

Pacific Gas and Electric developed Responses to Recommendations (RTR) contained in the evaluation studies of the 2013-2015 Energy Efficiency Program Cycle and beyond. This Appendix contains the Responses to Recommendations in the report:

RTR for the California Water Heating Market Study: Contractor Business Models, Training, and Electrification (ODC, Calmac ID # CPU0382.01)

The RTR reports demonstrate PG&E's plans and activities to incorporate EM&V evaluation recommendations into programs to improve performance and operations, where applicable. PG&E's approach is consistent with the CPUC Decision (D.) 07-09-043¹ and the Energy Division-Investor Owned Utility Energy Efficiency Evaluation, Measurement and Verification (EM&V) Plan² for 2013 and beyond.

Individual RTR reports consist of a spreadsheet for each evaluation study. Recommendations were copied verbatim from each evaluation's "Recommendations" section.³ In cases where reports do not contain a section for recommendations, the PG&E attempted to identify recommendations contained within the evaluation. Responses to the recommendations were made on a statewide basis when possible, and when that was not appropriate (e.g., due to utility-specific recommendations), the PG&E's responded individually and clearly indicated the authorship of the response.

The Joint IOUs are proud of this opportunity to publicly demonstrate how programs are taking advantage of evaluation recommendations, while providing transparency to stakeholders on the "positive feedback loop" between program design, implementation, and evaluation. This feedback loop can also provide guidance to the evaluation community on the types and structure of recommendations that are most relevant and helpful to program managers. PG&E believes this feedback will help improve both programs and future evaluation reports.

¹ Attachment 7, page 4, "Within 60 days of public release, program administrators will respond in writing to the final report findings and recommendations indicating what action, if any, will be taken as a result of study findings as they relate to potential changes to the programs. Energy Division can choose to extend the 60 day limit if the administrator presents a compelling case that more time is needed and the delay will not cause any problems in the implementation schedule, and may shorten the time on a case-by-case basis if necessary to avoid delays in the schedule."

² Page 336, "Within 60 days of public release of a final report, the program administrators will respond in writing to the final report findings and recommendations indicating what action, if any, will be taken as a result of study findings. The IOU responses will be posted on the public document website." The Plan is available at <http://www.energydataweb.com/cpuc>.

³ Recommendations may have also been made to the CPUC, the CEC, and evaluators. Responses to these recommendations will be made by Energy Division at a later time and posted separately.

Response to Recommendations (RTR) in Impact, Process, and Market Assessment Studies

Study Title: California Water Heating Market Study: Contractor Business Models, Training, and Electrification
Program(s):
Author: Opinion Dynamics (ODC)
Calmac ID: CPU0382.01
ED WO:
Link to Report: [Microsoft Word - Water Heater Market Characterization Study PDA Final 9 18 2024](#)

MANAGEMENT APPROVAL AFTER REVIEWING ALL IOU RESPONSES		
Name		Date
PG&E	Claire Braico, Senior Manager	1/15/2025

Item #	Page #	Findings	Best Practice / Recommendations (Verbatim from Final Report)	Recommendation Recipient	PG&E (if applicable)	
					Disposition	Disposition Notes
				If incorrect, please indicate and redirect in notes.	Choose: Accepted, Rejected, or Other	Examples: Describe specific program change, give reason for rejection, or indicate that it's under further review.
1	63	<p>A wide range of individuals install water heaters in California, including contractors registered with the CSLB, unlicensed handypersons, and Do-It-Yourselfers (DIYers).40 Approximately one-third of the 149 surveyed California homeowners who recently replaced a water heater in the past two years hired a licensed contractor for the installation. As seen in Table 2, most respondents who did not hire a licensed installer installed the system on their own (DIYers).</p>	<p>Recommendation: Fifty-two percent of homeowners who recently replaced a water heater installed the water heater themselves or used a friend or family member. In the TECH Clean California Time 1 Market Assessment, we also found that 36% of homeowners indicated they installed the water heater themselves or a friend or family member installed the new equipment.41 DIYers indicated they chose this pathway to save money and time. This trend poses a significant challenge for transforming the water heater market, yet it has not been widely addressed. Given the nascent stage of the market, heat pump water heater programs are currently predominantly focused on plumbing contractors. However, as the market evolves, it will become crucial to engage unlicensed handypersons and DIY enthusiasts to drive market transformation to meet California's climate objectives.</p> <p>Due to safety reasons, we do not want to encourage DIYers to install heat pump water heaters, with the potential exception of the 110-volt HPWHs. One potential strategy is to develop a program that targets communities interested in electrification. This program would involve collaborating with homeowners associations (HOAs), community-based organizations (CBOs), and/or energy champions to make homes in these neighborhoods electrification ready as part of a comprehensive effort. In working with targeted neighborhoods, each home would receive an audit to determine what is needed to make the home electrification ready. Options include identifying panel optimizations— like circuit pausers and circuit splitters, panel upgrades, panel replacements, or even smart panels, which are costly but, when paired with DR programs and other interventions, might prove viable from a grid-resources perspective. Such a program would make a HPWH DIY installation safer and help meet DIYers' motivations for cheap, quick, and easy installations.</p>	All	Other	PG&E agrees that general information about HPWHs needs to get to more homeowners, so they are aware of the technology before their existing WH fails. PG&E also agrees that DIYers should not install HPWHs on their own unless a 110V HPWH can be installed. However, it is not clear what the recommendation of “targeting communities interested in electrification” means or how that would educate the uneducated about HPWH technology prior to WH replacement. PG&E WE&T can support with education and training depending on program design, if the recommendation is adopted.
			<p>A second recommendation is to increase investment in technology solutions, such as 110-volt HPWHs, to improve efficiency and performance across a wider range of applications and then to develop programs to market, educate, and incentivize this equipment utilizing calls-to-action that will speak to DIYers.</p>	All	Other	PG&E supports providing broader support towards further development of the 110V HPWH technology, specifically trying to improve the First Hour Rating while maintaining optimal energy efficiency levels. Relevant WE&T courses can include information about 110-volt HPWHs.

2	64	<ul style="list-style-type: none"> • Many licensed contractors installing water heaters in California work in multiple trades. When installation jobs involve a licensed contractor, we found that installers often work in multiple trades. For instance, most water heater installers who completed the online survey reported that their company does heating, ventilation, and air conditioning (HVAC) and plumbing work. Moreover, we found various licenses among surveyed water heater installers, including C-36 plumbing contractors, C-20 HVAC contractors, B general building contractors, B-2 residential remodeling contractors, C-10 electrical contractors, and C-46 solar contractors.⁴² • Water heater installers indicate that, on average, 46% of their work is emergency replacements, and 43% is planned replacements. Other reports have found that the proportion of water heater installations that are emergency replacements can be as high as 90%.⁴³ The immediate need to reinstate hot water in a household often places a premium on speed, leaving minimal room for considering alternatives such as replacing a gas appliance with a heat pump. 	<p>Recommendation: Barnett Plumbing, which has provided residents in the California Tri-Valley area with plumbing and water heating service over the past 15 years, received a Quick Start Grant through the Technology and Equipment for Clean Heating (TECH) Initiative to develop a water heater loaner program. To account for the immediate need to replace hot water systems, Barnett Plumbing offered customers the option to install a gas water heater on loan at no cost while the retrofit work took place to install a HPWH. Barnett Plumbing increased its rate of customer conversion from gas water heaters from less than one percent to 17.1 percent and installed 149 HPWHs during the program period (January - December 2022), including 127 gas loaners. The Quick Start Grant funds provided a supplemental contractor payment of \$975 to cover the added cost of installation and removal of the loaner water heater. We suggest that the IOUs establish a statewide loaner program and provide a course for installers to learn best practices for running such a program as part of their business.⁴⁵ Lessons learned from Barnett Plumbing and other loaner pilots can be used as a basis for the course content.</p>	All	Other	<p>PG&E agrees that a loaner gas WH program could be a reasonable solution to ensure comfort and safety for customers whose gas WHs failed suddenly to allow for time to retrofit their home to a HPWH. PG&E will consider this approach and how it might fit into our portfolio strategy as part of our MCAL and/or business plan. It is important to note that, in conformance with D.18-01-004 Ordering Paragraph 1, the majority of the IOUs EE Portfolios are comprised of “third-party” programs according to the “third party” definition from D.16-08-019 Ordering Paragraph 10, and therefore are “proposed, designed, implemented, and delivered by non-utility personnel under contract to a utility program administrator.” IOUs can recommend this loaner concept to their current portfolio program Implementers as a suggestion for consideration, with these market study findings. Additionally, PG&E WE&T can support many programs with education and training depending on program design.</p>
3	64	<p>HPWH adoption is a relatively recent and growing phenomenon in California’s residential plumbing sector. Most installers reported they began installing HPWHs in the last several years, as 52% (n=35) reported that their HPWH installations started in or after 2019 (see Figure 1). Furthermore, fewer than a quarter (22%, n=17) said they had been installing HPWHs for a decade or longer. Most respondents (79%, n=53) whose company currently installs HPWHs expect more installations next year than in the last 12 months. The median number of HPWH installations respondents reported completing over the last year was 15, while the median number of installations these respondents expected to complete over the next year is 25. Additionally, nearly one-third of participants who indicated that they do not install HPWHs currently plan to do so within the next year (32%, n=19).</p>	<p>Recommendation: As of April 2023, the IOUs sponsored 22 unique courses that address water heating. However, on average, each course only covers 11 of the 80 KSAs identified in the WE&T Deliverable 30: Knowledge, Skills, and Abilities Market Studies: HVAC Rooftop Package Units and Heat Pump Water Heaters report published in 2020.⁴⁷ Given that HPWH adoption is a growing phenomenon, developing a standard curriculum for experienced plumbers to learn how to install HPWHs and a standard curriculum for HVAC installers (who are legal to install HPWHs in the state of California) to learn how to install HPWHs based on the validated KSAs from the 2020 study would support market transformation and faster attainment of California’s climate goals. The next finding and recommendation include specific topic areas that would be beneficial to include in a standardized HPWH training curriculum.</p>	All	Other	<p>PG&E partially accepts this recommendation. Several training organizations have already developed a body of curated HPWH training for plumbers and HVAC installers. To avoid duplicated efforts, PG&E WE&T does not propose to develop a unique body of comprehensive HPWH training. PG&E WE&T will continue to make PG&E WE&T program participants aware of PG&E offerings and will collaborate with other training and industry programs to provide training content and/or increase awareness of those of other relevant training programs.</p>

4	68	<p>Installers reported needing additional training on electrical components of HPWH installations, HPWH service topics, and plumbing codes and regulations. However, we found limited instances where training offerings addressed these areas. By assessing KSAs coverage in HPWH-related training offerings and the responses to questions on the online survey regarding training needs, we found several examples where the training may not cover the topics that online survey respondents feel are important. More than a quarter of HPWH-installing respondents said understanding and working with electrical components were the aspects of HPWH installations that required the most training. Table 3 displays five training topics that would benefit installers in learning to begin installing and servicing HPWHs and the percentage of the 34 trainings that referenced these topics. As seen in the table, a few trainings reference important electrical concepts and HPWH tank maintenance topics. Six of the 34 trainings discussed codes in some capacity, one of which was an IOU-sponsored training.</p> <p>Water heater installers report being motivated to pursue training to learn about new technologies, acquire new skills, and better serve their customers. They view manufacturers and distributors as trusted sources for professional learning and, as such, were the primary avenues through which they identified upcoming training opportunities. Among respondents in management roles, 66% (n=69) preferred training from manufacturers, and 55% (n=57) preferred training from distributors.</p>	<p>Recommendation 4A: The IOUs should consider using these insights regarding contractor motivations, interests, and preferences to inform how they position and promote training opportunities. For instance, promoting HPWH training opportunities in the context of electrification/decarbonization may limit the appeal to specific audiences. However, framing the opportunities in the context of cutting-edge technology taps into humans' natural curiosity and desire to stay updated with the latest technological innovations. Additionally, highlighting how acquiring new skills can enhance contractor revenue streams and help companies stand out from competitors will likely increase the value and attractiveness of training opportunities.</p>	All	Accepted	PG&E WE&T will consider these insights as part of a broader set of criteria, feedback, and data for promoting training opportunities.
			<p>Recommendation 4B: The IOUs should develop partnerships with manufacturers and distributors to promote and provide training opportunities related to plumbing and HPWHs, including potentially increasing access to hands-on lab opportunities. For example, on the HVAC side, TECH Clean California has partnered with Daikin to provide a mandatory 4-day Train the Trainer event for faculty at Riverside Community College, College of the Desert, Cypress College, Dehard Technical school, and San Bernardino Valley College on Daikin heat pump equipment donated to these schools.</p>	All	Accepted	PG&E WE&T will continue to collaborate with other training and industry programs to make PG&E WE&T program participants aware of PG&E offerings as well as those of other relevant training programs.
			<p>Recommendation 4C: The IOUs should develop more training opportunities that address the electrical components involved in HPWH installations, as well as service topics, plumbing codes, and regulations related to HPWHs. These could be new course offerings or additional topics added to existing courses.</p>	All	Accepted	PG&E has developed a competency gap analysis tool to help us evaluate our HPWH related curriculum and identify unaddressed competencies that might be added to existing or new WE&T training

5	66	<ul style="list-style-type: none"> Contractors who do both plumbing and HVAC install more heat pumps than contractors who work exclusively in plumbing. Respondents whose company does HVAC and plumbing work were more likely (55%, n=46) to report installing HPWHs than non-HVAC contractors (48%, n=21). Contractors who do both plumbing and HVAC report marketing HPWHs more than contractors who exclusively do plumbing work. They report advertising HPWHs through their company websites (84% compared to 53%), social media (75% compared to 38%), and direct advertisements (67% compared to 11%). Installers report that key barriers to HPWH customer adoption include many water heater installations occurring in emergency replacement scenarios, the higher upfront cost of HPWH equipment, and consumer awareness of HPWHs. 	Recommendation: Considering the influence of consumer demand and general lack of awareness of water heater equipment, the CPUC and IOUs should identify strategies to build utility customers' knowledge about HPWH equipment. Existing interventions include marketing regarding financial incentives via rebates or tax credits at the federal, state, and municipal levels. ⁴⁹ While financial incentives are crucial in increasing consumer demand, investing in programs to raise awareness of HPWH technology and capacity-building opportunities to ensure a trained workforce are also essential. Such programs could include bill inserts on customer utility bills, marketing campaigns using online advertising, educational opportunities through trade ally engagement, and point-of-sale information efforts at big box retailers.	All	Accepted	PG&E agrees that increasing marketing and education about HPWH is necessary for adoption. Existing incentives (e.g., rebates, tax credits) are in place, but more customers need to understand what the technology is and what the incentives are. PG&E WE&T can support with education and training depending on program design, if recommendation is adopted.
6	67	Despite contractor concern about HPWH costs, evidence suggests that HPWHs can be profitable for installers. Nearly one-third (32%, n=40) of installers reported HPWHs are the most profitable equipment their company installs. Installers without experience working with HPWHs perceive them to be the third most profitable, with gas conventional storage tank water heaters as the most profitable, followed by gas tankless systems.	Recommendation: Training developers, such as IOUs, manufacturers, and third-party training organizations, should use their platform to address concerns over equipment cost and illustrate how HPWH installations can be profitable to contractor's businesses. In our training landscape analysis, we found that the discussion of HPWH cost typically focused on how to talk to customers about the higher upfront expense of the equipment. For instance, training addressed calculating the payback for a customer (i.e., how HPWH's higher efficiency will result in lower operating costs that will pay for the equipment over time). However, we found no examples where training materials addressed how HPWH work can be profitable for contractors' businesses and how to integrate HPWHs into existing contractor business models. While calculating payback is an essential skill to develop, it is also crucial for installers to see that HPWHs make financial sense for their businesses.	All	Accept	PG&E has developed a competency gap analysis tool to help us evaluate our HPWH related curriculum and identify unaddressed competencies that might be added to existing or new WE&T training
7	67	Almost half (46%) of installers indicated they had participated in an EE program, and about a quarter (24%) reported participating in an electrification/decarbonization program. A quarter of respondents say they are aware of these programs but never participated and one-fifth of respondents (20%) indicated they were unaware of programs altogether.	Recommendation: Program implementers should consider focusing an effort on reaching contractors who are not currently participating in electrification/decarbonization programs. The CPUC should consider directing the IOUs to develop in-language outreach materials and workshops with free food targeted to installers who have participated in EE programs but are not participating in decarbonization programs and installers who have not participated in either. Such outreach material should cover opportunities to participate in programs as well as educational opportunities.	All	Other	PG&E partially accepts this recommendation. It is unclear as to the level of detail with which the CPUC should instruct IOUs, but PG&E agrees that IOUs should offer stakeholders, (e.g., contractors, CBO's, HOA's, etc.) some type of incentive to learn about the technology.
8	67	Nearly 60% of installers (59%, n=61) reported difficulty hiring technicians/installers over the last year. When asked about the sources of hiring challenges, 52% (n=32) of those who experienced difficulty said they could not find qualified applicants. Additionally, almost one-third of these respondents (30%, n=18) said they hired a candidate, but the new employee's work ethic did not meet their expectations.	<p>Recommendation 8A: Developing standard curricula as referenced above and potentially offering a certification that could become a requirement for participating in EE and decarbonization programs would likely help businesses identify and hire qualified candidates as well as ensure a qualified workforce. Typically, a certification is an official recognition that an individual has met specific qualifications or standards in a particular field or profession.</p> <p>Recommendation 8B: IOUs should consider partnering with CBOs to offer a short water heating installation boot camp. The objective would be to help job seekers determine if a career in the plumbing field is right for them. For individuals still interested in pursuing a career in water heating after the boot camp, IOUs should work with CBOs to match them with paid internship opportunities.</p>	All	Other	PG&E partially accepts this recommendation. Several training organizations have already developed a body of curated HPWH training and associated certification for plumbers and HVAC installers. To avoid duplicated efforts, PG&E WE&T does not propose to develop a unique HPHW certification program. PG&E WE&T will continue to make PG&E WE&T program participants aware of PG&E offerings and will collaborate with other training and industry programs to increase awareness of those of other relevant training programs and available certifications.
				All	Accepted	PG&E recently partnered with training partners to deliver an in-person HPWH and electrification training specifically for CBOs. PG&E will continue to look for opportunities to present training to CBOs and similar organizations when appropriate opportunities exist.

9	67	<p>According to the ACS, a substantial portion of the state’s plumbers and water heater installers meet one or more of the CPUC’s criteria to be considered a Disadvantaged Worker (DW). Although our exploration of ACS data did not result in the total of disadvantaged plumbers, we found indications that a considerable share of California plumbers may meet one or more of the CPUC’s DW criteria. For instance, we learned that over 10% (7,336 of 66,939) of Californian plumbers received Supplemental Nutrition Assistance Program (SNAP) benefits, a form for public assistance, in 2022. In the same year, the ACS identified that approximately 23% (n=15,728) of plumbers did not possess a high school diploma or an equivalent, such as a General Educational Development (GED) certification, another DW criterion.</p>	<p>Recommendation: The CPUC should consider additional research regarding DW participation in the plumbing workforce that may not be available through existing channels such as the ACS. Considering the linguistic diversity of the plumbing workforce in California, Opinion Dynamics also recommends that program outreach material be offered in multiple languages.</p>	CPUC	N/A	N/A
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