



**TECH** CLEAN CALIFORNIA

# ANNUAL REPORT 2021-2022



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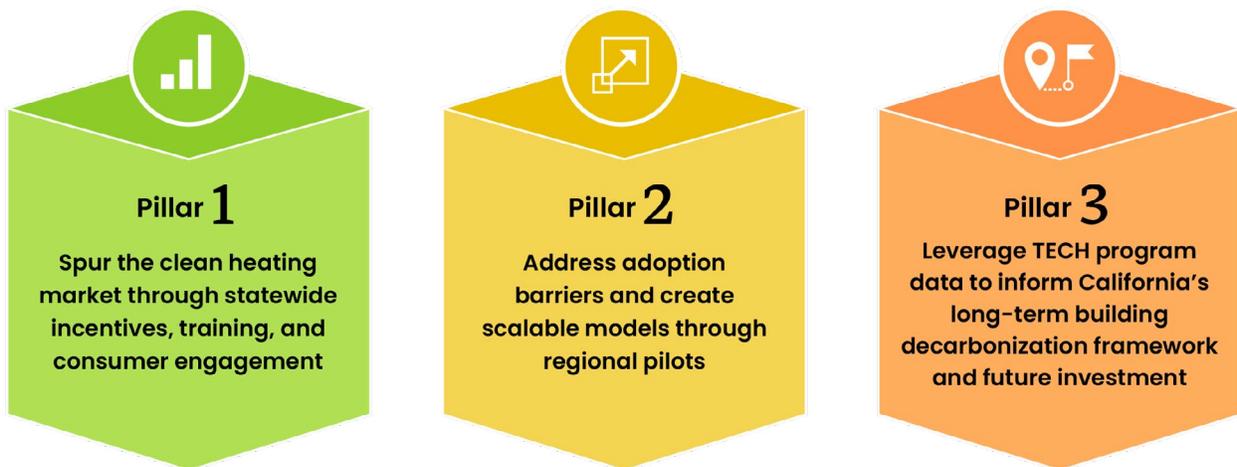
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# Executive Summary

Residential and commercial buildings are together responsible for 24% of total statewide greenhouse gas (GHG) emissions, including emissions from direct fuel combustion, electricity use, and refrigerants. Space and water heating are responsible for 91% of the direct emissions for this sector – meaning proactive, committed decarbonization of these sectors is an essential component of the state’s overall GHG reduction strategy (Kenney et al. 2022). Authorized by Senate Bill 1477, TECH Clean California is a market transformation initiative designed to increase the adoption of high-efficiency, low-emissions space and water heating technologies that put the state on a path to zero-carbon homes by 2045. Energy Solutions and its partners (TECH team) were selected via a competitive proposal process and launched the program in 2021. This report covers the first program year, June 2021 through June 2022.

The guiding principle of TECH Clean California is to put the State on a pathway to *six million heat pumps by 2030* and *carbon free homes by 2045*.

In July 2022, Governor Newsom announced a goal of installing six million heat pumps by 2030, with 50% of benefits flowing to low-income households and disadvantaged communities.<sup>1</sup> TECH Clean California is focused on supporting heat pump market transformation, with a dedicated focus on supporting adoption in low-income and disadvantaged communities. Inspired by the California Solar Initiative’s successful market transformation model, TECH’s program strategy is based on three strategic pillars to help meet the State’s heat pump goals:



1 Office of Governor Gavin Newsom. 2022. “Governor Newsom calls for bold actions to move faster towards climate goals”. <https://www.gov.ca.gov/2022/07/22/governor-newsom-calls-for-bold-actions-to-move-faster-toward-climate-goals/>



## Pillar One: Spur the clean heating market through statewide incentives, training, and consumer engagement

In year one, the TECH team successfully launched several initiatives to enable multi-program incentive layering (the Incentive Clearinghouse), gathered support in the heat pump HVAC and water heating markets, and targeted hard-to-reach customers. This involved a rigorous outreach campaign focused on contractor enrollment, education, and market engagement. Some high-level achievements include:

- Incentive Clearinghouse launched as both a center for facilitating incentive layering and as a tool for data collection
- Over 900 contractors enrolled within six months of statewide launch
- Over 20,000 units and \$50 million of heat pump incentives deployed or reserved
- Over 60 percent of multifamily incentives reserved will serve low-income and disadvantaged communities
- Introduced the Learning Management System (LMS) which has since provided 686 TECH Overview trainings, 672 Incentive Processing trainings, and 140 Load Shifting trainings
- Re-launched the *Switch Is On* website with enhanced features
- Partnered with 140 local ambassadors to garner awareness and support for home decarbonization
- Developed and supported technical training resources for heat pump professionals



## Pillar Two: Creating scalable models through regional pilots

The purpose of the regional pilots is to address key non-incentive barriers to heat pump adoption in smaller-scale targeted fashion. This helps reduce soft costs over time and increase access to benefits for underserved communities and customers. Pillar Two activities included the solicitation, approval, and launch of six pilots and eleven Quick Start Grants, along with efforts to expand project financing opportunities to historically excluded customers.

### Pilots

**Table 1: TECH Clean California Pilot Programs**

<b>Inclusive Utility Investment Program</b>	Launch Tariffed On-Bill (TOB) program with partner utility to expand access to up-front project capital
<b>Low-Income Integration</b>	Collaborate with existing low-income programs to more fully incorporate heat pumps
<b>Multifamily Housing</b>	Provide deep technical support in designing building systems that reduces the perceived risk of electrifying
<b>Heat Pump Water Heating (HPWH) Load Shifting</b>	Target contractors as key market actors to maximize HPWH load shifting
<b>Streamlining Permitting</b>	Design code-compliant, one-day HPWH permit process
<b>Customer Targeting</b>	Identify and engage customers who can benefit most from heat pumps

As the pilots finish their intended implementation periods, the TECH team will review the outcomes and assess the projects for potential scalability.

### Quick Start Grants:

Quick Start Grants fund 12 to 18-month projects which explore creative solutions to known market barriers in California, with a particular emphasis on equity. TECH’s 2022 cohort includes 11 project recipients, with over 70% of projects focused on low-income, disadvantaged, and hard-to-reach communities. Upon completion, TECH will publish a summary of project outcomes and lessons learned to inform future heat pump adoption efforts. Projects cover four overarching areas:

- enabling faster installations
- making heat pump programs more inclusive
- reducing energy costs for low-income customers
- innovation for hard-to-reach housing

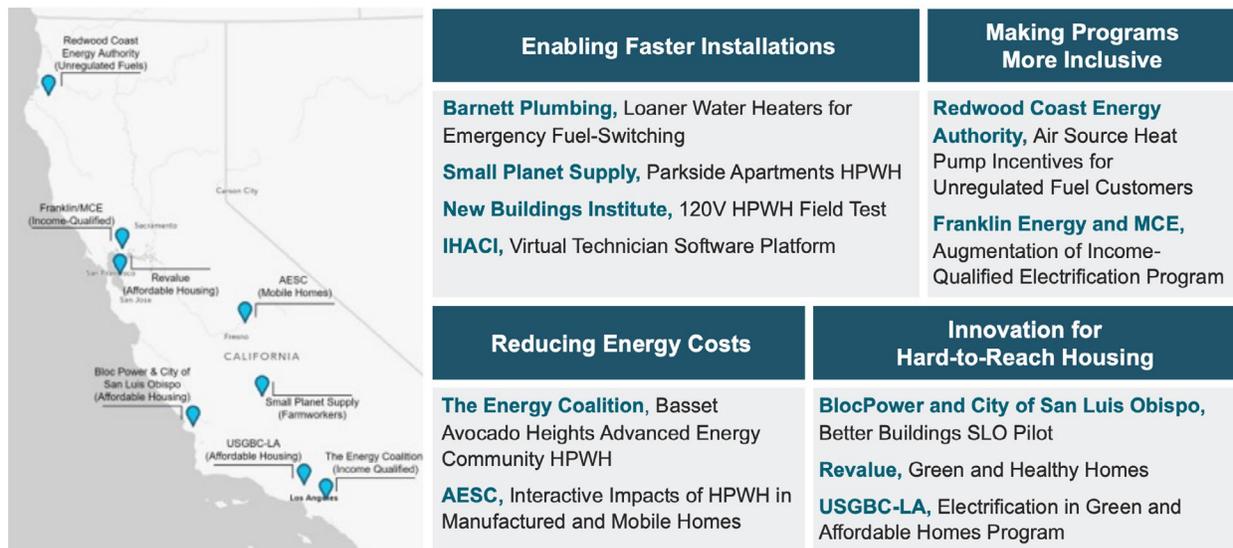


Figure 1: Quick Start Grants – 2022 Projects

The TECH Team will select its 2023 cohort at the end of 2022, with the goal of 100% of projects support low-income, disadvantaged, and hard-to-reach communities.

### Expansion of GoGreen Home Financing:

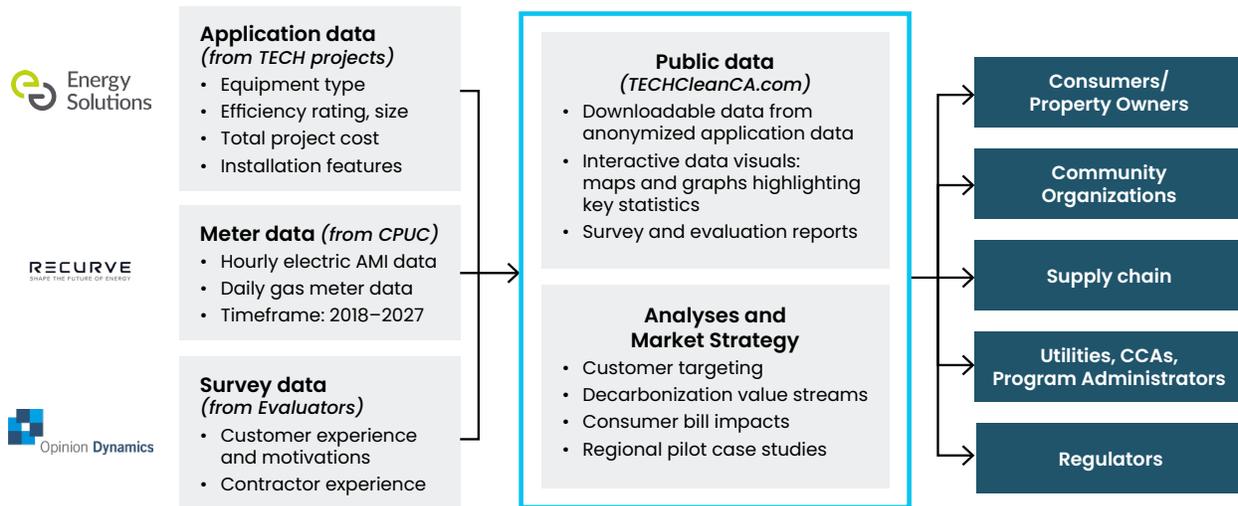
To support project financing, the TECH team has partnered with the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) to expand access to their existing GoGreen Home financing program. TECH Clean California provides credit enhancements for GoGreen financing in non-investor-owned utilities (IOU) (e.g., municipal and publicly owned utilities [POU]) areas, enabling the CAEATFA program to create a truly statewide offering. At the beginning of 2022, CAEATFA announced expansion of GoGreen Home eligibility to qualified contractors and in April 2022 began paying loans for home electrification projects in newly eligible territories.



## Pillar Three: Informing California’s long-term building decarbonization framework

The purpose of Pillar Three is to inform California’s long-term building decarbonization framework by incorporating sales, meter data, and survey data into a public reporting site, with both downloadable datasets and rigorous analysis quantifying the decarbonization impacts. California has aggressive decarbonization targets, and TECH’s data and lessons learned can inform decisions for a wide range of stakeholders.

Pillar Three accomplishments in the first year include acquiring meter data through collaborative efforts with the California Energy Commission (CEC) and California Public Utilities (CPUC). Coupling this meter data with data collected through incentive applications, we can draw useful insights about post installation impacts. Our current objective is to analyze the data and publish anonymized results through the public reporting site, a resource that is accessible to wide range of stakeholders and can illustrate the impact of heat pump installations. The TECH team will also employ these insights to inform future program refinement and optimize our approach.



**Figure 2: How TECH data can inform building decarbonization decisions**

# Overview

TECH Clean California is a market transformation initiative aimed at driving market adoption of low-emissions space and water heating technologies for existing single family and multifamily residential homes to help achieve California's goal of six million installed heat pumps and attain carbon neutrality by 2045.

The initiative was created as part of California Senate Bill 1477 and is funded by revenues collected through California's Cap-and-Trade program.

TECH Clean California is designed to be a centralized flagship implementation program for all existing and potential heat pump HVAC (HP HVAC) and heat pump water heater (HPWH) programs and to create best practices to inform statewide consistency. To achieve lasting scale, the initiative will pave a path for favorable decarbonization policy and make heat pumps cost-competitive with incumbent technologies.

To meet the initiative's goals within the timeframe specified, there must be a significant increase in market scale and a rapid shift towards clean technologies. This will be accomplished through a combination of market incentives, supply chain engagement, workforce development, consumer education, regional pilots, and Quick Start Grants. The TECH Clean California initiative will enable the installation of low-emissions space and water heating technologies and will collect and publish energy and GHG impacts with market data to inform California's long-term decarbonization framework.



*TECH Clean California aims to drive market adoption of low-emission space and water heating technology and put California on a pathway to carbon-free homes by 2045.*

## The Initiative Framework



### Pillar 1: Spur the clean heating market for decarbonization through statewide strategies

**Focus on contractors to prime the market:** TECH Clean California employs several strategies to prime the market; the TECH team's primary focus is on contractors. TECH Clean California concluded that contractors would have the greatest impact on market transformation since they directly influence the sales process for most heat pump installations, including decisions on fuel substitution. To impact heat pump sales in the near-term, engaging these supply chain actors is critical. However, contractors are often hesitant to break away from their existing profitable sales model and invest time and effort to sell and install nascent technologies with yet-to-be proven demand. Given these findings, this initiative is designed to 1) train contractors on the technology, value proposition, and business model aspects of decarbonization; and 2) motivate contractors to sell heat pump technologies by providing contractor incentives, sales rewards, and bonuses.



**Use existing infrastructure to drive consumer demand:** Consumer education that focuses on the benefits of heat pumps, and how to find qualified contractors and available incentives, has been a key missing piece within California heat pump initiatives to date. To drive consumer demand, TECH Clean California leverages and invests in resources to create a single, unified source of information with consistent messaging, rather than generate parallel and potentially overlapping efforts. The Building Decarbonization Coalition (BDC) has played a prominent leadership role in outreach and engagement thus far. Integrating with and enhancing their consumer inspiration campaign, the *Switch Is On*, has been a key means of engaging in mass market communications for the initiative.

**Create scalable statewide information infrastructure:** TECH Clean California addressed the lack of existing market-facing infrastructure for all parties. For consumers, enhancements to the *Switch Is On* provide a central source for finding comprehensive information on technology incentives, or locating contractors. For contractors, it offers a central source to streamline decarbonization program processes, rules, and applications. For stakeholders and policymakers, there is now a central resource giving heat pump performance results: TECH Clean California recently launched [techcleanca.com](https://techcleanca.com) to provide a trusted source of reporting data with comprehensive information on costs and measured impacts.

**Target low-income, hard-to-reach, disadvantaged communities (DACs):** TECH Clean California has deployed targeted strategies and localized investments to enable equitable decarbonization. These investments in impacted communities help fuel economic recovery and respond to the needs of those hit hardest by historical environmental and social inequities as well as the ongoing COVID-19 pandemic. **To ensure that investments are both impactful and equitable, TECH Clean California has a goal to invest 40 percent of program incentives in low-income households and DACs.** To promote program collaboration, with the support of the CPUC Low-income Oversight Board (LIOB), TECH Clean California has assembled a Low-Income Ambassador Panel, consisting of low-income regional representatives from across the state. From these activities, our objective is to gather the requisite data and market experience to inform policies and program designs that will transition all low-income weatherization programs towards decarbonization, ensuring that low-income households have access to the health and safety benefits associated with decarbonization.

▶ [Go to Pillar One: Spur the Clean Heating Market Through Statewide Strategies \(pgs. 12–21\)](#)



## **Pillar 2: Create scalable models for market transformation through regional pilots**

**Test strategies through regional pilots and Quick Start Grants:** The purpose of the regional pilots is to address key barriers to heat pump adoption in smaller-scale targeted fashion. The focus areas for two of the six pilots were selected to address adoption barriers for market segments particularly important for supporting an equitable transition: low-income households and multifamily housing. The remaining four pilots address key barriers along the customer journey: identifying the customers most likely to save money by switching to heat pumps, financing the project, streamlining equipment installation, and managing the new electrical load once the appliance is installed. TECH Clean California has launched six pilots and funded eleven Quick Start Grants.

▶ [Go to Pillar Two: Create Scalable Models Through Regional Pilots \(pgs. 22–30\)](#)



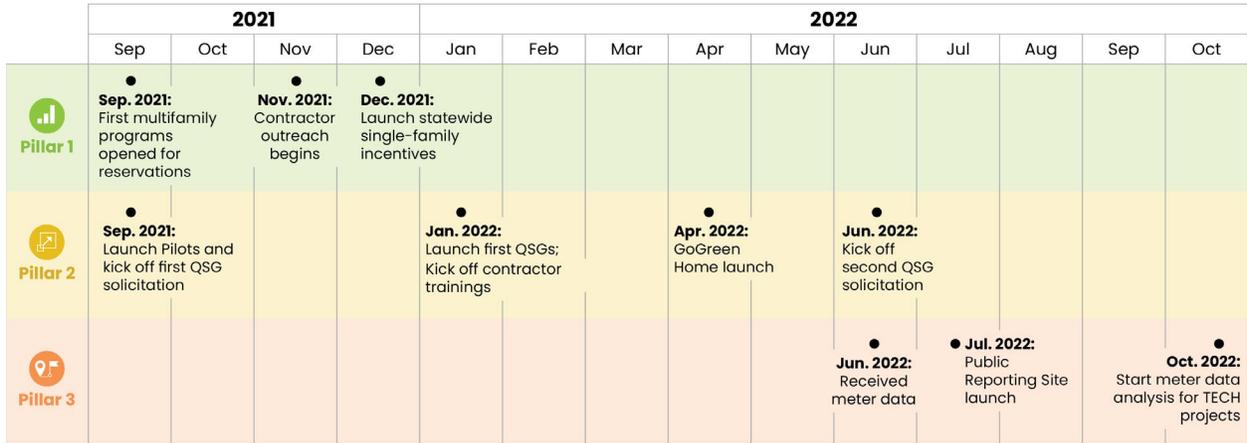
## **Pillar 3: Inform long-term building decarbonization framework**

**Public reporting drives policy:** TECH Clean California's role as a market transformation program is to support structural shifts (through policy and market mechanisms) and create sustained, long-term impacts. The initiative provides a single source of heat pump market data for California through its public reporting website, providing market transparency with reliable information on value, price, deployment progress, and meter-based impacts.

**Quantify the value of decarbonization:** A key barrier to decarbonization is the existing deficiency of the market to monetize grid and climate value. Because the primary benefits of decarbonization are grid- and climate-related (bill savings are generally secondary), a

key near-term opportunity is using installation data from the initiative to quantify these values and support the development of more formal markets. Achieving zero carbon homes by 2045 will require significant private capital investment and robust project finance that supports this investment. By quantifying GHG impacts, and all other value streams associated with decarbonization, TECH Clean California will support the development of these necessary project finance mechanisms.

► [Go to Pillar Three: Informing Long-Term Building Decarbonization Framework \(pgs. 31–34\)](#)



**Figure 4: TECH Clean California Timeline**

# Spur the Clean Heating Market Through Statewide Strategies

## Incentive Design

TECH Clean California is designed to provide a simplified and consistent statewide incentive structure that integrates with existing local heat pump programs. A large-scale, statewide initiative brings significant benefits by simplifying two key areas: contractor participation and general program communication. To support this, the TECH team developed the Incentive Clearinghouse to layer incentives across integrated programs. This incentive layering approach enables multiple organizations to provide funding for a single product. TECH Clean California has now integrated its application process with five additional heat pump programs.

## Single Family and Multifamily Offerings

TECH Clean California's single family incentive structure was designed with two goals in mind: 1) stretch the incentive budget by rewarding layering with local programs, and 2) provide a baseline set of incentives everywhere to ensure an equitable rollout. The TECH team concluded that the best approach would be to provide a statewide level of baseline incentives focused on overcoming the financial barriers associated with fuel switching, while coordinating with local energy efficiency programs to enhance incentives.

## Program Offering Summary

**Who:** Enrolled contractors installing heat pumps in single family or multifamily homes

**What:** Code compliant HP HVAC and HPWH

**When:** TECH Clean California incentives launched in December 2021

**Where:** California gas IOU territories

**Why:** To drive adoption of heat pump technology and support California's goal of carbon-free homes by 2045

### Baseline Single Family Incentives

- Available everywhere in gas IOU territory- where we do not have a partnership
- Simple and concise measure structure to encourage engagement
- Developed to facilitate future layering with other incentive programs

### Enhanced Single Family Incentives

- Available in regions where TECH Clean California has integrated with a partner PA program
- Additional incentives added on top of baseline measures to support quality installations and decrease electricity consumption
- Cost sharing between TECH Clean California and partner PA supports collaboration, contractor must enroll in both programs to earn total available incentive



**Figure 5: HPWH Claim submissions over time**



**Figure 6: HP HVAC Claim submissions over time**

Facilitating a truly seamless experience for the contractor requires that all programs adopt consistent eligibility rules and application processes. In the first phase of incentive layering integration, each program still had its own rules, which caused contractor confusion and uncertainty. TECH Clean California and the other programs continue to work to streamline requirements and processes.

In addition to single family incentives, TECH Clean California provides incentives for HPWH and HP HVAC equipment installed in multifamily properties for both retrofit and new construction applications. Incentives are available for various equipment types that serve residential apartments and communal spaces. For multifamily dwellings or properties with five or more dwelling units, the TECH team opted for a single incentive structure available throughout the gas IOU territories to make the program simple and consistent for building owners and property managers.

**SINGLE FAMILY INCENTIVES**

TECH Clean California launched statewide, single family incentives on December 7, 2021, and enrolled contractors ramped up participation quickly and enthusiastically. This is evidenced by the month over month growth in submissions shown in Figures 4 and 5 as well as the strong cumulative results in Figures 6 and 7.



**Figure 7: HPWH Cumulative units and incentives through August 2022**

*\*Additional ~215 units submitted for pre-install reservations*



**Figure 8: HP HVAC Cumulative units and incentives through August 2022**

*\*Additional ~2,000 units submitted for pre-install reservations*

See **Appendices A** and **B** for additional single family data trends through August 2022. For current incentive data and trends, see the TECH Clean California public reporting site.

### INCENTIVE RESERVATIONS

Incentive spend in certain gas IOU territories gained momentum much more quickly than others, resulting in program suspensions due to budgetary limits required by the California Air and Resources Board funding allocations. These suspensions started with SDG&E on April 26, 2022, and then PG&E and SoCalGas (HVAC only) on May 13, 2022.

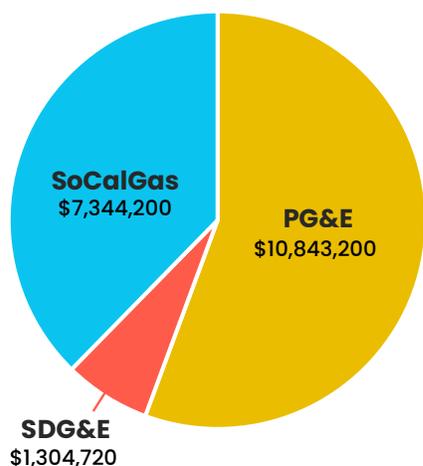
To address the potential for further overspending, TECH Clean California introduced an incentive reservation system in May 2022 which allowed contractors to reserve incentives prior to project completion to ensure that funding would still be available when they were ready to submit for reimbursement. The team worked with participating contractors and energy raters to develop the reservation process and obtain feedback. The team sent out several communications to stakeholders to ensure that contractors were aware of the new system and in the span of a single week we received over 5,000 claims for around \$14 million in incentives. The remaining incentive budget was quickly exhausted and the program suspended further PG&E and SoCalGas HVAC incentive reservations.

### Multifamily Incentives

TECH Clean California launched multifamily incentives with an incentive reservation system to accommodate the long pre-construction and construction timelines, the need to track incentive budgets, and the need for a contractor to provide property owners/managers with firm pricing proposals prior to decision-maker approval.

The TECH Clean California incentives enabled building owners and property owners to move forward with heat pump projects that they could not otherwise fund themselves. To date, reservations have been made for over \$12 million in multifamily incentives with the majority set aside for disadvantaged communities and affordable housing. In addition to the reserved incentives, there is around \$7 million worth of incentives on the multifamily waitlist, which represents projects in the pipeline that can be completed if funding becomes available as a result of new sources or projects that do not materialize. The incentives were mostly for projects in SoCalGas and PG&E territory with a smaller portion in SDG&E territory (see Figure 8 for breakout).

### Multifamily Incentives Submitted Through August 2022



\$12.2m reserved (\$7.2m on waitlist)

**Figure 9: Multifamily incentives reservations through August 2022**

As the number of incentivized technologies grows, and the TECH team gathers empirical data on their energy use, an analysis of what is driving — or impeding — heat pump adoption will become available. The first year of the program has produced key process-based lessons on the essential components of program design necessary to meet heat pump goals at the scale set by California.

See **Appendix C** for additional multifamily data trends through August 2022. For current incentive data and trends, see the TECH Clean California public reporting website.

### Looking Ahead

While the shutdowns themselves were undesirable outcomes, the overwhelming success of the TECH Clean California incentives is an extremely positive sign. While there has been impressive growth in year

one, the TECH team would need to increase participation by six times, and sustain that rate, to meet the State’s goal of six million heat pumps installed by 2045. To meet this goal, the TECH team’s focus shifted to completing processing of the existing claims in the system, while also reworking the application review process to prepare for an increased number of applications. We expect to significantly improve application processing times since maintaining cash flow is critical for contractors, and ensuring participation therefore requires paying incentives as quickly as possible. While most incentives were paid within eight weeks of receiving the claim, the TECH team is working to identify ways of making processing more efficient, with the aim of reducing time to two to four- weeks at most.

## Contractor Engagement

Contractor engagement is a vital part of ensuring both the short- and long-term success of the TECH Clean California incentive implementation. To facilitate a successful launch, the TECH team initiated a robust outreach campaign leveraging supply chain relationships to engage a diverse group of heat pump contractors in California. Our active outreach began in mid-November 2021

at the Institute of Heating and Air Conditioning (IHACI) conference and was shortly followed by a series of distributor- and manufacturer-supported webinars in December and January. These webinars led to a steep increase in contractor enrollment that continued through late March 2022.

It was especially important that enrollment not be limited to a few contractors doing the majority of installations but rather a wide network of contractors that would maximize the number of potential customer touchpoints and deliver the widespread market transformation envisioned by TECH Clean California. The objective is for heat pump installations to eventually become the norm rather than a novelty promoted by a select few market actors. Our original goal was to enroll 400 contractors over four years. **To date, we have enrolled nearly 1,000 contractors.** These contractors have demonstrated high levels of program engagement with about two-thirds of them actively participating over the first six months of the initiative.

As shown in Figure 10, we have seen large concentrations of enrolled contractors who serve major metro areas, specifically the San Francisco Bay Area, Los Angeles, San Diego, along with significant numbers in the Central Valley and in Inland Empire.

Our focus has shifted to providing additional support and opportunities for contractors to stay engaged with TECH Clean California, given that most incentives throughout the state are currently suspended. In the immediate future, the TECH team will be concentrating efforts on retaining contractors by showing the value TECH Clean California can provide beyond incentives. We aim to retain contractors by:

- Effectively communicating the value proposition of TECH Clean California’s benefits and offerings that will support the initiative’s goal of market transformation
- Promoting regional partner programs that offer incentives that promote decarbonization
- Promoting statewide financing offerings that can support project acquisition and completion
- Providing as much transparency as possible around participation simplification, improvements, and funding status



**Figure 10: Contractor enrollment over time**



**Figure 11: Enrolled contractors by zip code**

## Other Supply Chain Engagement

In addition to contractor engagement, the TECH team has worked to engage manufacturers, distributors, and other industry stakeholders such as energy raters. The goal of this activity was to:

- Gather input on program design and process (initially and over time) to ensure that the approach aligns with the evolving needs of the market
- Engage existing supply chain relationships to identify and engage contractors
- Gain insight on supply chain constraints and other key market insights that could help inform program activity

Manufacturers and distributors play a pivotal role in the effort to expand engagement. Manufacturers help drive the overall direction of the industry equipment stocking. Stock carried by distributors has a major impact on the equipment that is installed in residential projects due to the need for quick project turnarounds. Our trade ally outreach team kept manufacturers and distributors up to date with key program changes, which allowed these market actors to pivot their practices to align with a changing program landscape and helped ensure these important announcements would spread rapidly throughout the supply chain.

## Consumer Education and Outreach

TECH Clean California partnered with *The Switch is On*, a state-wide consumer awareness, inspiration, and education campaign to leverage the collective efforts of the Building Decarbonization Coalition (BDC) and its partners to promote home decarbonization across the state.

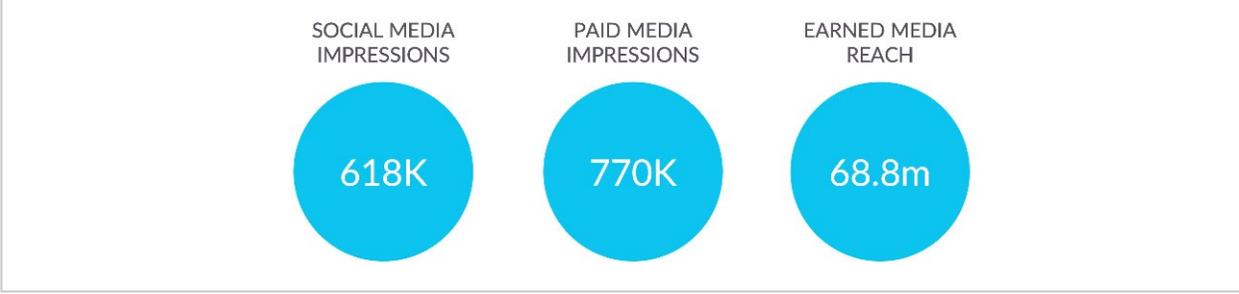
### Switch Is On Website

In December 2021, the Switch Is On website was relaunched with an enhanced experience for consumers to find information and practical tools to support Californians when they are ready to make the switch from a gas-powered home appliance to an electric powered home appliance. **From the site relaunch in December 2021 through June 2022, The Switch is On attracted 307,939 new users with 677,805 page views, and 4,472 contractor quotes requested.**



Figure 12: Website statistics

The campaign utilizes a variety of components that work together to build awareness and drive website traffic, including social media, paid media, earned media, community ambassadors, and partnerships.



**Figure 13: Social media results**

The relaunch also included a new contractor hub designed to provide a one-stop resource for contractors to find what they need to build their decarbonization business, learn about and enroll in TECH Clean California, and find the training and tools offered by TECH and other industry and market programs.

**The Switch Is On Ambassador Program**

The Switch Is On launched its Ambassador Program to achieve a deeper reach into California communities. The 140 Neighborhood Ambassadors act as the eyes, ears, and voice of the campaign in their community by sharing on social media, tabling at community events, running webinars, speaking to local media, engaging on the Nextdoor App (a social networking platform for neighborhoods), collaborating on articles, and more. In monthly forums, the ambassadors can learn from each other about engagement opportunities, get updates from the campaign team, and provide feedback on what they are hearing in their community. This two-way flow of information is vital to the campaign’s continuous improvement cycle. Due to the success of the current neighborhood ambassadors, the Switch is On is actively recruiting more ambassadors to better represent underserved communities and expanding to include ambassador organizations that have already established roots in those communities. The Switch is On team has attended a number of webinars and tabling events such as the East Bay Green Home Tour, USGBC LA Community Day, Climate Solutions Marin, and several Climate Reality hosted events.



**Figure 14: Ambassador program activities**

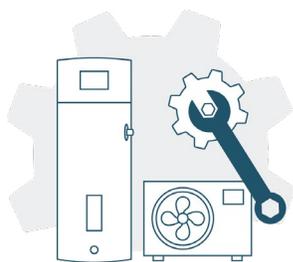
## Workforce Education & Training

Since TECH Clean California is a contractor-delivered initiative, understanding and working with the market is a core component of this and any other market transformation effort. Workforce education & training (WE&T) is our primary vehicle for shifting the “business as usual” practices of HVAC and water heater choices by Californians to more efficient options. Most customers choose equipment based on what their contractor offers them in terms of equipment type and brand. Because the contractor is where the customer primarily gets their information, the TECH team engaged in WE&T activities to train contractors on when and how to sell heat pump technologies, multifamily installation applications, quality installation, and support distributed energy resources such as load shifting.

### In-House Training Materials

In year one, the TECH team used a combination of in-house training materials and collaboration with partners best positioned to offer targeted and relevant trainings to heat pump contractors. In January 2022, the Learning Management System (LMS) was launched to provide required onboarding training for participating contractors. This training included a TECH Clean California overview, training on how to use the Incentive Clearinghouse, and HPWH load shifting training. **There were 837 unique registrants in the LMS. Of those, 60 percent reside in high unemployment (HUA) zip codes and approximately 63 percent of the companies that employ these users have offices located in HUA zip codes.**

To date, the LMS has provided:



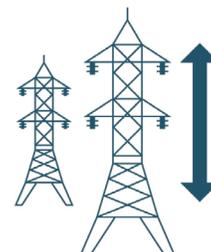
686

TECH Overview Trainings



672

Incentive Clearinghouse Trainings



140

Load-Shifting Trainings

### TECH WE&T Market Transformation Efforts

Beginning in 2021, the TECH team began developing a robust list of training opportunities to build a one-stop repository for the workforce and to support a broader market transformation effort. Outreach and collaboration with other utility and program administrators across the state followed to cross-promote courses on heat pump and industry standards and prepare the workforce to install, service, maintain, and sell heat pump technologies. TECH Clean California now partners with several regional training centers to outfit training labs with HPWH equipment mobile units to expand outreach and accessibility.

## Contractor Training and Business Model Support

Training	Description	Structure	Achievements
<b>Residential Space Conditioning and Water Heating Electrification Course</b>	Robust introduction to residential building electrification	Three-day course	<ul style="list-style-type: none"> <li>• Provided six three-day courses</li> <li>• 101 Certificates of Completion awarded</li> </ul>
<b>Residential Electrification Master Class Cohort Series</b>	Subject matter experts provided insight and strategic solutions to support contractor firms looking to make electrification their primary service	Weekly sessions spanning a ten-week timeframe	<ul style="list-style-type: none"> <li>• Two 10-week series offered</li> <li>• 21 contractor firms engaged</li> </ul>
<b>Residential HVAC System Performance Series</b>	Training series offered in both Northern and Southern California intended to elevate contractors and technicians from basic proficiency levels to high-performance leaders in their field	10 total classes offered over a six-month period	<ul style="list-style-type: none"> <li>• 88 Residential System Performance Certifications awarded</li> <li>• 103 attendees from High unemployment zip codes</li> </ul>

## Multifamily Building Industry Training and Education

Training	Description	Structure	Achievements
<b>Multifamily Electrification Training Plan Webinars</b>	Webinars to engage multifamily stakeholders	Eight total webinars	Total of 253 participants

## Low Income Training

Training	Description	Structure	Achievements
<b>Train-the-Trainer workshop</b>	In-depth “Train-the-Trainer” seminar that included tools, resources, and content for attendees to learn how to successfully train members of their staff at their own facilities	Two-day workshop	Trained representatives from seven contractor firms, many of which operate in high unemployment areas

In February 2022, the TECH team received a formal letter from Contractors State License Board (CSLB) articulating the appropriate licenses for HPWH installation. Our presentation at the HVAC Excellence Conference the next month emphasized the need for curriculum around heat pump technologies, and we then partnered with Strategic Energy Innovations (SEI) and eight community college HVAC programs on a plan to outfit training labs with heat pump technologies, provide faculty and curriculum support, and assist students with employer connections. In June 2022, a new partnership with a Department of Energy program focused on the Inland Empire territory. The TECH team established another partnership with the Energy Star Manufacturer Action Council

(ESMAC) to develop and deploy manufacturer-delivered HPWH webinar training focused on installation, service, maintenance, troubleshooting, and sales to the California market. The TECH team will work with the Institute of Heating and Air Conditioning Industries (IHACI) to host a career connections session at their annual trade show in November 2022.



**Figure 15: WE&T activity**

## Looking Ahead

Based on rapid participation rapid growth, it appears that motivated contractors already know how to sell heat pumps and that contractors in Northern California are well educated on HPWHs. The TECH team will use these lessons learned to inform the initiative's future WE&T activities and will continue to look for additional opportunities for collaboration, such as the future California Statewide Quality Installation and Quality Maintenance Program.

TECH Clean California provides an opportunity to potentially change the way WE&T is conducted to directly tie training to not just installation volume but also to delivered savings. The TECH team will have enough data after the first year of operation to look not only at the consumption impact change from installation of heat pump product but at delivered savings from contractors who undertook quality installation training.

## PILLAR TWO:

# Create Scalable Models Through Regional Pilots

## Project Financing

### Objectives

In the first year of TECH Clean California implementation, the TECH team sought finance market transformation to make affordable financing more accessible and appealing for residential HP HVAC and HPWH retrofit projects in both the near- and long-term. Currently, California's heat pump market has limited financing options, often requiring personal loans rather than more equitable project finance, thereby limiting adoption to wealthier California residents. The TECH team's goal for finance market transformation is to demonstrate viable pathways to deploy private capital in the heat pump retrofit market, enabling all California ratepayers to invest in home decarbonization at minimal upfront cost.

### First-Year Accomplishments

During the first year, the TECH team:

- Helped CAEATFA expand eligibility for GoGreen Home's affordable loans for home decarbonization.
- Co-marketed TECH Clean California and GoGreen Home to contractors to boost enrollment in both programs.
- Contributed \$200,000 initial funding to CAEATFA to credit enhance electrification loans and committed to make additional TECH Clean California funds available.

The primary near-term finance market transformation opportunity the TECH team pursued this year was in collaboration with CAEATFA's GoGreen Home financing program. GoGreen Home is a public-private partnership that offers below-market interest rates for home energy efficiency upgrades throughout California. As of 2021, heat pump retrofit projects were not universally eligible for GoGreen Home financing. This lack of access inhibited scaled adoption in the private sector. The TECH team engaged CAEATFA in Q3 2021 to determine collaboration opportunities and plan how GoGreen Home could expand and simplify eligibility. By the end of 2021, CAEATFA started pursuing necessary regulatory changes to enable collaboration. Through VEIC, the TECH team also submitted comments into the CPUC Clean Energy Finance Proceeding, helping establish regulatory support for this partnership.

In April 2022, CAEATFA made home decarbonization measures available for 100 percent project financing in all gas and electric IOU service territories. Additionally, the TECH team and CAEATFA have collaborated in the following ways:

- TECH Clean California committed \$600,000, and reserved an additional \$900,000, to fund credit enhancements<sup>2</sup> for loans in GoGreen Home’s newly expanded eligibility territory.
- TECH Clean California and CAEATFA made mutual commitments and set guidelines for co-marketing to contractors and key stakeholders.
- CAEATFA shared GoGreen Home data with TECH Clean California, and the TECH team will perform post-installation monitoring for projects that receive both TECH Clean California and GoGreen Home funding.

Adoption in newly eligible territories started slowly in April but has increased steadily each month. In Q2 2022, 14 GoGreen Home loans were issued in newly eligible territory and used TECH Clean California credit enhancement funds. These loans had an average interest rate of 3.95 percent, a term of 94 months, project cost of \$23,615, and loan coverage of 90 percent of project cost. This average is at least one percentage point lower than home equity loans currently available on the private market, saving GoGreen Home borrowers thousands of dollars in interest over their loan lifetime.

The TECH team will continue to monitor GoGreen Home participation and co-market to participating contractors, demonstrating how both incentives and financing can make heat pumps more affordable for people throughout the state.

## Regional Pilots and Quick Start Grants

The six TECH Clean California regional pilots, summarized in Table 2: Summary of TECH Clean California Pilots, are designed to test potential solutions to discrete market barriers, including impediments to widespread technology deployment and meeting California’s GHG reduction goals. The solutions that prove effective will be incorporated into the TECH Clean California framework and scaled into statewide approaches where feasible.

Two of the six pilots address adoption barriers for market segments that are particularly important for supporting equitable transition: low-income households and multifamily housing. The remaining four pilots address key barriers along the customer journey: identifying the customers most likely to save money by switching to heat pumps, financing the project, streamlining equipment installation, and managing the new electrical load once the appliance is installed.

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<sup>2</sup> A credit enhancement reduces the financial risk borne by a lender by guaranteeing to repay the lender some or all of the value of a loan in the event of borrower default. Credit enhancements are a key component of what allows GoGreen Home participating lenders to offer below-market interest rates to borrowers.

**Table 2: Summary of TECH Clean California Pilots**

Pilot	Objective
<b>Inclusive Utility Investment Program</b>	Launch program with partner utility to expand access to financing
<b>Low Income Integration</b>	Collaborate with existing low-income programs to more fully incorporate heat pumps
<b>Multifamily Housing</b>	Provide deep technical support in designing building systems that reduces the perceived risk of electrifying
<b>HPWH Load Shifting</b>	Target contractors as key market actors to maximize HPWH load shifting
<b>Streamlining Permitting</b>	Design code-compliant, one- day HPWH permit process
<b>Customer Targeting</b>	Identify and engage customers who can benefit most from heat pumps

### **Inclusive Utility Investment Program**

The Inclusive Utility Investment (IUI) Pilot aims to demonstrate and expand the TOB or IUI model through a partnership with a Load Serving Entity (LSE). TOB/IUI programs allow utilities to pay for cost-effective energy improvements, such as home heating and cooling units, at a specific residence. TOB/IUI also recover costs for improvements over time through a dedicated charge on the utility bill less than the estimated savings from the improvements. TOB/IUI is not a form of debt or lending, and cost recovery survives across successor occupants, making it more inclusive and allowing longer cost recovery terms. This proven model for energy efficiency has yet to be proven for decarbonization.

In year one of pilot implementation, a Memorandum of Understanding was completed with the LSE, Silicon Valley Clean Energy (SVCE). The pilot team developed and filed a Program Proposal with CPUC Clean Energy Financing Proceeding on April 15, 2022. The filing reflected internal program design, analysis, and consultation with external stakeholders including PG&E, Clean Energy Works, TECH Clean California’s Low Income Ambassador Panel, consumer advocates, and local government organizations. The pilot team based the proposal on information discussed in stakeholder workshops by TECH Clean California throughout late 2021, by CPUC on May 12, and DAC Advisory Group on May 20. In addition, the pilot team hosted a stakeholder feedback workshop with SVCE on May 26. Stakeholder reaction to the TECH/SVCE proposal has been recognized as being thorough, and response is positive. The team is currently awaiting approval in CPUC Clean Energy Finance Proceeding in November 2022. If approved on schedule, and barring delays in CPUC approval or PG&E tariff and billing adoption, implementation could begin the first quarter of 2023.

### **Low Income Integration Pilot**

The Low-Income Integration Pilot aims to expand access to building decarbonization technologies among low-income households by partnering with existing energy efficiency or income-based retrofit programs to ensure heat pumps are available in more programs and to more customers.

In 2019 the CPUC initiated the San Joaquin Valley Disadvantaged Communities (SVJ DAC) Pilots, seeking to increase access to affordable energy sources and reduce use of fossil fuels for generators. A key focus is on creating pathways to electrification for low-income households. The TECH Clean California Low Income Integration Pilot team collaborated with this program to address issues in low-income homes that must be remediated before electrification can proceed. THE SVJ DAC program had a limited budget for pre-existing homes that was proving inadequate to cover unforeseen repair needs. The goal of the TECH Clean California collaboration pilot is to address 70 single family homes that were not originally able to participate in the SVJ DAC program, by providing each home with additional funding for remediation. As of June 2022, TECH Clean California has funded remediation on 13 homes in the San Joaquin Valley, with more in the pipeline. A central learning of the pilot is that the initial costs for retrofitting and repairs that are essential before installing heat pumps are often underestimated.

In addition, the TECH pilot team has been discussing a collaboration opportunity with PG&E's Energy Savings Assistance (ESA) program. If implemented, TECH Clean California would provide outreach materials and training to ESA contractors as well as funding for home repairs necessary to convert electric resistance water heaters to HPWH.

## **Multifamily Housing Pilot**

The Multifamily Housing Pilot seeks to address barriers associated with electrification and energy efficiency upgrades in multifamily properties specifically by reducing the perceived risk of heat pump systems, by providing deep technical support in building system design. The strategy is to increase market familiarity with technologies and build capacity within design teams at multiple levels: from owners and architects to mechanical, electrical, and plumbing (MEP) engineers. By accelerating the learning curve, the pilot will reduce the time and cost for developers to transition to all-electric buildings. The pilot has three tracks of activity:

### **PROJECT SPECIFIC AND PORTFOLIO LEVEL ELECTRIFICATION ADVISING**

This pilot track aids in adjusting owner/developer practices by supporting multifamily property owners in developing a prioritized, portfolio level approach and a roadmap for electrification.

### **CENTRAL HEAT PUMP WATER HEATER TECHNICAL SUPPORT**

This track aims to decrease some of the risks in converting to a new central HPWH by providing pre- and post-installation technical support and system-based monitoring, coupled with enhanced TECH Clean California incentive offerings.

### **PROPERTY ELECTRIFICATION READINESS PLAN**

This track is adapting the “upgrade-at-change-out” approach — typically used for refrigerators or other like-for-like appliances — to address in-unit water heating and HVAC equipment. It will couple technical assistance with enhanced TECH Clean California incentives to develop replacement plans and support investment in electrical infrastructure to reduce initial capital costs.

As of June 2022, the pilot team is continuing to sign up properties for all three pilot tracks. The team has cultivated a list of interested owners for each of the three pilots, held calls with interested owners, and encouraged submission of the interest form. Four owners have submitted interest forms, and the pilot team has secured commitment from one owner for Portfolio Level Electrification Readiness Pilot and Property Electrification Readiness Plan. The team has also completed pre-improvement monitoring on one central HPWH system and initiated the development of a post-improvement monitoring plan.

Key takeaways include:

1. Owners and contractors are interested in all three pilots and indicate that these pilots will help address common pain points.
2. Participating property owners are diverse in terms of portfolio size and geographic footprint, which will provide a more holistic view of commonalities and variations in portfolio needs.

The pilot approach – diversified both among types of properties, technologies, and the assistance provided to property owners – will provide a range of lessons learned in line with what we would expect to see in a wide-scale market. Going forward, the team will also focus on expanding outreach for pilot participation to include unrepresented geographies, ownership structures, and building types.

## **HPWH Load Shifting Pilot**

This pilot aims to establish market readiness and ensure that the full load shifting benefits of HPWHs can be realized. It addresses this by motivating contractors to set up a HPWH to load-shift upon installation and encouraging them to sign customers up for demand response (DR) programs.

An initial focus of the pilot through 2021 and early 2022 was to educate contractors about the value of load shifting. The pilot team created an HPWH load-shifting training curriculum, and as of May 2022, more than 700 contractors had begun enrollment. Of these contractors, more than 150 had viewed the training video, and 75 percent of those who responded to the post-training survey reported that they had a positive view of the training, with only six percent being less than satisfied. Additionally, 84 percent of those surveyed said they intend to share the training information with their colleagues and/or employees.

Initially, the pilot team also offered a \$200 incentive to contractors who installed a thermostatic mixing valve (TMV), a component that greatly expands the load-shifting potential of an HPWH. The pilot received and paid 209 TMV incentive claims, and early results from the launch of general TECH Clean California incentives revealed that about 70 percent of installs were already including TMVs as a matter of course. In the fall of 2021, the Self Generation Incentive Program (SGIP) announced HPWH incentives with requirements that included the inclusion of TMVs for all installations. To align the TECH Clean California requirements with SGIP, and after consultation with contractors to ensure the market was ready to include TMVs as a standard part of installations, TMVs were made a requirement of receiving standard TECH Clean California incentives, and TMV bonus incentives were discontinued on June 20, 2022.

With the discontinuation of TMV incentives, the pilot team expanded the portion of this pilot that encourages contractors to enroll customers in DR programs by providing an additional \$50 incentive for each customer enrolled. Originally, the HPWH Load Shifting Pilot focused on collaboration with PG&E's WatterSaver DR program; however, standard TECH Clean California incentives were exhausted in PG&E territory in May 2022. The team expanded its focus and now offers the \$50 incentive for enrollment in DR programs statewide, and is currently collaborating with PG&E's WatterSaver, SMUD's PowerMinder, and OhmConnect, and open to other collaborations in the future. The pilot team will continue to educate contractors – and through them, customers – on the benefits of DR enrollment for both the grid and customer savings and will collect data on the barriers and challenges that dissuade contractors and their customers from enrolling in these programs.

### **Streamlining Permitting Pilot**

This pilot aims to close the permitting time gap between natural gas water heaters and HPWHs by adopting a single-day HPWH permitting process within single family homes where code compliance could be easily and effectively demonstrated. The permitting process for HPWH can currently span multiple days, deterring both homeowners and installers from making the switch from gas water heating to electric HPWHs. In emergency replacement scenarios, longer install periods due to allowing delays are an even more significant barrier.

Throughout the second half of 2021 and into 2022, the pilot team convened numerous meetings with stakeholders to identify permitting challenges and solutions and help shape the potential goals of the pilot. Incorporating feedback from these sessions, the group reviewed a permit guidance package intended to aid building permit offices and contractors in creating a more expedited HPWH permit process.

The team is now working with the City of Pleasant Hill as an implementation partner for piloting the permit guidance package and testing how these new resources speed their permit approval timeline. They are also seeking a second partner jurisdiction in Silicon Valley Clean Energy territory.

### **Customer Targeting Pilot**

This pilot seeks to identify and test outreach strategies to drive demand among customers for whom the value of decarbonization is most compelling. It addresses two key market barriers hindering adoption of heat pumps in California:

- A lack of large-scale data demonstrating which customers are most likely to benefit from upgrading to a heat pump, and how to motivate those customers to buy a heat pump instead of an alternative.
- Poor outcomes from recruitment of customers with low potential to save, which can have an outsized effect on adoption in early-stage technology markets. This highlights the need to recruit customers whose energy profiles indicate high potential to save.

This work transitioned from planning to implementation in early 2022 after receiving the necessary customer data from the utility. Working with SCE, the team devised an email campaign to be sent to SCE customers with a high likelihood of energy bill savings from installing HP HVAC systems. The campaign will compare the effectiveness of a general message about the efficiency and benefits of heat pumps, to a specific message stating that a customer's energy use indicates their household is a particularly good candidate.

While HVAC incentives were paused in SoCalGas territory in May 2022, the pilot team planned to implement the email campaign in late summer 2022. The team will be able to measure differential open rate of the emails, and the frequency with which customers seek out more information on heat pumps, for example by contacting SCE or visiting the Switch Is On site. The lessons learned from this pilot will provide TECH Clean California and SCE with important information on customer recruitment in advance of any future TECH Clean California HP HVAC incentives being available.

## Quick Start Grants

Along with other TECH pilots, the Quick Start Grant (QSG) program aims to identify and fund targeted, innovative pilots that test approaches to overcome market barriers to heat pump deployment. The QSG program has funding for two solicitations annually. With these, the QSG program aims to promote the development and refinement of interventions that meet our solicitation criteria:

- Test solution to a barrier to residential building decarbonization
- Have the potential to scale up to become statewide solutions
- Ensure feasibility within the budget proposed and can be implemented within one year

The first solicitation sought QSG pilots in the fall of 2021, received 35 grant applications and selected 11 projects for funding. Of the winning projects, 73 percent of overall funding went to projects expected to serve low-income households or historically underserved populations. The projects launched in early 2022. Since then, each of the grants has made progress in hitting individual milestones. Key achievements are outlined in Table 3: Quick Start Grant Milestones.

The second solicitation opened to applications from May 30 – July 31, 2022. Several changes were made to the second solicitation to reflect input from stakeholders as well as the implementation team's experience. These include expanding stakeholder outreach, extending the open time of the solicitation, adding an interview stage for grant finalists, and increasing the focus on projects addressing barriers in historically underserved communities.

**Table 3: Quick Start Grant Milestones**

Primary Implementer	Location	Project Description	June 2022 Project Update
<b>AESC</b>	PG&E territory	Install HPWH in 10 mobile or manufactured homes in high-poverty areas. Study impact on existing HVAC load.	<ul style="list-style-type: none"> <li>Entered into agreement with contractor with experience in manufactured homes installations to help with site selection and installation.</li> <li>Home enrollments beginning.</li> </ul>
<b>Barnett Plumbing</b>	Contra Costa and Alameda Counties	Provide “loaner” gas water heater to customers while infrastructure for fuel switching to HPWH is prepared.	<ul style="list-style-type: none"> <li>Installed 22 HPWH so far using “loaner” approach, on pace with overall program targets.</li> <li>Established marketing campaign advertising benefits of HPWH and TECH Clean California incentives.</li> <li>Continuing to educate customers on benefits of HPWH.</li> </ul>
<b>Bloc Power + City of San Luis Obispo</b>	San Luis Obispo, CA	Retrofit 10-12 affordable multifamily housing units with HPWH and ASHP. Establish Community Advisory Board to engage community members and devise communications plan.	<ul style="list-style-type: none"> <li>Held third Green and Healthy Homes Roundtable (community advisory board) meeting, with steadily increasing diversity of attendees and attendee engagement.</li> <li>Completed building audits with the Housing Authority of SLO.</li> <li>Creating schematic design so contractors can bid on specific retrofit projects.</li> </ul>
<b>Franklin Energy</b>	Northern Bay Area (MCE territory)	Complete home repairs preventing decarbonization in existing Marin Clean Energy (MCE) retrofit program.	<ul style="list-style-type: none"> <li>Proceeding with site selection.</li> </ul>
<b>IHACI</b>	Southern California	Expansion of Visual Service (VS) software, enabling real-time virtual collaboration between master technician and less experienced installer.	<ul style="list-style-type: none"> <li>Provided all diagnostic tools, totaling over \$80,000 in value, to participating contractors.</li> <li>Completed 56 total hours of contractor training.</li> <li>Supporting contractors in the field on over 100 triage calls and 10+ System Performance evaluations.</li> <li>Continuing to improve VS software and correct technical issues.</li> </ul>
<b>New Buildings Institute</b>	Statewide	Field test of emerging 120V HPWH at 32 sites.	<ul style="list-style-type: none"> <li>Procured HPWH for the study.</li> <li>Installations of HPWH at test sites have begun.</li> <li>Team is applying learnings from installation space constraints and contractor unfamiliarity with the equipment.</li> </ul>

Primary Implementer	Location	Project Description	June 2022 Project Update
<b>Redwood Coast Energy Authority</b>	Humboldt County	Expand ASHP incentive program to rural and Native American communities on unregulated fuels.	<ul style="list-style-type: none"> <li>• Currently focused on customer outreach and finding contractors to partner with.</li> <li>• Planning to begin installing equipment in Summer 2022.</li> </ul>
<b>Revalue.io Green and Healthy Homes</b>	West Oakland, CA	Remediate home health hazards or code violations in multifamily affordable housing through electrification.	<ul style="list-style-type: none"> <li>• Identified over 100 potential properties and have 12 letters of intent to conduct energy assessments.</li> <li>• Completed Building Electrification Contractor Training Curriculum.</li> <li>• Signed agreements with PG&amp;E and independent instructors.</li> <li>• Secured a contract for onsite demonstration training heat pump equipment.</li> </ul>
<b>Small Planet Supply</b>	Delano, CA	Install packaged, natural refrigerant central heat pump boiler in a 40-unit low-income farmworker community.	<ul style="list-style-type: none"> <li>• Central HPWH systems have been fully designed and assembled and are ready to be shipped to site and installed.</li> </ul>
<b>The Energy Coalition</b>	Bassett and Avocado Heights, CA	Incorporate HPWH into a CEC-funded solar + storage pilot in an LMI advanced energy community. Study the impact of solar on post-electrification energy bills.	<ul style="list-style-type: none"> <li>• Actively attending dozens of public outreach events at parks and schools each month to recruit program participants.</li> <li>• Conducting existing water heater inspections for potential HPWH customers.</li> <li>• Completed the Home Energy Assessment methodology and site assessment and electrification checklist.</li> </ul>
<b>USGBC-LA</b>	Eastern San Fernando Valley, CA	Install HPWH and ASHP in 10 naturally occurring affordable housing (NOAH) units. Add heat pumps to education and outreach program.	<p>Have received first signed Project Development Agreement and completed a walkthrough of the client's property to complete the first Building Specific Plan. Pursuing second Project Development Agreement with partner LA Family Housing. Engaged several other property owners who are interested in Green Affordable Housing Program offerings.</p>

## Looking Ahead

As the pilots and Quick Start Grants are completed, the TECH team will develop recommendations and explore activities to scale successful pilots and grant projects statewide. Furthermore, data gathered from the resulting installations will be incorporated into the data pipeline that feeds the public reporting website and meter-based analysis.

**PILLAR THREE:**

# Informing Long-Term Building Decarbonization Framework

The third pillar of TECH Clean California is taking lessons learned from year one implementation to inform and focus an improved long-term building decarbonization framework. While California has historically been a leader in investing in building decarbonization, the Inflation Reduction Act is set to infuse approximately \$300 billion into energy and climate reform measures, including \$9 billion for rebates on efficient equipment – including HP HVAC and HPWH – and corresponding contractor training and education. The information gained from TECH Clean California will be invaluable in guiding other programs within California and nationwide as others create their own programs in response to the Act.

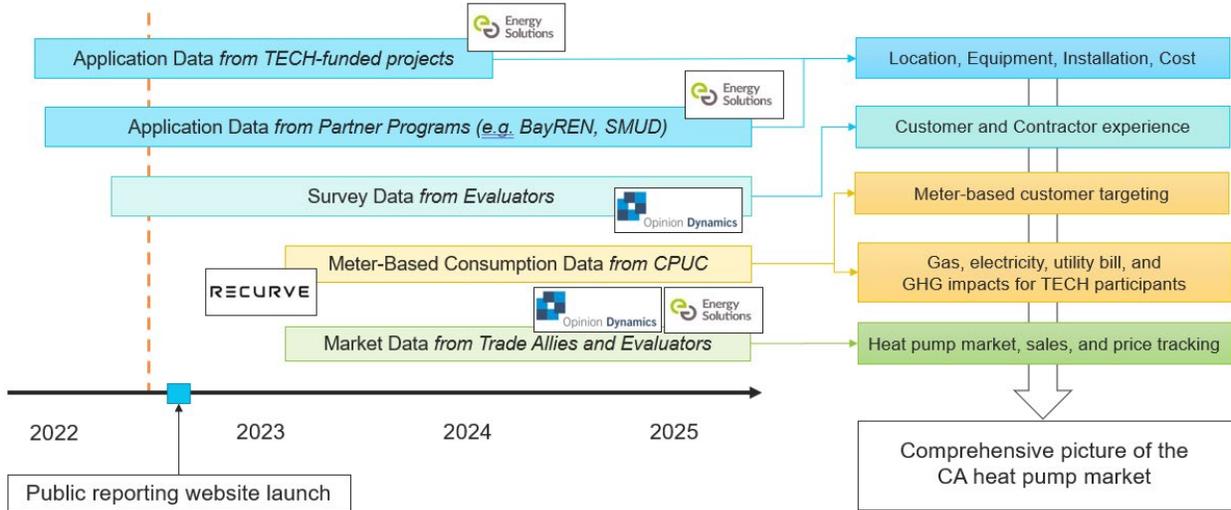
To achieve the goal of this pillar, the TECH team will analyze the collected data, review the gained experience, and make the findings known to key decisionmakers through public reporting and policy advisement.

## Public Reporting

The vision for TECH Clean California public reporting is to bring a variety of data sources together and layers them into a robust and scalable data pipeline that offers novel visibility into the California heat pump market. In the first year of implementation, the TECH team focused on building a core infrastructure to collect useful, actionable data.

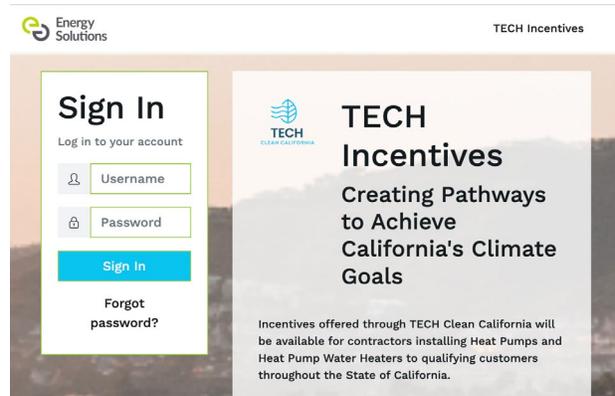
*First-year accomplishments include:*

- Building a robust incentive application data collection pipeline in Energy Solutions' Iris platform
- Unlocking access to historical meter data via CPUC to measure key participant outcomes
- Launching the public reporting website to collect data and key findings, including anonymized project-level data and evaluation data starting July 2022



**Figure 16: TECH Clean California data timeline**

The primary data pipeline starts with the Incentive Clearinghouse, where contractors submit incentive applications and data about project installation. An early focus area has been to outfit the Incentive Clearinghouse with all the features needed to fulfill TECH Clean California's ambitious goals — programs for two distinct technologies, each with high data quality requirements, and each capable of layering with other partner programs while making the combined incentive consistent enough for contractors to understand and predict. Once this functionality was in place, it was possible to quickly deploy incentives for thousands of projects over just a few months, layered with four partner programs, each with a distinct layering structure. The Incentive Clearinghouse can continue to serve as a processing and layering center for new incentive programs anywhere in the state.



**Figure 17: Screenshot of Incentive Clearinghouse homepage**

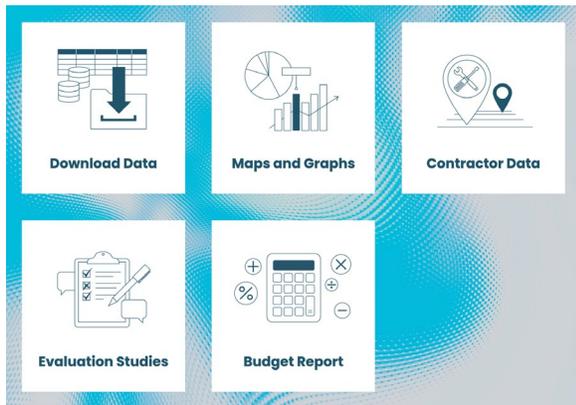
Meanwhile, the TECH team worked with CPUC to gain access to statewide residential historical electricity and gas meter data to understand the impacts of heat pump installations on the utility bills and GHG emissions of TECH Clean California participants. After collaborating with CPUC to resolve unforeseen legal barriers preventing the TECH team from accessing the necessary meter data, the TECH team was able to start auditing the database that stores statewide residential electricity and gas meter data. The TECH team has started building a baseline understanding of residential gas and electricity consumption throughout the state and using this data to inform customer targeting and regional pilots. Meter-based results for TECH Clean California participants will become available starting one year after heat pump installation – Q3 2023 for most TECH Clean California participants.

Finally, the TECH team has established regular data exchange with our evaluators, Opinion Dynamics, to further our understanding of customers' and contractors' experience with TECH Clean California and heat pumps in general. We are also working on data sharing arrangements with key market actors to obtain sales and product price data for the overall California heat pump market. Given the importance of this data to these companies' business models, traction on this is still in progress and obtaining the data requires persistent and attentive negotiation.

With a data pipeline built atop the Incentive Clearinghouse, and integrated meter-based impacts and TECH Clean California participant surveys, the TECH team will publish data-driven insights that catalyze market transformation. These will be hosted on our public reporting website, ([www.techcleanca.com](http://www.techcleanca.com)), which launched in July 2022. Hosting downloadable data and interactive data visuals, the public reporting site makes data engaging and impactful for both casual visitors as well as researchers. The site currently hosts application data from the several thousand market rate single family projects that received TECH Clean California incentives since December 2021, and this data is updated monthly as more incentives are paid.

## Looking Ahead

During the next year of TECH Clean California implementation, the focus of data reporting efforts will shift from building new infrastructure to scaling and improving. We will increase the depth and breadth of the TECH Clean California data available as well as develop analyses critical for future statewide decarbonization policies and investments. Our goal is to make application data and meter-based results for every TECH-funded project easily accessible and comparable in



**Figure 18: Screenshot of techcleanca.com Public Data page**

one place to showcase important differences between the various TECH Clean California programs, such as single family versus multifamily projects. In addition to public data, the TECH team has also initiated a process of customized quarterly reporting for key heat pump manufacturers, giving them critical insight into TECH Clean California participation. Manufacturers are just one key consumer of TECH Clean California data, though, and it will be critical for the TECH team to strategize where and how we focus our analysis and outreach to meet the most important needs for decarbonization policymakers and investors.

## Policy Advisement

Over the course of the initiative, the policy team has collaborated with decarbonization stakeholders — including utilities and program administrators, researchers, state agencies, nonprofit organizations, advocates, community-based organizations, and other key decisionmakers — to ensure they have access to relevant TECH Clean California data, analysis, and lessons learned to-date.

The first task of the policy advisement team was to identify the stakeholders and decision-makers most likely to benefit from TECH Clean California data. Since the fall of 2021, TECH Clean California has met with more than 30 different stakeholder organizations, including state and regional governmental agencies, focusing on how TECH data and insights can support important analysis and inform policy as part of the state's larger building decarbonization framework. Having introduced TECH Clean California and its data generation and analysis framework to a wide variety of stakeholders, TECH Clean California is currently working through a rotating schedule of follow-up meetings with existing stakeholder groups to make sure that they stay informed.

The TECH team is tracking more than a dozen regulatory proceedings for issues or questions that may benefit from TECH data. Our goal is to provide written comment only when TECH Clean California can offer unique data or insights that are not likely to be provided by other parties, or if there are key decisions that may directly impact the TECH initiative. This included multiple comments in the CPUC Clean Energy Finance proceeding that have been necessary to authorize TECH Clean California tasks, namely our CAEATFA finance partnership and our inclusive utility

investment pilot. The purpose of these comments was to provide regulators with information around relevant technologies, markets, and program design based on experience from the TECH Clean California initiative. The TECH team produced summaries of final decisions in these key proceedings and written or verbal comments from the team are listed in Table 4: Comment Letters from TECH Clean California.

**Table 4: Comment Letters from TECH Clean California**

CPUC	
Building Decarbonization Proceeding	A. 19-01-011
Affordability Proceeding	R. 18-07-006
Emergency Summer Reliability	R. 13-11-005
Self-Generation Incentive Proceeding	R. 20-05-012
Clean Energy Financing Rulemaking	R. 20-08-022
CEC	
Integrated Energy Policy Report	21-IEPR-06

Finally, the TECH team has attended conferences and related industry events to disseminate data and insights from the initiative. TECH Clean California participation focuses on California audiences, but the principles and lessons-learned have broader application, and the TECH team has prepared whitepapers and presented at events such as the California Association of Building Energy Consultants (CABEC) Conference, the National Home Performance Conference, and the American Council for an Energy-Efficient Economy (ACEEE) Summer Study. As we begin to gather and analyze additional statewide and pilot data, this activity will become more significant.

# Conclusion

TECH Clean California's mission is to transform the heat pump market, drive market adoption, and contribute to the achievement of California's goal of six million installed heat pumps and carbon neutrality by 2045. As of August 2022, over 20,000 units have been submitted through the TECH Incentive Clearinghouse. Looking forward, the TECH team will continue to expand on year one achievements and utilize the lessons learned to guide future decisions.

## Year One Key Takeaways



### Pillar One:

- There is much more contractor interest than originally anticipated and the initiative must be prepared to support even higher levels of participation, emphasizing the importance of streamlining application processing times, participation, quality acceptance/quality control rules, and contractor engagement.
- There is clear value in having comprehensive, easy-to-understand program information and contractor training materials available through a centralized source.
  - Uniform, consistent TECH incentives statewide are easier to understand than trying to flatten the total incentive amount based on other offerings because other programs may continually change, are unknown to contractors, or have varying requirements that make it difficult for contractors to participate.
  - While TECH can increase education and influence partner programs, other program administrators will have their own goals that will lead to different qualifications in those programs and TECH.
- Based on rapid participation growth, contractors are ready to support the installation of HP HVAC statewide. However, there are additional opportunities to increase quality installation measures, such as performing Manual J calculations, and we can collect and analyze the meter data results to inform future program design.
- Contractors in areas of Northern California where robust HPWH programs have operated for several years are well-educated and ready to support greater HPWH adoption, while contractors in other areas of the state remain in need of HPWH education and experience.
- Communication around incentive budgets for specific offerings needs to be centralized, clearly communicated, and proactively communicated through multiple forms of communication.



### Pillar Two:

- TECH Clean California is well positioned to provide support to existing project financing programs by filling gaps in funding and collaborating to create a more comprehensive offering.

- The pilots, although still early in their deployment, represent effective efforts for understanding and mitigating market barriers.
  - New Federal funding through the Inflation Reduction Act and access to bill impacts data for low-income pilot installations will expand opportunities and understanding of impacts for low-income customers that can help pilots further scale.
  - More assistance than loan loss reserves will need to be given to expand Tariff-on-Bill offerings
  - The first round of annual pilot results will be compiled in Q3 2023 and will be incorporated into the broader initiative as applicable.
- The first round of Quick Start Grants has yielded varying levels of success, providing important lessons learned that can be used to inform both future program design and the second-round solicitation taking place in Q3 and Q4 2022.
  - Additional funding could be used to expand successful Quick Start Grants, into larger pilots.

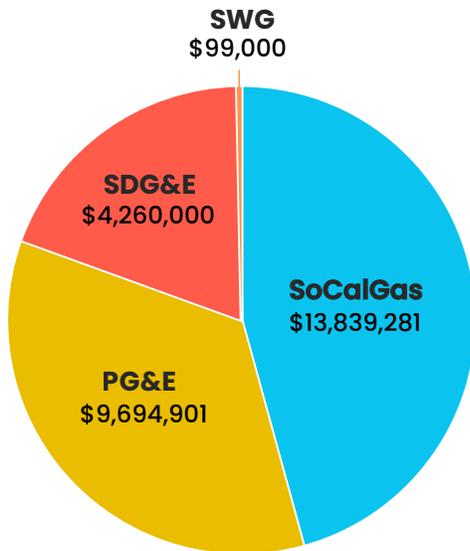


### **Pillar Three:**

- Comments on regulations have helped to inform decisions on five CPUC proceedings, and one CEC proceeding.
- TECHCleanCA.com has launched and has received heavy interest from many organizations that are looking to this data to inform future program developments and understand developments.
  - Insights from the public reporting website should keep downward pressure on HP installation costs, where the public now has visibility into average costs of installations.
  - The website’s format is easily scalable to integrate new types of data and learnings from TECH implementation, and the site is already slated to integrate at least four new webpages and multiple new types of data, like survey results and pilot progress reports.
  - The TECH policy team has proactively engaged multiple key policy stakeholders like the CEC, California Air Resources Board, and utility-sponsored 2025 Title 24 building codes and standards enhancement team to walk through the site and solicit feedback on potential updates and additions.
- Contracting, establishing data security, and coordinating data platforms to secure metered data is challenging but can be done and will lead to highly anticipated data analysis.
  - Analysis of metered data will be crucial to shaping future recommendations for incentives, installation best practices and add on incentives, workforce education and training activities, impacts to low-income customers, and future regulatory decisions.
  - Bill impacts for low-income customers is of particular importance as we seek to understand under what conditions these customers can achieve positive bill savings and help alleviate their energy burden.
  - Metered data analysis will be publicly available when complete.

# Appendix A: Single Family HVAC

June 2021-August 2022



**Figure 19: Single family HVAC incentives**



**Figure 20: Participation by county (single family)**

**Table 5: Additional Installation Components**

Installation Component	Percentage of Total
Ducts sealed/replaced	15%
Manual-J completed	7%
Full system performance test	3%
Smart thermostat included	44%

**Table 6: Furnace Settings Post-Installation**

Furnace Setting After Install	Percentage of Total
Decommissioned	88%
Setup as blower only	<1%
Emergency backup only	11%

**Table 7: Installed Unit Efficiencies**

Efficiency	Percentage of Total
< 16 SEER	26%
16 – 18 SEER	48%
> 18 SEER	25%

# Appendix B: Single Family HPWH

June 2021-August 2022

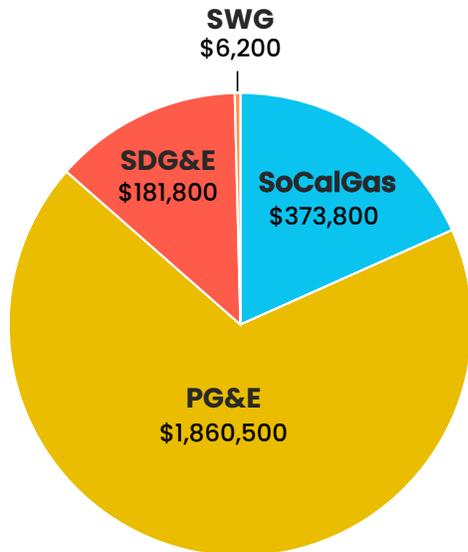


Figure 21: Single family HPWH incentives

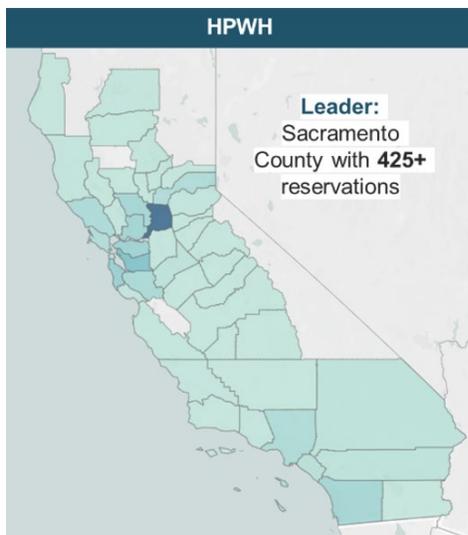


Figure 22: Participation by county (single family)

Table 8: Breakdown by Uniform Efficiency Factor (UEF)

UEF	Percentage of Total
3.00–3.50	56%
3.50–3.99	38%
4.00+	6%

Table 9: HPWH Breakdown by Capacity

HPWH Capacity (gallons)	Percentage of Total
40	3%
50	68%
65	18%
80	10%

Table 10: HPWH Breakdown by Previous Fuel Type

Previous Fuel Type	Percentage of Total
Natural Gas	95%
Electric Resistance	3%
Propane	2%

Table 11: Breakdown Electric Upgrades

Installation Component	Percentage of Total
Thermostatic Mixing Valve	59%
Water Heater Upsized	62%
Panel Upgrade Required	10%
80	10%

# Appendix C: Multifamily

June 2021-August 2022

**Table 12: Multifamily Reservations by Building Type**

Building Type	Percentage of Total Reservations
DAC	55%
Affordable Housing	56%

**Table 13: Multifamily HPWH Units by Type**

Measure	Total Units Served	Properties	Percentage of Total
In-apartment HPWH	2,389	25	20%
Central HPWH	3,709	42	31%

**Table 14: Multifamily HP HVAC Units**

Measure	Total Units Served	Properties	Percentage of Total
Individual Apartment HVAC	4,672	44	39%
Central HVAC	204	3	2%

**Table 15: Multifamily Apartment Upgrades**

Measure	Total Units Served	Properties	Percentage of Total
Individual Apartment Electrical Upgrades	974	20	8%