

ET Summit 2022

Presented by



Decarbonizing Water Heating

Low-GWP Central Heat Pump Water Heating in Multifamily Buildings

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Project Overview & Funding



Project Description

Early launch demonstration installs of Mitsubishi Heat₂O, large capacity low-GWP (CO₂) heat pump water heater product; extensive post-install monitoring & testing



R&D Funds

California Energy Commission (CEC) Electric Power Investment Charge (EPIC) grant



Program Funds

Low Income Weatherization Program (LIWP)
South Coast AQMD – Multifamily Affordable Housing Electrification Program (MAHEP)
LADWP – Comprehensive Affordable Multifamily Retrofit (CAMR) Program
SoCal Regional Energy Network (SoCalREN)

The Team



Association for Energy Affordability

Grant prime, site recruitment, project management, Measurement & Verification



Ecotope

Engineering lead



Mitsubishi Electric Trane US

Equipment manufacturer



NBI, EPRI

Market transformation

The Equipment



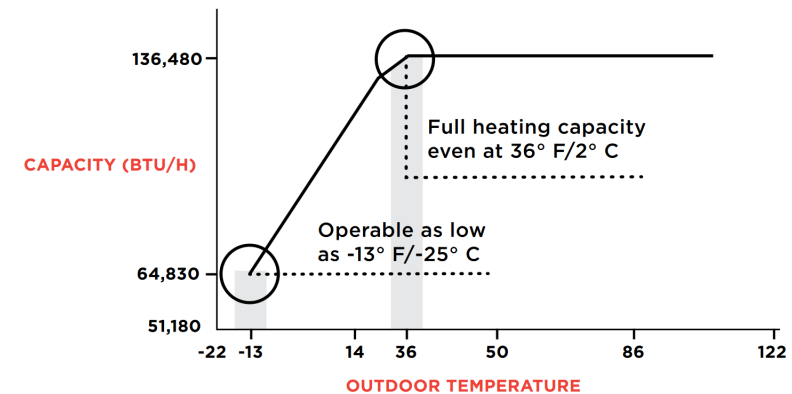
Image: Mitsubishi

Mitsubishi Heat ₂ O – QAHV-N136TAU-HPB		
Power	3P 208-230 V 60Hz	
Capacity	136,480 BTU/hr / 40kW	
COP (AHRI)	4.11	
Power Input	9.7 - 10.4 kW	
Current Input	27 – 32 A	
MCA	67 A	
Outlet Water Temp	149°F	
Low Ambient Performance	-13°F 50% output	36°F – 109°F 100% output
Dimensions	48" x 30" x 73"	
Sound Pressure	56 dB(A)	
Refrigerant & Charge GWP	R744 (CO ₂) – 14.3 lbs GWP = 1	
Additional Components	Secondary Hx, Secondary Pump, Sensors & Controls, Storage Tank(s), Swing Tank	

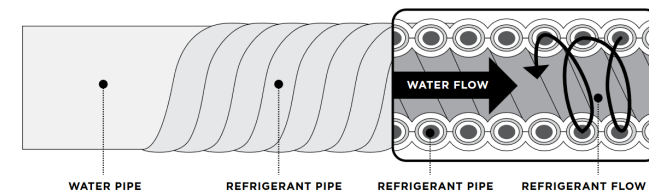
Mitsubishi Heat₂O Has Many Advantages

- **Low GWP**
 - Can't really beat CO₂
- **Low Ambient Performance**
 - Maintains output and efficiency well below freezing
- **Reduced Electrical Burden**
 - Very efficient at optimal conditions AND
 - Good low ambient performance so there is no need to oversize heat pumps or electric resistance backup to ensure hot water delivery for winter design conditions
- **Quiet**
 - 56 dBA vs
 - 65-80+ dBA for comparable non-CO₂ units

Heating Capacity



Patented Twisted Spiral Gas Cooler



Demonstration Sites & Plant Info

Site & Heat Pump Water Heater Plant Overview

Site	# HP Units	Total Storage (gal)	Site Specific Hurdles
A – San Francisco	2	360	Sound ordinance restrictions, reusing existing tanks
B – San Jose	2	500	380V vs 208V unit, switching from another mfr
C – Riverside	2	500	Electrical circuit runs, HP location
D – San Diego	2	800	Location, garage height
E – Fresno	2	800	WaterDrop system

Heat₂O General Plant Schematic

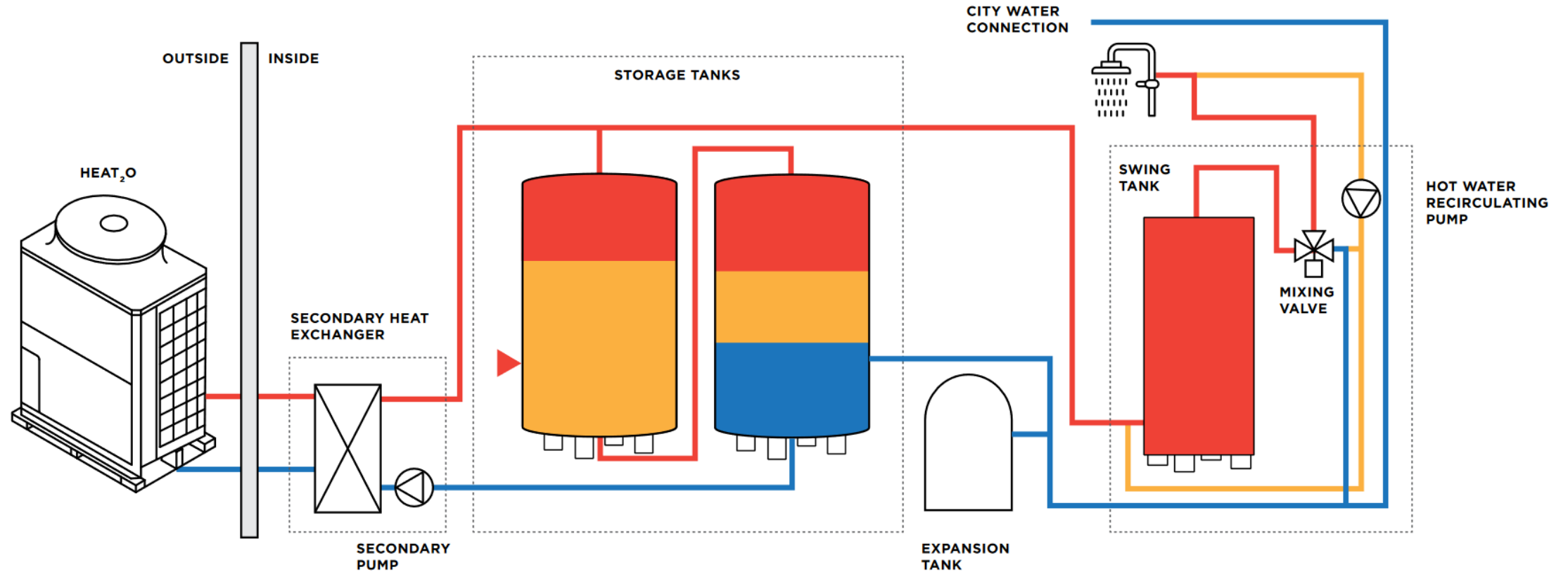
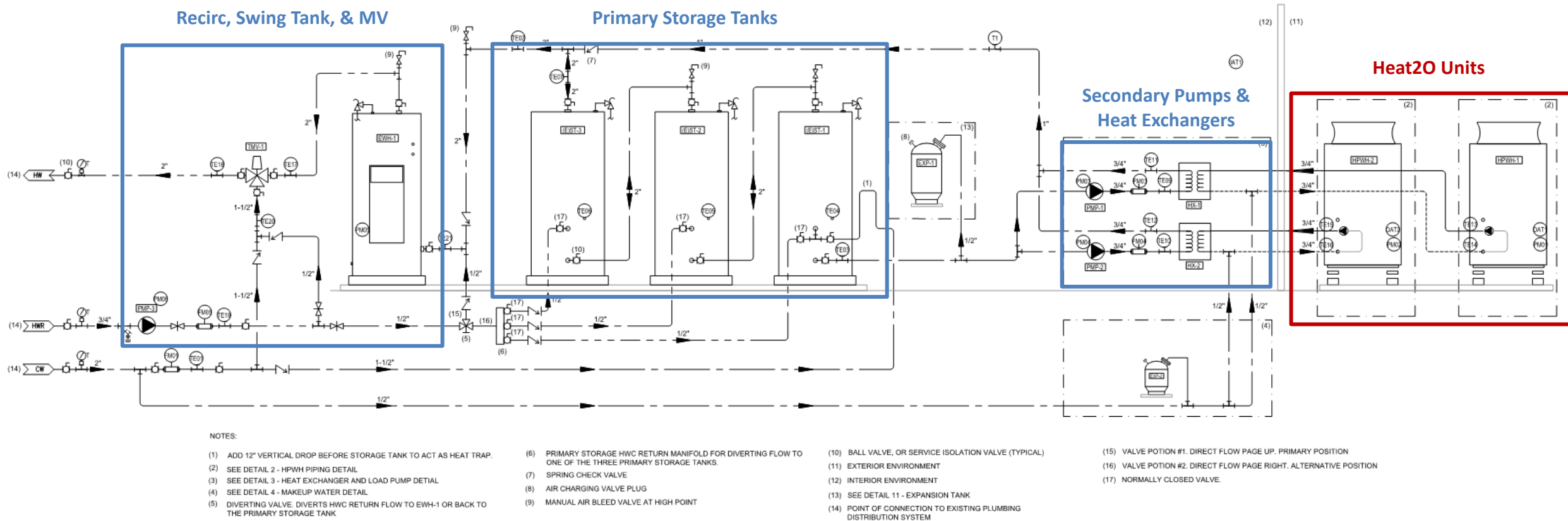


Image: Mitsubishi

Example Plumbing Drawing



① HPWH SCHEMATIC

N.T.S.

Challenges & Learnings

Challenges & Learnings (So Far) - 1



- *Everyone* is learning as we go
 - Product is new to us, but also to the manufacturer's USA team
 - Purpose of study is to work out kinks for bringing Mitsubishi Heat₂O to US market
 - Lots of corrections, changes; challenging to coordinate drawings
 - After these initial demo sites, package system from METUS will be standardized and easy to order
- Tight infill sites - Sound levels at neighboring properties; tank size limitations
- Electrical constraints at existing buildings

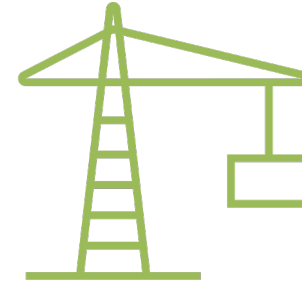
Challenges & Learnings (So Far) - 2

- Secondary Heat Exchanger & Pump
 - Required on Mitsubishi Heat₂O, unlike most R134a and smaller CO₂ systems (ECO2)
 - Current Hx spec: SWEP BH85x81/2P
 - Size: 21" x 9" x 5" – Relatively compact
 - SWEP offers insulated shell – Need to specify
- Primary side volume – minimum 10 gal
 - At ¾" run b/w HP & Hx would need to be 50'. OR:
 - Larger piping
 - Flow through expansion tank + insulation
 - Small electric WH w/ element removed
- Air Elimination
 - System is very sensitive to air in the lines



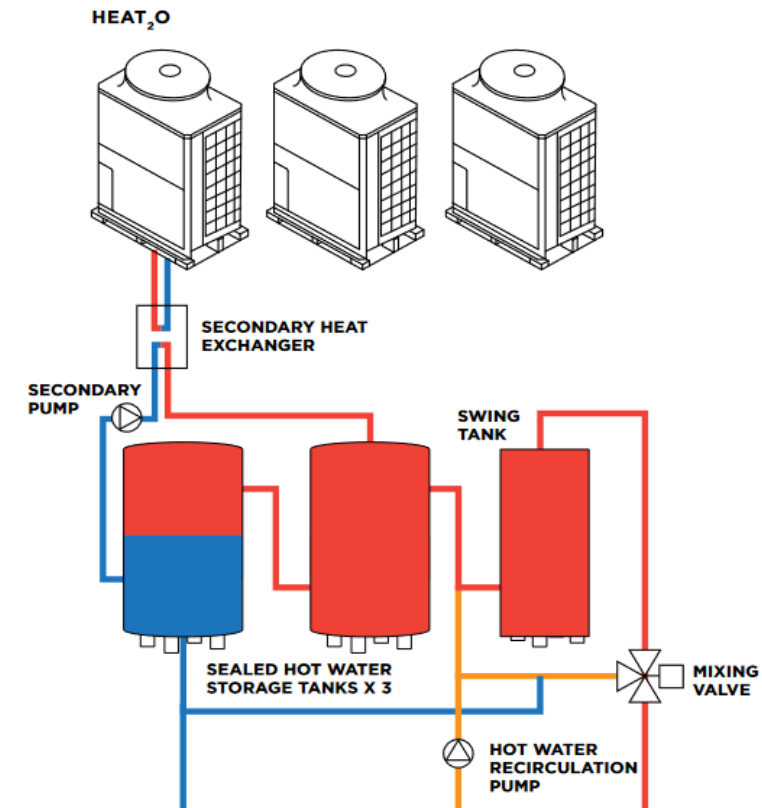
Challenges & Learnings (So Far) - 3

- Distribution channels
 - Local reps may not have a great handle on a product until they have been selling it for a while
 - Supply chain process is being worked out
 - Working through packaging, controls, & distribution as manufacturer has been figuring it out



Major Takeaways

- Early demonstrations have been / are challenging, BUT
- Working with a **responsive and invested manufacturer** like Mitsubishi make them doable.
- Once specifics of packages are ironed out, local reps are trained, and supply chains are standardized, **Heat₂O will be a very competitive offering** that should be relatively easy to specify



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For more information, contact Megan Ching at mching@aeacleanenergy.org

Thank you!

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