

ET Summit 2023

Presented by



Retrofit Market Decarbonization with Plug-In, 120-volt Heat Pump Water Heaters

California-wide field study results & national market
transformation efforts



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Advanced Water Heating Initiative

- A collective impact **national market transformation initiative** to advance energy-efficient and load-shifting capable HPWHs, started in 2019
- More than **400+** organizations involved
- Supporting **residential, multifamily, and commercial market sectors**

AWHI's Collective Impact Market Transformation Plan

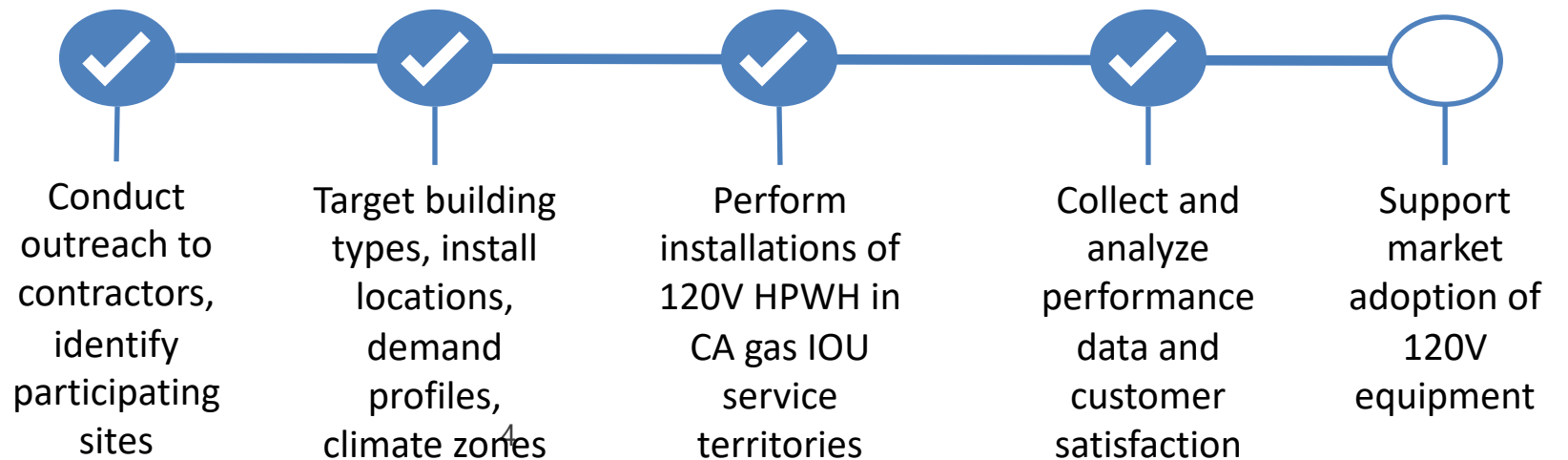
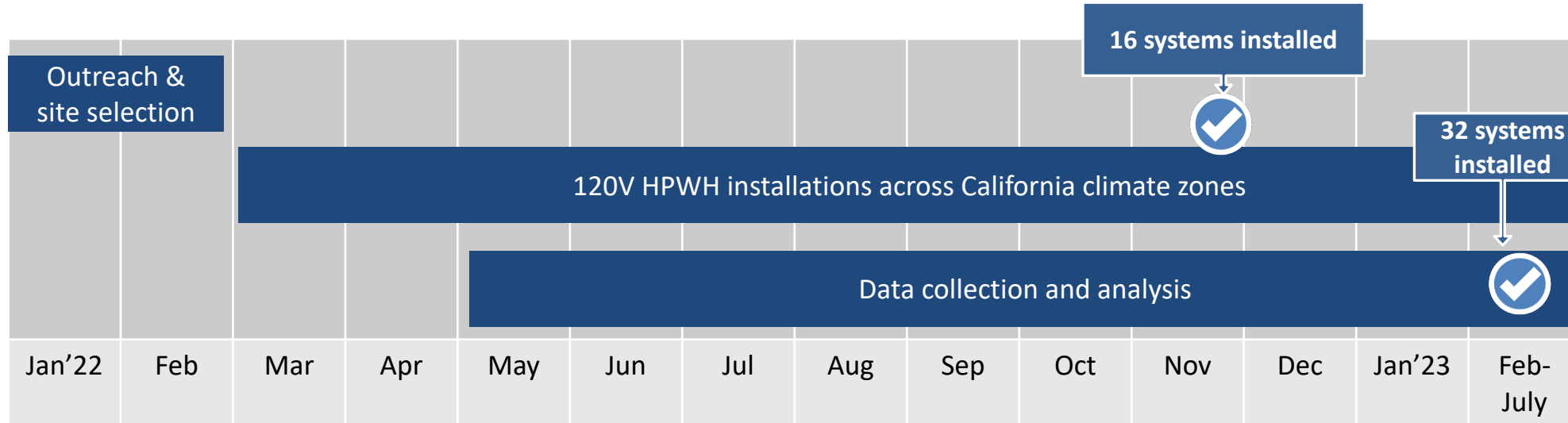


AWHI Working Groups



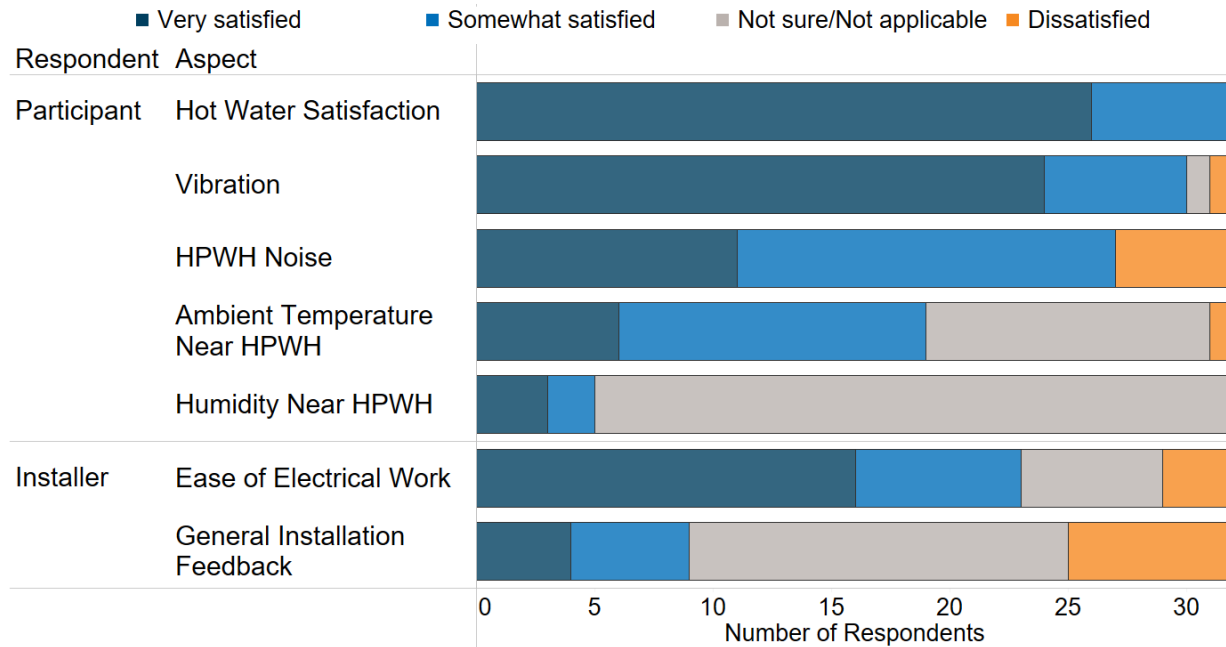
CA Statewide 120V HPWH Field Study

- **Goal:** 120V HPWHs are independently field verified for energy performance, installer acceptance, and user satisfaction to advance market commercialization and program promotion

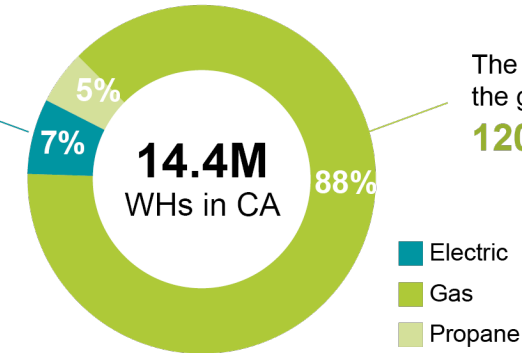


Retrofit Market Decarbonization: Solution for Emergency Replacements

Participant and Installer Satisfaction with 120-volt HPWHs



The solution for electric resistance replacements is **240V HPWHs**



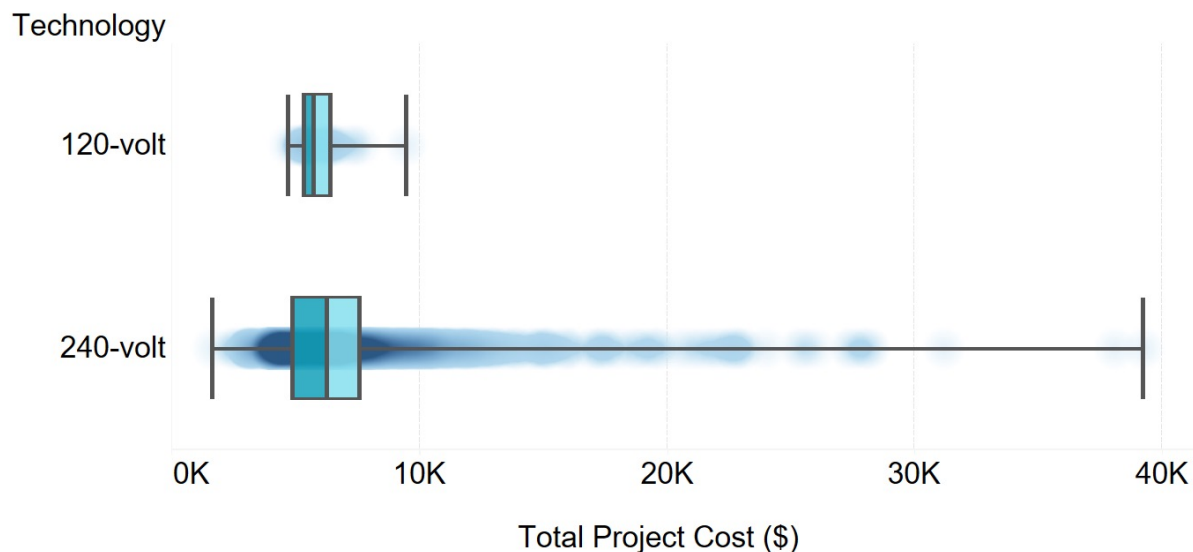
The solution for ~22-30% of the gas & propane markets is **120V HPWHs**

For low-medium (1-4 people) hot water demand sites

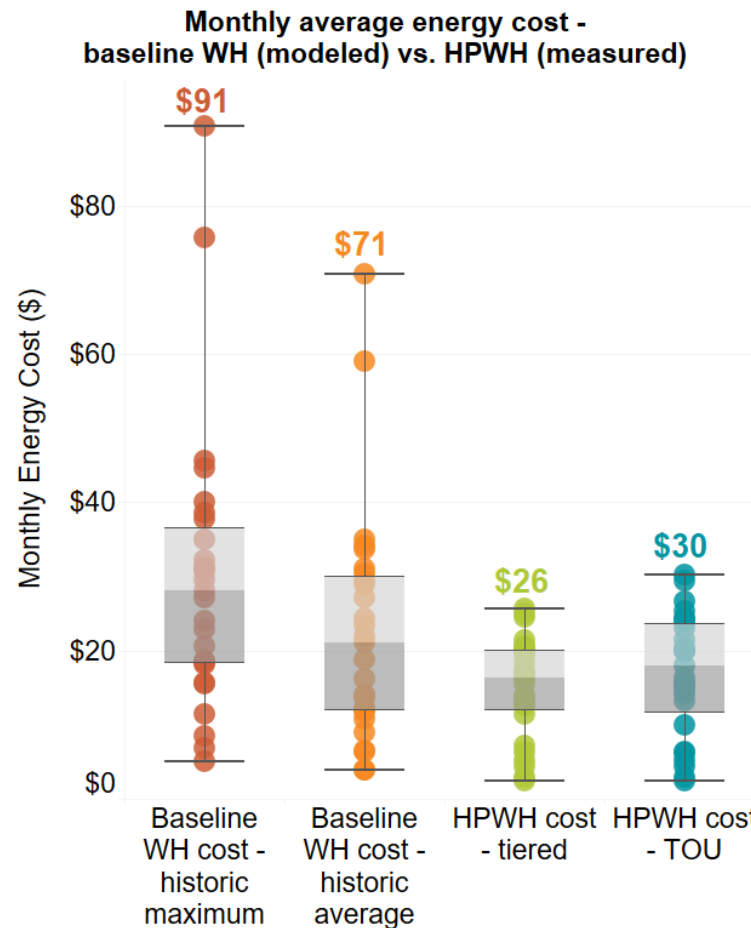
Plug-in, 120-volt HPWHs are a solution for retrofit market decarbonization

Retrofit Market Decarbonization: Equity & Affordable Solution

Total Project Costs: 120-volt versus 240-volt HPWHs (\$)



- * 120-volt costs are based on smaller sample size and stringent study parameters (n=27 sites)
- **240-volt cost information from TECH Clean CA dataset (n=1,650 sites)

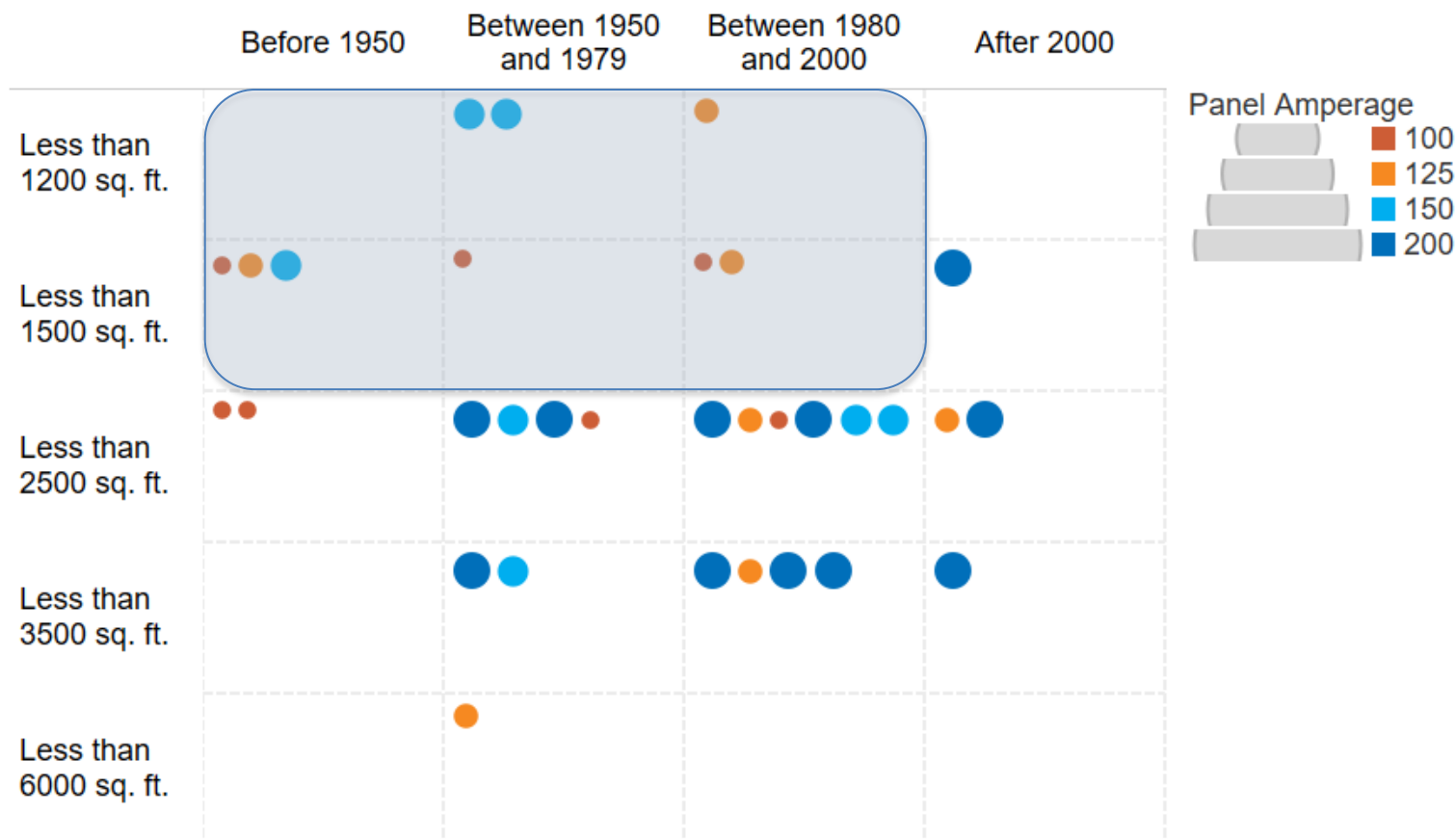


Quote from a study participant:
 “Overall, the unit is working very well, and our experience is very similar to the gas unit it replaced. I believe our gas bill is much lower than the increase in the electric bill. I anticipate adding a schedule to the unit, so it does not operate during the peak rate time, but with SMUD winter rates the difference is negligible.”

More narrow and predictable project costs, solution for emergency replacements

Retrofit Market Decarbonization: Market Assessment

Relationship between panel size, house size and house vintage



Technology for smaller panel amperage households:

- Houses built before year 2000
- Smaller houses, less than 2000 sq.ft.

Key Learnings

- Low amperage draw heaters, while rated at 15 amps, were only **pulling 4-6 amps of current** during the monitoring period.
- An average **monthly energy consumption savings** of approximately **~80%** in comparison to the pre-existing gas/propane water heaters. In addition, about **60% of the sites showed operating costs savings** as compared to the pre-existing water heaters.
- The 120-volt HPWHs are designed to reduce cost and complexity that customers may incur from installing a standard 240-volt HPWH in a fuel switching retrofit. They saved between **\$800 and \$15,000 per household compared to 240-volt HPWH installation**, primarily due to the minimal electrical interventions.



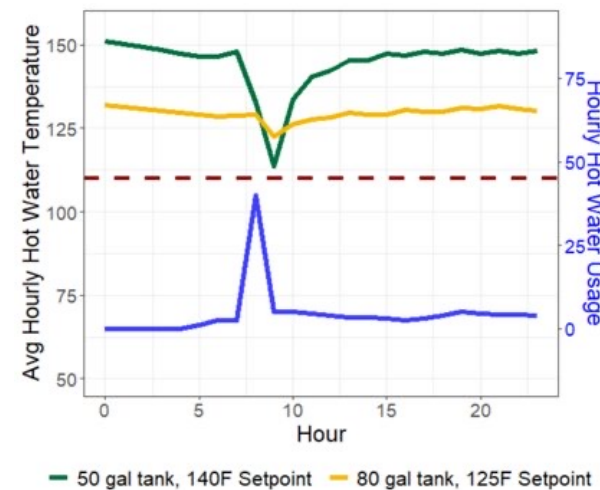
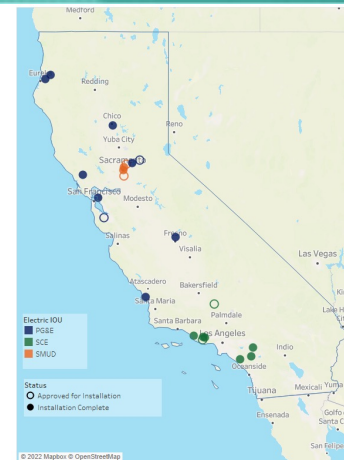
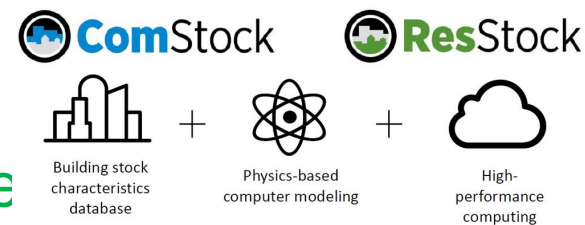
120-volt Technology & Market Vision

- + Validation of the technology nationwide
- + Adoption of the performance curves in the mode
- + Research methodology templated for other regions
- + Higher capacity compressor research
- + Standardized load shifting
- + Permitting and code readiness
- + Market connections and mapping
- + Use low-GWP refrigerants
- + Affordable

Legend

+ : task done/underway

+ : future tasks



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For more information, contact Mischa Egolf at mischa@newbuildings.org or Noah Gabriel at noah@newbuildings.org

The project report can be found at [Plug-In heat Pump Water Heater Field Study Findings & Market Commercialization Recommendations - New Buildings Institute](#)

Final Remarks & Next Steps

- **Creating demand and prioritizing LMI/energy burdened communities:**
 - Products should be absorbed into existing HPWH incentive programs.
 - Maximize outreach within low-income communities to ensure they benefit from the reduced energy burden provided by the 120-volt HPWHs.
- **Education and workforce development:** Training installers is paramount to ensure best possible performance and lack of installation issues.
- **Building officials training:** It's critical to ensure that permitting officers are aware and accepting of 120-volt HPWHs to prevent delays.



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