-ren.org)

Questions: [info@3c-ren.org](mailto:info@3c-ren.org)

Email updates: [3c-ren.org/newsletter](https://3c-ren.org/newsletter)



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