California Multifamily Split-System Heat Pump Water Heater Market Study

Final Report

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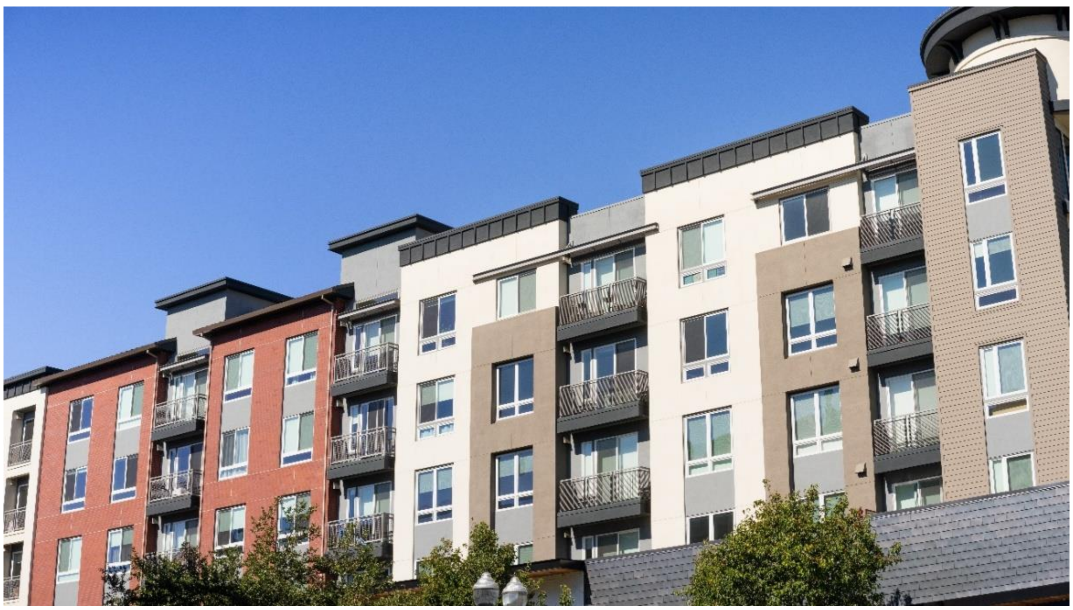

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Executive Summary

The diversity and performance of unitary Heat Pump Water Heaters (HPWHs) have increased significantly over the past few years, with national shipments exceeding 190,000 units in 2023, representing a 35 percent increase from 2022. Higher efficiency, quieter, unitary HPWH models, and the introduction of plug-in 120-Volt options offer robust decarbonization solutions and pathways for most California households and businesses. However, over 1.3 million California multifamily apartments have small in-unit water heaters commonly located in space-constrained areas, where unitary HPWHs are often unsuitable due to limitations related to ventilation, noise, size, electrical requirements, and condensate removal. Addressing these limitations can pose costly and potentially insurmountable barriers to achieving the heat pump and decarbonization goals set forth for California, as well as upcoming regulations requiring zero-NOx-emission water heaters starting in 2027 in the Bay Area, effectively banning most gas water heaters.

A new generation of split-system HPWHs is now entering the US market, offering potential solutions for buildings that are a poor match for existing unitary HPWHs. A split-system HPWH allows for the separate location and installation of the heat pump and storage tank. A typical installation would involve an outdoor ground- or wall-mounted heat pump and an indoor storage tank, matching the physical size and hot water needs provided by the existing gas or electric water heater.

This study explores the diversity of designs of the new split-system HPWH models; estimates the market opportunity and need within California multifamily buildings; evaluates their performance relative to conventional gas and electric water heaters and unitary HPWHs; identifies the limitations and barriers related to installation requirements, test procedures, and program requirements; and assesses their compatibility with existing California HPWH programs and new initiatives focused on the development and promotion of split-system HPWHs. The findings and recommendations identified in this report are a result of technical product reviews, building energy modeling, market data analysis, and interviews with manufacturers, contractors, program administrators, and other subject matter experts to better assess the feasibility, performance, benefits, and challenges of split-system HPWH installations in California multifamily buildings.

The study offers actionable recommendations to support product development and inform utility program design, thereby accelerating market development in California for split-system HPWHs.

Summary of Findings

This California Multifamily Split-System Heat Pump Water Heater Market Study identified several important areas requiring further product performance and field testing, program incentive and evaluation adjustments, future cost compression as well as ideal opportunities for early split-system HPWHs in California multifamily buildings.

California Multifamily Building Opportunity for Split-System HPWHs

California has approximately 1.7 million multifamily apartments with in-unit water heaters, 78 percent of which are 30-gallon electric or gas tanks in constrained spaces. The diversity of multifamily building types and water heater locations requires a range of unitary and split-system HPWH configurations. Split-system HPWHs offer flexible installation and improved performance in tight spaces. They enable direct replacement of existing in-unit water heaters while relocating the heat pump to an outdoor location, which helps eliminate issues related to noise, limited ventilation, over-cooling of small living spaces, restricted electrical panel access, wiring constraints, and capacity limitations. This configuration also facilitates the removal of condensate and piping.

This study identified several key market and technological barriers to the adoption of split-system HPWHs.

Split-System HPWH Costs and Rebate Availability

- **Higher equipment cost, installation cost, and complexity of split-system HPWH systems compared to unitary HPWHs.** As experience with split-system HPWHs has been limited to existing products, the impact of the new generation of split-system HPWH models is not yet known. Differences in design, equipment costs, and complexity of installations, especially for different monobloc (water) and split (refrigerant) solutions—could be significant. Emerging split-system HPWH models with plug-in 120V options and pre-charged refrigerant lines can potentially simplify installations, lower installed costs, and avoid electrical panel upgrades and load growth.
- **Few split-system HPWHs are commercially available and listed on qualified product lists for California HPWH programs.** Currently, only two split-system HPWHs are eligible for multifamily HPWH incentives through the TECH Clean California initiative. However, several manufacturers are introducing new split-system HPWH designs and are entering the Northwest Energy Efficiency Alliance (NEEA) Hot Water Innovation Prize.
- **Current incentive program requirements may exclude split-system HPWHs by relying on performance eligibility rules that do not reflect diverse system designs.** California and federal HPWH incentive programs reference recognized performance specifications—e.g., ENERGY STAR®, Consortium for Energy Efficiency (CEE), NEEA, etc.—or specific performance or size metrics—e.g., Uniform Energy Factor (UEF), First Hour Rating (FHR), storage capacity, load shifting, etc. Depending on split-system designs and performance testing, the program requirements could hinder individual split-system HPWH model participation.

Additional Market Barriers to Split-system HPWHs

- **Limited contractor familiarity, training, and installation experience with split-system HPWH designs.** Although there has been focused contractor training on quality unitary HPWH installations through utility and statewide program efforts, the separate installation of the heat pump exterior to the building introduces new knowledge gaps in sizing, installation, and maintenance for many existing plumbing contractors. Heating, ventilation, and air-conditioning (HVAC) contractors may offer a new leverage point for split-system HPWHs, due to their experience installing more complex heat pump systems for heating and cooling applications with outdoor units. Split HPWHs that use refrigerants to transfer heat from the outdoor heat pump to the indoor storage tank may be a particularly good match for HVAC contractors. Monobloc systems are more of a pre-packaged solution marketed towards plumbers, though the design does require freeze protection in colder climates to prevent freezing of the water piping outside the building.
- **Like unitary HPWHs, split-system models face additional market barriers, including permitting and split incentives between property owners and tenants in multifamily buildings.** Depending on ownership of existing in-unit or shared water heaters and billing for

electricity and gas, the opportunity for and installation of split-system HPWHs, especially when replacing existing in-unit gas water heaters, could be limited based on who is carrying the cost of the installed equipment and the potential shift in costs and savings from the reduced gas and increased electricity usage. Split-system HPWHs will encounter many of the same hurdles as unitary models, such as those related to the need for plumbing and potentially electric and building permits based on individual installation upgrades. However, the outdoor location of the split-system heat pump unit introduces potential additional permitting and building code requirements, similar to those of HVAC heat pump installations.

Performance, Evaluation, and Energy Savings of Split-System HPWHs

- **Split-system HPWHs offer increased energy savings over unitary HPWHs located in interior conditioned spaces with inefficient gas space heating systems.** Due to the interactive effects with a building's HVAC system, an interior unitary HPWH will transfer energy from the heating system to the stored hot water during the heating season. Alternatively, an interior unitary HPWH will contribute beneficial cooling—from the exhaust of the HPWH—during the cooling season. For this reason, a less efficient heating system, such as an older gas furnace, or an inefficient cooling system, like a room air conditioner, can impact the energy and cost savings of an HPWH. Split-system HPWHs and unitary HPWH energy and operating costs are based on the efficiency of the HPWH, the HPWH location in the building (e.g., interior, garage, exterior), the local climate (e.g., heating-dominated or cooling-dominated), electric and gas rates, and the efficiency of the HVAC system. Replacing conventional water heaters could yield significant energy savings and greenhouse gas reductions, with estimated Total System Benefits (TSB) ranging from $281–$1,954 or more per unit, depending on climatic factors and baseline water heater type.
- **Due to the smaller size of the storage tank, split-system HPWHs installed in constrained multifamily building locations may be limited in terms of load-shifting opportunities.** However, emerging energy storage technologies, such as phase change materials (PCMs), may offer options for maintaining a compact physical size by either improving or replacing the interior storage tank with a higher-density PCM thermal energy storage solution.
- **Existing federal test procedures and California electronic Technical Reference Manual (eTRM) evaluations of HPWHs do not accurately represent the performance of split-system HPWHs in exterior locations and California climates.** Testing of HPWHs is currently conducted in standardized test conditions, reporting water heater performance in terms of UEF and FHR, which are standard metrics for evaluating hot water delivery. However, for split-system models where the heat pump is located outside, the ambient conditions in heating-dominated or cooling-dominated climates, potentially significantly higher or lower than standard test conditions, can dramatically impact efficiency and hot water delivery capabilities. Unitary HPWHs, when installed in exterior or semi-exterior locations such as a garage, will similarly be affected by the ambient environment, temperature, and humidity. Federal test procedures allow for optional testing and reporting at additional temperature and humidity levels to provide more representative environmental conditions. The Northwest Regional Technical Forum (RTF) includes estimated energy savings for HPWHs based on installation location.

Recommendations for Split-System HPWH Market Development in California

Supporting the early market development of split-system HPWHs will require targeted actions from a broad range of California stakeholders, including policymakers, permitting and code officials, and administrators of incentive and rebate programs. Below is a set of recommendations informed by the key findings of this study:

1. **Ensure access to existing rebate programs and incentives, along with targeted and proactive support for early field demonstrations of split-system HPWH solutions.** Right-sizing incentives for these emerging solutions, which displace more difficult-to-replace, constrained in-unit water heaters in multifamily buildings, is critical to supporting product development, reducing installed costs, and building market confidence. Incentive eligibility details can be found in Table 12: California and federal rebate eligibility table in the Appendix.
2. **Assess and update eligibility requirements for statewide, utility, and local HPWH incentive programs to eliminate barriers to split-system HPWHs.** Limitations affecting multifamily, tenant, or owner participation, as well as specific performance criteria (e.g., ENERGY STAR or NEEA) and requirements (e.g., UEF, FHR, storage capacity, or specific technology types), can negatively impact early market development.
3. **Encourage and reward cost compression, reductions in load growth, and avoidance of panel upgrades in split-system HPWH designs.** Targeting electric water heater replacements and supporting emerging plug-in 120V models and do-it-yourself or contractor-friendly simplified installation designs (e.g., quick-connect refrigerant line sets) offer opportunities to drive down installed costs and complexity.
4. **Update California eTRM HPWH measures** to include installation location and modeled energy savings necessary to reflect the performance of new split-system HPWHs.
5. **Fund pilot demonstrations and field evaluations of new split-system HPWH installations** to validate performance, strengthen and inform California and national initiatives, and support building code and upcoming emissions regulations on water heaters.
6. **Support stakeholder engagement to identify and address persistent barriers to electrifying and decarbonizing water heating solutions.** These include updating rate designs to reduce longer-term electric operating costs; developing solutions to split incentives between property owners (who pay for equipment) and tenants (who pay utility bills); and reducing the cost and complexity of permitting for HPWHs and split-system HPWHs with outdoor heat pump installations.
7. **Develop training and contractor engagement strategies to support quality installations, reduce installation costs, and ensure proper system maintenance.** For both monobloc and split HPWH designs, current programs should identify and pursue opportunities to engage plumbing and HVAC contractor networks.

Abbreviations and Acronyms

Acronym	Meaning
ACEEE	American Council for an Energy-Efficient Economy
AEA	Association for Energy Affordability
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ASHRAE	The American Society of Heating, Refrigerating, and Air Conditioning Engineers
AWHI	Advanced Water Heating Initiative
CalMTA	California Market Transformation Program
CARB	California Air Resources Board
CCA	Community choice aggregator
CEE	Consortium for Energy Efficiency
CEC	California Energy Commission
COP	Coefficient of performance
CPUC	California Public Utilities Commission
DAC	Disadvantaged communities
DOE	US Department of Energy
eTRM	Electronic Technical Reference Manual
EIA	Energy Information Administration
EPA	Environmental Protection Agency
FHR	First hour rating
HCD	Department of Housing and Community Development
HPWH	Heat pump water heater

Acronym	Meaning
HVAC	Heating, ventilation, and air conditioning
IOU	Investor-owned utility
MMH	Mobile and manufactured housing
NEEA	Northwest Energy Efficiency Alliance
NREL	National Renewable Energy Laboratory
PCM	Phase change material
RECS	Residential Energy Consumption Survey
REN	Regional Energy Network
RTF	Regional Technical Forum
SEEM	Simplified Energy Enthalpy Model
SGIP	Self-Generation Incentive Program
TECH	Technology and Equipment for Clean Heating
TRM	Technical Reference Manual
TSB	Total System Benefit
UEF	Uniform energy factor

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Introduction

California's decarbonization goals require targeted solutions for replacing gas and electric water heaters in multifamily buildings, particularly in space-constrained locations. According to 2024 National Renewable Energy Laboratory (NREL) ResStock metadata, California has an estimated 1.3 million small-capacity (30-gallon and below) water heaters, often located in interior closets, crawlspaces, and attics—areas unsuitable for unitary HPWHs due to size, ventilation, and noise limitations. New split-system HPWH models, which separate the heat pump from the storage tank, are entering the California market, offering a potential alternative solution to overcome these barriers.

Assuming an equipment life of 13 years[1], the annual replacement of an estimated 100,000 small water heaters in constrained, interior locations in multifamily buildings represents a significant barrier to California building decarbonization and an opportunity for split-system HPWHs.

This report investigates the market potential, technical performance, and deployment challenges of split-system HPWHs in California's multifamily sector. It draws on stakeholder interviews, product reviews, building energy modeling, and policy analysis to identify actionable strategies for accelerating adoption.

This market scan leverages the growing knowledge base of split-system HPWHs and identified gaps in technology, application, and program design by engaging with national and other statewide initiatives and California programs. These include NEEA, Association for Energy Affordability (AEA), TECH Clean California, CalMTA, Advanced Water Heating Initiative (AWHI), program implementation teams, and existing low-income and market-rate multifamily programs.

This project aims to support utility program administrators in expanding electrification efforts by integrating split-system HPWHs into existing programs. Primary research included outreach to market-rate and low-income multifamily program stakeholders and manufacturers with existing split-system HPWH models and those in development. The project will advance decarbonization goals by identifying market barriers and opportunities, particularly in multifamily buildings with constrained indoor installation spaces. Additionally, mapping the development landscape of split-system HPWH technologies will help utilities and the TECH initiative target marketing strategies and incentive programs to support market development. Although field evaluation and performance data for the new split-system HPWHs are limited, this report provides modeled, representative estimates of energy usage and savings compared to conventional gas, electric, and unitary HPWHs, based on California's climate and most common building designs.

[1] 2025 California eTRM Measure "Residential Heat Pump Water Heater" assumed measure life is 13 years for unitary HPWHs, while Regional Technical Forum assumes a slightly longer lifetime of 15 years for split-system HPWHs.

Background

In 2022, the California Air Resources Board (CARB) established zero-emission standards for water heaters, effectively banning the sale of new gas water heaters beginning in 2030. Similar regulations from the Bay Area Air Quality Management District for smaller water heaters (less than 75,000 Btu/hour) are set to go into effect even sooner in 2027 (Bay Area Air District Clean Air for All 2024). These forthcoming regulations require that the market and technology development for residential-type electric and zero-emission water heaters accelerate to ensure an equitable and feasible transition.

Unitary HPWH models are steadily growing in market share, with national reported HPWH shipments exceeding 190,000 units in 2023, representing a 35 percent increase over 2022 (Advanced Water Heating Initiative 2025). Manufacturers have recently introduced higher efficiency and quieter HPWH models, as well as new plug-in 120-Volt models. However, stakeholders and recent studies report barriers to HPWH conversions for many homes and apartments in California and across the United States. Although the barriers can be diverse, the most often identified barriers are the cost and complexity of electrical upgrades for gas-to-electric conversions that affect all building types, as well as the limitations associated with the location of the water heaters, often within the constrained space of an interior closet. Overcoming the complexities of a unitary HPWH installation can introduce significant costs to the apartment owner or landlord, often in an emergency when an existing water heater fails.

In California, landlords must comply with California Civil Code § 1941.1 (West 2025), which establishes the minimum standards required for a dwelling to be habitable. Among the requirements are functioning plumbing and a water supply capable of providing hot and cold water to apartment fixtures. Many lower-income households with in-unit water heaters are renters, so the direct, upfront costs for an HPWH installation will be on property owners. Changes in energy costs, increased rent, or fees may indirectly impact lower-income households. As detailed later in this study, over 90% of apartments with in-unit water heating are rented, identifying the landlord or property manager as the primary focus for influencing water heater replacement decisions.

Most households in California, about 78 percent, use natural gas water heaters (Opinion Dynamics 2024). Based on guidance from early interviews with contractors experienced in HPWH installations, small-capacity, in-unit water heaters in multifamily buildings are fairly evenly divided between electricity- and gas-fueled water heaters. This higher penetration of electric water heaters in multifamily buildings offers a potentially less complex and more cost-effective opportunity for conversions, provided that appropriate HPWH solutions exist.

Contractors require alternative technology solutions to address the limitations of unitary HPWHs, including the physical limitations of small interior closets, noise, ventilation, condensate removal, and installation and maintenance constraints. Below are the leading identified barriers for unitary HPWH products relevant to effective split-HPWH designs.

Space and Ventilation Constraints

About 58 percent of low-income households live in multifamily units with less than 800 square feet of living space, which limits the location of unitary HPWHs (VEIC 2023a). These unitary units are typically taller than conventional gas and electric water heaters because the heat pump is mounted on the water storage unit (CalMTA 2024). In addition to their height, unitary HPWHs require clearance around the unit for airflow, heat exchange, and maintenance access (Moran, et al. 2023). Customers or contractors may consider minor renovations or relocating the water heater to accommodate these units. These remodel costs can quickly add up, making other water heating solutions more cost-effective.

In contrast, the indoor storage tank of a split-system HPWH is designed to occupy the same footprint as the replaced conventional gas or electric water heater, while the heat pump components are located outside the building. This configuration allows condensates to be discharged outside, prevents the heat exchange process from affecting the indoor temperature and humidity, and enables most maintenance tasks to be performed outside the home. As a result, the indoor tank does not require additional buffer space for access or airflow.

Moreover, many multifamily buildings with central direct hot water distribution systems, such as gas boilers, face challenges when considering conversion to centralized heat pump water heating. These systems often require large storage volumes and multiple tanks to meet demand, which may not be feasible due to space constraints or structural limitations. In such cases, transitioning to individual split-system HPWHs, either installed in-unit or shared between a few adjacent units, could be both viable and cost-effective. There is also the added benefit of reducing distribution and recirculation heat losses, which can account for up to one-third of energy use in multifamily buildings (Zeyghami and Zhang 2024).

Operational Noise

In multifamily buildings, water heaters are often installed in closets near living spaces or bedrooms, where operational noise from a unitary HPWH can directly impact occupant comfort. Although new models have consistently reduced noise levels, the pitch of unitary HPWH cycling noise remains a complaint (Moran, et al. 2023). Split-system HPWHs offer a significant advantage in noise mitigation, as noise will occur outside the home, minimizing the impact on resident comfort. The variable-speed functionality of the outdoor compressor of the split-system HPWH significantly reduces operational noise compared with unitary HPWHs. As many homes already accommodate outdoor HVAC equipment, such as window AC, packaged, or split AC, additional noise is unlikely to exceed existing ambient sound levels and limits.

Installation and Maintenance Challenges

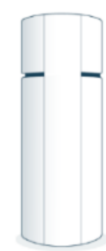
Multiple sources in the literature review noted that installers are generally unfamiliar with HPWHs and, therefore, more hesitant to install them, often increasing costs to account for additional learning-on-the-job time (ACEEE and NBI 2021). As with any new technology, contractors may be cautious with initial installations due to potential complications and customer callbacks. Since HPWHs account for roughly 2 percent of water heater installations annually in the United States, there is an opportunity to train installers on unitary and split-system HPWHs (NBI 2025). This training can help reduce initial installation costs and improve system operation and maintenance, as technicians will better understand HPWH systems and learn how to resolve potential issues.

Although split-system HPWH designs can overcome many of the limitations related to the interior installation of a unitary HPWH, existing split-system products may increase the complexity, time, and cost of installation. In a 2023 field study of new plug-in 120-Volt HPWH models, researchers found that the specific split-system HPWH installed had “unique installation requirements” and that an improvement would be to not “require multi-component installation steps” (NBI 2023).

HPWHs, regardless of style or configuration, can be more complicated to maintain and clean than legacy gas or electric water heaters. Although maintenance and cleaning will also be required for split-system HPWHs, accessing an external compressor unit (where most maintenance and cleaning occur) may be easier than doing so inside a resident’s home. Maintenance challenges were frequently highlighted at the 2025 ACEEE Hot Water Forum, especially with property staff turnover and the need for training on new heat pump technologies. Preventative maintenance for in-unit heat pump water heating is more complex than for centrally heated or gas-heated systems. Installation challenges include the potential need for multiple contractors, such as HVAC technicians, plumbers, and electricians.

Unitary and Split-System HPWH Configurations and Styles

Table 1: Split-system heat pump water heater configurations and types.

HPWH Configuration	Definition	
Unitary	An HPWH with all components, including the thermal storage tank, integrated into a single unit.	 Source: (EECA 2023)
Split-System	An HPWH in which the evaporator, and often the compressor, expansion valve, and condenser, are detached from the thermal storage tank. The remote components are usually located outdoors to transfer heat to an indoor location. Split-systems may transfer heat using water, glycol mix, or other refrigerants, piped between the remote equipment and the thermal storage tank (NEEA, Advanced Water Heating Specification Version 8.1 2024).	 Source: (EECA 2023)

HPWH Configuration		Definition
Split-System Designs	Split	A split HPWH is a style within the split-system HPWH category. The split HPWH design includes a remote unit (incorporating the primary heat pump components) and an interior thermal storage tank with heat exchange. Charged refrigerant lines transfer heat from the remote unit to the interior storage tank. Split HPWHs are often found in solar thermal or combination air-to-water heat pump designs or as an option for more complex installations, allowing for longer separation of the indoor and outdoor units.
	Monobloc	A monobloc HPWH is a style within the split-system HPWH category. The monobloc houses all the heat pump refrigeration cycle components in the remote unit. Heated water lines and wiring run through the building exterior to the interior thermal storage tank. Freeze protection for the exterior piping is required in cold climates.

Source: Project Team

Figure 1**Error! Reference source not found.** highlights the primary components of a monobloc split-system HPWH design, including the heat pump outdoor unit, the interior storage tank, and the associated system controller.

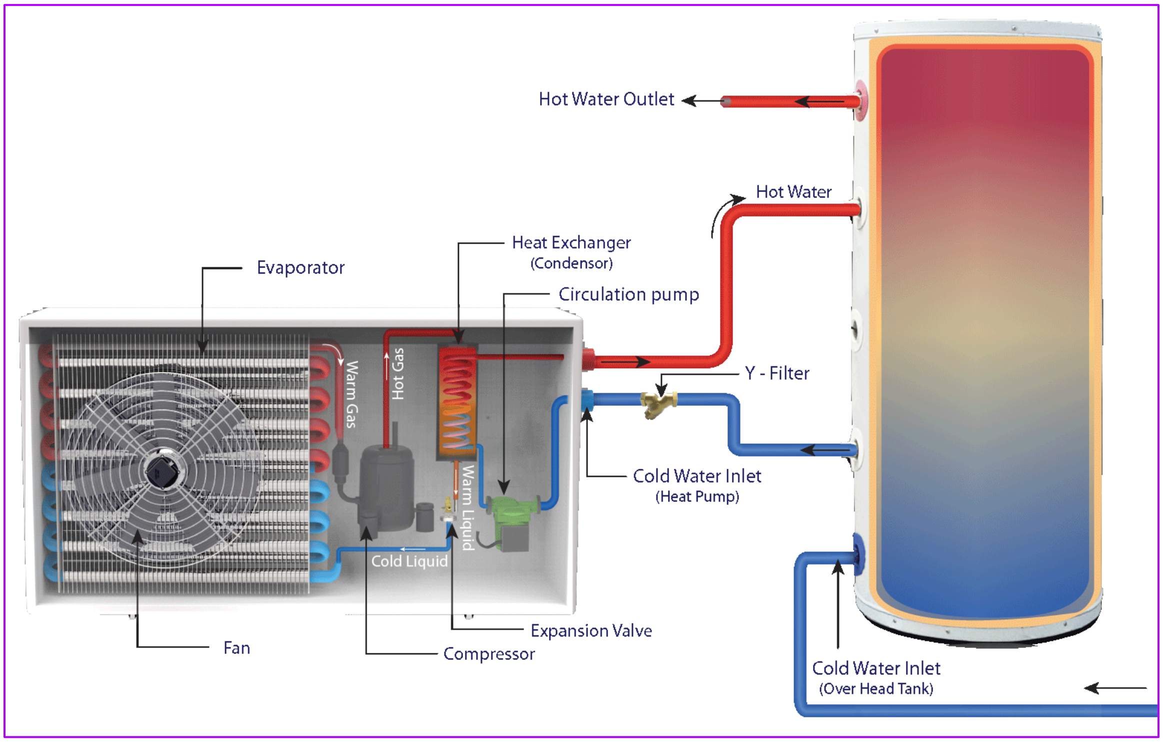


Figure 1: Monobloc split-system HPWH primary components.

(Venus Hot Water Professionals 2025).

Industry Context and Development

In 2024, NEEA released a Hot Water Innovation Prize to support the development of an affordable small split-system HPWH and accelerate the market transformation towards more efficient water heating solutions. NEEA aims to promote the development of split-system HPWHs that are low-cost, simple to install, and compact in design to accommodate the replacement of small "lowboy" 38-gallon water heaters. The contest seeks turnkey split-system HPWH solutions that are packaged, marketed, sold, and shipped with all components, including the heat pump and thermal storage water tank. The scoring criteria reward bonus points to designs that operate in cold climates.

Error! Reference source not found. below, from NEEA's Prize Guidebook, presents two possible configurations of a split-system HPWH (ENERGY STAR® 2025). The left configuration depicts the heat pump unit mounted on the exterior wall or positioned on the ground; the right configuration integrates the heat pump unit into the wall, like a packaged terminal air conditioner (PTAC) unit.

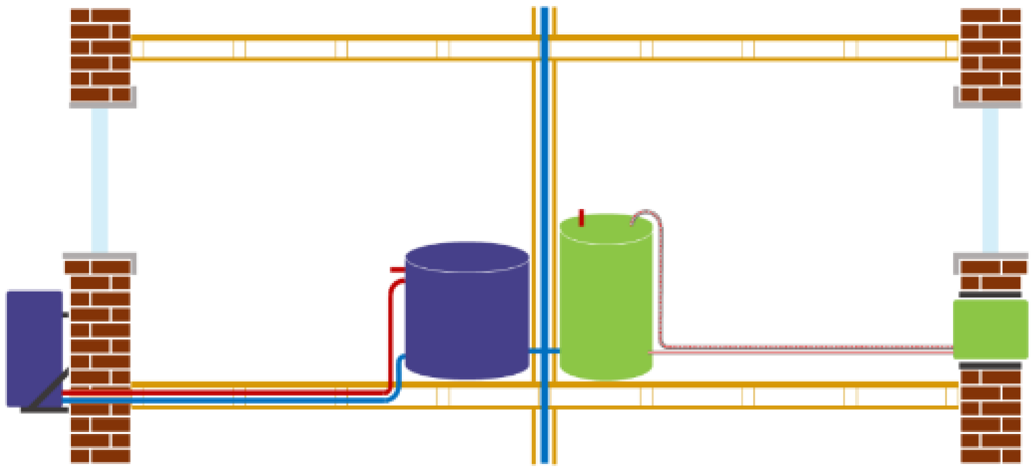


Figure 2: NEEA's diagram of possible split-system HPWH configurations.

Source: (Hot Water Solutions 2025)

NEEA collaborated with industry stakeholders in 2024 to develop the contest rules, including the prize package of media exposure, demonstration projects, and showcasing in utility incentive programs. NEEA is administering the contest and providing each manufacturing participant with up to $205,000 in co-funding. The prize aims to invest in innovation to make these systems available and affordable. The contest has four phases: Participant Qualification in Q4 2024, Project Plan Submissions in Q1 2025, Prototype Submission in Q1 2026, and Winner Announcement at the end of 2026.

NEEA is encouraging partner organizations in the United States to identify candidate sites and conduct assessments to support the market release of these new split-system HPWH model designs in late 2026 through 2028. This CalNEXT project supports these objectives by characterizing the market opportunity, barriers, and recommendations for adopting split-system HPWH solutions in California multifamily buildings.

Objectives

This project aimed to understand the market opportunity and technology performance of split-system HPWHs in California multifamily buildings, focusing on energy use, cost, and hot water delivery capabilities. Split-system HPWHs were evaluated as an alternative decarbonization solution to unitary HPWHs. Although the primary focus of this project was on multifamily buildings, the findings are also relevant to other building types, particularly mobile and manufactured homes, that face cost and complex challenges with unitary HPWH installations. As part of these objectives, energy modeling was performed to better understand the savings potential not available from other sources, such as TRMs.

Identifying Barriers and Opportunities for Split-System HPWH Adoption

The research captured insights from key HPWH and multifamily stakeholders, including building owners, homeowner associations and condominium representatives, affordable housing developers, standard-setting organizations, contractors, and manufacturers. It focused on identifying specific barriers and targeted replacement opportunities for split-system HPWH adoption in California multifamily buildings. These findings enabled the project team to develop informed recommendations for product and system design alternatives and assess the targeted market potential for split-system HPWHs and their energy savings and environmental benefits.

The project team reviewed existing literature on multifamily building characteristics, installation practices, technology solutions, equipment standards, and performance criteria to establish a baseline for current water heating systems. This included fuel types (e.g., electric resistance and gas), capacity, FHR, recovery rate, refrigerant type, and physical dimensions. The literature review also incorporated studies on multifamily electrification, market and technical evaluations of split-system HPWHs, in-unit water heating ownership, energy bill impacts, maintenance, sizing, and replacement practices in California multifamily buildings.

Additional research explored building codes, covenants, or restrictions that either supported or posed barriers to split-system HPWH adoption. Specific focus was placed on hot water delivery requirements, as well as the external placement of outdoor HP units. A review of existing California eTRM measures assessed current gaps related to the impact of water heater location and interactive effects with existing HVAC and recommendations for updates and further research.

The gaps identified during the literature research guided additional stakeholder interviews with multifamily building owners, property managers, contractors, distributors, manufacturers, and other subject matter experts. These interviews supplemented and validated research findings, contributing to a comprehensive understanding of in-unit unitary and new split-system HPWH performance and identifying opportunities for research and development.

Deliver Actionable Recommendations

The study provided valuable insights into the feasibility and potential impact of retrofitting California multifamily buildings with split-system HPWHs. These insights informed future policy and market interventions aimed at facilitating broader adoption. The project offered actionable recommendations based on technology analysis and stakeholder engagement.

Desired Outcomes and Deliverables

In the short term, this project served as a California-specific market study—a critical first step toward integrating split-system HPWHs into affordable housing, multifamily, and energy efficiency programs. It identified major barriers, opportunities, and early adopters to help establish a framework for long-term market transformation, transitioning away from gas and standard electric HPWH units in multifamily buildings.

The long-term benefits included laying the groundwork for future laboratory and field demonstrations to accelerate the adoption of low global warming potential (GWP) split-system HPWH models. The project also aimed to reduce barriers to regulatory advancements, such as air quality regulations for water heaters, and support building energy code improvements for alternative HPWH solutions.

This study's findings and recommendations will be shared with manufacturers, market-rate and affordable property owners, developers, regulators, and energy efficiency program managers through direct outreach to review findings and presentations in larger forums and conference opportunities.

Methodology and Approach

This research study included both market evaluation and technical evaluation components. The market evaluation analyzed market trends, size, segmentation, and opportunities for split-system HPWHs, while the technical evaluation assessed energy efficiency, installation requirements, maintenance, and cost-effectiveness across various technologies.

Market Evaluation

The market evaluation focused on the current state of California's multifamily water heating market and the developments driving increased interest in split-system HPWHs. It aimed to provide insights into both market conditions and technological readiness.

The project team conducted a comprehensive literature review to characterize water heating practices in California multifamily buildings and to identify national and regional initiatives supporting split-system HPWH innovation. Sources were prioritized based on relevance to energy impacts, market and technical evaluations, HPWH market transformation, electrification, baseline and potential studies, and financial implications, particularly those related to tenant ownership structures and energy cost burdens. Research related to the NEEA Hot Water Innovation Prize, TECH Clean California, California Public Utilities Commission (CPUC), California Energy Commission (CEC), California Technical Forum (CalTF), and the California Investor-Owned Utilities (IOUs) was given special attention.

In addition to the literature review, the team conducted outreach interviews with split-system HPWH manufacturers and stakeholders familiar with electrification efforts and barriers in the California multifamily market. Interviewees included contractors, retrofit specialists, program implementers, and representatives from national and regional organizations. Experienced HPWH contractors were specifically interviewed to discuss the barriers and needs they identified when engaging property owners and managers, as these decision-makers play a critical role in water heater replacement choices for rental properties. Stakeholders were asked open-ended questions about California's multifamily housing landscape, leading influences on contractor and customer decisions, and the comparative barriers and opportunities for unitary versus split-system HPWH solutions. Due to the absence of existing cost and installation time data for unitary HPWHs in various building types and applications, and the early stage of commercialization of new split-system designs, the project team shifted to incorporating feedback from stakeholder interviews to inform a comparison of HPWH model installations.

Technical Evaluation

The technical evaluation focused on identifying existing and in-development split-system HPWHs suitable for multifamily applications. The team reviewed commercially available products in the EPA ENERGY STAR and NEEA HPWH qualified product lists and gathered additional design and specification details through direct manufacturer engagement and online research.

The analysis compared technologies based on efficiency, hot water delivery, physical size, operational, installation, maintenance requirements, and refrigerants used in the heat pump system. It also included an assessment of gaps in current standards, test procedures, and specifications to guide future research and policy development.

To support modeling efforts, the project team used National Renewable Energy Laboratory (NREL) ResStock data to research key characteristics of multifamily buildings and establish baseline assumptions for in-unit water heaters in California. ResStock provided granularity to visualize and model diverse housing stock and communities, leveraging multiple public and private data sources, statistical sampling, sub-hourly building simulations, and high-performance computing.

The potential energy and cost impacts for California multifamily, mobile, and manufactured homes were modeled using extrapolated ResStock data and building energy simulations conducted on NREL's OpenStudio and EnergyPlus platforms. These simulations compared performance across a sample set of California regional climates and utility energy costs, evaluating split-system and unitary HPWHs against conventional gas and electric water heaters.

Findings

This section covers a review of split-system HPWH market developments, findings, and insights from conversations with manufacturers and market stakeholders; a summary and analysis of current multifamily building stock in California; a summary of the HPWH solutions on the market today; a review of existing standards, specifications, test procedures, and identified gaps; and an evaluation of energy impacts on multifamily buildings.

Evaluating new split-system HPWH technology replacement opportunities and market strategies is critical to overcoming the persistent barriers to HPWH adoption in confined interior locations in multifamily buildings. In addition to addressing the space limitations, understanding the specific needs of multifamily buildings for simplified installations (e.g., plug-in 120V options to eliminate electrical upgrades and permitting requirements, or plug-and-play water or refrigerant connections) and identifying technologies or strategies to lower installed costs (e.g., potential reuse of existing water heaters with supplemental heat pump modules) are objectives for this study.

Market Evaluation

Evaluation of the Existing California Multifamily Housing Market

Multifamily apartments account for approximately 32 percent of the California residential housing stock, or 4.2 million units (NREL n.d.), of which nearly 75 percent is comprised of five or more units.

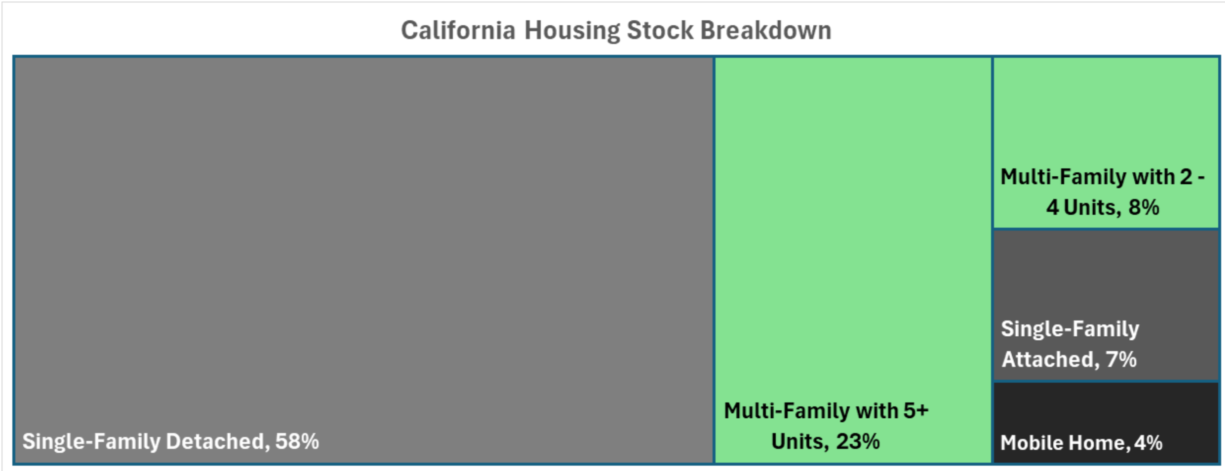


Figure 3: Residential housing units in California.

Source: NREL ResStock

The relative age of California's multifamily building stock offers insights into trends in water heating systems and the associated electrical wiring and panel capacity required to support California's decarbonization goals. These building characteristics affect the potential energy savings impacts and related installation and equipment replacement needs.

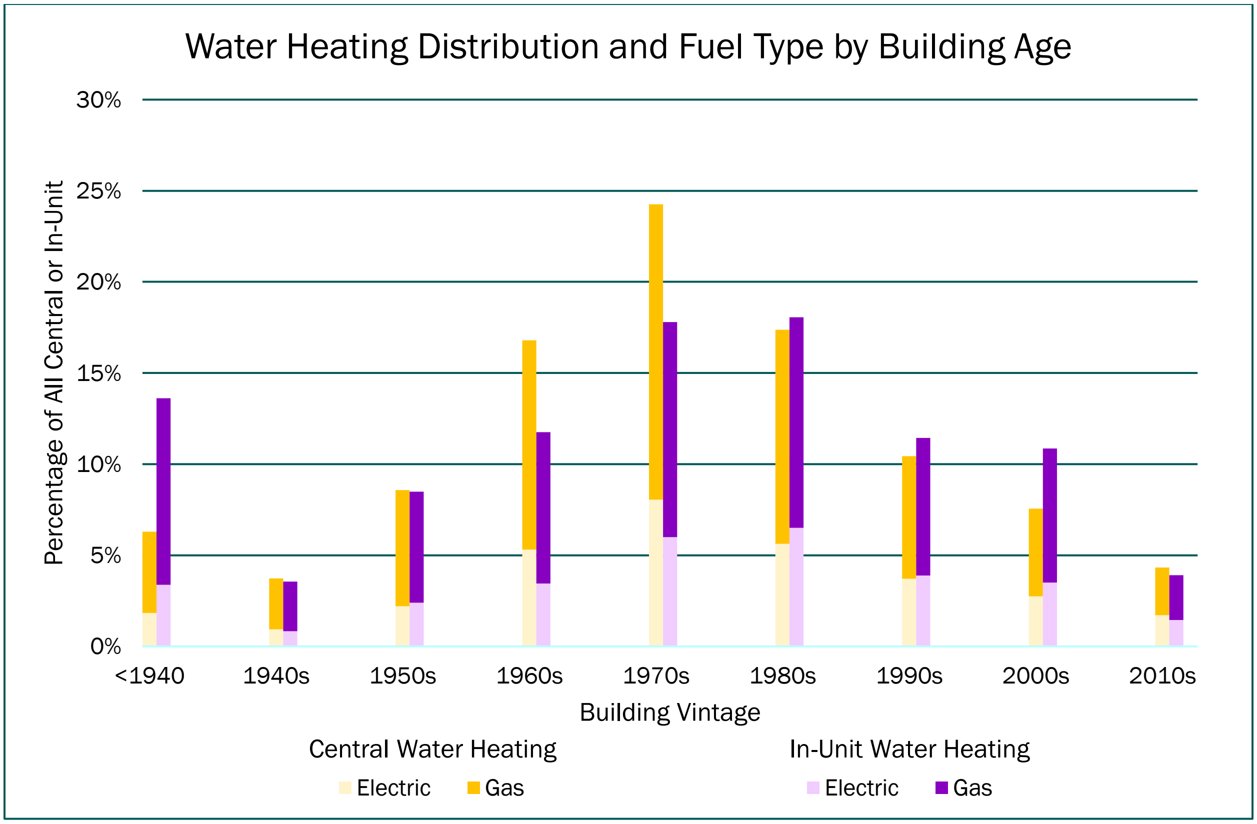


Figure 4: Percentage of central and in-unit water heating based on year of construction.

Source: NREL ResStock

Multifamily buildings constructed between 1940 and 1960 tend to be relatively equally served by central and in-unit water heaters; buildings between 1960 and 1980 shifted towards central water heating systems. Restock data suggests a correlation between a higher prevalence of small (2- to 4-unit) multifamily units built before 1940, and a proportionally higher prevalence of in-unit water heating. During this period, central and in-unit water heating was predominantly gas-fueled, with a slight increase in electric water heating in the 2010s. Buildings from the 1970s and 1980s account for the largest share of multifamily homes, with roughly 35 percent of in-unit water heaters fueled by electricity and 65 percent by gas.

Ownership and Utility Cost Allocation of Multifamily Building Apartments

Replacement and maintenance of in-unit water heaters are typically the responsibility of the unit owner, whether an individual or the owner of a multifamily building. More than 90 percent of multifamily building apartments in California are rental units. This highlights the importance of property owners in the decision-making process for upgrading existing electric and gas in-unit water heaters to HPWHs.

Table 2: In-unit water heating based on renter and owner status in California multifamily buildings.

In-Unit Apartment Housing Status	Quantity	Percentage
Own	159,806	9.6%
Rent	1,507,208	90.4%

Source: RECS (US Energy Information Administration, Office of Energy Demand and Unitary Statistics, Form EIA-457A of the 2020 Residential Energy Consumption Survey)

However, even in rental apartments with in-unit water heating, the tenant may often be responsible for the gas or electric fuel cost. Cost-effective HPWH solutions can reduce the financial burden of fuel costs, especially for electric water heater replacements. More than 94 percent of tenants in California are directly billed for electricity costs for multifamily buildings with in-unit water heating (RECS, 2020).

As shown in Table 3 below, there are significant differences in who pays for electric and gas bills, depending on the hot water fuel types. Out of 1.67 million total multifamily units with in-unit water heating, approximately 1.19 million residents, or 71 percent, are responsible for electric and gas bills.

Table 3: Multifamily utility bill responsibility of residents with in-unit water heating.

Electric Bills Paid by Resident, by Hot Water Fuel	
Electric	22.8%
Natural Gas	77.2%
Gas Bills Paid by Resident, by Hot Water Fuel	
Electric	7.7%
Natural Gas	92.3%

Source: RECS (US Energy Information Administration, Office of Energy Demand and Unitary Statistics. State Microdata, 2020.)

With most in-unit water heaters using natural gas for water heating, installing an HPWH would require a fuel switch. This introduces the risk of overall bill increases since electricity rates are typically higher per unit of energy than natural gas rates. While it is expected that the increase in heating efficiency of an HPWH would mitigate the risk of electricity cost increases, the risk of energy cost increases is important to consider and monitor, especially for low- and middle-income residents. A similar risk exists when moving from a central system to in-unit HPWHs. Most apartments are billed for electricity, so the water heating cost shifts from the building owner to the resident. This is particularly relevant in affordable, regulated housing, where buildings often have utility allowances calculated based on existing systems and are often difficult to modify to appropriately represent cost shifts related to alternative heat pump water heating solutions.

EXISTING BUILDING ELECTRICAL INFRASTRUCTURE

Converting gas water heaters to electric, unitary, or split-system HPWHs often requires new electrical wiring and may necessitate upgrades, such as additional breakers, electrical panel replacement, or service upgrades. Utilities, whether for gas or electricity, typically charge fixed monthly fees for infrastructure and service, regardless of the amount of energy used. Electrification can eliminate gas services and fixed fees, offering potential cost savings that help defray upfront costs.

Table 4, from the CalNEXT Multifamily In-Unit Heat Pump Market Study (VEIC 2023b), highlights the gradual increase in electrical service capacity for apartment units due to changes in electrical code requirements and the increasing number and diversity of electrical appliances.

Table 4: Electrical infrastructure serving individual residential units by multifamily building vintage.

Infrastructure Type	Building Vintage and Capacity per Unit			
	Pre-1950	1950–1974	1974–2010	2010–present
Whole-building infrastructure (overall service size)	10–20 A per unit	15–45 A per unit	20–70 A per unit	25–70 A per unit
In-unit infrastructure	30–40 A	30–60 A	60–90 A	100–150 A
Appliances and end-use (branch/circuit) infrastructure	Two 15 A circuits	Two to six 15 A circuits and one to two double-pole 20–30 A circuits	Five to seven 15–20 A circuits and one to three double-pole 20–50 A circuits	Six to eight 15–20 A circuits and three to four double-pole 20–50 A circuits

Source: Accelerating Electrification of California's Multifamily Buildings, Association for Energy Affordability, May 2021

The limited capacity for adding additional electrical loads is a critical barrier to decarbonizing space conditioning and water heating in older multifamily buildings. In split-system HPWH designs with the heat pump located external to the building, providing electricity service introduces additional cost and complexity, but offers potential alternative solutions.

For electric water heater replacements, an existing 240V, 30- to 40-amp electrical service must be extended to the outdoor heat pump location, along with the necessary water plumbing lines and controls of a split-system HPWH design. Replacing gas may require new electrical wiring from the apartment's electrical panel, if sufficient space and capacity are available. Alternatively, especially when converting multiple apartments, a new exterior electrical service could be installed, potentially minimizing the cost and the limitations of the existing electrical panel and eliminating new wiring within the apartments.

ESTIMATE OF CALIFORNIA MARKET POTENTIAL

California has about 4.2 million multifamily apartment units, representing 30 percent of all housing units across the state. Nearly 1.7 million of these multifamily apartments (~40 percent) are served by in-unit water heaters, 86 percent of which are storage tanks with a capacity of less than 50 gallons. The divide is similar in multifamily households earning less than 80 percent of the area median income; about 60 percent have central water heating, and 40 percent have in-unit water heating.

Table 5: California multifamily existing water heating characteristics.

		Small Apartment Buildings (2–4 units)	Large Apartment Buildings (5+ units)	Total Multifamily	Total California
Number of housing units (millions)		1.09	3.08	4.17	13.18
Fuel type	Gas*	0.75	2.02	2.77	10.70
	Electricity	0.34	1.06	1.40	2.48
Location	In-unit	0.65	1.02	1.67	10.68
	Central	0.44	2.06	2.50	2.50
Tank size for in-unit WHs	Tankless (on-demand)	0.04	0.04	0.08	1.13
	Small tank (<=30 gallons)	0.15	0.23	0.38	0.97
	Medium tank (31–49 gallons)	0.38	0.68	1.06	5.26

	Small Apartment Buildings (2–4 units)	Large Apartment Buildings (5+ units)	Total Multifamily	Total California
Large tank (>50 gallons)	0.08	0.07	0.15	3.32

*Includes Natural Gas and Propane as Fuel Type
Source: RECS (US Energy Information Administration, Office of Energy Demand and Unitary Statistics. State Microdata, 2020.

As highlighted in Figure 5 below, 30-gallon gas and electric water heaters represent over 78 percent of the in-unit water heaters in California multifamily buildings, or 1.3 million water heaters. These small-capacity water heaters are commonly designed to accommodate space-constrained interior locations with either narrow ("slim") or short ("low-boy") profiles.[2]

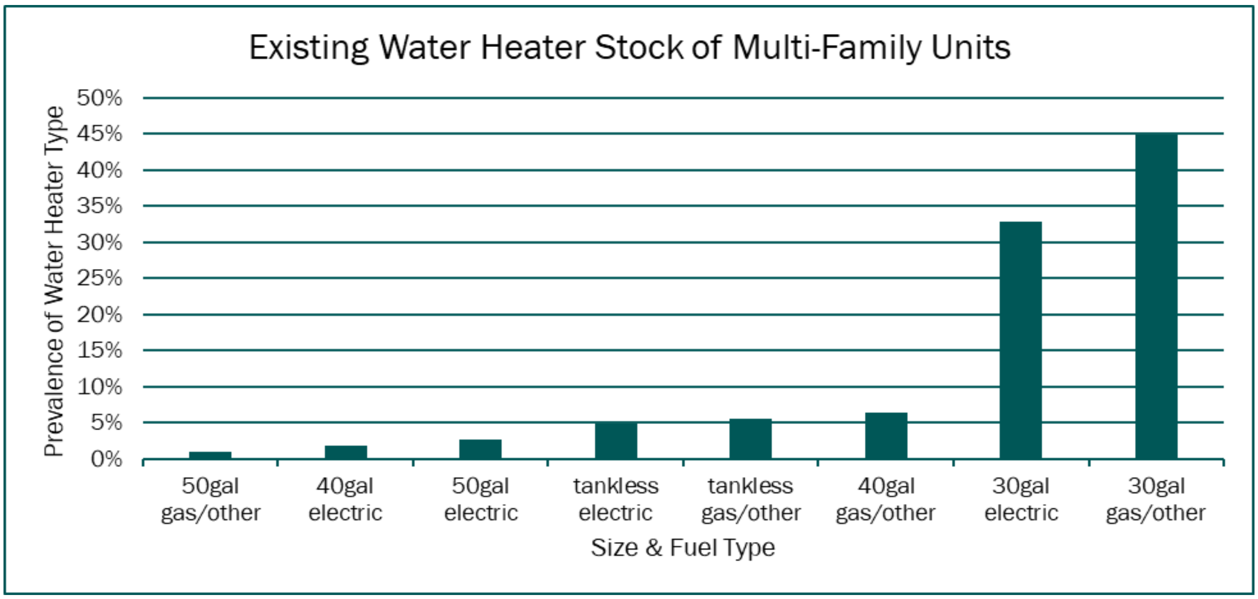


Figure 5: Fuel and equipment type for in-unit water heaters in California multifamily buildings.

Source: NREL Restock Sept. 2024, multifamily in-unit water heater population

[2] The data from RECS 2020 and ResStock 2024 align in reflecting the majority of in-unit water heaters being smaller, 30 and 40 gallon capacity tanks. However, the binning of sizes is not the same which affects how the data is presented (e.g. ResStock uses "30gal", where RECs uses either (<30gal or 31-49gal).

Figure 6: Example of available 30-gallon slim and low-boy model water heaters.

Source: Lowe's

Replacing these existing slim and lowboy water heaters in apartments poses a significant challenge in meeting the Bay Area and California air quality regulations' requirements to shift away from the emissions associated with gas water heaters by 2027 and 2030, respectively. Existing unitary HPWH designs require a larger space to accommodate the physical size of larger storage tanks, as well as the additional requirements for ventilation and plumbing connections.

Technical Evaluation

Currently, limited split-system HPWH products in the United States could serve as water heater replacements in constrained multifamily locations. However, growing US interest is increasing the demand for cost-effective solutions to decarbonize water where existing unitary HPWHs are not viable.

Comparing Split-System HPWH Specifications to Conventional Water Heaters

Split-system HPWHs currently available and those in product development vary in configuration, form factor, refrigerant, efficiency, size, and availability in the United States and internationally.

The following table presents a comparative sample of conventional electric and gas water heaters, as well as unitary and split-system HPWH models.[3] The manufacturers listed are provided for illustrative purposes only and do not imply a preference for or comprehensiveness of all potential manufacturers.

Comparative factors include the type of water heater, physical size, storage capacity, refrigerant used, efficiency, and hot water delivery metrics. As many of the split-system HPWHs are either new to

[3] The list of water heaters is not comprehensive but selectively pulls from existing qualified product lists (e.g., EPA ENERGY STAR, NEEA Advanced Water Heater Initiative, TECH Clean California, internet research, and manufacturer interviews).

the US market or in product development stages, an additional non-US product was included for comparison purposes.

Table 6: Specification comparison of electric and gas water heaters to split-system and unitary HPWHs.

Manufacturer	Type & Voltage	Tank Height (in)	Tank Diameter (in)	Rated Storage (gallons)	Refrigerant	COP /UEF	First Hour Rating (gallons/h)
ECO_2Systems	Monobloc 240V HPWH[4]	39	25	43	CO_2	UEF 3.66	69
Panasonic[5] (non-US product)	Monobloc 240V HPWH[6]	71	22	42	CO_2	COP 5.2[7]	n/a
Eco-Logical	Split 240V HPWH[8]	73	19	46	513A	UEF 4.29	57
	Split 120V HPWH[9]	73	19	46	513A	UEF 3.0	50
Embertec	Split 120V HPWH[10]	68	19	41	134a	UEF 2.64	49
AO Smith	ER Lowboy 240V[11]	34	26	35	n/a	UEF 0.92	50
	ER 40 Tall 240V[12]	61	18	36	n/a	UEF 0.92	53

4 Split-system HPWH Model # GS5+43G (B) (ECO2SYSTEMS 2025)

5 Requires a separate Smart Controller with 240V power.

6 CO_2 Heat Pump Water System Model # HE-UM60AR (Panasonic Australia n.d.)

7 COP reported at 66.2°F ambient with 57.2°F water inlet.

8 OMNI-50HP2 (Eco-Logical 2025)

9 OMNI-50HP1 (Eco-Logical 2025)

10 EmberH2O Heat Pump (embertec 2025)

11 ProLine® 38-Gallon Lowboy Top Connect Electric Water Heater (AO Smith n.d.)

12 ProLine® 40-Gallon Tall Electric Water Heater (AO Smith n.d.)

Manufacturer	Type & Voltage	Tank Height (in)	Tank Diameter (in)	Rated Storage (gallons)	Refrigerant	COP /UEF	First Hour Rating (gallons/h)
	Nat. Gas Short[13]	47	20	38	n/a	UEF 0.57	68
	Unitary 240V HPWH[14]	66	20	36	134a	UEF 3.6	55
	Unitary 120V HPWH[15]	66	22	46	513a	UEF 3.0	52
Rheem	Unitary 120V HPWH[16]	63	20	36	134a	UEF 2.8	45[17]

Based on the information in Table 6 and information gathered from manufacturer interviews, several key findings emerge regarding split-system products, which are described next.

PRODUCT LANDSCAPE AND MARKET ENTRY PATHWAYS

At the time of this report, the most widely available residential-scale, split-system HPWH product in the United States is the ECO$_2$Systems monobloc. This HPWH design packages all the heat pump components—including the compressor, evaporator, heat exchanger, and refrigerant—in a single outdoor unit, using water as the heat transfer medium between the heat pump and indoor storage tank. AO Smith announced a partnership with Panasonic at the 2025 AHR Expo to introduce a lowboy monobloc system to the US market later this year, signaling increased competition and innovation in compact HPWH formats (Aldrich n.d.). Although not yet available in the United States, the Panasonic HE-UM60AR is included in the table above for comparison.

In addition to AO Smith and ECO$_2$Systems, manufacturers Eco-Logical and Embertec have introduced split HPWH products into the US market through direct sales. Unlike monobloc systems, these split designs use refrigerant lines to connect the outdoor unit to the indoor storage tank, with heat exchange occurring inside the tank.

The manufacturers interviewed for this report highlighted a growing focus on multifamily buildings, manufactured homes, and accessory dwelling units where space constraints demand compact, replacement-ready solutions. There is also increasing attention on disadvantaged communities,

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[13] ProLine® 40-Gallon Atmospheric Vent Short Natural Gas Water Heater (AO Smith n.d.)

[14] Voltex® MAX 40-Gallon Smart Hybrid Electric Heat Pump Water Heater (AO Smith n.d.)

[15] Voltex® 120V Plug-In 50-Gallon Hybrid Electric Heat Pump (AO Smith n.d.)

[16] Professional Prestige Plug-in Heat Pump Water Heater (Rheem n.d.)

[17] Reported first hour rating for the Rheem 120V HPWH uses a higher 140°F storage temperature setpoint.

which may face barriers to accessing resources needed to comply with upcoming air quality regulations, making affordable, non-combustion alternatives especially critical.

Market entry incentives such as the NEEA Hot Water Innovation Prize are expected to attract new manufacturers. One developer notes the need for more precise guidance on the CTA-2045 standard and its implications for demand response integration, underscoring the importance of standardized communication protocols in enabling grid-interactive water heating.

TYPE AND VOLTAGE

Replacing conventional water heaters with HPWHs often faces electrical constraints, particularly the panel's power availability. Historically, HPWHs required 240-volt access, making the replacement of 240-volt electric resistance water heaters relatively straightforward. However, replacing natural gas water heaters can pose more of a challenge if there are no electrical connections, in the case of use of atmospheric venting, or if only a 120-volt supply is available for power vented designs. Eco-Logical and Embertec plan to introduce plug-in 120-volt models to the U.S. market to avoid potentially costly and time-consuming electric wiring and panel upgrades.

SIZE (TANK HEIGHT, DIAMETER, AND RATED STORAGE)

Space constraints in multifamily buildings pose challenges for HPWH adoption. Manufacturers are responding with compact designs tailored to tight spaces. For example, ECO_2Systems offers a 39-inch tank, comparable to the 34-inch electric resistance lowboy, which is often installed in cabinets, under sinks, or in short crawl spaces. In narrow closets, where tanks wider than 20 inches are impractical, taller and slimmer options are needed. Eco-Logical and Embertec offer split indoor tanks 19 inches in diameter and 73 and 68 inches tall, respectively. In contrast, the Panasonic monobloc tank is 71 inches tall and 22 inches wide and may be unsuitable for narrow installations.

REFRIGERANTS

Refrigerants play a vital role in the heat exchange process, with different types influencing the efficiency and environmental impact of the heat pump water heater. Each refrigerant has a global warming potential (GWP) number, which indicates the amount of heat the gas traps in the atmosphere relative to carbon dioxide, which has a GWP of 1. The refrigerants in the products in Table 6 are CO2, R513a, and R134a.

- CO_2 is a natural refrigerant with excellent thermodynamic properties and broad temperature range capabilities, though it operates at higher pressures and may be less efficient in high ambient temperatures (effecterra 2023).
- R-134a, a synthetic hydrofluorocarbon (HFC), is noncorrosive and nonflammable but has a high GWP of 1,430.
- R-513a, a blend of R-134a and R-1234yf, has a GWP of 630 and meets current regulations (HVAC Industry Refrigerant Update 2024).

PRICE

Price remains a significant consideration, as noted by most stakeholders and contractors the project team interviewed. The ECO_2Systems monobloc, sold through distributors, is praised for its efficiency and capacity to serve in different configurations, but stakeholders and manufacturers noted its high cost, listed at $5,845 (pricing from plumbestore.com), compared to other HPWH options. Eco-Logical lists the MSRP of both their 120V and 240V units at $3,350. Conventional water heaters are significantly cheaper, ranging from $539 for a 40-gallon electric unit to $769 for a natural gas unit and $2,098 for a 240V unitary HPWH (pricing from Lowes.com in Mission Valley, San Diego). Streamlining installation and permitting processes and financial incentives are needed to improve adoption, as split-systems will likely be more expensive than a unitary system. Manufacturers are aware of this cost disparity, and one manufacturer the team interviewed aims for future products to be comparably priced to unitary HPWHs. Both Eco-Logical and Embertec are using direct-to-customer sales channels at this time. Units privately in development through NEEA's Hot Water Innovation Prize have yet to be announced, and their sales channels will become public when the winners are announced.

One study from the literature review highlighted that affordable housing properties often face funding challenges and a lack of technical staff to manage complex systems. However, their long-term ownership structure allows for strategic planning and implementation of upgrades like HPWH retrofits, which may not be feasible in market-rate buildings with shorter investment horizons (ACEEE and NBI 2021).

FHR AND RECOVERY RATES

Many small-form-factor water heating heat pump products, including split-systems, are available internationally, but several barriers limit their entry to the US market. These include the need for compliance with federal performance and safety standards, such as UL Standards and Engagement certification, and modifications to meet US electrical voltage and frequency requirements. In an interview at the Hot Air Hot Water Forum, one manufacturer expressed a lack of clear market demand, causing them to hesitate on the investment required in these product adaptations. However, recent AO Smith, Eco-Logical, and Embertec announcements indicate that several international split-system products will be introduced to the US market in the coming months and years.

In the United States, the two most important performance metrics for water heaters are FHR and UEF. FHR, a component of UEF, estimates the maximum volume of hot water a storage-type water heater can deliver in its first hour of use, starting from a fully heated tank. It reflects the tank's storage capacity and recovery rate (ENERGY STAR® n.d.).

Among the products listed in Table 6, the ECO_2 System has the highest FHR at 69 gallons per hour, matching the performance of a natural gas water heater and exceeding that of comparable electric resistance and split HPWHs. The Eco-Logical split 240V HPWH delivers an FHR roughly 10 gallons lower than the ECO_2systems, but still outperforms other split-system models, particularly the 120V units. These 120V models have FHRs similar to electric resistance and unitary HPWHs. This suggests that split-system HPWHs can outperform other water heating systems in the first hour of use. This signals that split-system HPWHs, especially higher-voltage models, can meet a household's hot water needs during high-demand periods, which is often a concern about unitary HPWH products.

Recovery rate, while related to FHR, specifically refers to how quickly a water heater can reheat water after the tank has been depleted. Gas water heaters typically have higher recovery rates, enabling smaller tanks or tankless designs (Energy Solutions 2025). For example, the AO Smith natural gas short model recovers 41 gallons per hour. Electric resistance models recover more slowly, 27 gallons per hour for the 240V lowboy and 21 gallons per hour for the tall model. AO Smith's unitary 240V HPWH recovery rate is 28 gallons per hour, which is more than that of an electric water heater. At the time of this report, there is no public data for split-system HPWH recovery rates.

Split-system HPWH recovery rates are influenced by ambient air temperature, incoming water temperature, defrost cycles, and compressor capacity. Unlike traditional systems, split-system HPWHs rely on ambient heat via a refrigerant cycle, which can have a slower recovery. John Miles from ECO_2Systems explained that their monobloc system uses an inverter-driven compressor that consistently produces 145°F water. At 47°F, the compressor draws 4.5 kW. As ambient and incoming water temperatures rise, the temperature differential (ΔT) decreases, allowing the compressor to reduce its power draw while increasing the flow rate. This results in higher hot water output when the ΔT is low. In colder conditions, the system initiates a defrost cycle, which boosts hot water availability but lowers the coefficient of performance (COP). This dynamic behavior means the recovery rate in inverter-driven systems is not fixed but varies with environmental and operational conditions. Due to California's relatively mild climate, this is less of a consideration than for colder locations, where cold-weather performance is of higher priority.

The recovery rate is not published as part of the required Department of Energy (DOE) test procedures for HPWHs. While unitary systems allow for standardized recovery testing due to their consistent configurations, split-systems introduce variability in installation and operation, such as differences in refrigerant line length, ambient conditions, and system controls, complicating standardized measurement. As a result, manufacturers may be reluctant to publish recovery rate data that could be misinterpreted or fail to reflect real-world performance. As split-system HPWH adoption grows, particularly in multifamily and commercial settings, there may be increasing demand for recovery rate data and the development of standardized testing protocols to support system design and sizing. A load and climate-specific testing procedure for split system air-to-water heat pumps is currently in development (CSA Group n.d.) and will be incorporated into the NEEA Advanced Water Heating Specification (NEEA, Advanced Water Heating Specification Version 8.1 2024). This test procedure utilizes DOE HPWH test conditions, 24-hr simulated draw patterns, and an optional minimum temperature test condition. Seasonal Coefficient of Performance (SCOP) calculation procedures will also be performed to measure annual efficiencies across various climates.

INSTALLATION AND MAINTENANCE REQUIREMENTS

The successful deployment of HPWHs in multifamily retrofits ultimately hinges on the feasibility of installation, which is often challenged by space constraints, infrastructure limitations, and permitting requirements. Installation requirements vary depending on the system type and building conditions. Unitary HPWHs may require relatively minor renovations for space, electrical capacity, and ventilation, but these can still significantly impact the installed cost.

Split-system HPWHs - particularly emerging 120V plug-in models - may offer a more cost-effective and less complex electrification pathway by addressing space, noise, ventilation, and potential electrical upgrade barriers. However, program staff and contractors with multifamily experience have expressed concerns about the complexity of installing split-systems, particularly the routing of electrical wiring, plumbing, and refrigerant lines from outdoor units to interior components (NBI 2023). Stakeholders identified potential barriers, including exterior retrofit costs, compliance with the California Housing Code, aesthetic restrictions, and risks from new building penetrations. These issues are especially pronounced in dense urban areas, historic buildings, and sites where rooftop space is already occupied by solar panels.

During interviews, contractors noted longer installation times for current split-system models; however, no standardized, published cost or time data exist. Anecdotal evidence suggests wide variability based on site conditions such as electrical upgrades, ventilation, and condensate management. This gap underscores the need for pilot projects and systematic tracking of split-system and unitary HPWH installation metrics to evaluate the impacts and inform program design, incentives, and contractor training for alternative HPWH models and applications.

Emerging designs—such as monobloc units and pre-charged quick-connect refrigerant lines—aim to reduce complexity and labor time. Because split-systems are delivered and installed as separate equipment components rather than a single unit, they may allow a single contractor to complete the installation, potentially lowering labor costs. Regardless of system type, proper training remains essential for accurate sizing, installation, and servicing.

Due to the outdoor heat pump unit, maintenance requirements for split-system HPWHs are similar to those of ductless mini-split systems. Routine tasks include cleaning the heat pump and evaporator coil, inspecting leaks, checking electrical connections and valve function, verifying system operation and temperature delivery, and ensuring the tank and piping are sediment-free and properly insulated. These checks help maintain system efficiency and longevity and can typically be performed by trained HVAC or plumbing professionals (ECO2Systems n.d.).

Despite the challenges, split-systems offer promising flexibility. One manufacturer and a multifamily housing expert noted that split-systems can be installed in units where space constraints make unitary systems impractical. For example, at the Legacy Square apartment complex in Santa Ana, California, a hybrid approach was used: upper-level units were equipped with unitary HPWHs, while lower-level units used ECO2Systems' split-system product. This case highlights the value of adaptable system design in meeting diverse installation needs across multifamily housing types.

DRAW PATTERN AND OCCUPANCY

Occupancy and draw patterns are also critical in determining whether a water heater's recovery rate is sufficient. High-occupancy buildings or homes with simultaneous hot water demands—such as multiple showers, laundry, and dishwashing—require systems with either high recovery rates or large storage volumes. For example, a unit with a 12-gallon-per-hour recovery rate may be adequate for low-occupancy or intermittent use but may struggle to meet the needs of multifamily settings with concentrated demand.

Draw profiles provide a detailed picture of hot water usage patterns over a specific period, typically 24 hours. These profiles help evaluate water heater performance under different usage scenarios by modeling hour-by-hour demand across various building types. They include metrics such as maximum hourly use, maximum daily use, and average daily use, which are essential for system sizing and performance evaluation (Energy Solutions 2025). For instance, a sharp morning peak may be manageable with a high First Hour Rating, while sustained demand throughout the day requires robust recovery performance. Split-system HPWH recovery rates vary with ambient temperature, water inlet temperature, and compressor dynamics. Matching systems to draw profiles is essential to avoid undersizing and ensure comfort.

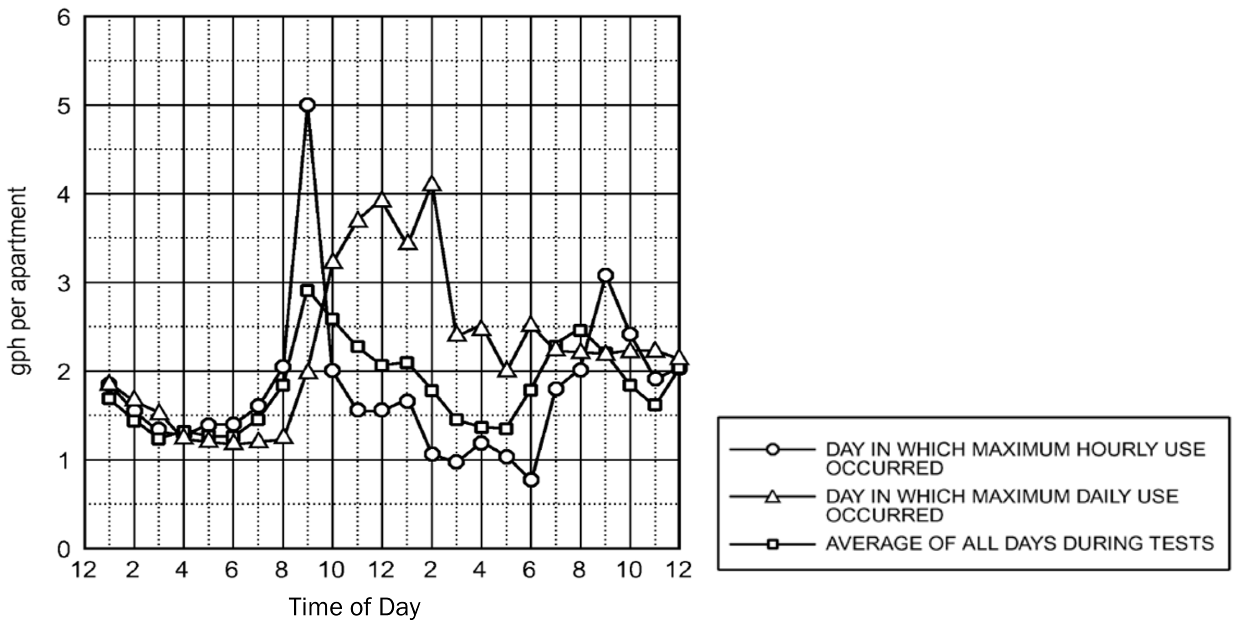

Figure 6: Hot water demand profile.

Source: 2023 ASHRAE Handbook Chapter 51.

Although the specific flow rates shown in the hot water demand profile illustrated in Figure 6 may be higher than expected with modern low-flow fixtures, the overall shape of the demand curve remains a valuable representation of when hot water is typically used throughout the day. The chart includes two lines, one representing the day with maximum hourly use, and another representing maximum daily use. The maximum hourly use occurred at 9 am, with a peak of 5 gallons per hour. This is important for determining the First Hour Rating of a water heating system—how much hot water it can deliver immediately during peak demand. In contrast, the maximum daily use day shows sustained high usage between 10 am and 2 pm, which is critical for evaluating the system's recovery rate, or its ability to reheat water quickly enough to meet ongoing demand. These profiles help designers and engineers size systems appropriately to ensure immediate and sustained hot water availability.

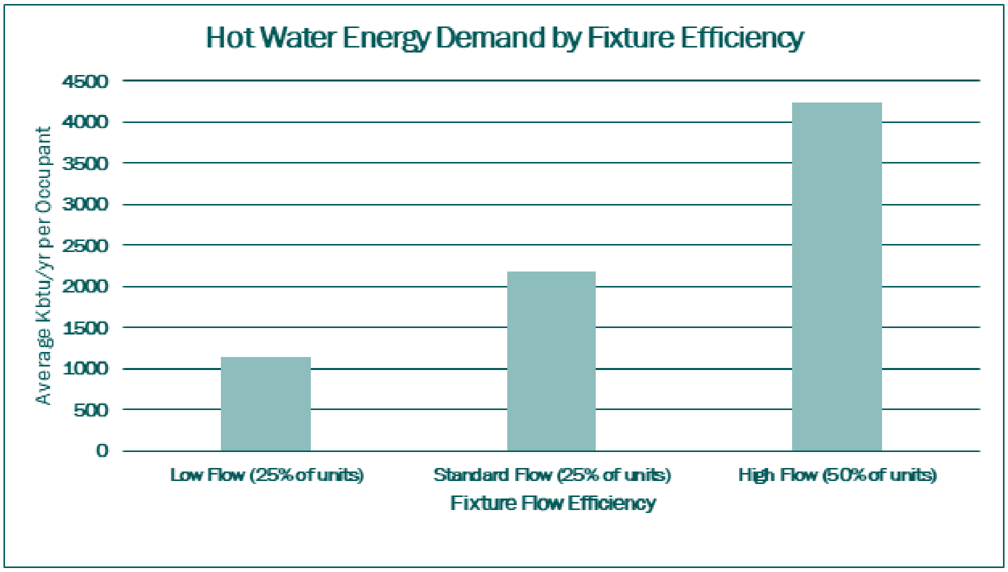

Figure 7: Fixture flow efficiency.

Source: NREL Restock, Sept. 2024.

While Figure 6 highlights when hot water is used, Figure 7 demonstrates how fixture efficiency can significantly reduce the volume of hot water needed during those peak periods. In scenarios where water heater capacity and recovery rate are limiting factors, upgrading fixtures from high to standard flow can reduce energy demand by approximately 50 percent. Further upgrading to low-flow fixtures can cut demand by an additional 50 percent, resulting in just 25 percent of the original energy demand associated with high-flow fixtures. This reduction in Btu usage directly translates to lower operational loads on water heating systems. From this dataset, it is also estimated that high-flow fixtures make up approximately 50 percent of the multifamily unit population.

UNIFORM ENERGY FACTOR AND COEFFICIENT OF PERFORMANCE

The UEF measures the input and output energy ratio, indicating how much energy is converted into heating water under real-world conditions. The higher the UEF, the more efficient the water heater.

As FHR and UEF are US DOE standards, the Panasonic model, which is not intended for the US market, does not have an FHR or DOE rating. Internationally, heat pumps are rated on their coefficient of performance (COP), which measures the ratio of heat output to electrical energy input. Like FHR and UEF, a higher COP indicates higher efficiency. The UEF tests water heaters at 67°F, while the Panasonic unit in Table 6 was tested at 66.2°F. Although the Panasonic system was tested at a comparable temperature, it is challenging to compare COP to UEF because UEF accounts for standby and cycling losses to rate the overall water heater efficiency. In contrast, COP rates the electrical energy conversion of the heat pump itself. Understanding the distinction between COP and UEF is essential when evaluating international products for US applications, especially as manufacturers seek to enter the domestic market.

TESTING PROCEDURES

Examining the standardized testing procedures is important to understand how these performance metrics are established. The energy performance of residential water heaters in the United States is tested according to the Department of Energy (DOE) standards and test procedures specified in "Appendix E to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Water Heaters" (Code of Federal Regulations 2025). This outlines uniform methods for measuring the energy efficiency of water heating equipment. These procedures provide consistent test conditions, draw patterns, and delivery temperatures, simplifying comparisons among other water heater technologies.

Water heater models are evaluated in a lab that performs a simulated use test, examining water heater efficiency under certain conditions. This test determines the water heater's FHR, and for the remainder of the test, the water heater's usage pattern is simulated over 24 hours with specific water temperature, air temperature, and use timing. The results of these tests are combined to determine the overall UEF of the product, which also includes the standby losses from the tank to the surrounding ambient air. The Air-Conditioning, Heating, and Refrigeration Institute's (AHRI) directory for residential water heaters lists the results for reference, primarily by industry professionals. ENERGY STAR's Product Finder[18] identifies the UEF for each qualifying unit and allows users to quickly sort water heaters by UEF and other product specifications.

Although residential split-system HPWHs are also tested using the same DOE test procedure, the different designs of the separate locations of the heat pump and the storage tank introduce an important difference in performance between test conditions and actual residential home and apartment applications. Residential water heaters are tested at an ambient air temperature of 67.5°F to develop the UEF and FHR ratings. However, wider temperature and humidity swings in outdoor heat pump locations for split-systems can dramatically affect efficiency, e.g., UEF, and the effective hot water delivery, e.g., FHR (Jutras 2024).

The DOE test procedure for residential water heaters provides optional alternate test conditions for HPWHs at lower (E_5 and E_{34} at 5°F and 34°F) and higher (E_{95} at 95°F) outdoor air temperatures and relative humidities. In addition, the water supply inlet temperature is lower than the standard test conditions for lower temperatures.

[18] The ENERGY STAR Product Finder identified two other split-system HPWHs: Smart Solar and AquaThermAire. Smart Solar had additional solar components, complicating direct comparison to other split-system models. There were no details available for the AquaThermAire product.

Heat pump type	Metric	Outdoor air conditions		Indoor air conditions		Supply water temperature (°F)
		Dry-bulb temperature (°F)	Relative humidity (%)	Dry-bulb temperature (°F)	Relative humidity (%)	
Split-System or Circulating	E_5	5.0	30	67.5	50	42.0
Integrated, Split-System, or Circulating	E_{34}	34.0	72			47.0
	E_{95}	95.0	25			67.0
	E_{50}	N/A	N/A	50.0	58	50.0
	E_{95}	N/A	N/A	95.0	40	67.0

Figure 8: DOE test procedure, optional test conditions for heat pump-type water heaters. (Code of Federal Regulations 2025)

As these alternative tests are optional, they are not reported in AHRI, ENERGY STAR, and manufacturer specifications for split-system HPWHs. It is more common for split-system manufacturers to additionally report the COP and heat delivery capacity based on different outside air temperatures. However, this reporting is inconsistent across all manufacturers, increasing the likelihood that a split-system will be improperly sized for a specific climate and application.

Technology Innovation in Split-System Designs

Despite these barriers and market development needs, manufacturers continue to improve their products and experiment with alternative designs. Next-generation technology may include smart features for better control and monitoring, improved efficiency and load shifting. Technological designs mentioned by manufacturers include:

- Connecting multiple parallel indoor tanks, although this requires more complex controls and design.
- Using phase change materials for energy storage to provide load-shifting capabilities and reduce the need for large water storage tanks.

ALTERNATIVE SPLIT-SYSTEM CONFIGURATIONS

As highlighted in the Background section, split-system HPWHs can have either a split-system or a monobloc configuration. In 2022, NREL evaluated the feasibility of using a single outdoor CO_2 heat pump connected to tanks in multiple housing units, yielding very encouraging results. NREL's results showed that it was feasible for this heat pump to support more than two tanks (Roberts and Sparn 2022). Below are two figures showing the basic schematics of the experiment.

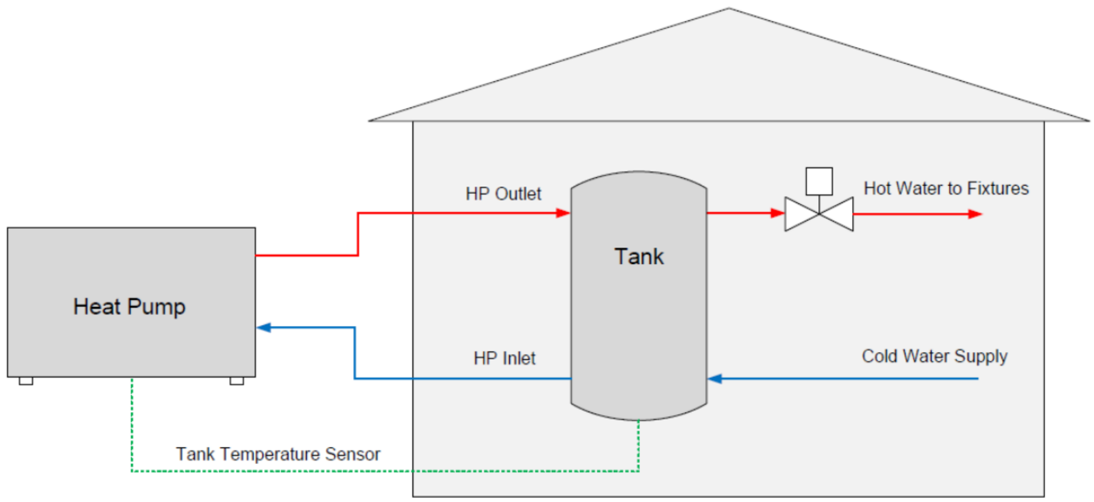

Figure 9: Split-system HPWH with a single interior tank.

(NREL 2022).

The figure provides a schematic of a typical, simplified split-system CO_2 HPWH design, with the heat pump installed outside and water lines running to the interior storage water tank location. The cold water is heated in a single pass through the heat pump, relying on the heat gain to achieve the desired temperature of the tank setpoint, and is ultimately used at the fixtures in the home. As the heat pump outlet water temperature can be as high as 150°F, a mixing valve is needed to prevent scalding.

For the NREL evaluation, the alternative design included two 43-gallon tanks connected in parallel to a single heat pump. This tank arrangement would apply to a split HPWH servicing two multifamily units. The heat pump outlet hot water can be equitably and efficiently distributed between the two tanks using temperature sensors and controlled valves.

A primary reason for utilizing a multi-tank design is to spread the relatively expensive cost of the outdoor CO_2 heat pump across multiple apartment units, improving the cost-effectiveness and efficiency of split-systems in multifamily buildings. A primary finding from the NREL study is that "a shared heat pump with two tanks does not cut the per-unit equipment costs in half; rather, it reduces the cost per unit by about 1/3." (Roberts and Sparn 2022). However, the NREL team highlighted that determining utility billing for two or more units with a shared single heat pump can be challenging.

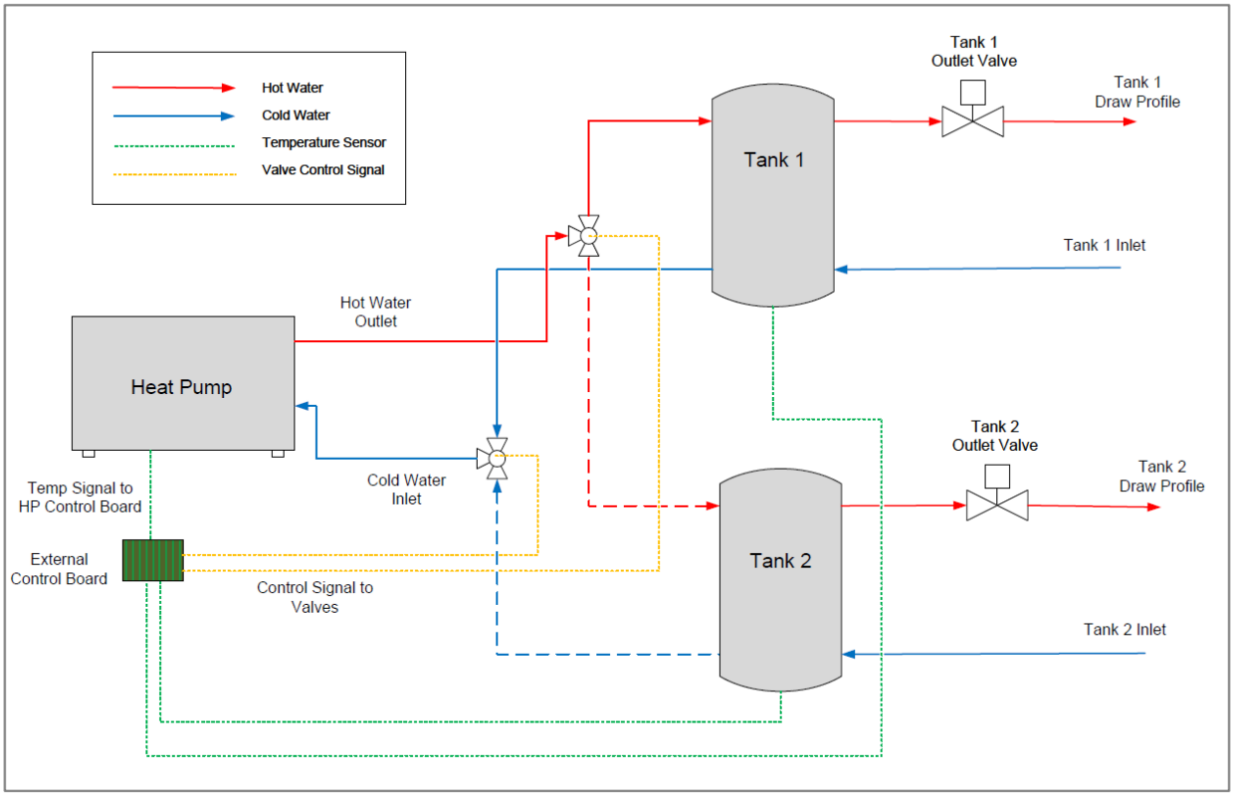

Figure 10: Laboratory setup for the two-tank experiment with the SanCO$_2$ heat pump.

(NREL 2022).

PHASE-CHANGE MATERIALS (PCM)

PCMs are an emerging solution to enhance thermal energy storage in a water heating system. Without significant temperature changes, PCMs absorb and release thermal energy during phase transitions, such as melting and solidifying. When PCMs melt, they store large amounts of thermal energy as latent heat, and when they solidify, they release this stored heat. This makes PCMs ideal for thermal energy storage in hot water systems, providing a compact solution that maintains stable temperatures during energy storage and release. In contrast, conventional systems that use water or glycol to store heat must rely on large volumes to achieve similar storage capacity. PCMs can store thermal energy at densities up to four times greater than water, enabling the equivalent of hundreds of gallons of stored hot water in a much smaller footprint and significantly reducing the need for bulky storage tanks.

In the US market, PCM storage has primarily been used for HVAC applications and not for in-unit residential water heating systems. However, a new PCM water heater has been introduced to the US market and may be an important complement or alternative to split-system HPWHs.

While grid-interactive HPWHs are increasingly promoted for load shifting and heating water during off-peak hours to reduce electric grid strain, the relatively small tank sizes for in-unit multifamily buildings often limit the actual load-shifting capacity. Efficiency gains may stem more from load reduction efforts than from actual load shifting. This is where PCMs offer a promising innovation: by increasing the thermal storage density within a compact footprint, PCM-enhanced systems could enable split-system HPWHs to store more usable hot water for later use, thereby expanding their potential for meaningful load shifting. This could allow for better alignment with time-of-use rates and grid needs without requiring larger tanks or centralized systems.

Enabling Adoption: Specifications, Permitting, and Incentives

Successfully deploying split-system HPWHs in California's multifamily buildings requires more than just technical innovation. While new models offer promising performance and flexibility, their market adoption hinges on a complex interplay of standardized testing procedures, advanced efficiency specifications, permitting pathways, and financial incentives. This section explores the critical infrastructure that supports—or hinders—the transition from product development to widespread deployment. It examines how performance is measured, how regulations influence the feasibility of installations, and how incentive programs can either accelerate or limit access to these emerging technologies.

Advanced Energy Efficiency Specifications

Beyond federal testing, many water heater manufacturers also strive to meet voluntary, advanced specifications established by state and utility energy efficiency programs, which set higher efficiency and performance requirements. Nationally, several overlapping and dependent specifications are related to HPWHs, and more recently, the Hot Water Innovation Prize specifically targets split-system HPWHs.

EPA ENERGY STAR added split-system HPWHs to the Version 4.0 Eligibility Criteria for Residential Water Heaters in March 2022, with a minimum efficiency UEF of 2.2 and FHR delivery of 45 gallons per hour.[19] Of the 465 ENERGY STAR HPWH models, 392 are 240V unitary HPWH models, 63 are 120V unitary HPWH models, and only 10 are split-system HPWH models.

One such entity that develops performance tiers and specifications for energy-efficient products, often exceeding ENERGY STAR requirements, is the Consortium for Energy Efficiency (CEE). For example, CEE's Residential Electric Water Heating Specifications for Split-System HPWHs establishes performance requirements for Heat Pump Water Heating certification in two tiers, which utilities use to develop different incentive levels. Tier 1 aligns with ENERGY STAR, and Tier 2 products surpass ENERGY STAR's minimum efficiency standards.

NEEA developed the Advanced Water Heating Specification to advance higher-performing electric and gas heat pump water heaters, ensuring their performance in cooler northern climates. NEEA also lists multiple tiers and requirements beyond ENERGY STAR. "AWHS goes beyond federal standards by addressing factors—including varying operating conditions, system COP, installation guidance, warranty requirements, controls, and user comfort—contributing to user satisfaction and energy efficiency for various applications." (NEEA, Advanced Water Heating Specification Version 8.1 2024).

[19] The ENERGY STAR eligibility criteria remain the same in Version 5.0 (May 5, 2025).

Table 7: Advanced performance criteria for split-system HPWHs.

Performance Specification	Minimum Performance Criteria	Additional Requirements
ENERGY STAR Version 5.0	UEF ≥ 2.20 for split-systems FHR ≥ 45 gallons/hour	Safety: Must comply with UL 174 and UL 1995 or UL 60335-2-40 Warranty: Minimum of 6 years on the sealed system
CEE	Tier 1: ENERGY STAR V 5.0 Tier 2: UEF ≥ 3.3	AHRI Standard 1430
NEEA QPL	The NEEA QPL has five advanced tiers and multiple unique certification requirements. Units must be ENERGY STAR certified.	Freeze Protection Testing Backup ER Heating limitations Demand response capabilities Sound regulations Condensate management Extended warranty
TECH Clean California (Residential Unitary HPWH) (Energy Solutions n.d.)	California Energy Commission (CEC) JA131 compliant and either: • NEEA with EcoPort, or • ENERGY STAR Residential Water Heater V4 (or later), connected capable.	Split-system HPWHs are currently only supported for commercial applications.
NEEA Hot Water Innovation Prize	UEF ≥ 2.2 SCOP ≥ 2.4 FHR ≥ 38 gallons/hour	Tank is located at a minimum of 20 feet from the HP unit. Freeze protection above 20°F for temperature unit, and −5°F for cold climate unit. Storage tank dimensions: 24 in. x 26 in. x 36 in height, including all fittings.

Regulations, Permitting, and Codes

While voluntary specifications help ensure product quality and efficiency, translating these into widespread adoption requires navigating California's complex permitting landscape. The next section outlines the regulatory and permitting challenges that split-system HPWHs face, particularly in multifamily buildings.

California's permitting process for HPWHs remains fragmented, contributing to slow and costly installations (TECH Clean California 2024). HPWH installations may require multiple permits, including electrical, plumbing, and building permits, which can be cumbersome and time-consuming (Emergency Replacement Heat Pump Water Heater Market Study ET23SWE0020). Due to their combination of indoor and outdoor components and the need for coordination across trades, split-system HPWHs may face permitting challenges similar to unitary HPWHs and ductless mini-split HVAC systems.

Permitting requirements and local plumbing codes vary across California's more than 600 local jurisdictions, and no standardized statewide permitting pathway exists. This creates significant challenges for contractors, who must navigate different processes, documentation requirements, and fee structures, depending on the city or county. These inconsistencies can delay installations and increase costs, particularly for emergency replacements (Increasing Heat Pump Water Heater (HPWH) Deployment Final Report ET22SWE0056).

Incentives and Rebates

In addition to regulatory hurdles, financial barriers remain a significant obstacle to adopting split-system HPWHs. Incentive programs and rebates can help offset high upfront equipment costs and the added expense of complex installations. However, eligibility criteria—such as equipment type, performance standards, building classification, and program design—often explicitly or through omission exclude split-system configurations.

This section reviews California's current HPWH incentive offerings and identifies gaps in support for split-system configurations. While the state offers several programs to promote HPWH adoption, eligibility requirements vary across initiatives, and support for in-unit split-system HPWHs remains limited. The following programs were examined:

- TECH Clean California
- Golden State Rebates
- Statewide Midstream Water Heating Program
- Energy Savings Assistance Program
- Energy Smart Homes program
- Building Initiative for Low-Emissions Development program

(See Table 12: California in Appendix A for more details.)

TECH Clean California provides rebates for HPWH installations in both single-family and multifamily buildings. However, its eligibility criteria primarily supports unitary or central systems. As a result, the program does not currently support the unique configurations or compliance pathways required for split-system HPWHs. The **High-Efficiency Electric Home Rebate Act** incentives are provided through TECH Clean California contractors. They do provide rebates for in-apartment split-system HPWHs in multifamily buildings with five or more residential units and income-qualified residents (TECH Clean California 2025).

The Golden State Rebates Program previously offered incentives for ENERGY STAR-certified HPWHs. As of mid-2025, the program is temporarily paused, with updates expected in November 2025. Future eligibility for split-system HPWH technologies remains uncertain (Golden State Rebates n.d.).

The **Statewide Midstream Program** includes incentives for multifamily split-system HPWHs, but only for central systems serving multiple units. (Statewide Midstream n.d.). They refer customers seeking in-unit support to their local utility program for incentives.

The Energy Savings Assistance Multifamily Energy Savings program provides no-cost and reduced-cost energy upgrades and project assistance for eligible affordable multifamily properties. Support for water heater measures includes both in-unit and central distribution systems. HPWHs must have a UEF > 3.09. The ESA Handbook list does not specify whether unitary or split-system configurations are eligible (TRC 2025).

The Energy Smart Homes program incentivizes electrification in existing low-rise multifamily buildings, requiring converting all gas appliances to electric alternatives. Each participating building must install heat pump space heating, heat pump water heating, induction cooking, and an electric dryer. For deed-restricted affordable multifamily housing, all units must be fully electrified. HPWHs must meet NEEA Tier 2 or higher standards and may be installed either in-unit or as part of a central system (California Energy-Smart Homes n.d.).

Administered by the California Energy Commission, the **Building Initiative for Low-Emissions Development** Program supports residential building decarbonization through technical assistance and financial incentives. Eligible projects include new construction, adaptive reuse of commercial buildings, and major renovations. Multifamily buildings must be deed-restricted low-income housing. Incentives are based on modeled GHG reductions, calculated at a flat rate of $150 per metric ton of avoided emissions. This is calculated for the whole building's GHG performance modeling. HPWHs must meet NEEA's Electric Advanced Water Heating Specification (California Energy Commission n.d.).

Additional Incentive Resources

The **Switch is On** website provides an incentive lookup tool to help customers identify rebates for switching from gas to electric appliances. However, due to limitations in filtering based on customer eligibility and individual program requirements, not all eligible incentive programs may be captured (Switch Is On. n.d.). Customers may need to contact local utilities and municipalities to identify all applicable programs.

Beyond statewide and IOU incentives, local Regional Energy Networks (RENs), Community Choice Aggregators (CCAs), and non-profit entities have incentive programs offering direct or indirect support for HPWH installations in multifamily buildings. Many local programs are designed around comprehensive retrofit strategies rather than menu-based or "widget" rebates. As a result, HPWH incentives may not be explicitly listed or searchable unless the program is focused on low-cost, high-impact measures or is administered by utilities. Similar to the statewide incentive programs, some local and regional programs reference qualified product lists that may inadvertently exclude split-system HPWHs or multifamily applications. These exclusions are often not explicitly stated, making eligibility unclear and requiring additional verification. Program design and documentation may not reflect the full range of viable HPWH configurations, creating barriers for multifamily projects seeking to adopt split-system technologies.

Examples of Regional Energy Network (REN) and Community Choice Aggregator (CCA) Incentives:

- **3C-REN** (Tri-County Regional Energy Network n.d.) and **BayREN** (BayREN n.d.) are both examples of RENs offering rebates for multifamily buildings, including adders for income eligibility, qualified contractors, or bundled measures. Rebates are available for both central and in-unit HPWH rebates, though program documentation does not specify whether split-system configurations are eligible.
- **MCE** (MCE n.d.) is a CCA providing eligible multifamily property owners (5+ units) with comprehensive assessments, technical assistance, and incentives of up to $6,000 per unit for in-unit electrification measures, which may include HPWHs.

One stakeholder anecdotally mentioned that several programs marketed as single-family focused may still accommodate multifamily properties on a case-by-case basis. Outreach to program staff is often key—many are willing to work with multifamily building owners to identify eligibility pathways, subject to budget availability and other program-specific variables.

As of the writing of this report, in the Federal Tax Code, Section 25C offers a 30 percent tax credit on eligible installed costs for HPWHs in multifamily apartments that are owned but not tenant-occupied. Eligible HPWHs must meet ENERGY STAR requirements (Internal Revenue Service n.d.). The tax credit is set to expire at the end of 2025.

Measure Review and Estimated Savings for In-Unit HPWHs

Technical Reference Manuals (TRMs) are a common source of estimating energy savings for state and utility efficiency programs for residential HPWH measures. However, very few characterize split-system HPWH models. While California's eTRM provides numerous HPWH-based measure offerings, they are limited in scope to unitary HPWH models and do not distinguish energy savings based on installation location within or outside the home. Measure permutations also do not appear to consider the interactive effects between the unitary HPWHs and the HVAC systems, which impact overall energy use in a home.

As an alternative route to understand potential savings, the RTF has developed a detailed analysis using the Simplified Energy Enthalpy Model (SEEM) Water Heater Simulation Model, a tool designed to model small-scale residential building energy usage (Regional Technical Forum n.d.). From this analysis, it is possible to compare energy savings between multiple HPWH efficiency tiers, installed locations, and fuel types. The installed location is a crucial piece differentiating the eTRM from RTF's analysis, as it contributes greatly when comparing split-system HPWHs to unitary units within the living space. Environmental factors from the RTF analysis, such as climate and groundwater temperature are considered, but it should be stated that they do not represent actual conditions specific to California. Therefore, the savings provided (Table 8) should be interpreted only as a reference. RTF's analysis collected data from 107 households in the Pacific Northwest to determine inlet water temperature, enabling generic simulations based on relationships between inlet water temperature and outdoor air temperature (OAT). Modeling for Seattle, Washington, specifically assumed city surface water temperatures typical for the area. Similarly to inlet water temperature, a regression analysis was performed to generalize the relationship between OAT and HPWH intake air temperature for garage locations. Hot water usage “draw profiles” were assumed for varying household sizes to represent average usage per household (Regional Technical Forum 2023).

Table 8: Comparison of estimated energy savings impact for unitary and split-system HPWH systems.

HPWH configuration*	ΔkWh/y***	Δtherms/y	ΔMMBtu/y
Tier 3 Unitary HPWH (in living space)	1631	-32	2.36
Tier 3 Unitary HPWH (garage installation)	1494	0	5.10
Tier 3** Monobloc system without resistance heat	1720	0	5.87

(Regional Technical Forum 2023)
*Savings represent all tank sizes
**From NEAA Qualified Products Tier 3- rated models
***Includes interactive effects of heating and cooling loads, and climate assumptions for Seattle, Washington

In California’s climate—warmer and drier overall than Seattle’s—it can be inferred that split-system and garage-installed unitary HPWH electric savings may trend higher due to higher efficiencies at higher ambient temperatures. Living space installations would encounter increased savings from beneficial interactions with cooling and a diminished negative impact on space heating loads. RTF assumes a higher measure life of 15 years for split-system HPWHs, compared to 13 years for unitary models. The split-system HPWH measure life is assumed to be the same as that of ductless heat pumps for space conditioning due to a similar outdoor location of the heat pump equipment.

Modeled Energy Savings

To estimate energy savings for split-system heat pump water heaters in California multifamily units, multiple scenarios of existing space heating and cooling systems, climate zones, and building characteristics were considered using energy modeling software. Using the OpenStudio EnergyPlus Parametric Analysis Tool (PAT), results were provided for four climate zones, two of which are cooling-dominated, and the other two heating-dominated. Using ResStock metadata, building characteristics were intended to emulate a 1970s-era low-rise multifamily unit in Los Angeles, California. Building unit sizes and locations were assumed as a single average 840-square-foot multifamily unit. Tenant ownership status was not considered as part of the modeling simulation. One PAT project was used to modify water heating inputs for each savings scenario, the gas and electric baseline assumptions, and modeled results for a unitary HPWH placed in various locations and at multiple UEF ratings. Locations included within the living space, an exterior area, and an additional non-freezing space, e.g., an unheated garage. Three heating fuel scenarios were considered to represent actual HVAC systems encountered in typical multifamily units. For natural gas heating, an 80 percent annual fuel utilization efficiency furnace was selected, while for electric heating, results were modeled for a SEER 9.7 and 6.6 heating seasonal performance factor (ASHRAE 2016) air-source heat pump (ASHP). To establish energy usage, a unitary HPWH was selected, as split-system units are not yet a selectable system type in Energy Plus. Installation locations included inside the living space, and two alternate locations outside of the living space. This approach is considered reasonable for milder climates but does not specify potential performance differences due to refrigerant type, which may be noteworthy for models such as the Sanden CO_2 HPWH. Three HPWH efficiency tiers were modeled, with UEFs of 3.0, 3.66, and 4.29, representing actual models (see Table 6).

Interpretation of Results

Results for each scenario were provided in units of combined annual electricity and natural gas consumption (MMBtu) for each space heating and cooling scenario, as well as water heating baseline technology.

Initial takeaways indicated that in heating-dominated climates with a gas furnace, HPWH scenarios resulted in a higher total energy consumption over a baseline electric water heater, due to increased space heating load if located within the living space. For example, comparing a 4.29 UEF HPWH with an electric resistance water heater in the modeled cold climate[20] showed a ~6 MMBtu decrease in hot water heating consumption, but a space heating energy increase of almost 7 MMBtu, which resulted in a net increase in energy consumption of ~1 MMBtu. This increase in total energy usage is exacerbated in situations with poor-performing gas furnaces, where the fuel required to offset the ambient cooling effects of an HPWH is even higher. Conversely, results were quite favorable for units equipped with ASHPs across all climates, especially in warmer (cooling-dominated) climates.

Energy savings were the highest for units in warmer climates using ASHPs as the sole heating and cooling source, with results closely matched between living space installations (4 MMBtu savings) and exterior installations (3.9 MMBtu savings). In colder climates, units using ASHPs still showed much higher savings than units with gas furnaces and room A/C's; however, unitary HPWHs installed within the living space still showed much higher overall savings at 3.8 MMBtu, compared to 1.8 MMBtu for exterior locations (assumes existing water heater is fueled by gas).

Energy savings are much higher in fuel switch scenarios, where the baseline water heater is gas. Since the assumption for ASHP efficiency used ASHRAE 2016 guidelines, newer and more efficient ASHPs are anticipated to enable even higher energy savings when coupled with HPWHs. Expectedly, savings were highest for HPWHs in the modeled warm climate[21], where interactions with space heating equipment would be minimal. In colder climates, despite the beneficial contribution to cooling loads, it is apparent that the increase in space heating load is of greater detriment and should avoid interior HPWH installations.

[20] Cold climate performance reflects an average of results for modeled buildings in Lake Tahoe and Truckee.

[21] Warm climate performance reflects an average of results for modeled buildings in Riverside and San Francisco.

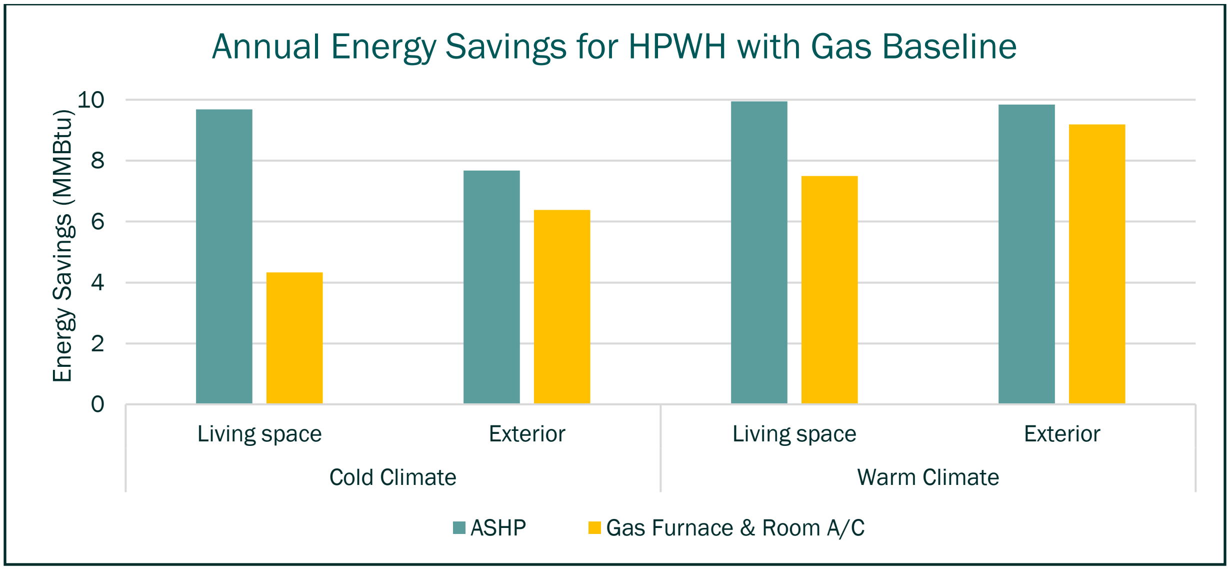

Figure 11: Modeled Annual Energy Savings for HPWHs with Gas Water Heater Baseline

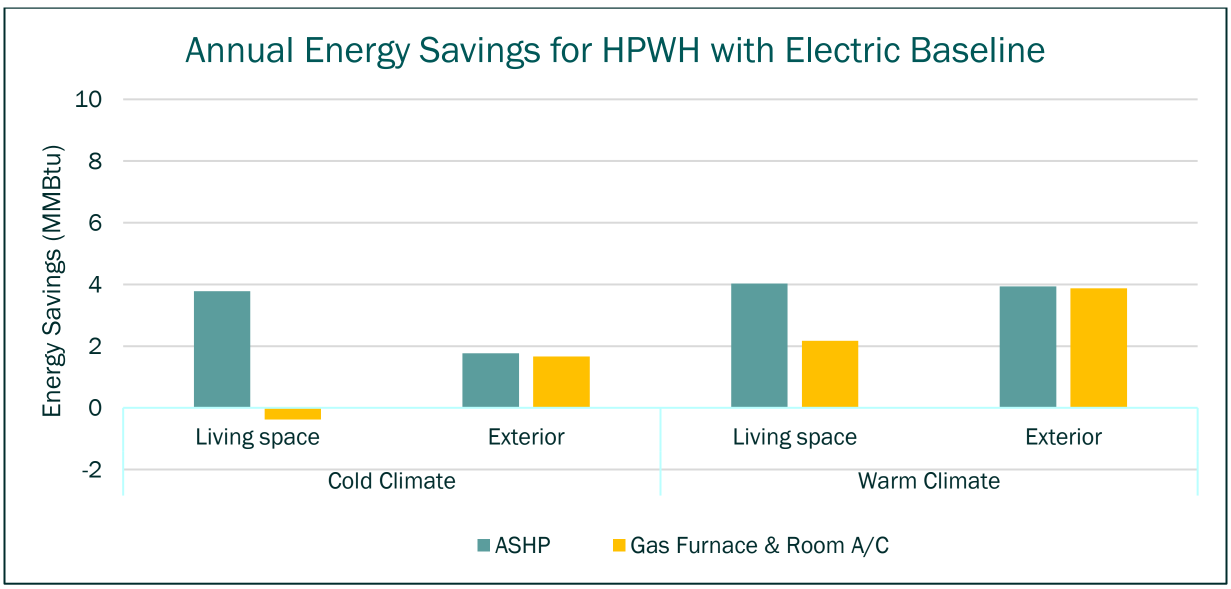

Figure 12: Modeled Annual Energy Savings for HPWHs with Electric Water Heater Baseline.

*Warm and cold climate examples assumed an average of results for San Francisco and Riverside, and Truckee and Lake Tahoe, respectively. Savings examples above assume a baseline electric water heater with a UEF of 0.92, a baseline gas water heater with a UEF of 0.58, and a measure case HPWH with a UEF of 4.29. Source: OpenStudio Parametric Analysis Tool (PAT), NREL TMYx.
**To more accurately model split-system HPWHs, a request has been made to the National Renewable Energy Laboratory (NREL) to add to the OpenStudio list of inputs. This modeling simulation used a unitary HPWH in all installation locations.

Billing Impacts

High energy costs for California rate payers emphasize the importance of ensuring that energy-saving measures are utilized to their full potential. Energy modeling has illustrated the effects of installed location, climate, and HVAC interactions on the energy savings achieved with split-system HPWHs. Utility costs must be closely considered to ensure that energy savings result in cost savings.

With time-of-use electricity rates available through some California utility providers, customers can choose how they are billed for electricity usage. This enables residents to leverage cheaper energy during defined off-peak periods and reduce usage during peak periods, which provides additional system-wide benefits to grid operators. Table 9 shows theoretical cost savings for customers switching from electric resistance water heating to a split-system HPWH, in multifamily units heated and cooled by air source heat pumps. Typical domestic hot water draw schedules are assumed, as applied in the OpenStudio EnergyPlus modeling results. Alternatively, customers replacing gas water heating with split-system HPWHs may experience a net *increase* in utility costs. This can be attributed to the relatively inexpensive cost of natural gas compared to electricity. Additionally, situations where demand response strategies can be employed to leverage time of use rates will create further opportunities for cost savings.

Table 9: Customer billing impacts.

Customer Annual Cost Savings *		
Location and Rate Type**	**Replacing an Electric Water Heater**	**Replacing a Gas Water Heater**
San Francisco (Time of Use)	$333.85	$165.08
San Francisco (Fixed)	$379.87	$127.08
Lake Tahoe (Time of Use)	$186.88	-$142.31
Lake Tahoe (Fixed)	$135.78	-$255.46

*The calculation assumes gas and electric costs for replacing an electric-resistance water heater (UEF 0.92) with an exterior-installed split-system HPWH (UEF 4.29). The gas cost is assumed to be $1.98/therm in Lake Tahoe and $2.32/therm in San Francisco.
**Electric Rates Assume Peninsula Clean Energy's E-1 (fixed) and E-ELEC (time-of-use) residential rates. Time-of-use rates were assumed to be the same for both locations, although Liberty Utilities rates may differ slightly for Lake Tahoe.
Source: OpenStudio Parametric Analysis Tool (PAT), and residential electric rates provided by Peninsula Clean Energy and Liberty Utilities (August 2025).

Total System Benefits

The California Public Utilities Commission (CPUC) requires that all energy efficiency measures use TSB as the primary metric to track program performance, rather than conventional energy savings metrics, which do not indicate system-wide energy impacts. The calculation for TSB considers many factors, and specific dollar values are assigned to every hour of every month in which savings are expected to occur. This can vary both seasonally and with daily demand cycles, where certain periods provide more benefit than others. Other factors that affect TSB include avoided costs associated with generation, transmission, distribution, gas infrastructure, building vintage, end use, climate zone, and greenhouse gas impacts. (CPUC 2021) The California eTRM *Heat Pump Water Heater, Residential* measure (California Technical Forum 2025) includes TSB for numerous measure scenarios, dependent on factors such as baseline water heater type, tank size, energy factor, building type—mobile home, single family, or multifamily—climate zone, measure case HPWH size, and HPWH energy factor. Although split-system HPWHs will not have equal TSB values to residential offerings currently in the eTRM, it is assumed that many factors affecting TSB are very similar between the two measures. Because split-system HPWH performance depends more on outdoor conditions, it can be inferred that month-to-month benefits will differ from indoor unitary units, where performance is assumed to be more or less constant throughout the year. Due to HVAC interactions, gas system benefits may improve when comparing indoor and outdoor HPWHs when using gas space heating. Table 10 shows the TSB that have been calculated for a unitary HPWH installed within the living space and for a split-system HPWH installed outside. It is important to note from the table below that while eTRM energy saving assumptions are higher, they do not consider the interactive effects with HVAC systems. In this example, the baseline water heater is a 50-gallon electric resistance (UEF 0.92) or a 50-gallon gas heater (baseline gas UEF assumptions differ between the eTRM and Split-System HPWH modeling, with values of 0.63 and 0.58, respectively). The measure case is an integrated HPWH (UEF of 3.75 eTRM, 3.66 split-system HPWH).

Table 10: TSB of residential HPWHs.

HPWH TSB	Baseline Comparison	Total Energy Savings (MMbtu)	Total System Benefit	Climate Zone
eTRM Residential HPWH Total System Benefits	Electric Water Heater Baseline	5.43	$1,028.71	Riverside
		6.21	$1,150.83	Lake Tahoe
	Gas Water Heater Baseline	13.35	$2,883.82	Riverside
		14.93	$3,264.39	Lake Tahoe
Estimated Split-System HPWH Total System Benefits	Electric Water Heater Baseline	3.24	$616.26	Riverside
		1.51	$281.69	Lake Tahoe
	Gas Water Heater Baseline	9.19	$1,984.54	Riverside
		7.43	$1,625.13	Lake Tahoe

**Extrapolated values are based on the same $/MMBtu for Residential HPWH TSB from CA eTRM (2025). Split-system HPWH energy savings were selected for units with a UEF of 3.66, installed outside, and ASHP as primary space heating/cooling.*

Mobile and Manufactured Housing (MMH)

Although this report primarily focuses on multifamily housing, split-system heat pump water heaters also present a compelling opportunity for MMH. These housing types share many of the same challenges as multifamily buildings, particularly space limitations and electrical constraints. As such, modeling their potential for split-system HPWH adoption provides valuable insights into broader market applicability and supports strategies for equitable decarbonization across California's diverse housing stock.

According to the 2023 CalNEXT Mobile and Manufactured Housing Market Characterization Study (ET23SWE0017), California has over 500,000 manufactured housing units, representing approximately 4 percent of the state's housing stock. Natural gas is the primary fuel source, with 90 percent of MMH units using it for water heating and just under 60 percent for space heating. The figures below detail the breakdown of heating and air conditioning systems in these homes (VEIC 2023c).

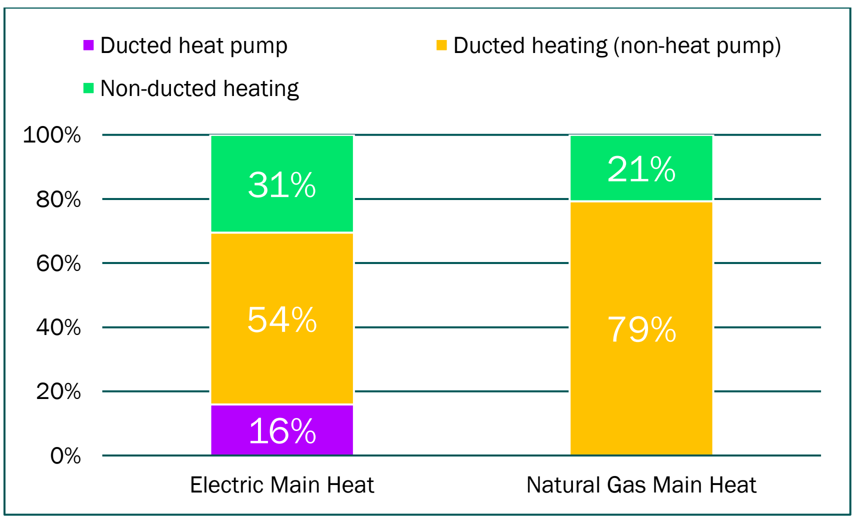

Figure 13: Heating system type of MMH units in California.

Source: (VEIC 2023c).

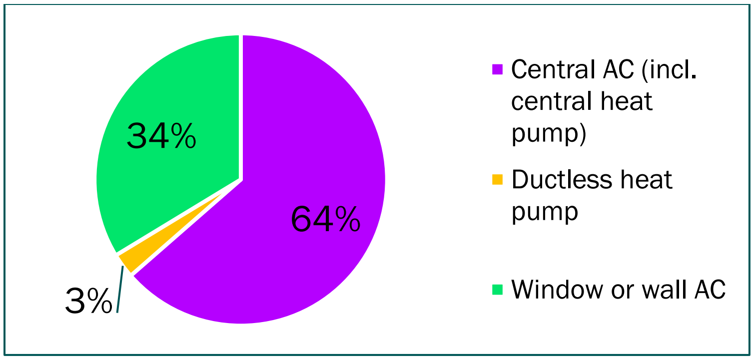

Figure 14: Type of primary air conditioning used by MMH residents.

Source: (VEIC 2023c).

The impact of split-system HPWHs in MMH was extrapolated using the California eTRM deemed savings (California Technical Forum 2025) and modeled energy consumption[22] across different climate zones and HPWH installation locations (interior vs exterior). Table 11 summarizes estimated energy savings.

Table 11: Estimated Split-system HPWH savings for Mobile Homes

	Electric Baseline Savings (kWh)	Gas Baseline Savings (net kWh)	Climate Zone
eTRM mobile home unitary HPWH energy savings	1320	3939	Riverside
	880	3967	Lake Tahoe
eTRM mobile home split-system HPWH energy savings*	934	2885	Riverside
	509	2524	Lake Tahoe

*kWh savings for split-system HPWHs are extrapolated based on the difference in modeled multifamily energy savings (units with ASHP and split-system HPWH installed outside) and eTRM prescriptive savings. Modeled savings assume a 3.66UEF split-system HPWH while the eTRM assumes a 3.75 UEF unitary HPWH. Baseline Water heater efficiency assumes 0.92 for electric, and 0.58 (modeled data) or 0.63 (eTRM) UEF for gas.
Sources: 2025 California eTRM "Heat Pump Water Heater, Residential", and "Heat Pump Water Heater, Residential, Fuel Substitution", OpenStudio Parametric Analysis Tool (PAT) energy modeling results.

[22] The modeled energy consumption for split-system HPWHs in mobile and manufactured homes was estimated by applying a proportional adjustment factor based on the ratio of deemed savings for unitary HPWHs in multifamily versus mobile and manufactured housing applications (from eTRM values). This ratio was then applied to the OpenStudio-modeled savings for multifamily split-system HPWHs to approximate expected savings for mobile/manufactured homes. This approach provides a reasonable estimate given the absence of direct modeling inputs for split-system HPWHs in this housing type.

As identified through a TECH Clean CA Quick Start Grant, manufactured housing is regulated under federal code administered by the HCD, rather than California's state building codes. This regulatory distinction has led to lagging energy efficiency standards compared to other residential building types. The manufactured housing code primarily addresses combustion airflow, earthquake bracing, leak mitigation, fire protection, and isolation of combustion gases (AESC 2025). While these requirements are critical for safety, they can complicate or even prohibit HPWH installations. For example, HCD has previously determined that outdoor heat pump installations are not permitted due to:

- Requirements that water heaters be installed inside the home (AESC 2025).
- Anchoring and strapping requirements may necessitate attachment to the home's exterior, which is often not feasible (AESC 2025).

To enable split-system HPWH retrofits in MMH, regulatory changes may be necessary. Regulation changes may be required for split-system HPWH retrofits to be possible in manufactured homes.

Recommendations

Supporting the early market development of split-system HPWHs will require coordinated actions across a broad spectrum of stakeholders. These systems offer promising solutions for decarbonizing water heating, particularly in multifamily buildings where unitary HPWH replacements are often impractical. The following recommendations outline specific actions to overcome technical, regulatory, and market barriers, accelerate adoption, reduce costs, and lay the groundwork for long-term market transformation.

1. **Expand incentive access and support early demonstration installations.**
   Audience: Program Administrators and Policymakers
   Ensure access to rebate and incentive programs for split-system HPWHs, which are already entering the market. These programs should be structured to support product adoption and early-stage field demonstrations that validate performance in real-world conditions. Special attention should be given to installations that replace hard-to-access, in-unit water heaters in multifamily buildings, where space constraints, electrical limitations, and tenant-owner dynamics present unique challenges. Tailored incentives can reduce installed costs, support product development, and build trust among contractors and building owners. Demonstration projects can also serve as valuable case studies for future program design and incentive calibration.

2. **Revise incentive program criteria to remove barriers.**
   Audience: Program Administrators and Policymakers
   Conduct a comprehensive review of incentive program requirements to identify and remove barriers that disproportionately affect split-system configurations. This includes reevaluating performance criteria (e.g., ENERGY STAR, Uniform Energy Factor (UEF), First Hour Rating (FHR), and minimum storage capacity thresholds). Eligibility rules should also be updated to ensure access for multifamily buildings, tenants, and property owners, particularly in underserved or disadvantaged communities.

3. **Drive innovation to reduce costs and installation complexity.**
   Audience: Manufacturers and Retailers
   Support innovations that reduce equipment and installation costs, especially for split-system HPWHs, which currently face higher first costs and installation complexity than unitary systems. Innovation efforts should focus on low-cost, easy-to-install solutions, such as plug-and-play models with 120V configurations and quick-connect refrigerant lines, that reduce labor time, eliminate the need for panel upgrades, and expand the installer base.

   Access to existing installation data, such as from the TECH initiative, does not currently distinguish between unitary and split-system installations. Tracking split-system installations and conducting targeted surveys of property owners' replacement and installation costs will be important for identifying trends and informing product development. Continued support for these innovations is essential to drive down complexity, expand contractor participation, and accelerate adoption in multifamily and other hard-to-electrify building types.

4. **Update California eTRM HPWH measures to reflect split-system performance.**
   Audience: Utilities
   Revise California's electronic Technical Reference Manual (eTRM) to include split-system HPWHs and reflect installation and operational differences compared to unitary HPWHs. Current measures are tailored to unitary models and do not account for differences in installation location (e.g., indoor vs. outdoor), climate zone (e.g., warm vs. cold), or interactive effects with HVAC systems. The eTRM also offers limited visibility into scenarios where gas water heaters are the baseline. These gaps limit the ability of programs to accurately model energy savings and design effective incentives for split-system technologies.

5. **Invest in pilot demonstrations to inform codes and standards.**
   Audience: Regulators, Utilities, and Program Administrators
   Fund pilot demonstrations and field evaluations of split-system HPWHs to validate energy savings, assess installation feasibility, and generate data to inform updates to building codes, emissions regulations, and national appliance standards. These evaluations should capture detailed performance data, including recovery rates under varied draw patterns, installation location, and climate conditions, and inform updates to measure characterizations and incentive program criteria. Pilot programs would be beneficial in increasing confidence in product development and in evaluating early products. Early market adoption requires adequate education and performance assurances for multifamily property owners, building managers, and individual apartment or condominium owners.

6. **Engage stakeholders to address persistent barriers to electrification.**
   Audience: Program Administrators and Policy Makers
   Engage stakeholders to identify and address persistent barriers to electrifying and decarbonizing water heating. While split-system HPWHs offer technical solutions, broader adoption requires addressing systemic issues such as rate design reform to reduce operating costs, solutions for split incentives between owners and tenants, and streamlined permitting processes. These barriers must be addressed in parallel with the deployment of technology to ensure an equitable

and scalable market transformation.

7. **Build workforce capacity through training and engagement.**
   Audience: Workforce Development Agencies, Trade Associations, Manufacturers, and Program Implementers
   Embed split-system HPWH training into existing workforce development programs to build technical capacity across plumbing and HVAC trades. Training should equip contractors to install and maintain both monobloc and split systems, reduce labor costs, and ensure the long-term performance of these systems. Cross-sector collaboration is essential to align training with evolving standards and regulations.

   In addition to contractor engagement, manufacturers need clear guidance on market-specific requirements, including refrigerant line routing, unit development constraints, CTA-2045 demand response standards, and building code compliance. Addressing these gaps through targeted training, outreach, and pilot programs can provide valuable real-world feedback, validate early product designs, and increase confidence among manufacturers, contractors, and customers. These efforts are essential to building a robust installer network and ensuring consistent, high-quality deployment across California's diverse housing stock.

Together, these coordinated actions will support the foundation for a resilient, scalable, and equitable market for split-system HPWHs—advancing California's broader goals for building decarbonization and energy equity.

Appendix A — Reviewed List of Federal and State Incentives

Table 12: California and federal rebate eligibility table

California Rebate Eligibility Table	
TECH	TECH Clean CA Rebate: **Incentive**: $1,100-$5,300 NorCal: $1,100 rebate for <55 gal; $1,800 rebate for >55 gal SoCal: $3,100 rebate for <55 gal ; $3,800 rebate for >55 gal Low-GWP* bonus ("kicker") incentive: $1,500 Electrical upgrade incentive: $2,000 (capped at 50% of reported costs) **Equipment Type**: HPWH **Eligibility:** Customers whose homes don't fall within the California Plumbing Code (Chapter 5, Table 501.1(2) in the 2022 California Plumbing Code—e.g., homes with 7+ bedrooms or 4+ bathrooms, etc.) are not eligible. **Stackable**: Yes TECH Clean CA Small Multifamily Rebate **Incentive**: $3,100 to $4,185 per unit for replacing existing multifamily water heaters with unitary heat pumps statewide. Additional incentives from $2,000 to $4,000 are available to support electrical upgrades Only available to Small Multifamily properties, 10 or less units Project must be a non-heat pump to heat pump install No new construction, only retrofits. Customer must be enrolled in time-of-use and demand response (DR) program **Unitary HPWH:** Must be JA13 compliant per the California Energy Commission (CEC) and either: A) NEEA residential HPWH with EcoPort OR B) ENERGY STAR Residential WH V4 (or later) with Connected Capability **Eligibility:** 2-4 unit properties must submit an Occupant Based Annual Income through the CCES TECH Income Verification Portal. 5-10+ unit properties/projects, applicants must submit a Property Deed Restriction at time of reservation application, showing that at least 80% of the benefiting units are ≤ 60% AMI. High-Efficiency Electric Home Rebate Act **Incentive**: $1,750 **Equipment Type**: In-unit HPWH **Eligibility:** For multifamily properties that provide homes for income-qualified Californians, rebates for eligible equipment and appliances per multifamily unit range from $700 to $8,000. For low-income multifamily properties, HEEHRA rebates can cover up to 100 percent of eligible project costs, not to exceed $14,000 per residential unit. For moderate-income multifamily properties, HEEHRA rebates can cover up to 50 percent of eligible project costs, not to exceed $14,000 per residential unit.

	Stackable: Yes
Golden State Rebates	**Golden State Rebates HPWH incentives are paused until at least the end of 2025 due to a lack of funding. An update on renewed funding will likely be available in November 2025.* Golden State Rebate on HPWH **Incentive:** Up to $900 $700 rebate: 45 to 55-gallon Minimum UEF of 3.30. Must be replacing a 30- or 40-gallon natural gas storage water heater. $900 rebate: >55 to ≤ 75-gallon. Minimum UEF of 3.30. Must be replacing a 40- or 50-gallon natural gas storage water heater. **Equipment Type**: HPWH **Eligibility:** Heat pump water heater must be on the Qualified Products list at the time of purchase. Customers may reside in single-family, multifamily, manufactured, or mobile homes. Must be an electric customer of SDG&E, SCE, or PG&E.
Statewide Midstream Water Heating Program	**Statewide Midstream Water Heating Program Incentives** **Incentive:** Split-System Heat Pump Water Heaters (Multifamily, COP 3.0), $91.20 / kBtuh output capacity **Equipment Type**: Central HPWH **Eligibility:** Multifamily units must have HP in a common area and service multiple units (central system). Individual units do not qualify for incentive.
Energy Savings Assistance	**The Energy Savings Assistance Multifamily Energy Savings program** **Incentive**: Rebates can be up to the full cost of eligible HPWH equipment and installation. **Equipment Type**: HPWH **Eligible Incentives:** HPWHs must have a UEF > 3.09. **Stackable**: Yes
Energy Smart Homes	**Multifamily Low-Rise/ADU Whole Building Electrification Alterations** **Incentive**: $2,200 per unit **Equipment Type**: Each participating building/ADU must install heat pump space heating, heat pump water heating, induction cooking, and an electric dryer (Properties with existing electric cooking qualify without upgrading to induction cooking). Additional incentives for induction cooking, HP dryer, and electric infrastructure upgrade. **Eligibility:** existing low-rise multifamily buildings, requiring conversion of all gas appliances to electric alternatives.
Building Initiative for Low-Emissions Development	**Building Initiative for Low-Emissions Development Program, Second Edition** **Incentive:** Incentives are based on modeled GHG reductions, calculated at a flat rate of $150 per metric ton of avoided emissions. **Equipment Type**: HPWHs

	Eligible Incentives: Multifamily buildings must be deed-restricted low-income. HPWHs must meet NEEA's Electric Advanced Water Heating Specification
Switch is On	Lists multiple rebates specific to counties and cities in California. Some of which are listed in this table.
3C Ren	3C Ren HPWH Multifamily Rebate **Incentive**: $500-$750 **Category**: Water heating **Equipment Type**: HPWH **Who can apply:** Homeowners, renters, contractors **Eligible Incentives:** Multifamily building project with three or more energy efficiency/electrification measures. Bonus rebate of up to $1000 for each heat pump installed. Only valid for residents of the Counties of San Luis Obispo, Santa Barbara, and Ventura. **Stackable**: No, but can be used in combination with the TECH Clean California incentive. **Income Qualifying**: No
BayRen	The Bay Area Multifamily Building Enhancements Program **The Bay Area Multifamily Building Enhancement (BAMBE) Program has paused enrollment for applicants who have not yet reserved rebate funds, effective 7/3/25. Updates will be provided as soon as they are available.*
MCE	MCE Multifamily Savings **Incentive**: up to $6,000 per unit for in-unit electrification measures **Category**: Water heating, HVAC **Equipment Type**: HPWH, windows, insulation, induction stoves **Who can apply:** Multifamily affordable housing property owners (5+ units) **Eligible Incentives:** Comprehensive assessments, technical assistance, and incentives. **Stackable**: Not listed **Income Qualifying**: Affordable housing or deed-restricted properties

Federal Tax Credit	IRA Tax Credits Section 45L – New Energy Efficient Home Credit **Incentive**: Up to $5,000 per dwelling unit: - $2,500 for ENERGY STAR-certified homes - $5,000 for Zero Energy Ready Homes (ZERH) - Multifamily units: $500 or $2,500, depending on wage compliance **Category**: Federal Business Tax Credit for energy-efficient residential new construction. **Equipment Type**: Based on whole-home energy performance, certified under: - ENERGY STAR - DOE ZERH programs **Who can apply:** Eligible contractors who: - Construct or substantially reconstruct homes - Own and have a basis in the home during construction - Sell or lease the home for residential use **Eligible Incentives:** Applies to: - Single-family homes - Multifamily buildings (including apartments and condos) - Manufactured homes **Stackable**: Yes **Income Qualifying**: No **25C - Energy Efficient Home Improvement Credit** **Incentive Pricing**: 30% of eligible costs, up to: - $2,000 for heat pumps, HPWHs, biomass stoves/boilers **Category**: Federal Individual Tax Credit for existing home energy upgrades. **Equipment Type**: Includes HPWHs certified under ENERGY STAR. **Who can apply:** Individual taxpayers who: - Own and reside in the home (for envelope upgrades) - Own or rent the home (for energy property upgrades) - Must have a tax liability to claim the credit **Eligible Incentives:** This incentive applies to existing homes. Eligible upgrades must meet standards like ENERGY STAR or CEE's highest efficiency tier. **Stackable**: Yes **Income Qualifying**: No

* Sample of California HPWH incentives available for single and multifamily.

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