

Engaging Contractors: a Critical Partner to Realize the Load Shifting Potential of HPWHs

Emily Kehmeier, Energy Solutions

Christine Riker, Energy Solutions

JJ Vandette, VEIC

Nick Dirr, Association for Energy Affordability

ABSTRACT

TECH Clean California is designed to greatly increase the installations of heat pump technologies for space and water heating in residential buildings across California by catalyzing the supply chain with incentives and training. As heat pump water heaters (HPWHs) installations replace gas loads with electric loads, it is important for these units to be grid-interactive¹ so their thermal energy storage capabilities are harnessed as a load-shifting resource to help balance the grid rather than adding strain to the grid.

The TECH Market Readiness for HPWH Load Shifting Pilot (“the Pilot”) aims to do just that by testing the hypothesis that contractors will be critical market partners in facilitating grid connection during the time of installation, provided that they receive effective outreach and interventions.

The pilot team and paper authors bring years of experience designing and implementing a wide variety of demand response and grid-interactivity pilots and programs; and have harnessed that experience as well as literature reviews, market research, contractor feedback, and collaboration with industry experts to design and launch the Pilot, and develop strategies and collateral for contractor engagement.

Introduction

With large quantities of behind-the-meter renewables, especially solar, continuing to be installed; the energy industry is anticipating that the “duck curve”—where net load is lower in the midday (when solar power is being generated) with a steep ramp up after sunset—will create new grid balancing challenges. This issue could be further exacerbated as home and building owners replace gas-fired water heaters with HPWHs, amplifying the imbalance in net load. To help address this issue, HPWHs can be configured to respond to grid needs by connecting to and participating in a demand response (DR) program or aligning HPWH operation with a time-of-use (TOU) rate schedule. Both of these methods of configuring the HPWH to help address grid imbalances are also beneficial to the electric TOU rate customer because electricity usage is reduced during the most expensive hours.

¹ When using the term “grid-interactive” in this paper, the authors are referring to a HPWH that provides demand flexibility to the grid while co-optimizing for energy cost, grid services, and occupant needs and preferences. This is based on the LBNL GEB Roadmap definition of “Grid-interactive efficient building (GEB): An energy efficient building that uses smart technologies and on-site DERs to provide demand flexibility while co-optimizing for energy cost, grid services, and occupant needs and preferences in a continuous and integrated way. (LBNL 2021)”. The authors of this Pilot paper consider “grid-interactive” as one step beyond “grid-connected”, which the authors use to refer to a HPWH that is connected to home wifi and capable of providing demand flexibility but not yet fully enabled to do so (via program enrollment or JA13 programming, for example).

HPWHs are uniquely suited to become a grid resource rather than a grid stressor by providing thermal energy storage and grid interaction. Previous research has demonstrated significant technical potential for load shifting with water heating. A study by Bonneville Power Administration (BPA 2018) demonstrated average energy reductions of 222 – 512 Watt-hours per HPWH through load shifting strategies (varying by time of day and season). The PG&E WatterSaver Beta program demonstrated nearly 59% reduction of peak demand in efficiency-only mode, and about 68% reduction in efficiency-plus storage mode compared to uncontrolled HPWHs – an average of 150 Watts and 174 Watts respectively (DSA 2021).

The main barriers for harnessing the load shifting capabilities of HPWHs in aggregate are the low market saturation of HPWHs and the even lower portion of HPWHs which are configured to be grid-interactive. To address the former, TECH Clean California is a program tasked with increasing the number of installations of HPWHs in California. As part of this effort, the TECH Market Readiness for HPWH Load Shifting Pilot (“the Pilot”) will engage contractors serving the San Francisco Bay Area to integrate DR program enrollment – specifically, PG&E’s WatterSaver load shifting pilot – and thermostatic mixing valves (TMVs) into their sales and installation process. Contractors will receive targeted outreach, incentives, and the training and education needed to support these additional installation practices.

The main strategy of the Pilot is to engage contractors who are already motivated to take advantage of substantial TECH HPWH incentives and to make it simple and valuable for them to receive the additional incentives for mixing valves and WatterSaver enrollment. Pilot outreach and education to contractors is focused on communicating the added value they can bring to their customers by installing mixing valves and enrolling customer HPWHs in WatterSaver.

Throughout the two years of the Pilot, the Load Shifting Pilot Team (the Pilot Team) will gather contractor feedback and monitor installation progress to understand the barriers that contractors face along with the support and interventions needed to resolve those barriers. The Pilot will also build a dataset of HPWH performance to assess the energy impacts of TMV installation and DR enrollment. The Pilot will compile lessons learned to scale a statewide strategy for DR enrollment and TMV inclusion in California.

The remaining subsections of this introduction describe the partners and collaboration approaches of this Pilot, including the overarching TECH Clean California initiative, WatterSaver, the BayREN HPWH program, and the PG&E Midstream HPWH Study and Field Test. Additionally, the Next Steps section highlights a significant shift in strategy and focus for the Pilot Team since the paper was first accepted, due to the external forces. This paper for the most part describes the Pilot as designed and implemented before these external forces arose, but the Next Steps section describes the shifts.

TECH Clean California

The central design of the Pilot – engaging contractors to increase HPWH grid interactivity through simple actions at the time of installation – is made possible by the TECH initiative which creates a fertile ground for contractor engagement.

TECH Clean California is a \$120 million statewide initiative designed to accelerate the adoption of efficient electric space conditioning and water heating technology across California—a significant source of the state’s current carbon footprint. The initiative was developed as part of California Senate Bill 1477 and is funded by California gas corporation ratepayers under the auspices of the California Public Utilities Commission. It provides market incentives and workforce education and training to make it easier and more profitable for

contractors and distributors to stock, sell, and install heat pump technology for residential replacement projects. TECH Clean California is designed to both support existing incentive programs, through layered funding, and to extend incentives statewide with an emphasis on access for low-income and disadvantaged communities, to help meet California's goal of being carbon-neutral by 2045.

In addition to statewide incentives and training, TECH Clean California is conducting regional pilots aimed at testing scalable solutions to market barriers preventing widespread and equitable adoption of heat pump technologies. Increasing the market uptake of grid-interactive HPWHs and participation in load shifting and DR programs is one of the market barriers that the TECH pilots aim to address.

The Pilot Team has access to direct touchpoints (e.g., newsletters, trainings, incentive processing, etc.) with all contractors enrolled in TECH; contractors who are already actively interacting with the initiative due to the substantial \$3,100-\$6,600 incentives per HPWH. As of May 13, 2022, 927 contractors had enrolled². Enrollment began in September with a strong level of interest starting in December 2021 and rapidly scaling. 193 of these contractors are based in the San Francisco Bay Area and install HPWHs – and are therefore eligible to participate in the Pilot.

WatterSaver

PG&E's WatterSaver Program (www.watter-saver.com) is a residential load-shifting program for grid-connected water heaters. The March 2022 launch marks the first official year of the program, following a beta test in 2019 and 2020. PG&E electric customers or Community Choice Aggregation (CCA) customers in PG&E service territory with a grid-connected water heater can enroll in WatterSaver. WatterSaver optimizes the operation of the connected water heaters on a daily basis to avoid energy use during the TOU 4-9pm peak period and takes advantage of discounted electricity all other hours, with an intent to avoid sacrificing comfort. WatterSaver enrollment is simple, and the fact that it is open to bundled and direct access customers across PG&E's service territory means there is high potential to scale lessons learned beyond the San Francisco Bay Area to enable widespread enrollment.

The Pilot is partnering closely with WatterSaver as the eligible DR program for contractors to enroll customers and earn enrollment incentives. The Pilot Team and WatterSaver team have set up a data sharing agreement so that enrollment in WatterSaver can be confirmed by a TECH claim processing team member to approve the contractor enrollment incentive adder. While this arrangement was not easy to implement, it allows for verification of enrollment without slowing the HPWH incentive review and incentive payment to the contractors.

WatterSaver and the Pilot have distinct, complementary goals, and the lessons learned from each will serve to move the HPWH market forward. WatterSaver will focus on managing the details of the load shifting control strategies of the HPWHs and the corresponding analysis, as well as customer incentives for enrollment. However, WatterSaver will not have the resources to properly engage contractors for customer enrollment in the program, nor does it have the direct contractor touchpoints. Engagement with contractors is, however, a key focus of the Load Shifting Pilot. To achieve the WatterSaver goals of 2.5MW of load shifting capacity and 5,000-

² Enrollment data is provided as of May 13, 2022, because this is the last day that TECH incentives were available statewide before the budget in PG&E territory was fully subscribed. This is discussed in more details in the Next Steps section of this paper.

9,000 enrolled units, WatterSaver is planning to collaborate with HPWH incentive programs as an enrollment pathway since it is not offering incentives for the HPWH itself, and the partnership with this Pilot presents an opportunity for both teams to collaborate in creating lessons learned for implementing a HPWH incentive program to DR enrollment pathway statewide.

BayREN Midstream HPWH Incentive Program

The Pilot is also collaborating with the BayREN HPWH Contractor Incentive and BayREN Home+ program teams. The BayREN HPWH and Home+ programs offer \$1,000 - \$2,000 per HPWH depending on the county.

The [Bay Area Regional Energy Network \(BayREN\)](#) is a coalition of the San Francisco Bay Area’s nine counties — a network of local governments partnering to promote resource efficiency at the regional level (BayREN 2022). Starting with the December 2021 launch of TECH statewide incentives, BayREN and TECH were officially integrated to provide “Enhanced” HPWH incentives throughout the nine Bay Area counties. In contrast to the “Baseline” HPWH incentives of \$3,100 (for gas replacement) and \$1,000 (for electric replacement) available statewide (where a local program has not integrated with TECH), the following incentive levels listed in Table 1 were available in the Bay Area (specifically the nine BayREN counties) and other Enhanced HPWH regions through:

Table 1 Enhanced heat pump water heater incentives³

Replacement Scenario	Measure Criteria	Total Incentive Per Unit (TECH + Local Program)
Gas/propane to HPWH	HPWH < 55 Gallons	\$3,100
	HPWH > 55 Gallons	\$3,800
Electric resistance to HPWH	All HPWH sizes	\$1,500
Panel upgrade/load center expansion	Sizing up to 200amps	\$2,800

CCAs in BayREN territory have all expressed strong interest for HPWHs installed in their territory to be configured to follow TOU rates and/or enrolled in a DR program. The BayREN incentive teams provide advice as well as contractor outreach support because they have experience and strong contractor touchpoints from years of offering HPWH incentives.

PG&E Midstream HPWH Study and Field Test

The PG&E Midstream HPWH Study and Field Test is currently underway, with the goal of building upon knowledge gained during the WatterSaver Beta Test. It includes a market assessment of HPWH supply chain actors, and a field test of strategies to engage distributors to accelerate the adoption of connected HPWHs for load-shifting. The main collaboration between

³ As of May 13, these incentives are revised. Incentives have moved to a flat structure statewide without Baseline and Enhanced regions. There is no longer a panel upgrade incentive provided by TECH nor differentiation between tank sizes, and there is only \$1,000 for electric resistance to HPWH. Details of the current incentive structure are shared at www.switchison.org/contractors/incentive-resources. More context on these updates is shared in the Next Steps section of this paper.

the PG&E Midstream HPWH Study and Field Test and this pilot is information sharing – both are conducting outreach to the market regarding barriers to and strategies for increasing the installation and enablement of grid-connected HPWHs. Additionally, the two teams coordinated during the design phase to ensure comprehensiveness of interventions without overlap. For example, the PG&E Midstream HPWH Field Test offered an incentive for TMVs at the distributor level outside of the BayREN territory, while this Pilot will be offering an incentive for TMVs at the contractor level only in BayREN territory. This will allow both efforts to test two different strategies on the best target in the supply chain for increasing the market uptake of TMVs.

Pilot Goals

The primary goal of the Pilot is to effectively engage contractors to play a critical role in enabling HPWH load shifting by enrolling customer HPWHs in WatterSaver at the time of installation, and to later scale lessons learned statewide. The high-level hypothesis behind the Pilot is that contractors will be critical market partners in facilitating grid connection during the time of installation, and the Pilot Team hopes to understand which contractor engagement tactics are most effective.

Through the two years of the Pilot, the Pilot Team will work to engage as many Bay Area contractors as possible to include program enrollment in their installation process. The team will gather contractor feedback and monitor installation progress with the goals of understanding and overcoming the barriers contractors face for program enrollment and understanding the relative efficacy of various interventions offered through the Pilot. The Pilot Team will compile lessons learned to inform a statewide strategy for load shifting and DR program enrollment, with a focus on how to apply lessons learned to TECH contractor engagement statewide in subsequent years of the initiative.

In addition to the goals of testing and identifying effective contractor engagement strategies to inform a statewide strategy, the Pilot also aims to build upon several previous studies in California and other states that have demonstrated the load shifting potential of controlled HPWHs with empirical data (BPA 2018), (DSA 2021). So far, these prior efforts have not demonstrated load shifting effects at scale – 60 HPWH units at most. This pilot, working with TECH Clean California, aims to build a significantly larger dataset of HPWHs undergoing load shifting to analyze the effects on GHG emissions, HPWH efficiency, customer bills, and energy savings.

Research Questions

As a pathway to achieving pilot goals, the Pilot Team has defined the following research questions:

- How do the following strategies (including in combination) influence enrollment in a DR program and the installation of a TMV on HPWHs?
 - Contractor incentives for customer enrollment in PG&E’s WatterSaver program
 - Thermostatic mixing valve incentives
 - Outreach and training and educational materials for contractors
- What kind of training and educational materials are needed for contractors and for contractors to provide to customers?

- Why do contractors currently install HPWH without TMVs and/or third-party DR program enrollment? Do they have any concerns? What are the primary knowledge gaps?
- What is a sufficient incentive amount to motivate contractors to facilitate enrollment in a third-party DR program?
- What is a sufficient incentive amount to motivate the installation of TMVs with a HPWH?
- What are the energy impacts of enrollment in WatterSaver? How does the inclusion of a TMV affect those impacts?

Market Barriers

To increase success in achieving the Pilot goals, the Pilot Team is tracking the market barriers for DR enrollment and/or TMV installation at the time of the HPWH installation. These barriers, listed below, are gathered from experience with prior programs and pilots including the WatterSaver Beta Test which provided preliminary results on barriers and lessons learned on HPWH market adoption, installation challenges, and connectivity challenges (DSA 2021).

- Contractor concerns and lack of awareness about the benefits and customer value proposition of load shifting
- Consumer concerns about privacy, security, and performance with grid connected HPWHs
- Contractor educational gaps around TMV installation, grid connectivity, upsizing HPWHs
- Difficulty of obtaining CTA-2045 modules needed to enroll in third-party DR programs, such as WatterSaver
 - Rushed timeline of replacement of equipment at end-of-life makes it difficult to prepare for a proper grid-connected installation in the case that add-ons are needed
- Connectivity challenges (ex: Wi-Fi connection) and customer interactions (ex: finding SAID on electric bill) waste precious time and distract from contractors' core business of installing equipment

The Pilot Team will engage with contractors to address these barriers and identify additional barriers. Various aspects of the Pilot and WatterSaver approaches have already been informed by awareness of these market barriers. For example, the Pilot Team, in collaboration with WatterSaver, has created contractor educational materials which explain the concept and importance of grid-interactivity, and the value propositions for customers. Additionally, the Pilot Team created a double-sided sheet with talking points for contractors to help describe WatterSaver and address potential customers concerns (e.g., performance, TOU rates, etc.). To address the Universal Communication Module (UCM) barrier, WatterSaver offers an option for contractors to enroll the unit in WatterSaver even if they do not have a CTA-2045 module or other required add-on at the time of installation; WatterSaver will deliver the module to the customer free of charge. WatterSaver will proactively equip contractors with the modules they need in advance of jobs to make the customer experience as seamless as possible.

Pilot Design

Approach

In the initial design stages, the Pilot Team defined pilot parameters in terms of eligible geography (BayREN counties) and eligible grid-interactivity approach (WatterSaver enrollment) to focus the scope of the Pilot.

The Team carefully considered how to balance a wide range of potential research questions, approaches to grid interactivity, and pilot parameters with the need to dedicate resources to engage with contractors to gather feedback and create lessons learned. Early-on in the Pilot timeline, the Team reviewed prior studies and documented the following relevant findings:

- Thermostatic mixing valves cost approximately \$100 and are not expected to add a significant labor cost if they are installed along with the HPWH plumbing system at the time of installation (VEIC, Energy Solutions 2019).
- Larger tank sizes with higher setpoints (enabled by TMVs) are best suited for load shifting (AEA 2021).
- Maintaining the HPWH setpoint at 135 degrees Fahrenheit can increase the load shift/shed potential by between 100 – 600 Watts (BPA 2018).
- A simulation study showed that a 135-degrees Fahrenheit tank setpoint is optimal for load shifting, allows for shifting all but 1% of HPWH load off-peak, and also saves customers 10-19% on their bills on a hypothetical TOU rate (Delforge 2018).

The Team also reached out to HPWH manufacturers and other industry experts about questions that could inform the Pilot design. For example, the Team asked manufacturers about the feasibility of confirming when a HPWH is set to follow TOU rates via Title 24 Joint Appendix JA13 (JA13)⁴ programming, and the Pilot Team learned that this programming can be enabled via a cloud connection to the manufacturer’s logic, or natively. The manufacturer would only be able to confirm whether JA13 programming had been completed via cloud connection, and even this approach could spur questions of data sharing and privacy.

Contractor Survey

Once the pilot scope was defined, the Pilot Team turned to refining design details such as the level of incentive to offer for TMV inclusion and WatterSaver enrollment, and which educational materials to prioritize. The Pilot Team first created hypotheses about effective approaches and then sent a survey out to Bay Area contractors to get input on the tentative pilot design details. This was a limited information gathering effort, but the results are interesting, nonetheless. Generally speaking, the Team’s hypotheses about incentive levels and education were confirmed. The following are a distillation of key questions and takeaways from the survey, which helped confirm the pilot design as well as raise other issues for the Pilot Team to keep in mind.

⁴ [Joint Appendix JA13](#) was approved by the CEC in August 2020 and provides the qualification requirements for a HPWH demand management system to meet the requirements for the optional HPWH demand flexibility compliance credit in Title 24. At a high level, JA13 requires installation of a TMV, minimum efficiency of NEEA Tier 3 V7.0, capability to store at least 5 TOU rates with local and remote set up options, and a variety of demand management response capabilities.

Table 2 Contractor survey questions, answers, and key takeaways

Question	Summary of Answers and Takeaways
Approximately how often do you include TMVs with water heater installations?	~50% of respondents install TMVs for every HPWH installation; the remaining were split between 0% and 25% of the time.
Why do you install TMVs in some locations and not others?	Reasons given (rebates, making up for inability to upsize) indicate that both education on the importance (safety, load shifting) and incentives will likely have an impact on increasing installations.
What level of incentive, per TMV, would be necessary to motivate your installers to add TMVs on all HPWHs?	Most common answer \$200. Average amount: \$162. Pilot amount set at \$200.
Do you or your installers ever connect HPWH to the home Wi-Fi? If so, why?	Nearly 50% of respondents connect the HPWH to home Wi-Fi during installation, which means they are capable of completing WatterSaver enrollment; after establishing a Wi-Fi connection, enrollment should take roughly 10 minutes.
Are you familiar with the California Title 24 Building Standards Code, Joint Appendix 13 (JA-13) specification for HPWHs?	Over 50% of contractors indicated familiarity with Title 24 Joint Appendix 13 (JA13), but only one contractor enables it.
Do you or your installers ever set up the HPWH to follow a Time of Use (TOU) rate? If so, why?	
If it takes less than 30 minutes for the installer to enroll the customer in WatterSaver at the time of installation, what kind of incentive would be necessary for you or your installers to do so?	Most common answer: \$75. Average amount: \$63. Pilot amount set at \$50.
<p>What kind of support/info/training from TECH would be useful to support installers to enroll customers in WatterSaver?</p> <ul style="list-style-type: none"> • WatterSaver flyers to provide to the customer • Education on how to communicate to customers about WatterSaver • Training for installers on how to complete the WatterSaver enrollment • Technical training on TMV installation (TMVs are required to receive the enrollment incentive) 	Just over 50% of contractors selected the first three options, and just under 50% selected the 4 th option.

Key Pilot Design Details and Logic

Load Shifting Pilot Incentive Requirements

- 1 HPWH must be installed in **single-family homes in BayREN territory**
 - 2 **Thermostatic mixing valve (TMV) must be installed** with the HPWH to earn the TMV incentive
 - 3 Contractor must **enroll the customer in WatterSaver** at the time of HPWH installation **and install a TMV** to earn the enrollment incentive
- Any contractor enrolled in TECH Clean California can receive these extra incentives if installing units in single-family homes in BayREN territory**



Figure 1. Summary of Pilot incentive requirements. This is an excerpt from the Pilot onboarding training which will be required for all contractors who install HPWHs in the Bay Area.

Limit the geographic scale of the pilot to installations in the Bay Area only. This allows the Pilot Team to focus on a smaller group of contractors for close engagement and feedback. Additionally, Bay Area contractors are already familiar with and engaged with HPWH and incentives through BayREN – the load shifting education and incentives is just one added layer. There is a greater risk of information overload for contractors outside of the Bay Area who are newer to incentive programs and these contractors could potentially disengage from TECH Clean California entirely if the additional Pilot layers are introduced at the same time as bringing them on board with all the other new TECH Clean California information.

Limit the grid-interactivity strategy to WatterSaver DR approach. Though there are grid-interactivity methods which would be interesting to study (JA13, other DR programs), focusing on one way to earn an enrollment incentive allows for a simpler message to contractors and allows the Pilot Team to focus on a limited set of variables at the onset of the pilot. Additionally, Ecotope conducted laboratory simulations of JA13 grid benefits (Ecotope 2018), but there has been no empirical data published which quantifies the load shifting potential of harnessing JA13 capability to set HPWHs to follow TOU rates. Furthermore, as described above, there was no clear pathway for confirming JA13 programming. With a utility DR program, it is relatively simple to confirm enrollment to pay out the incentive to the contractor. Thus, the Pilot Team chose to limit the utility program eligibility to WatterSaver only. WatterSaver is available in the Bay Area and open to bundled-access and direct-access customers unlike the only other HPWH DR program in the Bay Area, Sonoma Clean Power’s GridSavvy, which is only open to Sonoma Clean Power direct access customers. Additionally, limiting the scope to one utility program allows for simplicity and uniformity in terms of outreach and collateral. Lessons learned from WatterSaver enrollment scope can help scale TECH partnerships with other DR programs in the future.

Require TMV for the WatterSaver incentive. Prior research has demonstrated that TMVs are an important add-on to maximize the load-shifting potential of HPWHs, especially those which have not been upsized. This is documented above in the Approach section.

Single-family only. The Pilot Team’s hypothesis is that there is less of a relationship between contractor and tenant in multifamily projects – and that dynamic would need to be tested under a different pilot design. More importantly, TMVs are already a requirement for TECH multifamily incentives.

\$50 for WatterSaver enrollment and \$200 for TMV inclusion. These were the amounts that the Pilot Team initially hypothesized would be adequate, and these were generally supported by the contractor survey. The most common answer for WatterSaver enrollment incentive was slightly higher, at \$75, but the Pilot Team is hopeful that education focused on the ease of enrollment and the value proposition to the customer means that \$50 is sufficient.

No separate “Pilot enrollment” required. Contractors enrolled in TECH can earn the additional pilot incentives by answering yes to questions on the TECH application about TMVs and DR enrollment. This is meant to lower the barrier to entry. Furthermore, the Pilot Team is simplifying messaging to contractors by omitting mention of a pilot, which is irrelevant to the contractor participants. The focus of the messaging is that two additional incentive opportunities are available in the Bay Area – for TMVs and enrolling the customer in WatterSaver.

Contractor Education and Outreach

The Pilot Team understands that contractors need to receive outreach, education, and training to 1) be aware of this additional opportunity in the Bay Area, 2) understand how to earn the pilot incentives, and 3) to understand the value proposition for doing the TMVs and Wattersaver enrollment beyond the extra incentives. To that end, the Team has created or is creating the following resources, the importance of all of which was supported in by the contractor survey results.

Onboarding Training

A recorded HPWH Load Shifting Training presentation was added on 4/6/2022, following the launch of WatterSaver, to the small list of required onboarding trainings for TECH contractors. All contractors enrolling in TECH are required to complete two short trainings (e.g., less than 15 minutes each) – an overview of TECH and deep dive into submitting incentives claims. Contractors who install HPWHs in the Bay Area are also required to complete the HPWH Load Shifting training (13 minutes). This is required in order to spark participation in the load shifting Pilot and because the TECH initiative understands the critical importance of greatly increasing the portion of HPWHs that are enabled as a load shifting resource. The contents of the training are as follows:

Load shifting

- What is load shifting and why is it important
- HPWH load flexibility capabilities
- Importance of TMVs
- TOU explanation and relevance
- Load shifting benefits for customers
- Title 24 JA13⁵

Additional Bay Area incentive opportunities

⁵ JA13 was included as a topic to support alignment with code and potential future program requirements. The messaging is that JA13 capabilities can be enabled in addition to utility program enrollment.

- Overview of the incentive opportunities in the Bay Area for TMVs and WatterSaver enrollment
- Equipment eligibility (ability to connect to the grid via integrated Wi-Fi or CTA-2045 EcoPort)
- How to earn the additional incentives (relevant TECH incentive application fields)

WatterSaver

- What it is and how it works – emphasis on no customer sacrifice
- Value propositions to the customer – bill savings, enrollment incentives, environmental and societal contributions
- How to enroll your customer – including screenshots of the enrollment interface and all information required

Given that the WatterSaver launch was delayed – March 2022 as compared to initial estimates of late October or early November 2021, many contractors had enrolled prior to this load shifting training being launched and made a requirement. Therefore, the Pilot Team has focused outreach and messaging to previously-enrolled contractors to emphasize the added value of watching this training – learning how to earn additional incentives and increase the benefits that their customers receive from their new HPWHs.

Marketing Collateral

There are two pieces of collateral that the Pilot and WatterSaver teams are sharing with contractors and other stakeholders. Both are linked in the learning management system (LMS) hosted by the Association for Energy Affordability, a partner on the TECH Clean California implementation team and also a member of the Pilot Team. When a contractor watches the load shifting onboarding training, they will be prompted to review these flyers. The flyers will also be hosted on the WatterSaver website as well as the switchison.org website, where other contractor-facing TECH Clean California documentation is hosted.

One of the flyers is a WatterSaver one pager – marketing collateral for contractors to provide to customers. It does not go into much detail on the program but is designed to spark interest and open up the conversation between the contractor and customer.

The other flyer is a double-sided sheet co-created by the Pilot Team and WatterSaver which contains a summary of pertinent information from the onboarding training. This collateral outlines the details that sales staff and installation technicians would need to know to talk to the customer about WatterSaver effectively, including instructions for enrolling the customer in WatterSaver. This resource is important since it's an easy way to access and review the information from the onboarding training, and also because the person taking the onboarding training is likely in an administrative role and needs to easily provide the information to the sales staff and installation technicians.

TMV Training

Though TMVs are commonplace for commercial applications, residential contractors may lack experience with mixing valves. The Pilot team is in the process of reviewing the trainings that are currently publicly available and found that various mixing valve manufacturers have training materials for their products, but for the most part TMV training content is

incorporated into larger trainings on various plumbing topics and are focused on commercial applications. Conversations with contractors and HPWH manufacturers as well the Team's review of existing TMV manufacturer trainings indicates there may be a need for a third-party, non-proprietary training focused on residential retrofit installations. The feedback from the HPWH installers and equipment manufacturers is that the best format would likely be a short video covering the basics of why TMVs are important, how to select one, and how to install one, and assessing how to offer the more introductory-type guidance.

Caleffi, one of the major TMV manufacturers, reached out to the Pilot team after a presentation about the Pilot at an Advanced Water Heating Initiative (AWHI) working group meeting and offered to create this nonproprietary training for TECH Clean California contractors. It includes all the necessary how-to information, and also information about the ASSE 1017 certification required for JA13 along with the alternate certifications for HPWHs with TMVs included in-unit. The focus, however, is on ASSE 1017 since HPWH models with incorporated TMVs will likely not be common in the market in the immediate future, especially outside of the 120V models.

This training is hosted on Caleffi's YouTube channel and also on the TECH Electrification Knowledge Hub and Contractor Support Center.

Outreach Strategy Considerations

The Pilot Team will send pilot information to contractors by working with the TECH contractor support partner, Frontier Energy, who manages all aspects of enrollment and provides dedicated account management for each contractor. Frontier sends out a semi-regular e-newsletter to all enrolled contractors, with an average open rate of just under 50%. The Pilot Team plans to use this e-newsletter for announcements such as the launch of the Bay Area incentives and for sending out initial survey requests. The Pilot Team can also conduct one-on-one follow up outreach to specific contractors, as needed.

The Pilot Team also plans to collaborate with BayREN to get important messages out to contractors. Contractors have high familiarity with BayREN since they have been offering Midstream HPWH incentives for longer than TECH has – since Summer 2020 for Midstream incentives, and because contractors applying for TECH incentives in the Bay Area do so by first applying to the BayREN program.

In addition to directly contacting contractors through TECH and BayREN, the Pilot Team is also collaborating with HPWH manufacturers to increase awareness. Manufacturers have large contractor networks. When manufacturers share information about TECH, contractor enrollment spikes. Similarly, TECH has learned that working with manufacturers to convey important TECH rules and information is an effective way to educate contractors.

After initial outreach to increase contractor awareness of the pilot opportunities, subsequent outreach will focus on follow up with participating contractors to understand the efficacy of the various Pilot interventions and follow up with non-participating contractors with additional engagement attempts and questions to understand additional barriers the Pilot may need to address.

Results To-Date

One of the most significant results to date is the feedback gathered from the survey that contractors are required to fill out after taking the HPWH Load Shifting Onboarding Training in order to complete their enrollment. As of July 7, 2022, 166 contractors had completed the training video since its launch on April 6, 2022. Of those contractors, 142 filled out the post-training survey. 76% had a positive view of the training and only 6% were dissatisfied; 86% of those surveyed intent to share the training information with their colleagues and/or employees. 52% of respondents said the training will make them or their installers more likely to install TMVs.

As of July 30, 2022, TMVs had been installed and the \$200 incentive had been paid for 202 HPWH installations in BayREN territory. That represents 38% of the total installations in that area. Statewide, excluding the BayREN territory and SMUD territory (where TMVs are required), 26.1% of installations have included TMVs, which could point to a positive influence from the pilot.

The team looks forward to sharing results regarding contractor-led WatterSaver enrollments in the future.

Next Steps

Since this paper was accepted to be presented at Summer Study, two significant external forces arose which resulted in a reconsideration of priorities and requirements, and a shift in the direction of this Pilot.

The first external force was on April 7, 2022, when the California Public Utilities Commission (CPUC) released their “Decision Establishing Heat Pump Water Heater Program Requirements” for the upcoming Self Generation Incentive Program (SGIP) HPWH incentives. The Decision includes the requirements for TMVs and DR program enrollment for any HPWH installed with SGIP funding, which are the two items that the pilot was promoting and trying to test. While in theory some HPWHs could be installed outside of the SGIP program (in which case the pilot would still be relevant), the pilot team assumed that the vast majority of HPWH installations would be enrolled in SGIP going forward due to the lucrative incentives. In essence, SGIP is forcing the transformation of the HPWH market to be more inclusive of load-shifting in the middle of this pilot. While this change was the long-term goal of the pilot, this came about faster than the pilot team had anticipated.

Thus, after this SGIP decision, the TECH Team and Pilot Team agreed that, to align with SGIP and prepare contractors for upcoming requirements, TECH should shift both of the pilot-encouraged activities (TMV inclusion and DR enrollment) to the overall TECH statewide incentive design. The TECH Team sent a communication to contractors on April 20, 2022 about these two upcoming HPWH incentive changes (detailed in the bullets), along with other changes to HPWH and HP HVAC incentive changes aimed at lowering overall incentive amounts and slowing the pace of TECH budget depletion. These two significant changes took effect on June 20, 2022 and the impacts for the pilot is described below:

- **TMV required statewide and the Bay Area pilot \$200 TMV incentives no longer offered.** The Pilot team was confident that adding this requirement would not present a significant barrier to contractors’ ability to earn HPWH TECH incentives. This was based on TMV’s low costs compared to the TECH incentive amounts, the relative ease of installation especially for residential applications, the rate of TMV inclusion on TECH

HPWH incentive claims (shared above in the Results to Date section), as well on another CA HPWH program’s success implementing this requirement.

- **DR enrollment, \$50 incentive available statewide.** TECH and the Pilot Team have the opportunity to prepare the statewide contractor market with a statewide incentive before the SGIP requirement kicks in. The Pilot Team is in the process of forming agreements with other DR programs so that there are enrollment options statewide rather than just PG&E territory.

The second external force is that, as alluded to above, TECH saw a much higher volume of incentive claims, and with that, a much quicker depletion of budget than anticipated. Sparked by the SDG&E service territory budget running out on April 26, TECH moved to a reservation system, by which contractors create draft incentive claims in order to “reserve” funding for projects, rather than budget being allocated by claim submit date. This system means that contractors have the security of knowing projects will be funded before completing sales. Once this reservation system was launched, funding in PG&E service territory was completely accounted for by May 13.

This depletion of budget presented another hurdle in the Pilot plan. Previously, the team had planned to continue the Bay Area version of the pilot design until June 20 when the TMV \$200 would sunset and the \$50 DR enrollment would go statewide. But with budget depleted, the Pilot focus shifted again: to achieve pilot goals of DR enrollment, the \$50 contractor bonus for customer enrollment in WatterSaver was extended to all contractors with reserved claims. The Pilot Team worked with the TECH Team to prioritize outreach to contractors with “reserved” but not yet installed projects – in the Bay Area and beyond – to encourage them to install mixing valves and enroll customers in DR.

Since these changes occurred, the Pilot Team has prioritized 1) preparing statewide contractors for the upcoming TMV requirement and statewide DR incentive, focusing on contractors in the SoCalGas and Southwest gas territories where HPWH funding remains, and 2) engaging contractors who “reserved” incentive funding with unsubmitted claims, to encourage them to install mixing valves and work with their customers to enroll in WatterSaver. To this end, the Team has been working on the following activities:

- Created a statewide DR and Load Shifting training to replace the version that has been a requirement for Bay Area contractors. This training will contain all of the same content in the Bay Area version but will describe the statewide incentive opportunity rather than the Bay Area incentives. It will also cover both DR and load shifting at a high level as opposed to focusing just on load shifting. This training will be added as an enrollment requirement for all contractors going forward, and may be required for all prior enrolled contractors if additional funding becomes available statewide.
- Collaborate with Caleffi on a short TMV training video for residential retrofit installations.
- Collaborate with other DR program providers to add program options for the enrollment incentive aside from WatterSaver. The Pilot Team expects to have a data sharing agreement and collateral for contractors about one statewide DR program option by mid-June.
- Create a flyer about DR program options. This will allow for the recorded DR and Load Shifting training to be a more evergreen resource, and this supplemental flyer will be updated whenever additional DR program options become available.

- Prioritize email and phone outreach to contractors with claims that were created in time to reserve incentives, but still unsubmitted, meaning that the installations have likely not happened yet. The goal of outreach to these contractors is 1) for projects in PG&E territory, encourage them to enroll the customer in WatterSaver and earn the \$50 even outside of the Bay Area, and 2) to encourage them to install TMVs even before the requirement kicks in; and.
- Conduct email and phone outreach to contractors doing installations in Southern California where funding remains to ensure they understand the TMV requirement and statewide DR enrollment incentive, and share the TMV training video and the Statewide DR and Load Shifting training video and flyer.

The Pilot team is actively engaging with additional potential DR program options as well as collecting feedback from contractors on what additional support and resources they may need to include DR enrollment in their installation process. Given contractors unfamiliarity with DR programs, the Pilot Team has shifted focus to fill this market gap and to continue to provide vital research and information to TECH and the greater HPWH load-shifting marketplace.

This shift will mean that some of the original Pilot research questions are more difficult to answer, but this shift in focus helps the Pilot pivot and continue to bring value to the market in this evolving load-shifting landscape. Some of the original research questions such as what is the right level to set the TMV incentive are no longer as important. Claim data so far and up through the sunset of the Bay Area TMV incentive, along with responses to the mandatory post-Load Shifting Training survey, will allow for some lessons learned related to many of the pilot research questions.

Conclusion

At the onset of the project, the TECH Market Readiness for HPWH Load Shifting Pilot set out to test a new contractor-focused pathway for activating HPWH load shifting capabilities via TMV inclusion and enrollment in a DR program. The Pilot had been designed to focus on Bay Area contractors in order to create lessons learned to expand to statewide contractor engagement. However, the SGIP Decision to require TMVs and DR enrollment represents an exciting accelerated timeline to expanding contractor-activated HPWH load-shifting to the statewide level.

Since the SGIP changes have been announced, the Pilot Team's focus has pivoted to support contractors in new ways, including offering the DR enrollment incentive statewide instead of just in the Bay Area – following market adoption best practices to have a voluntary incentive before a required rule to help educate the market and set them up for success with the new requirements. The Pilot still aims to motivate and empower TECH-enrolled contractors, who engage with customers at the time of installation, to enroll their customers in WatterSaver as well as additional DR program options at a statewide level. By doing so, contractors not only earn additional incentives, but they also increase the value that customers receive from their new HPWHs.

The potential to scale this pathway for HPWH enrollment in utility DR programs comes at a critical point in time, since TECH Clean California incentives are designed to accelerate the adoption of heat pump technologies, and since the upcoming SGIP HPWP incentives come along with requirements (the DR enrollment more so than the TMV requirement) that are likely unfamiliar to most HPWH contractors. This change provides a new opportunity for the Pilot

team to engage with contractors regarding these upcoming requirements by documenting and sharing feedback and defining best practices for this contractor-centric approach to HPWH load shifting enablement. The overarching goal of the Pilot remains the same: increasing HPWH market adoption and ensuring performance as a load shifting resource to help achieve California's clean energy goals.

References

- AEA (Association for Energy Affordability). 2021. *Getting to All-Electric Multifamily ZNE Construction*. California Energy Commission.
- BayREN (Bay Area Regional Energy Network). 2022. *About BayREN*. March 20. <https://www.bayren.org/about>.
- BPA (Bonneville Power Administration). 2018. *CTA-2045 Water Heater Demonstration Report*. Bonneville Power Administration.
- DSA (Demand Side Analytics). 2021. *WatterSaver Beta Test: Use of Water Heater Thermal Storage to Manage TOU Peak Periods*. Pacific Gas and Electric Company.
- Ecotope. 2018. *Heat Pump Water Heater Electric Load Shifting: A Modeling Study*. Ecotope, Inc. https://ecotope-publications-database.ecotope.com/2018_001_HPWHLoadShiftingModelingStudy.pdf.
- Lawrence Berkeley National Laboratory (LBNL). 2021. *A National Roadmap for Grid-Interactive Efficient Buildings*. U.S. Department of Energy.
- Nick Carew, Ben Larson, Logan Piepmeier, and Michael Logsdon. 2018. *Heat Pump Water Heater Electric*. Ecotope.
- VEIC, Energy Solutions. 2019. "TECH Market Study: Decarbonizing California's Residential Buildign Stock."