Opinion Dynamics

TECH Clean California: Time 2 Market Assessment Final Report

Prepared for the California Public Utilities Commission

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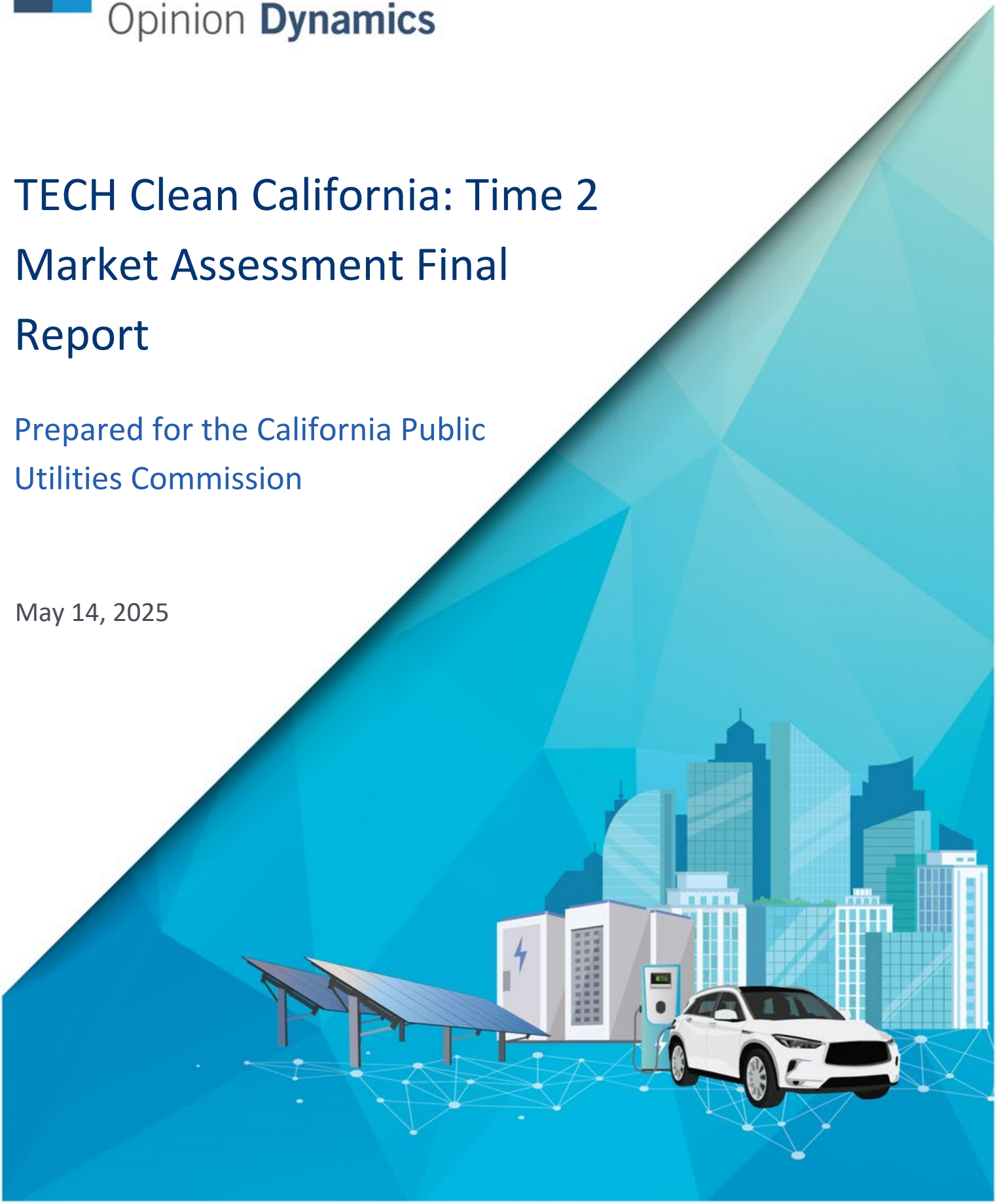

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1. Executive Summary

The Technology and Equipment for Clean Heating (TECH) Initiative incentivizes the installation of air-source heat pumps for space-conditioning (HVAC heat pumps) and heat pump water heaters (HPWHs) for water heating in existing residences. TECH does this through a combination of market incentives, supply chain engagement, workforce development, consumer education, regional pilots, and Quick Start Grants. The initiative's overall goal is the full-scale market transformation of the heat pump market in California to ensure a thriving market for clean heating technologies in the next 10 years.

Opinion Dynamics is the independent developmental evaluator for TECH Clean California, researching program impacts, market effects, policy developments, and technology advances. This report characterizes the conditions in the space- and water-heating markets for heat pumps in mid-2024, approximately two and a half years after the TECH Initiative launched. To assess the markets for space-conditioning and water-heating equipment, we surveyed a general population of homeowners in California as well as HVAC and plumbing contractors who serve the California market. A primary goal for our analysis was to identify differences in the market since completing the TECH Baseline Market Assessment 2021[1] and a Time 1 Assessment in 2023.[2] To inform this Time 2 Market Assessment, our key survey objectives were to investigate (1) the awareness and preferences of property owners who purchase heat pumps, (2) contractor readiness to install heat pumps, (3) contractor heat pump promotion efforts, (4) awareness of heat pump incentives, and (5) the availability and use of financing offerings.

A total of 115 contractors took our survey. About half (63 of 115; 55%) worked in both the water-heating and HVAC industries, and about a quarter worked in only one of those. A total of 91 worked in HVAC and 87 worked in water-heating. Our general population homeowner survey achieved a sample size of 500 respondents spread throughout the state. We also used secondary data from a variety of sources to inform equipment shipment volume, the available workforce for heat pump installations, the availability of heat pump incentive programs, and the uptake of financing for heat pump projects.

1.1 Key Findings

Below, we highlight key findings from our Time 2 Market Assessment.

1.1.1 HVAC Market

California HVAC Contractors

- National data show an increase in residential HVAC heat pump shipments in the US when comparing 2024 to 2023; and compared to both the Baseline and the Time 1 Market Assessments, our surveyed HVAC contractors sold more heat pumps in 2024. Furthermore, their HVAC heat pump sales represented a greater proportion of their total HVAC sales. On average, respondents reported that 62% of their company's jobs in the last year

[1] Opinion Dynamics. Technology and Equipment for Clean Heating (TECH) Baseline Market Assessment 2021 https://www.calmac.org/publications/TECH_Baseline_Market_Assessment_Final_Report.pdf.
[2] Opinion Dynamics. Technology and Equipment for Clean Heating (TECH) Clean California Time 1 Market Assessment https://www.calmac.org/publications/TECH_Time_1_Market_Assessment_Final_Report_4.22.24.pdf

involved heat pumps (n=67), a 26 percentage point increase and a 20 percentage point increase from the Baseline and Time 1 Market Assessments, respectively.[3]

- Contractors reported installing HVAC heat pumps with Time-of-Use (TOU) controls more often than in previous years.[4] Approximately two-thirds of HVAC contractors whose firm sold at least one heat pump last year (48 of 79; 61%) said that at least 50% of their heat pump sales included TOU controls—a 35 percentage point increase since the Baseline Market Assessment, and a 14 percentage point increase since the Time 1 Market Assessment.
- Surveyed HVAC contractors had more experience with heat pump installations for single-family and smaller, in-unit multifamily properties than with centralized HVAC heat pump systems for larger multifamily properties, with almost all respondents (66 of 68, 97%) saying their company has experience installing HVAC heat pumps for the first property type, while about half (30 of 68, 44%) reported their company has experience with HVAC heat pump installations for the latter.[5] However, surveyed contractors reported similar levels of confidence in selling, sizing, installing, servicing, and maintaining HVAC heat pump equipment regardless of property type (between 64% and 79% reported being "extremely confident" in said skills). This shows an improvement in the level of confidence contractors have when it comes to HVAC heat pump installations, especially in large multifamily properties, compared to what they showed in the Time 1 Market Assessment.[6]
- About one-third of HVAC contractors (29 of 87; 33%) "often" or "always" discuss demand response programs with their customers. However, nearly half (37 of 87; 43%) "rarely" or "never" engage in these conversations. This means there is a significant opportunity to raise awareness of demand response programs and increase enrollment. Contractors who discuss demand response programs with their customers generally find this conversation "neither easy nor difficult".
- Contractors have encountered situations where customers need panel upgrades to accommodate an HVAC heat pump. Over two-thirds of respondents (52 of 76; 68%) had at least one HVAC heat pump installation in the last year that required a complete electrical panel upgrade or replacement to accommodate the heat pump. A similar proportion of contractors (48 of 76; 63%) had at least one HVAC heat pump installation in the last year that required some sort of panel optimization, such as load-sharing or adding a subpanel.[7]
- Most HVAC contractors (48 of 74; 65%) reported that their firm typically hires between one and four installers annually. On average, HVAC firms hire one more installer or technician in a typical year than found in the Baseline Market Assessment, according to contractors. Less than one-tenth (3 of 74; 4%) reported zero hires in a typical year at their firm.[8]
- Heat pump experience is growing as a desirable trait when hiring new technicians.[9] More than two-thirds of contractors who hire others (57 of 86; 66%) said heat pump experience was "very attractive". We observed an increase of 9 percentage points since the Time 1 Market Assessment in the proportion of contractors finding that heat pump experience is at least "moderately attractive".
- Most contractors (60 of 79; 76%) said at least 50% of their staff have installed or worked on HVAC heat pumps in the past year—a 14 percentage point increase since the Time 1 Market Assessment. Over half of respondents (43 of 79; 54%) said that all their staff had experience working with heat pumps in the past year.[10,11]

[3] These findings come from companies that get more than half their business from completing HVAC installations.
[4] Time of Use controls are sometimes referred to as demand response controls.
[5] We are unable to assess the extent to which our sample reflects the population of HVAC contractors in California.
[6] These findings come from companies that get more than half their business from completing HVAC installations.
[7] The survey did not ask who performed the electrical panel work in these cases.
[8] These findings are from contractor firms with two or more employees.
[9] This report uses the terms technicians and installers interchangeably.
[10] We did not define "experience" in the survey. We can presume it means a combination of selling, sizing, installing, or servicing HVAC heat pumps.
[11] These findings are from contractor firms with two or more employees.

- Most surveyed HVAC contractors (75 of 91; 78%) have received heat pump equipment training—a 12 percentage point increase since the Baseline Market Assessment and an 8 percentage point increase since the Time 1 Market Assessment. They have received heat pump equipment training most commonly from distributors (55 of 75; 73%) or through a manufacturer (45 of 75; 60%), with the latter being their preferred training source. Most contractors (68 of 91; 75%) valued in-person education, preferring training either fully in-person or through a hybrid online and in-person model.

California Homeowners

- The proportion of homeowners who are concerned about the increase in extreme weather (235 of 500; 47%) has increased since the Baseline Market Assessment—by 11%. Relatedly, over the last two years, we observed a decrease in the subset of homeowners who appeared to be climate change skeptics (48 of 500; 10%)—by 2% and 5% since the Time 1 and Baseline Market Assessments, respectively.
- When it came to interest in electric devices, nearly half of homeowners (208 of 500; 47%) were interested in purchasing a battery to store energy generated by solar panels. Other electric devices were of interest to about one-third of surveyed homeowners (between 32% and 39%). Conversely, the end uses with the strongest preference for natural gas among surveyed homeowners were water heating and indoor cooking, with more than two-thirds of respondents (67%) saying natural gas is "extremely" or "very important" for those activities.
- Natural gas central forced-air furnace is the most common type of heating equipment among surveyed homeowners (266 of 500; 48%), while central air conditioning is overwhelmingly the most common primary cooling system (323 of 500; 63%). Only a minority of homeowners use a heat pump as their primary heating (10%) or cooling (7%) system. The proportion of homeowners using a heat pump to heat their home decreased by 2% since the Baseline and Time 1 Market Assessments; while the proportion of those who use it to cool their home remained the same compared to the Time 1 Market Assessment, but decreased by 5% since the Baseline Market Assessment.
- About one-third of respondents' primary heating systems are at least 14 years old (152 of 461; 31%), and a similar share of respondents' primary cooling systems are at least 9 years old (162 of 420; 37%). This gives us an indication of the proportion of heating and cooling systems that may need to be replaced in the near term.
- Surveyed homeowners' awareness of HVAC heat pumps has increased over time. Three-fifths of respondents (302 of 500; 60%) indicated they were aware of HVAC heat pumps in 2024—an 11% increase since the Baseline Market Assessment in 2022. Respondents with a through-the-wall heat pump, mini-split, or a ductless system reported greater familiarity compared to those with a central heat pump. Homeowners' knowledge about heat pump equipment has improved over time, with the proportion of respondents who identified at least one benefit or drawback of HVAC heat pumps (216 of 338; 68%) increasing by 22 percentage points since the Baseline Market Assessment. However, when asked to provide the benefits of HVAC heat pumps unaided or to agree/disagree with various statements about heat pumps, about half of homeowners still did not know the benefits and drawbacks of HVAC heat pump systems, despite being generally aware of them.
- Homeowners' perspectives on heat pumps are changing to view them as increasingly reliable and efficient heating and cooling technology. Surveyed homeowners were most likely to agree that HVAC heat pumps use less energy than other electric heating and cooling options (168 of 342; 51%) and that they are reliable systems (163 of 342; 50%)—the latter representing a 12 percentage point increase since the Baseline Market Assessment.
- Homeowners were more likely to replace their HVAC systems when they were not functioning well or were completely broken than to replace functioning HVAC equipment. Of respondents who had ever replaced their HVAC system, over two-thirds (178 of 259; 69%) said their prior equipment failed completely (36%) or was not functioning properly (33%), similar to what we observed in the Baseline Market Assessment.

- The most common way respondents found their contractor when replacing their HVAC systems was through a personal referral or prior experience with them or their company (144 of 259; 52%). Nearly one-quarter of surveyed homeowners (24%) found their contractor online, either through a general web search such as Google® or Yelp®[12], their utility's website or The Switch is On "Find a Contractor" tool.[13] The project cost offered by the contractor was the most common reason why surveyed homeowners selected them to install their HVAC equipment; however, homeowners also valued contractors' trustworthiness, reliability, and strong interpersonal skills.
- If they were to consider upgrading their space heating or cooling system, surveyed homeowners were more likely to begin looking for information through their own online research and personal relationships rather than through industry professionals. Additionally, other customers' reviews, the equipment's manufacturer, and a recommendation from a professional contractor were rated as the most influential sources to surveyed homeowners when considering purchasing a new heating or cooling system.
- As we observed in both previous market assessments, surveyed homeowners rated equipment cost, reliability, and performance as the most important factors in their purchasing decision if they were to replace their HVAC equipment. Respondents in disadvantaged communities (DACs) were significantly more likely to rate cost as an "extremely important" factor (75%) if they were to replace their heating or cooling equipment than non-DAC homeowners (61%).[14]
- Similar to both previous market assessments, surveyed homeowners most commonly cited the upfront cost of the equipment, the possibility of needing an electrical panel upgrade or wiring remediation, and the possibility of increased utility bills as the "major barriers" to considering purchasing an HVAC heat pump.

1.1.2 HPWH Market

California HPWH Contractors

- HPWH installations have increased in the last two years. The proportion of HPWH installations among surveyed contractors went from an average of 14% of their total annual jobs in 2022 to 20% in 2023 to 40% in 2024. We also saw a 15 percentage point decrease in contractors reporting they had *not* installed any HPWHs in the past year (12 of 71; 17%) since the Baseline Market Assessment, and an 11 percentage point decrease since the Time 1 Market Assessment.[15]
- Similar to the Time 1 Market Assessment, over half of contractors' firms (52 of 81; 52%) sold between one and 20 HPWHs in the past year. However, over one-third (29 of 81; 36%) sold more than 20 HPWHs within the past 12 months—a 29 percentage point increase compared to the Time 1 Market Assessment. In other words, sales of HPWHs grew in 2024 compared to the previous year. Relatedly, the proportion of firms that did not have *any* HPWH sales in 2023 (37%) decreased in 2024 (19%).

[12] All product or company names that may be mentioned in this publication are tradenames, trademarks, or registered trademarks of their respective owners.
[13] TECH uses the Switch is On website as a customer-facing educational website for heat pumps and other home electrification technologies.
[14] The definition of a Disadvantaged Community (DAC) is a census tract within the top 25% of census tracts most burdened by pollution per the CalEnviroScreen 4.0 scoring tool.
[15] These findings come from companies that get more than half their business from completing water-heating installations.

- The proportion of businesses with HPWH experience is also increasing.[16] The majority of surveyed contractors' businesses (64 of 76; 84%) had experience with HPWHs. A few (12 of 76; 16%) had no HPWH experience—representing a 12 percentage point decrease since the Baseline Market Assessment.[17]
- A larger proportion of contractors' businesses had experience with unitary HPWH installations in single-family or in-unit multifamily properties compared to those with experience with centralized HPWH systems in large multifamily properties. However, surveyed contractors indicated similar levels of confidence in selling, sizing, installing, servicing, and maintaining HPWHs in both property types. Contractors were most confident in their ability to properly install HPWHs and least confident in their ability to properly service HPWHs. There was an improvement in contractors' confidence in installing large centralized HPWHs in multifamily buildings, compared to what we observed in the Time 1 Market Assessment.[18]
- HPWH contractors reported that, on average, 67% of their HPWH installations include a thermostatic mixing valve (TMV), 58% are connected to the Internet, and 53% are programmed with TOU controls. Since the Baseline Market Assessment, the installation of these features increased by 26 percentage points, 20 percentage points, and 25 percentage points, respectively.
- While about half of contractors (30 of 66; 46%) "often" or "always" discuss demand response programs with their customers, about one-third (25 of 66; 38%) "rarely" or "never" addresses them. This means there is still a significant opportunity to raise awareness of demand response programs and increase enrollment. Contractors who discuss demand response programs with their customers generally find this conversation "neither easy nor difficult".
- On average, contractors discuss the benefits of upsizing the system's tank with 64% of their HPWH customers. Among contractors whose firm had installed at least one HPWH in the past year in a single-family or in-unit multifamily property, over three-quarters (43 of 63; 68%) discussed the benefits of upsizing a water heater tank with at least half of their HPWH customers; while nearly half of the contractors (31 of 63; 49%) discussed these benefits with all of their customers.
- Contractors have encountered situations where customers need panel upgrades to accommodate a HPWH. Over half of respondents (33 of 57; 58%) had at least one HPWH installation in the last year that required a complete electrical panel upgrade or replacement to accommodate the HPWH.[19]
- Most contractors (43 of 69; 62%) reported their firm typically hires between one and four installers annually, although responses ranged from zero to 50 hires. A few respondents (4 of 69; 6%) said their firm hires zero new installers or technicians in a typical year—a 22 percentage point decrease since the Time 1 Market Assessment.[20]
- HPWH experience is desirable when hiring new water-heating installers or technicians. More than half of contractors who hire others (45 of 84; 54%) said HPWH experience was "very attractive". Most contractors (69 of 84; 82%) said HPWH experience is at least "moderately attractive"—an 11 percentage point increase since the Time 1 Market Assessment.
- More contractors have HPWH experience compared to previous years. On average, over half of water-heating contractors (40 of 73; 55%) said at least 50% of their staff have installed or worked with HPWH equipment in the past year, while one-quarter (18 of 73; 25%) shared that all of their staff have. A minority of respondents (7 of 73; 10%) said *none* of their staff had worked with HPWH equipment in the past twelve months—which represents a

[16] We did not define "experience" in the survey. We can presume it means a combination of selling, sizing, installing, or servicing HPWHs.
[17] These findings come from companies that get more than half their business from completing water-heating installations.
[18] These findings come from companies that get more than half their business from completing water-heating installations.
[19] The survey did not ask who performed the electrical panel work in these cases.
[20] These findings come from respondents' firms with two or more employees.

15 percentage point decrease since the Baseline Market Assessment and a 9 percentage point decrease since the Time 1 Market Assessment.[21]

- Over three-quarters of surveyed water-heating contractors (69 of 87; 79%) had received heat pump equipment training—a 27 percentage point increase since the Baseline Market Assessment and a 30 percentage point increase since the Time 1 Market Assessment. They received heat pump equipment training most commonly through a distributor (68%), a manufacturer (65%), or while on the job (46%), consistent with previous market assessments. However, their preferred source of training was through manufacturers. Most water-heating contractors (64 of 87; 74%) also preferred in-person education, either through a hybrid approach of in-person and online or fully in-person training.

California Homeowners

- Most surveyed homeowners (393 of 499; 78%) have a gas-powered water-heating system; most frequently, a conventional natural gas storage tanked water-heating system (67%). Similar to the prior market assessments, HPWHs remain the least common type of water heater (13 of 499; 2%).
- One-third of surveyed homeowners' water-heating systems (130 of 471; 33%) are fairly new—under four years old. However, about one-third (140 of 393; 31%) of gas water heaters were nine years or older, indicating that a significant proportion of California's water heaters will likely need to be replaced in the next few years.[22]
- In 2024, we found that 37% of California homeowners were aware of HPWHs—a 5% increase since the Baseline Market Assessment in 2022. The awareness of HPWHs, however, is notably lower than the 60% who had heard of HVAC heat pumps. The most common sources of information for respondents were word of mouth (41 of 182; 24%), news articles (32 of 182; 19%), and social media (27 of 182; 16%).
- Of surveyed homeowners who were aware of HPWHs, about two-thirds (102 of 182; 60%) were "very" or "somewhat familiar" with the equipment (7% increase from baseline). Among homeowners with a HPWH, the proportion who reported being "very familiar" with the equipment increased by 34 percentage points since the Baseline Market Assessment and by 17 percentage points since the Time 1 Market Assessment.
- Among respondents who had heard of a HPWH, 70% identified at least one benefit or drawback of this equipment. This represents a 53 percentage point increase since the Baseline Market Assessment and a 9 percentage point decrease from the Time 1 Market Assessment and suggests a large increase in homeowner knowledge about HPWH equipment in the last two years. Additionally, about one-third of respondents (59 of 180; 32%) believed HPWHs were more efficient than alternative water heaters—an increase of 25 and 5 percentage points since the Baseline and the Time 1 Market Assessments, respectively.
- As with HVAC systems, most homeowners who installed a new water-heating system at some point did so because the equipment either failed completely (194 of 313; 63%) or did not function properly (71 of 313; 23%). These were also the two main reasons homeowners reported in the Time 1 Market Assessment (55% and 27%, respectively).
- About one-third (97 of 313; 30%) installed the water heater themselves or used a friend or family member. Among respondents who reported hiring a professional contractor to install their new water heater (n=236), almost one-third (80 of 236; 32%) found their contractor through prior experience with them, and one-fifth (55 of 236; 21%) found them through a personal referral. The contractor's ability to complete the project within a short timeline was the most common reason surveyed homeowners selected them to install their water-heating

[21] These findings come from respondents' firms with two or more employees.

[22] The effective useful life for a gas storage water heater is 11 years and gas tankless water heater is 20 years.

equipment (93 of 236; 42%). Other common reasons were the project costs (38%), responsiveness (38%), and positive previous experiences with the contractor/company (31%).

- As we observed in both previous market assessments, the most important factors to respondents when considering replacing their water heater were the system's reliability and performance, followed closely by equipment longevity[23], and cost. Between 64% and 68% of all surveyed homeowners (n=500) listed these factors as "extremely important". Respondents who lived in DACs were significantly more likely than non-DAC respondents to rate cost and speed of installation as "extremely important" when considering purchasing a new water heater.
- Respondents rated other customers' reviews (116 of 500; 27%) as the most impactful source influencing their decision about a new water-heating system.
- Similar to an HVAC heat pump, respondents' largest concerns with purchasing a HPWH were the associated upfront costs (62 of 182; 39%), the possibility of increased utility bills (65 of 182; 35%), and the possibility of additional home upgrade requirements (58 of 182; 35%), qualifying these factors as "major barriers". Respondents rating the upfront cost of a HPWH as a "major barrier" rose by 21 percentage points since the Baseline Market Assessment and by eight percentage points since the Time 1 Market Assessment. It is hard to know if this barrier increased because there is greater awareness of HPWHs, if people are more cost-conscious now, or something else entirely.

1.1.3 Financing

- Over half (70 of 115; 61%) of surveyed contractors' companies offered financing options to customers who purchase new HVAC or water-heating equipment—an 11 percentage point increase since the Baseline Market Assessment and a 21 percentage point increase since the Time 1 Market Assessment. Contractors who worked with HVAC equipment were more likely to offer financing options to their customers (63 of 91; 69%) than those who worked with water-heating equipment (49 of 87; 56%).
- As observed in both previous market assessments, regardless of the equipment they worked with, the most common financing surveyed contractors offer to their customers is through a private lender. GoGreen Home financing is the second most common option contractors offer. Contractors who worked with both types of equipment and those who worked exclusively with HVAC were more likely to offer GoGreen Home financing to customers than those who work exclusively with water heaters. The fact that water-heating contractors are less likely to offer financing could be due to the relatively lower cost of water heaters compared to HVAC equipment, or low awareness among water-heating contractors that HPWHs qualify for GoGreen Home loans.
- Heat pump equipment customers most frequently utilized financing when purchasing equipment from a contractor who worked with both HVAC and water-heating equipment. Almost one-fifth of contractors who work with both equipment types, have heat pump or HPWH experience, and offer financing options (7 of 38; 18%) said 50% or more of their customers used financing to purchase their heat pump equipment. This represents an 11 percentage point decrease since the Time 1 Market Assessment and a 6 percentage point increase since the Baseline Market Assessment.
- Nearly half of homeowner respondents (241 of 500; 47%) were unaware of financing options available to them to purchase new space heating/cooling or water-heating equipment, while another 19% (91 of 500) were unsure

[23] Equipment longevity was added to the list of factors respondents could rate in the Time 2 Market Assessment.

whether they knew about these options.[24] Homeowners were most likely to be aware of general financing options, such as a credit card or a loan through a banking institution.

- In 2024, California's GoGreen Program financed 898 heat pump projects, compared to the 62 heat pump projects financed in 2021.[25] The number of GoGreen-financed heat pump projects in DACs has also increased, from 7 in 2021 to 52 in 2024.

1.1.4 Marketing, Incentives, and Promotions

- Most surveyed contractors (93 of 105; 89%) were aware of rebates or incentives available in California for space-conditioning and/or water-heating heat pump installations. This represents a 17 percentage point increase since the Baseline Market Assessment and a 30 percentage point increase since the Time 1 Market Assessment.[26]
- Most contractors who were aware of incentives (89 of 93; 96%) said they promote them to their customers. Moreover, contractors working with both space- and water-heating equipment were more likely to promote heat pump incentives to their customers than contractors working with one type of equipment.
- The majority of firms that sell HVAC equipment promote heat pumps to some degree (83 of 87; 95%); while a smaller proportion of those that sell water heaters promote HPWHs to some degree (55 of 66; 83%). Nearly one-third of firms that sell water-heating equipment (35%) said their company puts less effort into HPWH promotions than into promoting other water-heating equipment or puts no effort at all into promoting HPWHs. Firms that provide HVAC services are more likely to promote heat pump equipment above and beyond other equipment options (45 of 87; 52%) compared to firms that provide water heating services (24 of 66; 36%).
- Regardless of the type of equipment they work with, surveyed contractors' companies most commonly promote heat pump equipment while on-site at a customer's property. The other two common channels contractors use to promote heat pump equipment are online sources like their company's website or direct mail inserts.
- Among homeowners aware of HVAC heat pumps, less than half (161 of 342; 46%) were also aware that some organizations offer financial incentives for installing an HVAC heat pump—an increase of 6 percentage points since the Baseline Market Assessment. The most common ways for homeowners to hear about financial incentives for installing an HVAC heat pump were through the utility—either via bill inserts (37%) or other information (31%)—by word of mouth (32%), and through a general web search (32%).
- Nearly half of the homeowner respondents who were aware of HPWHs (90 of 182; 44%) reported they were aware of the incentive offerings for HPWHs—a 4 percentage point increase since the Baseline Market Assessment. Similar to HVAC heat pump incentives, the most common ways respondents heard about the availability of HPWH incentives was through information from their utility—either via bill inserts (35%) or through other information (48%)—through a web search (40%), and by word of mouth (36%).
- About one-fifth of homeowners who were aware of HVAC heat pumps (74 of 342; 21%) and about one-third of those aware of HPWHs (60 of 182; 31%) knew they might be eligible for up to a $2,000 tax credit from the federal government.
- While a very limited number of respondents had heard of The Switch is On (54 of 500; 9%) and TECH Clean California (63 of 500; 14%), most homeowners were unaware of both. Homeowners who were aware of the TECH

[24] This is a difference of one percentage point from the Time 1 Market Assessment. The Baseline Assessment numbers were not separated by HVAC and HPWH, and are therefore not included.

[25] The TECH program launched in December of 2021, and CAEAFTA began offering the expanded loan program funded by TECH dollars on April 1, 2022.

[26] These findings are from contractors whose firm sold at least one heat pump or one HPWH over the past year.

Initiative or The Switch is On website were significantly more likely to be interested in purchasing or to already own an electric device compared to those that were unaware, with 92% (79 of 86) expressing interest or reporting ownership in the survey.

1.2 Conclusions and Recommendations

Based on the findings of this Time 2 Market Assessment, we offer the following conclusions and recommendations:

Conclusion: Homeowners in California are increasingly viewing HVAC heat pumps more favorably. More customers perceive heat pumps as offering better value compared to other systems and believe they will not cost more to install. Awareness of HVAC heat pumps is growing modestly, while understanding of their benefits is expanding at a faster rate. These trends may be linked to the rise in homeowners' awareness of incentives for HVAC heat pumps. Although utilities are a primary source of information about these incentives, they are not a top source for general awareness of heat pumps. Word of mouth was the top source for heat pump awareness, suggesting that it has been influential in helping homeowners remember the term "heat pump."

> **Recommendation:** Since word of mouth has been a primary way of improving customer awareness for HVAC heat pumps, incentive providers could explore opportunities to collect and share customer testimonials reflecting their positive experience with heat pumps. Incentive providers' continued promotion of heat pump incentives is still crucial, as the upfront cost of heat pumps is one of the biggest barriers customers face when considering an HVAC heat pump.

Conclusion: We are seeing evidence of market transformation for HVAC heat pumps in California. Contractors are investing in their businesses to enhance their ability to offer their customers HVAC heat pumps. This is reflected in the substantial increase in the proportion of contractor firms attending HVAC heat pump trainings. Experience with heat pumps is becoming a valuable trait in technicians when hiring them, indicating that firms recognize the importance of this skill set. Contractor firms report that a growing percentage of their staff is involved in heat pump work, suggesting that it is becoming a more common task for their employees. Finally, contractors' self-reported confidence working with HVAC heat pumps has grown in the past few years.

> **Recommendation:** As the number of contractors who install HVAC heat pumps grows, it will be important for training providers to continue to offer heat pump courses for new staff being introduced to HVAC heat pumps.

Conclusion: It is uncommon for HVAC contractor firms to discuss demand response programs with their customers, potentially forgoing some greenhouse gas and customer bill savings. Despite contractor firms gaining experience with heat pumps, their engagement in demand response conversations lags behind. As more electric heat pumps are installed to replace gas end-uses, it is crucial for the increased electric load to be flexible, which allows demand to be shifted to times when the grid relies on cleaner energy sources. Contractors should be prepared to discuss demand response programs with customers to ensure HVAC heat pumps maximize their potential to reduce greenhouse gas emissions.

> **Recommendation:** We recommend that TECH Clean California and other HVAC heat pump incentive program administrators develop a toolkit for contractors. This toolkit should include customer-facing scripts, talking points, and educational materials that clearly explain the benefits of DR participation. With DR enrollment now required for customers receiving TECH Clean California incentives, contractors should be both informed and motivated to integrate these conversations into their sales and installation processes.

Conclusion: Contractor firms are showing increased interest in and savviness related to HPWHs, yet do not always discuss demand response with customers. The proportion of water-heating firms that did not sell any HPWHs in the

past year declined, while the proportion of firms selling more than 20 HPWHs grew. We observed substantial growth in the proportion of water-heating contractors attending trainings, and appreciable growth in HPWHs installed with load shifting-enabling technologies, such as thermostatic mixing valves and Time-of-Use schedules. Together, these data imply that heat pump equipment is becoming a more common product for water-heating contractors to sell and install. However, a considerable number of water-heating contractor firms do not discuss demand response with their customers, indicating an opportunity to raise customer awareness and increase enrollment in demand response programs. A minority of contractors find demand response conversations with customers easy. At the same time, many HPWH programs in California are now requiring customers to enroll in demand response programs if they are not already in one, heightening the importance of contractors' ability to discuss these programs with customers.

> Recommendation: Water-heating contractors appear receptive to learning about heat pumps and load-shifting practices associated with HPWHs. In order for HPWHs to be an asset for the electric grid, HPWH customers will need to participate in demand response programs. We recommend that HPWH incentive program staff consider creating a "demand response toolkit" that includes scripts contractors can use in their conversations with customers to outline the benefits of demand response programs.

2. Introduction

The TECH Initiative, publicly known as TECH Clean California, launched in December 2021. TECH Clean California is an initiative designed to help advance the state's mission to achieve carbon neutrality by 2045 by driving the market adoption of low-emissions space and water-heating technologies for existing single-family and multifamily residential homes. The initiative was created as part of California Senate Bill 1477. Through market incentives, supply chain engagement, workforce development, consumer education, and regional pilots, the initiative enrolls contractors to install low-emissions space and water-heating technologies across California in existing homes.

Opinion Dynamics is responsible for evaluating the TECH Initiative. Utilizing our Whole Independent Systems Evaluation™ (WISE™) framework, we maintain our third-party independent voice as we walk alongside Energy Solutions, the prime implementer for the initiative, and its team of sub-contractors so that we can infuse real-time evaluation insights into key steps of program design and implementation. This approach creates effective feedback loops to help all parties better understand complex market adoption patterns, the effectiveness of program strategies, and opportunities for course correction.

The goals of our market assessments are to characterize the residential retrofit, space- and water-heating market in California. We have done this by examining homeowner preferences and decision-making around equipment replacement, as well as their awareness of home upgrade financing and heat pump rebates. We also investigated the availability of a qualified workforce to sell and install heat pumps, including their experience and confidence with heat pumps and their promotion of heat pump rebates and financing. Finally, we assessed the size of the heat pump market, looking into shipments and sales at the national level, as well as the use of GoGreen Home financing.

We completed a Baseline Market Assessment in the summer of 2022 and a Time 1 Market Assessment in 2023. This report represents an update and tracks changes in California's residential retrofit, space- and water-heating markets. To inform the current Time 2 Market Assessment, our team repeated our surveys with contractors and California homeowners in the summer of 2024, about a year after the Time 1 Market Assessment surveys were conducted.[27] We

[27] The Time 2 Market Assessment data collection instruments included the following changes compared to those used in the Time 1 Market Assessment: (1) Homeowner survey--questions about home size, building age, and number of people in the home were removed; (2) Contractor & Installer survey—a question about the languages in which contractors offer services was added; a question about the percentage of HVAC equipment that was ENERGY STAR certified was added; a question about how difficult it is to find contractors with heat pump experience when hiring was added; questions about how often contractors talk to their customers about demand response programs, and how easy that

compared findings between the single-family and multifamily markets,[28] and DACs and non-disadvantaged communities.

3. Research Methods

For this Time 2 Market Assessment, Opinion Dynamics used a mixed-methods approach, relying on primary and secondary data. Primary data collection included surveys with contractors in California and with a statewide representative sample of California homeowners. All data collection instruments can be found in Appendix B. Below, we explain our data sources in more detail, along with the research objectives for each survey.

3.1 Secondary Data

We assessed the size of the heat pump market by reviewing shipment data from the Air-Conditioning, Heating, and Refrigeration Institute (AHRI). We also used data from the Contractors State Licensing Board (CSLB) to estimate the number of contractors licensed to work on heat pumps. The Building Decarbonization Coalition provided data on other heat pump incentive programs in California. Finally, information on the use of financing for residential equipment upgrades comes from the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA).

3.2 Market Survey of Contractors

Opinion Dynamics surveyed contractors in California to gather information about contractor familiarity with heat pump technologies and the share of HVAC and water-heating jobs and sales that are heat pumps. More specifically, the research objectives of the market study of contractors were to complete the following:

- Assess contractor confidence in selling, installing, servicing, and/or maintaining HVAC heat pumps and HPWHs
- Assess share of HVAC and hot water work and sales that are heat pump related
- Gather information about the number of workers trained to work on heat pumps
- Gather information about the type of training contractors receive and prefer
- Collect information about the percentage of available positions for working on HVAC heat pumps and HPWHs
- Assess the availability of heat pump financing offered through contractors
- Understand contractor promotion of heat pump systems and initiatives

Our sample frame was based on two groups: contractors in California who either were or were not enrolled in TECH. Of the 1,944 contractors we invited to complete the survey, 1,104 were enrolled in TECH. We selected contractors who had one of the following CSLB licenses: C-20 HVAC Contractor, C-36 Plumbing Contractor, or B General Building Contractor.[29] We prioritized the first two licenses, as those are the specialty licenses needed to install space- and water-heating heat pumps, though B General Building Contractors can also install heat pumps in some situations. Please note that many surveyed contractors held a combination of these licenses, and some held other licenses, such as C-10

conversation is were added; a question about the percentage of customers enrolled in a demand response program in the last year was removed; a question about the percentage of customers who required electrical panel upgrade or optimization to accommodate their heat pump was added; and a question about why contractors' companies do not promote heat pump equipment was added.

[28] The TECH Initiative defines multifamily buildings as those with five or more units.

[29] The Contractors State License Board (CSLB) protects California consulters by licensing and regulating the state's construction industry. *www.cslb.ca.gov*

Electrical Contractor and C-46 Solar Contractor. A total of 40 contractors in our sample held more than one license. Sixteen respondents held none of these licenses asked about in the survey. Table 1 provides a breakdown of license type(s) held by survey respondents by TECH enrollment.

Table 1. Survey Sample License Type(s) by TECH Enrollment (n=115)

Market Actor Licenses	TECH-Enrolled	Non-TECH-Enrolled	Total
C-20 HVAC Contractor	45	30	**75**
C-36 Plumbing Contractor	17	23	**40**
B General Contractor	16	14	**30**
Other (i.e., C-10, C-46)	8	8	**16**
None of the above licenses	6	10	**16**

We contacted these contractors between September and December 2024, via email up to five times (including the initial invitation and reminder emails). We screened them to ensure they offered residential installation or maintenance services for HVAC and/or water heating; more specifically, a minimum of 30% of their business had to be HVAC and/or water-heating installation jobs. We achieved a total of 115 survey completes, resulting in a response rate of 5.9%, after accounting for undeliverable emails (Table 2). Respondents received a $100 gift card as a token of appreciation for taking the time to participate in this research.

Table 2. Survey Completes by Contractor Services (n=115)

Market Actor Type	TECH-Enrolled	Non-TECH-Enrolled	Total
HVAC system installation, repair, and/or maintenance	15	13	**28**
Water heater installation, repair, and/or maintenance	5	19	**24**
Both HVAC system and water heater installation, repair, and/or maintenance	37	26	**63**
Total	**57**	**58**	**115**

3.2.1 Contractor Sample

Over half of survey respondents' companies (67 of 115; 58%) performed both retrofit and new construction work—a decrease of 21 percentage points since the Baseline Market Assessment and by twelve percentage points since the Time 1 Market Assessment—while the remaining 42% (48 of 115) worked only within the retrofit space.

Almost all surveyed contractors (111 of 115; 97%) served the single-family market, and just over two-fifths (47 of 115; 41%) served the multifamily market. The overlap of surveyed contractors serving both the single-family and multifamily markets (43 of 115; 37%) (Table 3) was smaller than the overlap we observed in the Baseline and Time 1 Market Assessments (46% and 67%, respectively). **The proportion of contractors serving the single-family market was similar across all market assessments, but the proportion of those serving multifamily buildings has fluctuated.** Since the Baseline Market Assessment and the Time 1 Market Assessment, the proportion of contractors serving multifamily buildings has decreased by 6 percentage points and 29 percentage points, respectively.

Table 3. Survey Respondents by Sector (n=115)

Market Actor Type	Single-Family Only	Multifamily Only	Both Single-Family and Multifamily	Total
HVAC system installation, repair, and/or maintenance	16	0	12	**28**
Water heater installation, repair, and/or maintenance	14	2	8	**24**
Both HVAC system and water heater installation, repair, and/or maintenance	38	2	23	**63**
Total	**68**	**4**	**43**	**115**

Note: Multifamily is defined as a building with five or more units. Multifamily buildings with four or fewer units are grouped with single-family.

When asked about their role within their company, respondents reported being the owner (58 of 115; 50%), president or CEO (30 of 115; 26%), general manager (30 of 115; 26%), service manager (18 of 115; 16%), or sales manager (19 of 115; 17%). The remaining respondents (8 of 115; 9%) reported holding a different position at their company.

About one-third of contractor respondents (70 of 115; 61%) worked in Pacific Gas and Electric's (PG&E) service territory—a 1 percentage point increase since the Baseline Market Assessment and an 8 percentage point increase since the Time 1 Market Assessment. This was the most common utility service territory reported among both HVAC and water heater market actors (Table 4). More than one-third of surveyed contractors (78 of 115; 68%) work in two or more utility service territories in California—a 30 percentage point increase since the Baseline Market Assessment and a 16 percentage point increase since the Time 1 Market Assessment.

Table 4. Utility Service Territory Where Respondents Work

Utility Service Territory	HVAC (n=28)	Water Heater (n=24)	Both Equipment Types (n=63)	Total (n=115)
Pacific Gas and Electric (PG&E)	14 (50%)	11 (46%)	45 (71%)	**70 (61%)**
Southern California Gas (SoCalGas)	6 (21%)	17 (71%)	24 (38%)	**47 (41%)**
Southern California Edison (SCE)	20 (25%)	5 (46%)	24 (38%)	**49 (43%)**
Sacramento Municipal Utility District (SMUD)	7 (25%)	1 (4%)	16 (25%)	**24 (21%)**
Los Angeles Department of Water and Power (LADWP)	3 (11%)	7 (29%)	13 (21%)	**23 (20%)**
San Diego Gas and Electric (SDG&E)	14 (29%)	4 (17%)	9 (14%)	**27 (23%)**
Other	2 (7%)	4 (17%)	9 (14%)	**15 (13%)**

Note: Cell percentage based on column n value. SoCalGas and SCE share a largely overlapping service territory. Multiple responses were allowed.

Similar to both Market Assessments, most surveyed contractors (97 of 115; 84%) worked in a single-location facility. The remaining respondents said the facility they work in is the headquarters of a company with multiple locations (12 of

115; 10%), a branch or franchise location of a company based in California (2 of 115; 2%), a branch or franchise location of a company based outside California (2 of 115; 2%), or something else (2 of 22; 2%).[30]

Over half of contractor respondents (63 of 115; 55%) worked at a company with fewer than 10 employees, and a few (13%) worked at a company with only one employee (Table 5). Similar to both previous Market Assessments, almost half (48 of 115; 42%) said their company currently employs between two and nine people. The proportion of respondents who worked for companies with ten or more employees (52 of 115, 45%) increased by 10 percentage points since the Baseline Market Assessment estimate and by 21 percentage points since the Time 1 Market Assessment. We especially observed an increase in the number of surveyed contractors who work at a company with 100 or more employees compared to the previous year.

Table 5. Number of Part- and Full-Time Employees by Service Type (n=115)

Number of Employees	HVAC	Water Heater	Both	Total
1	3 (11%)	7 (29%)	5 (8%)	**15 (13%)**
2–9	15 (54%)	7 (29%)	26 (41%)	**48 (42%)**
10–49	8 (29%)	8 (33%)	20 (32%)	**36 (31%)**
50–99	0 (0%)	0 (0%)	4 (6%)	**4 (3%)**
100 or more	2 (7%)	2 (8%)	4 (13%)	**12 (10%)**
Total	**28 (100%)**	**24 (100%)**	**63 (100%)**	**115 (100%)**

As observed in both previous Market Assessments, only a small portion of surveyed contractors reported that their company's employees are union members (2 of 115; 2%). One of these two contractors was enrolled in TECH at the time of the 2024 survey. Both of these respondents worked solely on water-heating systems. Each reported membership in one or more labor unions, separated by respondent below:

- United Association (UA) Local Union 38, UA Local Union 62, UA Local Union 159, UA Local Union 228, UA Local Union 246, UA Local Union 342, UA Local Union 343, UA Local Union 393. UA Local Union 442, UA Local Union 447, UA Local Union 467
- UA Local Union 467 and UA Local Union 38

Over half of contractor respondents (62 of 115; 54%) reported their company's annual revenue is one million dollars or more—a 16 percentage point increase since the Baseline Market Assessment and a 30 percentage point increase since the Time 1 Market Assessment. Less than one-tenth of respondents (7 of 115; 6%) reported an annual revenue of less than $100,000. Four respondents (4 of 115; 3%) chose not to disclose this information—a decrease of 9 percentage points since the Baseline Market Assessment and of 4 percentage points since the Time 1 Market Assessment—while 3% of respondents (3 of 115) said they did not know (Table 6).

[30] "Other" responses included a main office with one other location (1 mention). One respondent said they don't know what type of facility it is.

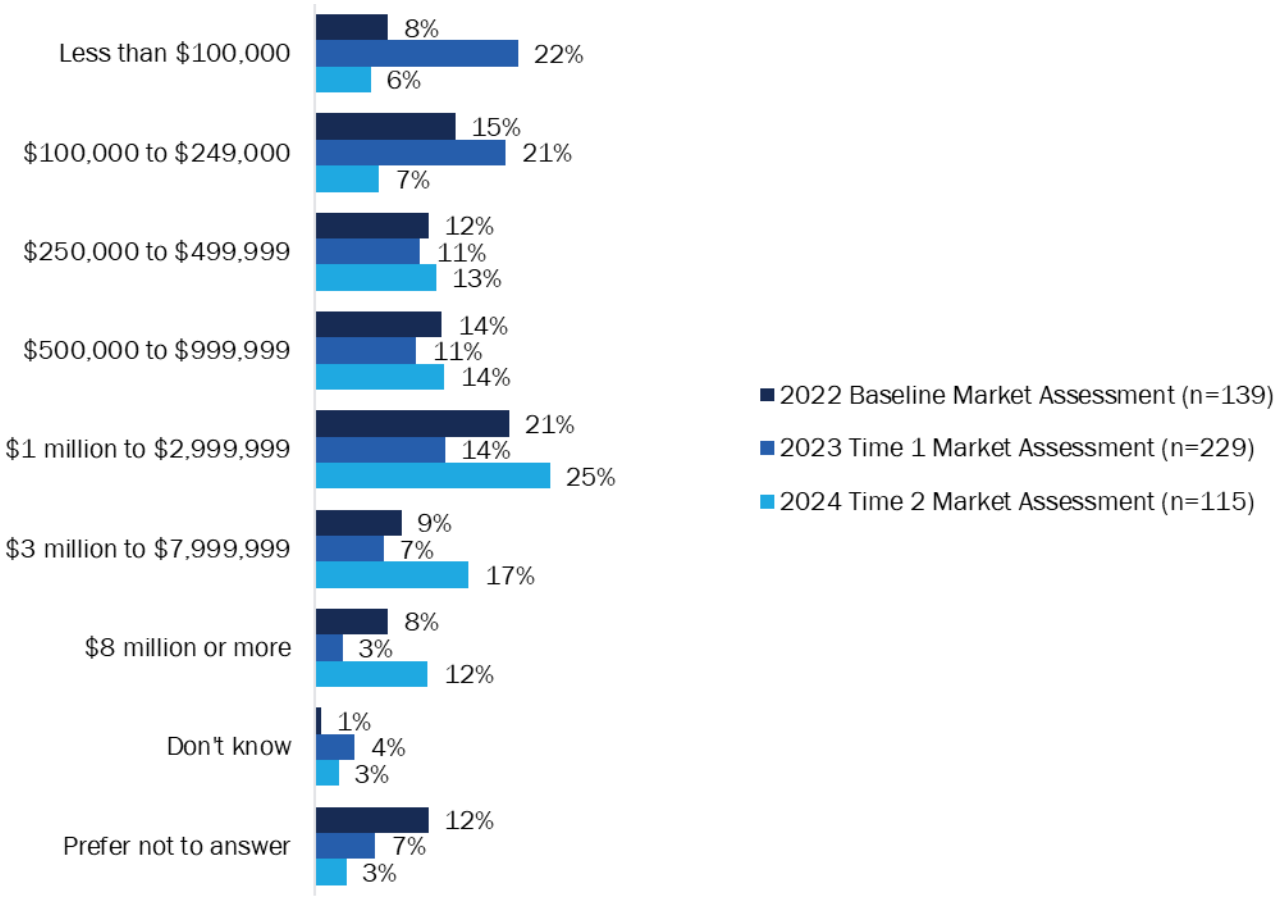
Table 6. Company Annual Revenue (n=115)

Annual Revenue	HVAC	Water Heater	Both
Less than $100,000	2 (7%)	2 (8%)	3 (5%)
$100,000–$249,999	1 (4%)	5 (21%)	2 (3%)
$250,000–$499,999	7 (25%)	1 (4%)	7 (11%)
$500,000–$999,999	5 (18%)	1 (4%)	10 (16%)
$1 million–$2,999,999	7 (25%)	6 (25%)	16 (25%)
$3 million–$7,999,999	3 (11%)	4 (17%)	12 (19%)
$8 million or more	2(7%)	2 (8%)	10 (16%)
Prefer not to answer	0 (0%)	1 (4%)	2 (3%)
Don't know	1 (4%)	2 (8%)	1 (2%)
Total	**28 (100%)**	**24 (100%)**	**63 (100%)**

We compared key firmographics between the contractors in the Baseline Market Assessment and those in the Time 1 and Time 2 Market Assessments. In the Time 2 Market Assessment, 13% of the sample worked at a company with only one employee, a decrease of 4 percentage points and 16 percentage points since the Baseline and the Time 1 Market Assessments, respectively. Conversely, the Time 2 Market Assessment saw an increase in the proportion of businesses with ten or more employees compared to both the Baseline Market Assessment—by 10 percentage points—and the Time 1 Market Assessment—by 21 percentage points.

Relatedly, the Time 2 Market Assessment sample also included more contractors whose firms generated an annual revenue of one million dollars or more (Figure 1). **This Time 2 Market Assessment sample had a larger proportion of medium to large firms with moderate to high revenue streams compared to the Time 1 and the Baseline Market Assessments.**

Figure 1. Comparison of Respondents' Company Annual Revenue Across the Baseline, Time 1, and Time 2 Market Assessments



3.3 General Population Single-Family Homeowner Survey

Opinion Dynamics fielded a survey for single-family homeowners in California to assess awareness of, familiarity with, interest in, and motivators for space conditioning and water-heating equipment. Specifically, the survey explored respondents' perceptions and understanding of heat pump technologies with the following objectives:

- Explore respondent environmental belief systems, including perspectives on clean energy and climate change, and willingness to use electric appliances
- Gather information about homeowners' space-conditioning and water-heating systems
- Explore customer decision drivers around space conditioning and water-heating equipment purchases
- Gauge awareness of and familiarity with HVAC heat pumps and HPWHs and the benefits and barriers to adoption
- Assess awareness of financing options and utility rebates for installing heat pump technologies

The survey was fielded in September 2024. We achieved a total of 500 survey completes, representing a response rate of 24%. By design, half of the sample was located in a DAC, and half were outside DACs. The sample data were weighted on US census data for gender, age, race, and education to ensure representation of the overall California population.

All homeowner findings in this report are based on analyses of survey data with weights applied. Please note that all values are the unweighted count of respondents included in each analysis. In many cases, we conducted statistical testing to see if responses significantly varied between homeowners who reside in DACs and outside of DACs. Throughout this report, we use the term "significantly" to call out statistically significant differences using a significance threshold of p<.05.

3.3.1 Homeowner Sample

Pacific Gas and Electric (PG&E) and Southern California Edison (SCE) provide electric service to nearly three-quarters of surveyed homeowners, with SCE providing service to over two-fifths of respondents (185 of 500; 42%) and PG&E providing service to nearly one-third of respondents (172 of 500; 31%) (Table 7). Half of the respondents (231 of 500; 50%) reported their natural gas provider is Southern California Gas (SoCalGas), while about one-third (185 of 500; 34%) received gas service from PG&E. Five percent of surveyed homeowners (28 of 500) indicated they live in an all-electric home and do not receive gas service.

Table 7. Surveyed Homeowners' Electric and Gas Providers (n=500)

Utility	Electric Provider	Gas Provider
Southern California Edison (SCE)	42%	--
Pacific Gas and Electric (PG&E)	31%	34%
San Diego Gas and Electric (SDG&E)	9%	8%
Los Angeles Department of Water and Power (LADWP)	8%	--
Sacramento Municipal Utility District (SMUD)	3%	--
Southern California Gas (SoCalGas)	--	50%
Other providers	5%	1%
Not applicable – do not receive gas service	--	5%
Don't know	3%	3%
Total	**100%**	**100%**

Note: Other electric providers included municipal utilities and small multi-jurisdictional utilities. Totals exceed 100% due to rounding.

Over half of surveyed homeowners (260 of 500; 59%) reported a household income of less than $100,000, while one-fifth (90 of 500; 20%) had an income of less than $50,000. Eight percent of respondents (41 of 500) either reported they did not know their household income or preferred not to share this information (Table 8). DAC respondents were significantly less likely to earn $150,000 or more in 2023 than non-DAC respondents.

Table 8. Surveyed Homeowners' 2023 Household Income (n=500)

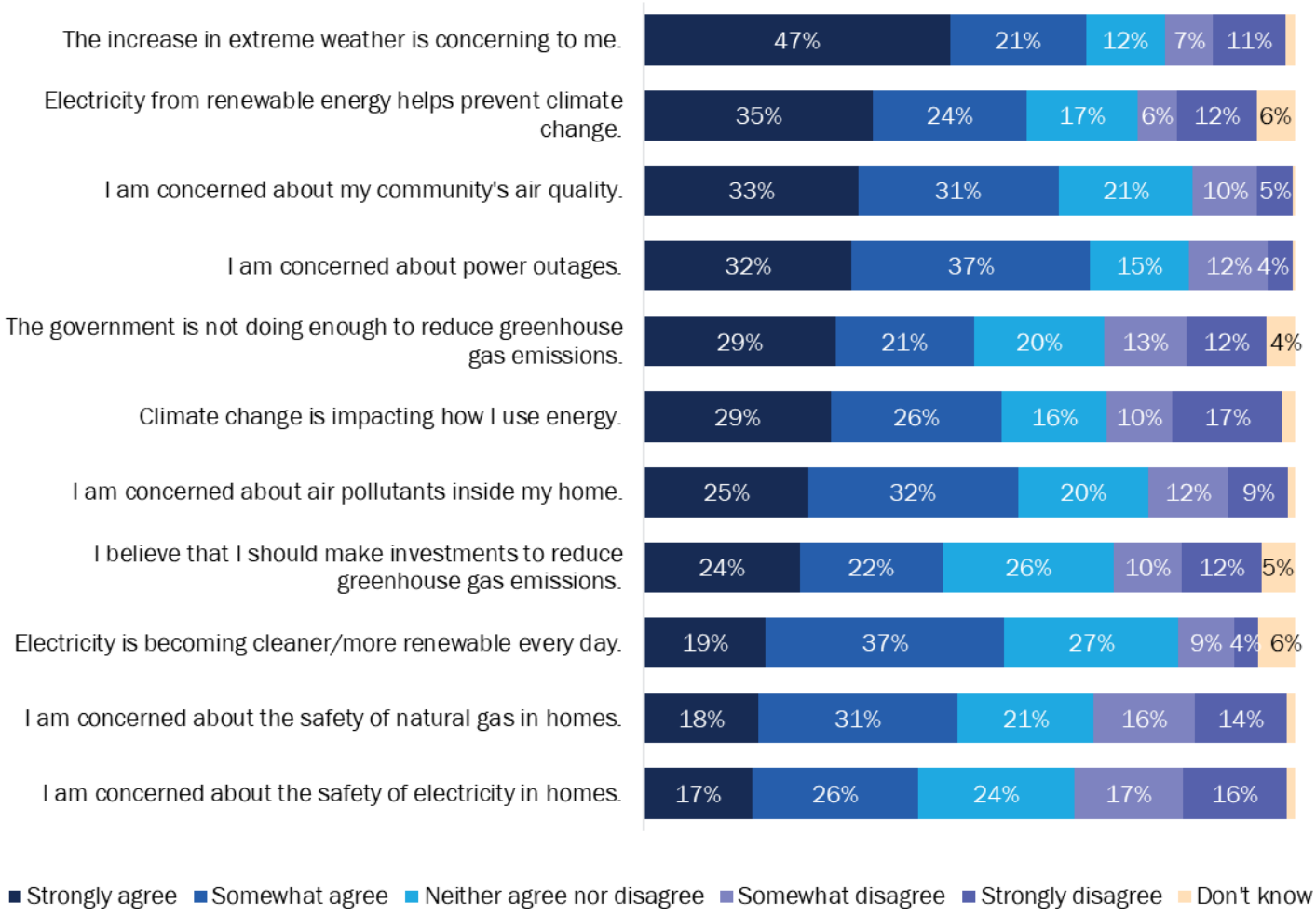
Income Level	Count of Respondents
Less than $25,000	27 (8%)
$25,000 to under $50,000	63 (13%)
$50,000 to under $75,000	70 (15%)
$75,000 to under $100,000	100 (24%)
$100,000 to under $150,000	103 (19%)
$150,000 to under $200,000	44 (7%)
$200,000 or more	52 (7%)

Income Level	Count of Respondents
Don't know	4 (1%)
Prefer not to say	37 (7%)
Total	**500 (100%)**

A subset of respondents (48 of 500; 10%) appeared to be climate change skeptics. This is a 2% decrease from the proportion identified in the Time 1 Market Assessment and a 5% decrease from those identified in the Baseline Market Assessment. These respondents strongly disagreed that electricity from renewable energy helped to prevent climate change and that climate change was impacting how they used energy (Figure 2).

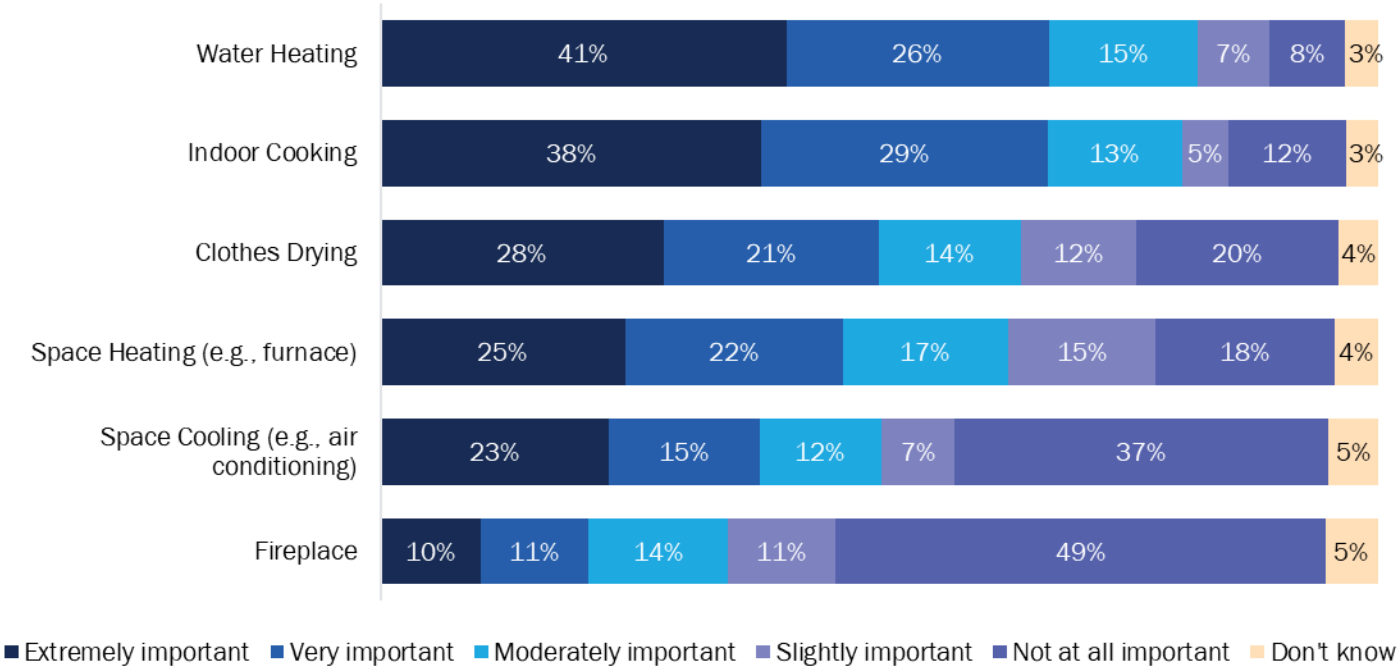
Conversely, nearly half of respondents (235 of 500; 47%) "strongly agreed" they were concerned about the increase in extreme weather—a 3% decrease from the Time 1 Market Assessment but an 11% increase from the Baseline Market Assessment. Additionally, over one-third of respondents (178 of 500; 35%) "strongly agreed" that electricity from renewable energy helps prevent climate change. Respondents were least likely to "strongly agree" that they were concerned about the safety of electricity in homes (74 of 500; 17%) or the safety of natural gas in homes (80 of 500; 18%).

Figure 2. Environmental Belief Systems (n=500)



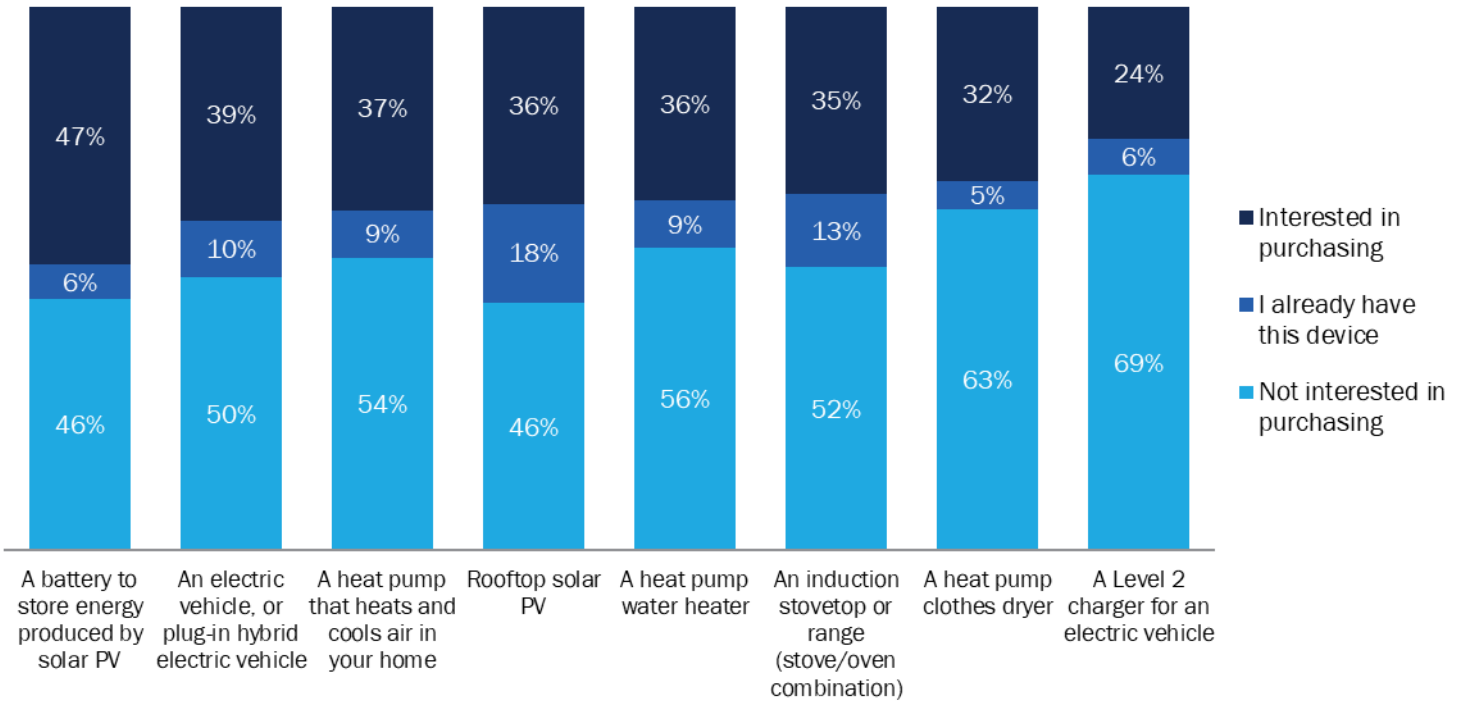
Regarding homeowners' willingness to use electric appliances, respondents who had strong preferences for one natural gas appliance tended to prefer gas for other appliances as well, which was consistent with the Baseline and Time 1market assessments. **Water heating (320 of 500; 67%) and indoor cooking (311 of 500; 67%) were the end uses with the strongest preference for natural gas, with more than two-thirds of respondents saying that gas was "extremely" or "very important" for those uses (Figure 3).** Respondents felt least strongly about using natural gas for indoor fireplaces.

Figure 3. Importance of Having an Appliance Be Natural Gas (n=500)



A minority of surveyed homeowners were interested in purchasing the electric devices we asked about in Figure 4, with the exception of a battery to store energy generated by solar panels, which interested nearly half of respondents (208 of 500; 47%). The second most popular device among homeowners was the electric or plug-in hybrid vehicle. Additionally, 18% of respondents (105 of 500) reported they already had rooftop solar. These results are similar to those from the Time 1 Market Assessment. Homeowners, however, were least interested in purchasing a Level 2 charger for an electric vehicle, with 69% of respondents indicating so—a 7% decrease from the Time 1 Market Assessment.

Figure 4. Interest in Electric Devices (n=500)



3.4 Study Limitations

This market study uses a combination of data sources, some of which are self-report survey responses (i.e., the contractor and homeowner surveys). Self-reported data can have limitations such as respondents' inaccurate reporting, incomplete reporting, or socially desirable reporting. Like all surveys, this study is also subject to survey nonresponse bias, in which those who complete the survey are different from non-responders in ways that correlate with our study variables. We attempted to minimize nonresponse bias by offering survey participation incentives and sending up to three reminder emails to encourage response. The study also uses cross-sectional data to compare the Time 2 findings from the summer of 2024, the Time 1 findings from the summer of 2023, and the Baseline findings collected in 2022 instead of longitudinal data. Longitudinal data requires collecting answers from the same respondents in all surveys and can be considered more robust, but is more time-intensive and expensive to collect.

4. HVAC Heat Pump Market Detailed Findings

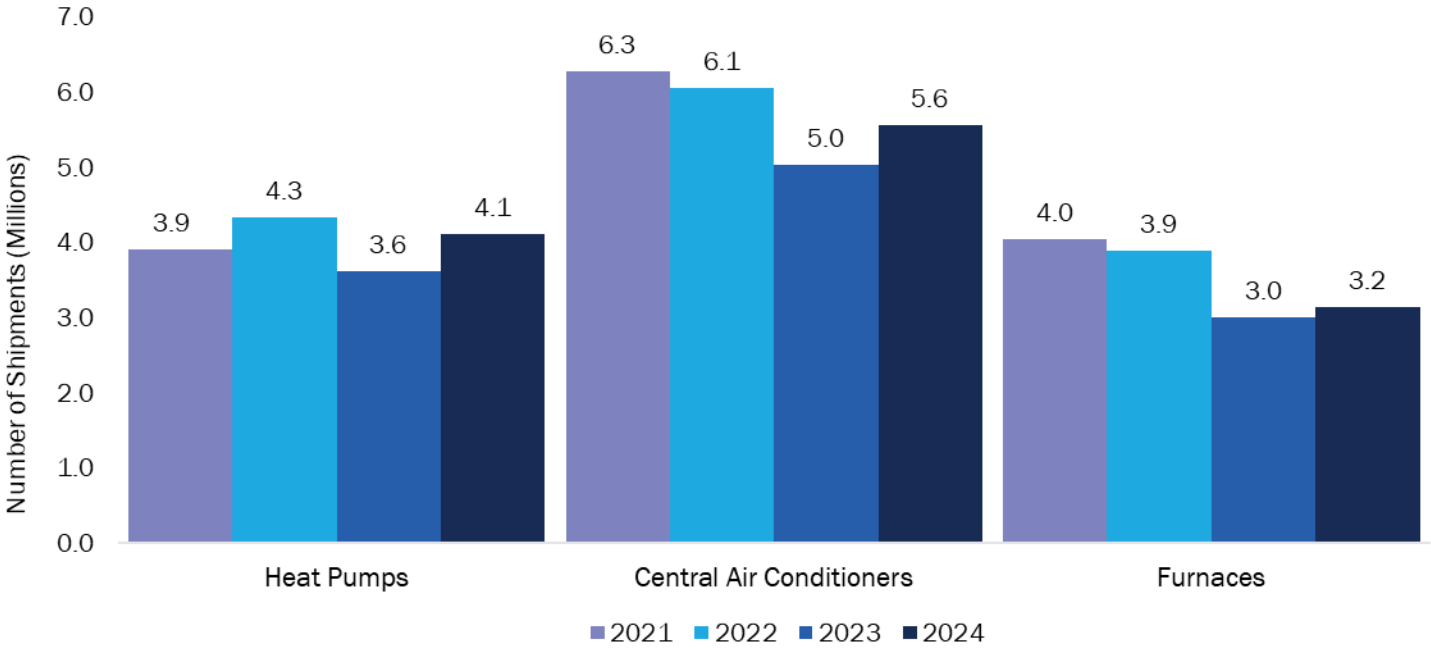
In this section, we review the HVAC market and present findings about surveyed HVAC contractors' experience with heat pumps, their heat pump training, and the perceived value of training. We also discuss findings about California homeowners' familiarity with HVAC heat pumps, their decision drivers for space-conditioning equipment, and their awareness of incentives for heat pumps.

4.1 Market Overview

In the Baseline Market Assessment, we used shipment data, which refers to the number of units sent from the manufacturers to the supply chain (e.g. distributors, wholesalers, retailers), for gas furnaces, central air conditioners, and air-source heat pumps to study the relative volume of HVAC shipments into California between January 2019 and December 2021. Unfortunately, the Heating Air Conditioning Refrigeration Distributors International (HARDI) organization has not made available state-level shipment data for 2022, 2023, or 2024. We explored alternative data sources for California-level shipment, stocking, or installation data in 2023 to support the Time 1 Market Assessment. After a thorough review of the various datasets available, we concluded that national-level shipment data from AHRI was the best source available. National-level shipment data from AHRI also remains the best available source for 2024.

According to AHRI, nearly 4.1 million residential air source heat pumps were shipped nationwide in 2024. As displayed in Figure 5, there was an increase in furnace, central air conditioner, and heat pump shipments between 2023 and 2024.[31] Heat pump shipments showed the largest year-over-year increase, at 14%. Furnaces showed the smallest year-over-year change, at a 5% increase. The overall increase in HVAC shipments suggests that more customers in the US replaced or installed HVAC equipment in 2024 compared to 2023, regardless of the equipment type.

Figure 5. US HVAC Equipment Shipments



4.2 Current HVAC Systems

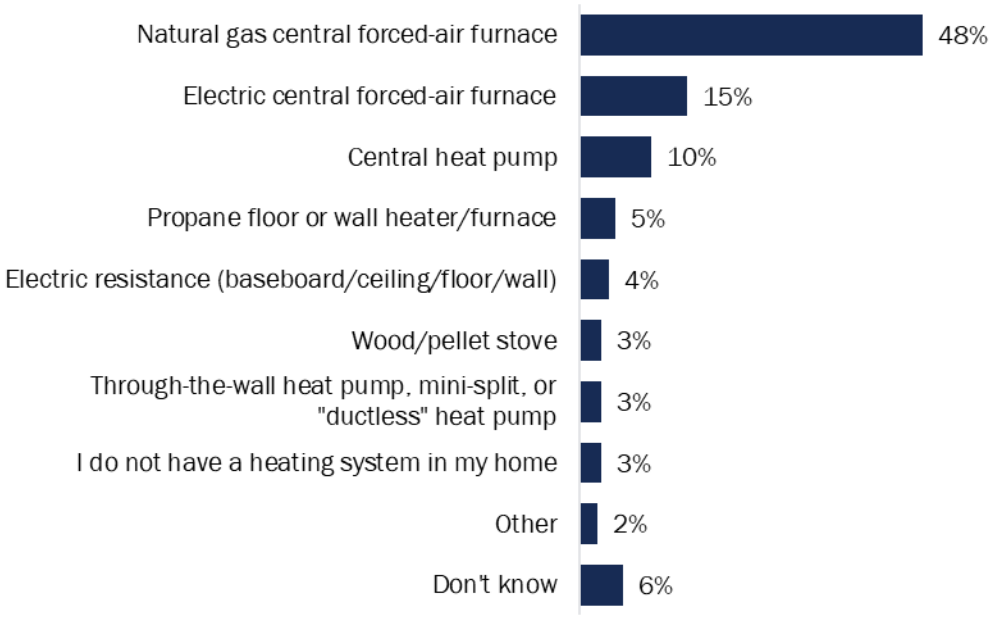
The following sections describe what primary heating and cooling equipment surveyed homeowners in California have installed.

[31] Fossil fuel furnaces are included in furnace shipment counts since distributor sales of electric furnaces are often sold just as the electric insert.

4.2.1 Space Heating

Nearly half of surveyed homeowners (266 of 500; 48%) used a natural gas central forced-air furnace as their primary heating system, which is the most common type of heating equipment (Figure 6). Ten percent of respondents (43 of 500) use a heat pump as the primary heating source in their home. The proportion of respondents with a natural gas furnace has decreased by 4% since the Baseline and Time 1 Market Assessments. Similarly, the proportion of those who reportedly have a heat pump decreased by 2% since the Baseline and Time 1 Market Assessments.

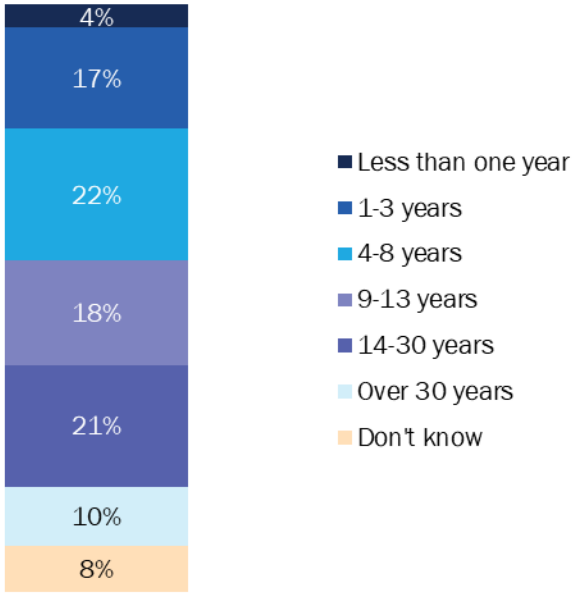
Figure 6. Primary Heating System (n=500)



Note: "Other" responses included natural gas floor furnaces (4 mentions), wood-burning fireplaces (2 mentions), a hydropump (1 mention), a "room heater" (1 mention), and a propane central forced air (1 mention), as well as two respondents who cited not really using their primary heating system.

Similar to both the Baseline and Time 1 Market Assessments, nearly a third of surveyed homeowners' primary heating systems (152 of 461; 31%) are at least 14 years old (Figure 7). This gives us an indication of the proportion of heating systems that may need to be replaced in the near term. One-fifth of respondents (88 of 461; 21%) have a fairly new heating system, reporting their equipment is less than four years old—a similar proportion as in the Baseline Market Assessment. Conversely, a tenth of respondents (49 of 461; 10%) have a system over 30 years old—a 3 percentage point increase since the Baseline Market Assessment but a decrease of 1 percentage point compared to the Time 1 Market Assessment. Overall, for respondents with a natural gas central forced-air furnace or with a propane floor or wall heater/furnace, the average weighted age of their equipment is 14.7 years old.

Figure 7. Age of the Primary Heating System (n=461)



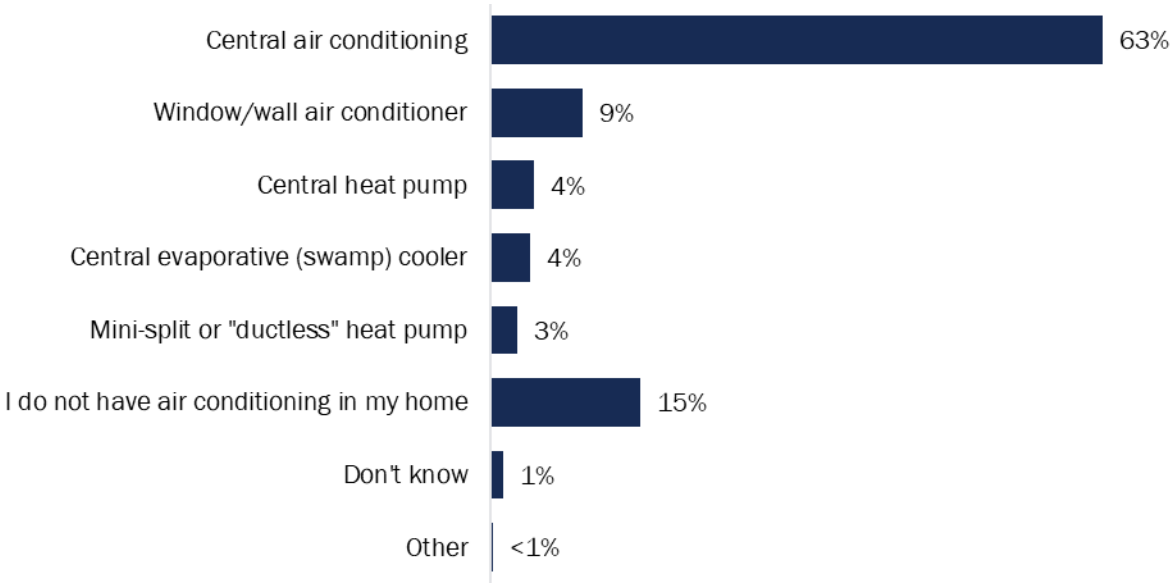
Note: The analysis excludes 39 respondents who either did not know what type of technology their primary heating system was or did not indicate using a primary heating system.

Although the average age of surveyed homeowners' primary heating systems in the Time 1 Market Assessment was significantly older in DACs than in non-DACs, this changed in the Time 2 Market Assessment. Respondents in DAC communities were significantly more likely to have heating systems that are one to three years old compared to respondents in non-DAC communities.

4.2.2 Cooling

Central air conditioning is overwhelmingly the most common primary cooling system used by surveyed homeowners (Figure 8). A minority of respondents (41 of 500; 7%) said a heat pump, either central or ductless, is the primary cooling source in their home—5% fewer than in the Baseline Market Assessment, but the same proportion as in the Time 1 Market Assessment. Additionally, 15% of respondents (74 of 500) reported they do not have air conditioning, which is 3% less than observed in the Baseline Market Assessment but 1% more than observed in the Time 1 Market Assessment.

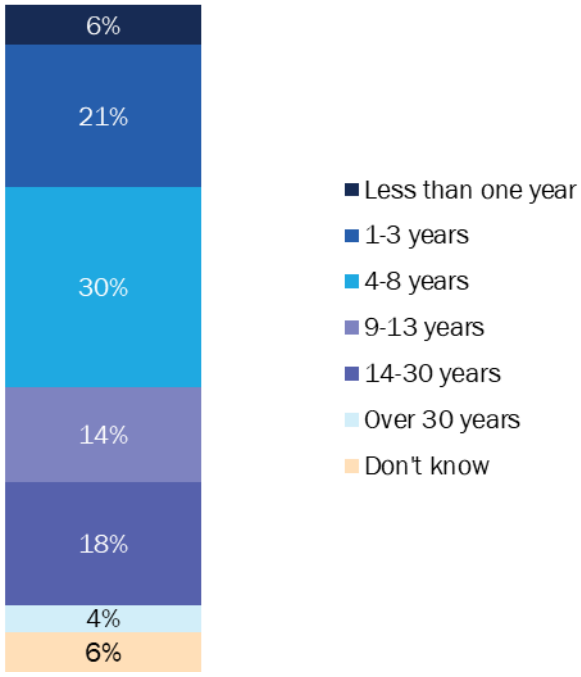
Figure 8. Primary Cooling System (n=500)



Note: "Other" responses included a whole house fan (1 mention) and a respondent who cited not using their cooling system (1 mention).

Similar to the Time 1 Market Assessment, over one-third of respondents' primary cooling systems (162 of 420; 37%) are at least nine years old—an 8 percentage point decrease since the Baseline Market Assessment (Figure 9). This gives us an indication of the proportion of cooling systems that may need to be replaced in the near term. Conversely, over one-quarter of surveyed homeowners (111 of 420; 27%) reported their cooling system is quite new, less than four years old—a 4 percentage point increase since the Baseline Market Assessment and the same as the Time 1 Market Assessment. For respondents with either a central air conditioner, a window/wall air conditioner, or a swamp cooler, the weighted average age of their equipment is 8.8 years old.

Figure 9. Age of the Primary Cooling System (n=420)



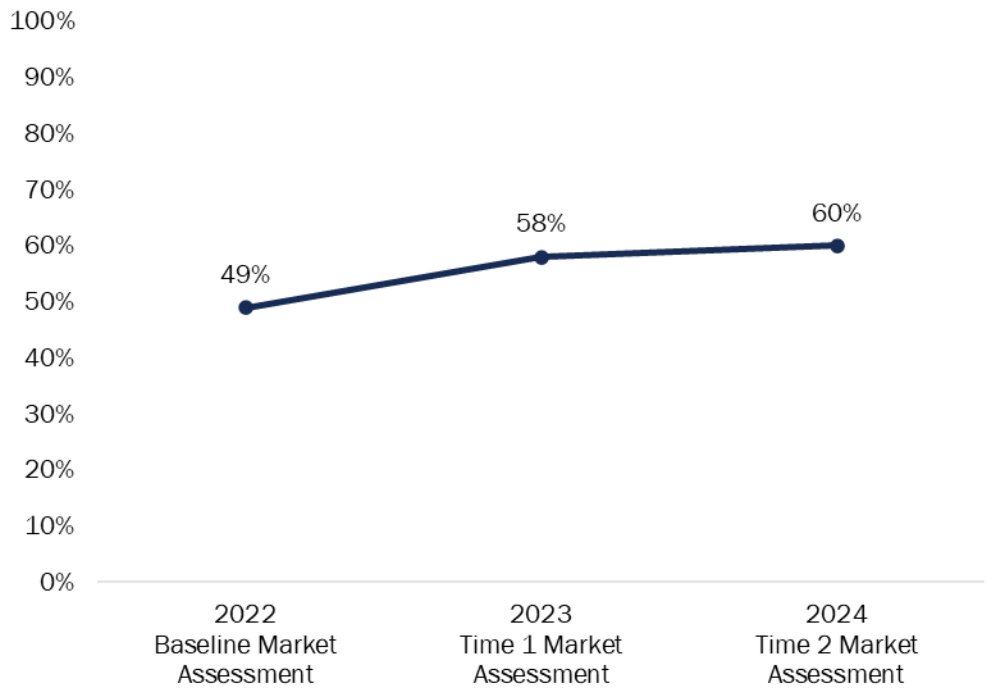
Note: Asked of respondents who reportedly had a cooling system and were aware of the type of system they have.

As in previous surveys, primary cooling systems are, on average, significantly older in non-DACs compared to those in DACs. DAC respondents were significantly more likely to report that their primary cooling systems are between four to eight years old and non-DAC respondents were significantly more likely to report that their primary cooling systems are between nine and thirty years old.

4.3 Customer Awareness

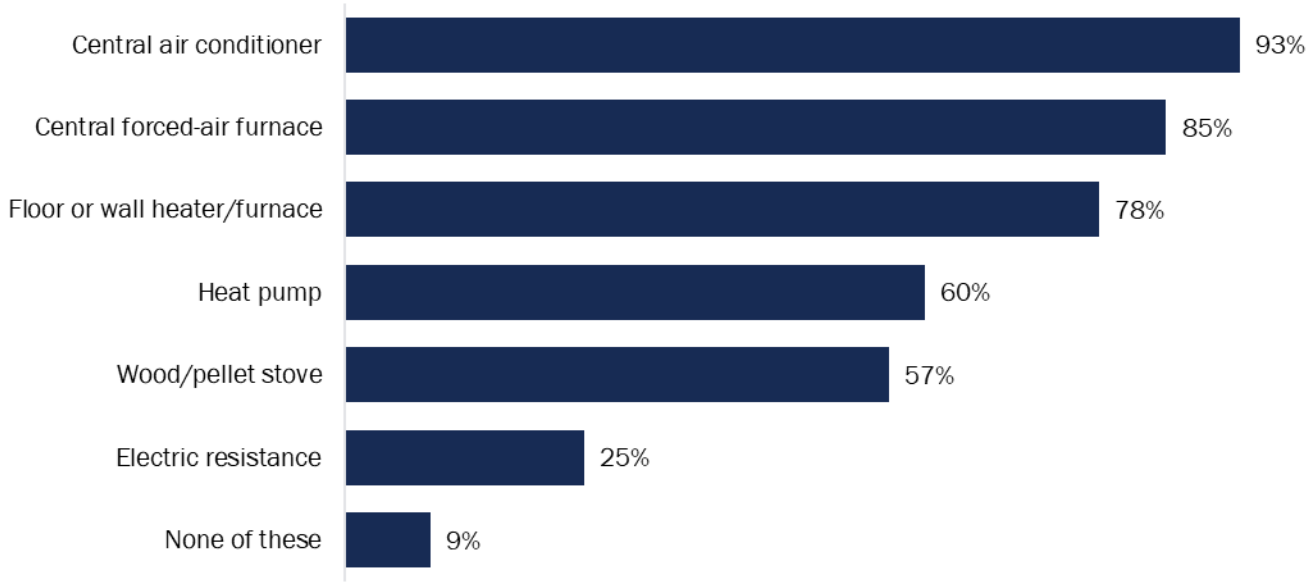
Surveyed homeowners' awareness of HVAC heat pumps has increased over time. Three-fifths of respondents (302 of 500; 60%) indicated they were aware of HVAC heat pumps in 2024. We saw greater increases between 2022 and 2023 compared to the increase from 2023 to 2024 (Figure 10).

Figure 10. Awareness of Heat Pumps Over Time (n=500)



Surveyed California homeowners were most aware of central air conditioners (475 of 500; 93%), central forced-air furnaces (437 of 500; 85%), and floor or wall heaters/furnaces (423 of 500; 78%), which are the same top three most known technologies identified in both the Baseline Market Assessment and the Time 1 Market Assessments (Figure 11).

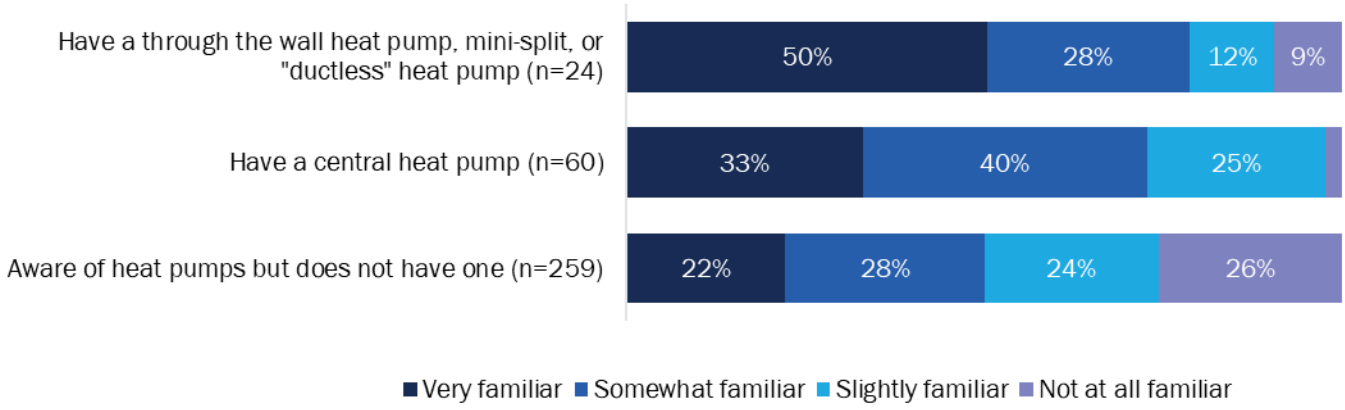
Figure 11. Awareness of Different Heating and Cooling Systems (n=500)



Note: Response option "None of these" is exclusive. Multiple responses were allowed.

Among homeowners who had heard of HVAC heat pumps, whether they had one or not, those who have a through-the-wall heat pump, mini-split, or "ductless" heat pump were most familiar with the equipment (Figure 12). Respondents with a through-the-wall heat pump, mini-split, or a ductless system (13 of 24; 50%) were more likely to be "very familiar" with the equipment than those who had a central heat pump (25 of 60; 33%). Respondents who indicated they were aware of HVAC heat pumps but did not have one in their home were *least* familiar with the equipment, with about one-fifth (44 of 259; 22%) being "very familiar" with it.

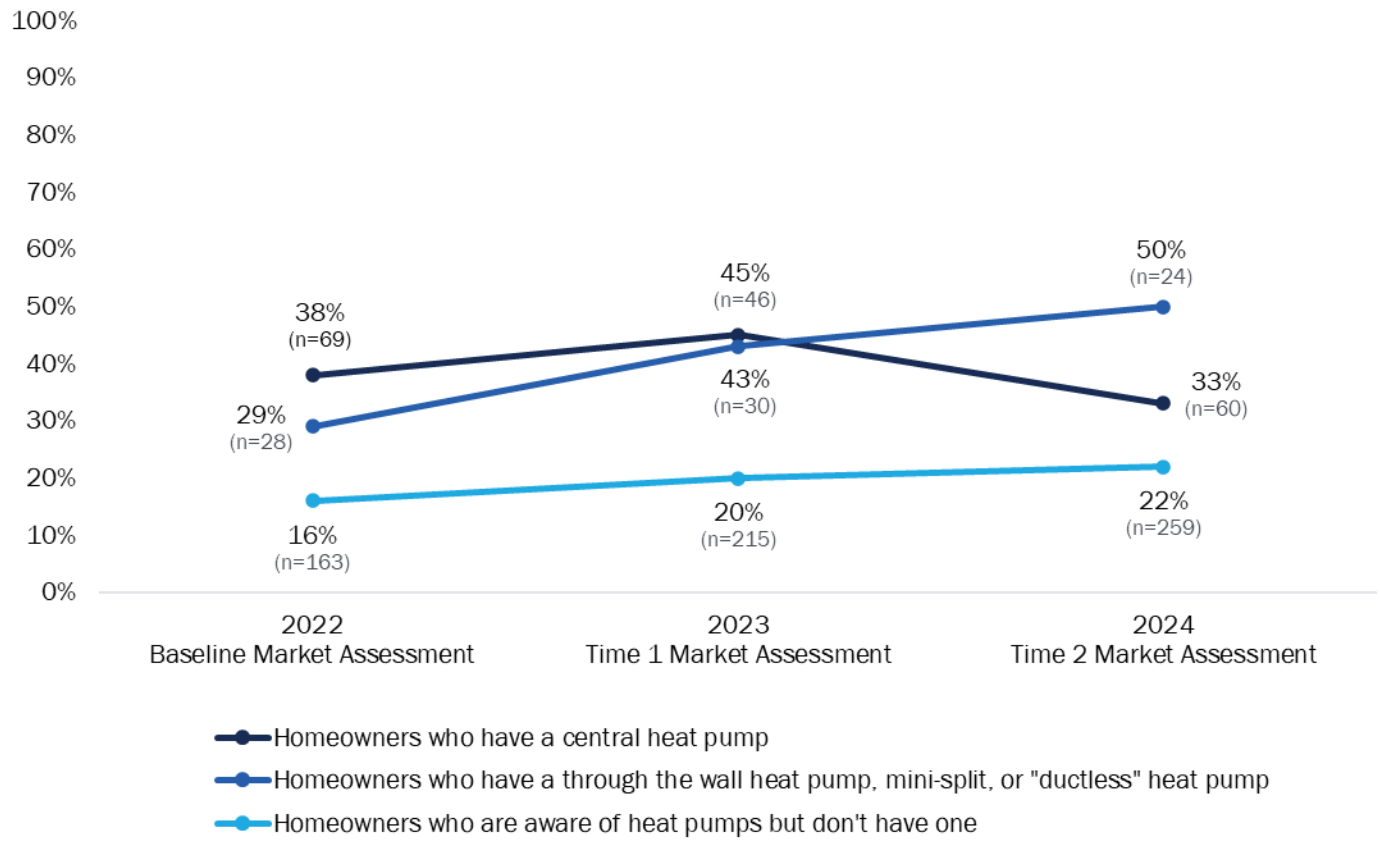
Figure 12. Familiarity with HVAC Heat Pumps (n=343)



Note: Asked of respondents who indicated they had heard of HVAC heat pumps or had one.

Familiarity with heat pumps, specifically the proportion of respondents who said they were "very familiar" with the equipment, increased by 7 percentage points in the last year and by 21 percentage points since the Baseline Market Assessment among respondents who reportedly have a ductless heat pump. Moreover, the proportion of respondents with a central heat pump who reported being "very familiar" with it decreased by 12 percentage points in the last year and by five percentage points compared to the Baseline Market Assessment (Figure 13).

Figure 13. Respondents Who Are "Very Familiar" with Heat Pumps Over Time



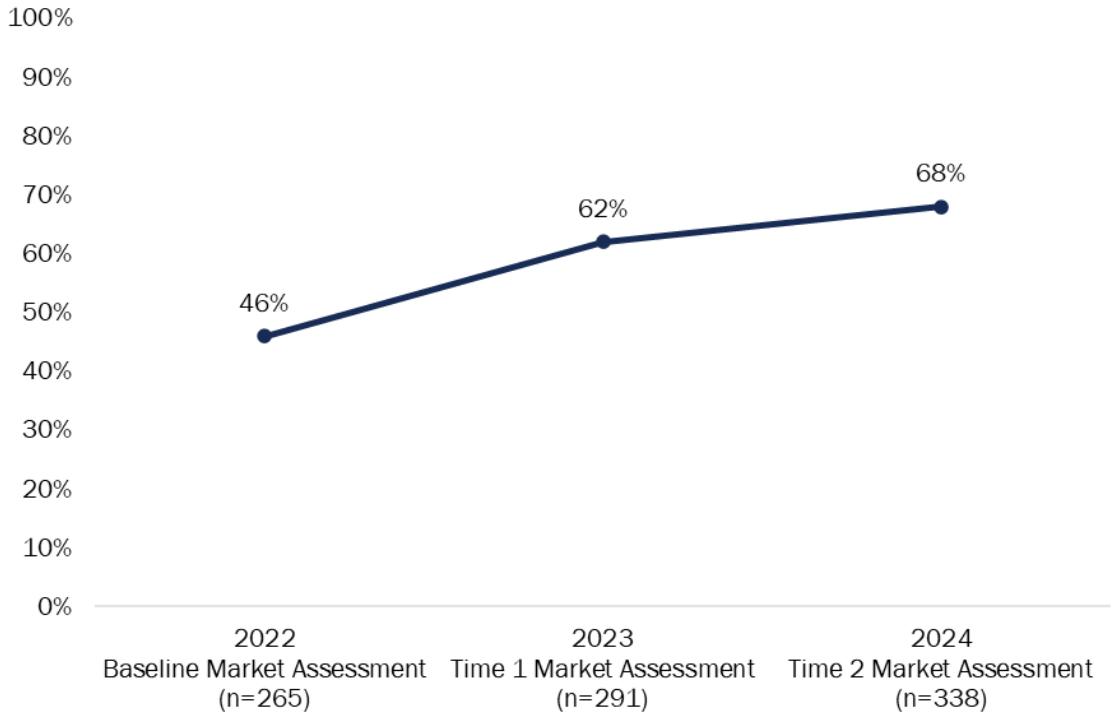
Note: Asked of respondents who indicated they had heard of HVAC heat pumps or had one.

About a quarter of respondents who were aware of HVAC heat pumps (93 of 343; 24%) had heard of the equipment through word of mouth, while the second most common source of information was news articles (49 of 343; 16%), either on the internet or in a newspaper or magazine. A fifth of those respondents (76 of 343; 20%) did not recall where they had heard about HVAC heat pumps.

While a large proportion of homeowners did not know about the benefits and drawbacks of HVAC heat pumps, we observed an improvement in knowledge since the Baseline Market Assessment. When we asked respondents who were aware of heat pumps to identify heat pump benefits in an open-ended, unaided question, 32% (122 of 338) said they did not know enough to make a guess—a 6 percentage point decrease since the Time 1 Market Assessment, and a 22 percentage point decrease since the Baseline Market Assessment (Figure 14). In other words, the proportion of respondents who identified at least one benefit of HVAC heat pumps increased by 22 percentage points in the last two years, suggesting homeowners' knowledge about heat pump equipment has improved.[32]

[32] This analysis excluded five respondents who were asked to provide benefits or drawbacks of HVAC heat pumps but who did not answer the question.

Figure 14. Awareness of Benefits or Drawbacks of HVACs Over Time



Note: Asked of respondents who indicated they had heard of HVAC heat pumps or had one.

When asked about the benefits of HVAC systems in an open-ended, unaided question, nearly one-quarter of surveyed homeowners (96 of 338; 24%) believed heat pumps are more energy efficient—a 3 percentage point decrease from the Time 1 Market Assessment, but still representing an increase of 11 percentage points from the Baseline Market Assessment (Table 9). Conversely, 7% of respondents (26 of 338) reported heat pumps present no benefits—a 1 percentage point increase from the Baseline Market Assessment and a 3 percentage point decrease from the Time 1 Market Assessment.

Table 9. Customers' Perceived Benefits of Heat Pump Over Other HVAC Systems (n=338)

Benefits	Count of Respondents	Percent of Respondents
Energy efficient	96	24%
Cost efficient	45	10%
Effective heating/cooling	21	8%
Provides both heating and cooling	22	6%
Reduced environmental impact	17	5%
Electric (less reliance on gas)	16	5%
Safer than gas systems	3	2%
Easy to operate	1	<1%
Able to utilize energy generated with solar PV	3	<1%
Other	18	6%
No benefits	27	7%
Don't know	122	32%

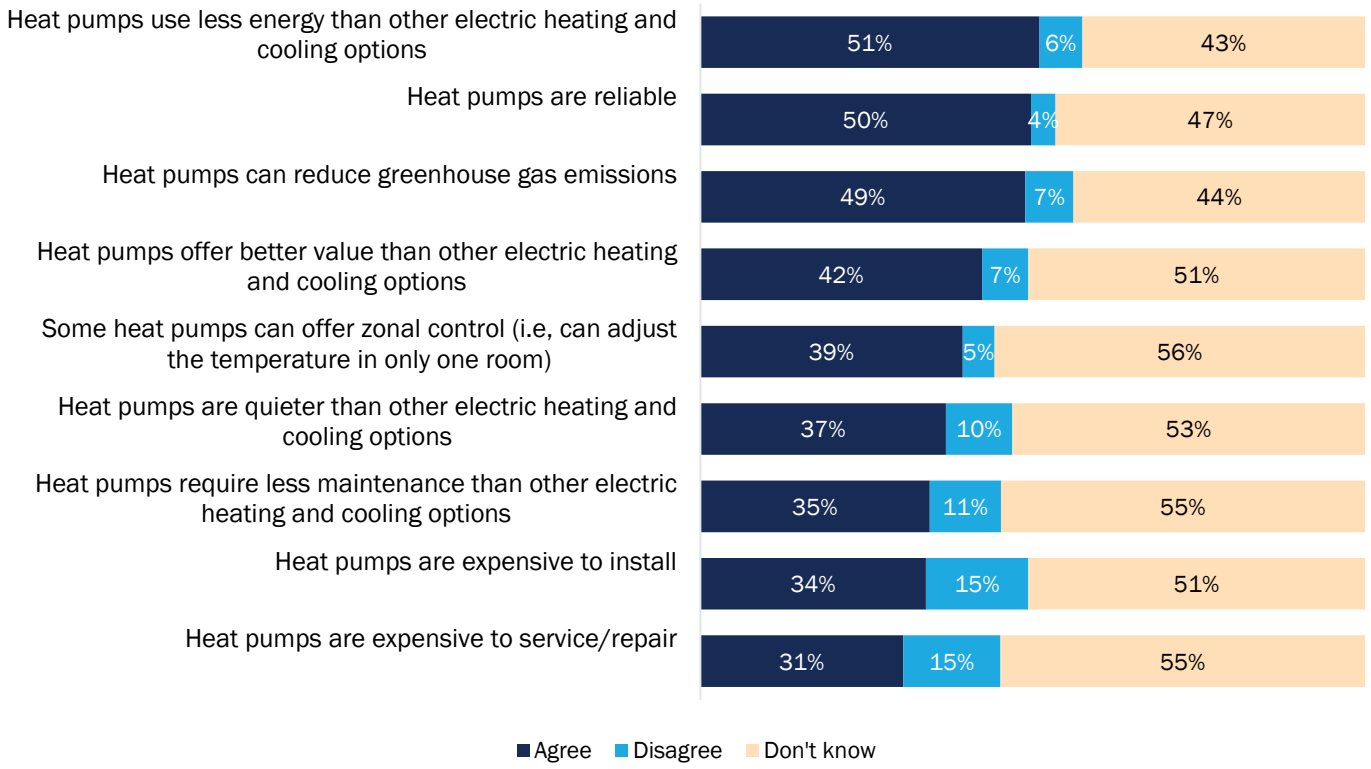
Note: Asked of respondents who indicated they had or had heard of HVAC heat pumps. Multiple responses were allowed. Five respondents did not provide responses to this question and were excluded from these calculations. There was one mention of each of the following "Other" responses: portability, low maintenance, improved comfort, and the fact that heat pumps can be used in a single room rather than the entire house. The additional "Other" responses were more broad statements on the benefits of heat pumps, such as "it's a good system" or that it is "excellent" and "beneficial". "No benefits" and "don't know" responses were exclusive.

Below are some illustrative quotes from respondents representing those who believed heat pumps were more energy efficient, that they offered no benefits, and those who did not know:

- **Energy efficient:** "Heat pumps are energy-efficient systems that provide both heating and cooling, reducing energy bills and environmental impact while offering consistent temperature control and lower maintenance needs."
- **No benefits:** "I don't think a heat pump is superior to standard gas heating and central air."
- **Don't know:** "I don't know. I have only heard the term, nothing more."

We also asked homeowners who were aware of heat pumps to indicate whether they agreed or disagreed with various statements about HVAC heat pumps. Figure 15 shows that for each statement, between 43% and 56% of respondents reported that they did not know, similar to that observed in the Baseline Market Assessment and the Time 1 Market Assessment. **The continued high rate of "don't know" responses tells us that surveyed homeowners did not feel comfortable taking a side or even guessing an answer, indicating that despite being generally aware, many still do not understand the benefits and drawbacks of HVAC heat pump systems.**

Figure 15. Benefits and Drawbacks to HVAC Heat Pumps (n=342)



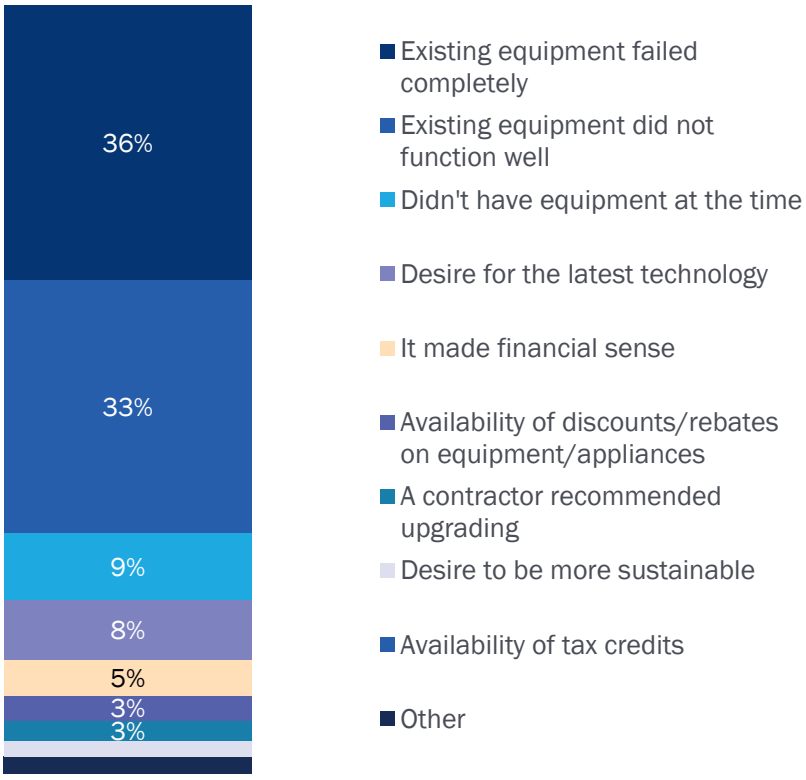
Note: Asked of respondents who indicated they had heard of HVAC heat pumps or had one.

Surveyed single-family homeowners who were aware of heat pumps were most likely to agree that HVAC heat pumps use less energy than other electric heating and cooling options (168 of 342; 51%), are reliable systems (163 of 342; 50%), and can reduce greenhouse gas emissions (155 of 342; 49%). Respondents were most likely to disagree that heat pumps are expensive to install (56 of 342; 15%), service, and/or repair (52 of 342; 15%). The proportion of those who strongly agreed that HVAC systems are reliable increased by 12 percentage points since the Baseline Market Assessment, and those who strongly agreed that HVAC systems offer better value than other heating and cooling systems increased by 8 percentage points since the Baseline Market Assessment. Additionally, the proportion of respondents who agree that heat pumps are expensive to install has decreased by 6 percentage points since the Baseline Market Assessment and by 3 percentage points since the Time 1 Market Assessment. This shift suggests that **homeowners' perspectives on heat pumps are changing to view heat pumps as an increasingly reliable and efficient heating and cooling technology**.

4.4 Customer Decision Drivers

Homeowners typically waited until their heating/cooling equipment was not functioning well or completely broken before they replaced it, similar to what we observed in the Baseline Market Assessment. Slightly more than half of surveyed homeowners (259 of 500; 52%) had either replaced their heating/cooling system or installed a new one in their home. For survey respondents who had replaced their heating or cooling system or had installed a new one in their home, we investigated what caused them to purchase the new equipment, the factors that were important to them, their sources of information, and the reasons that led them to select their contractor. A minority of respondents purchased new equipment for reasons outside of the existing system's functionality, such as the desire to have newer technology (17 of 259; 8%) or that the switch made sense financially (13 of 259; 5%) (Figure 16).

Figure 16. Main Reason for Replacing Heating/Cooling Equipment (n=259)

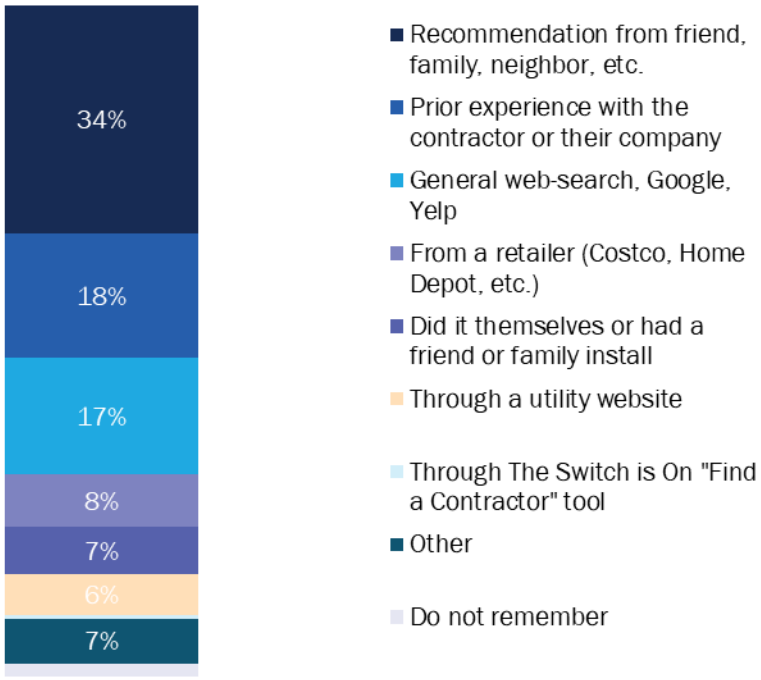


Note: Asked of respondents who indicated they had either replaced their air conditioning or heating system or had a new one installed in their home. "Other" responses included replacement because respondents were remodeling (no specification around new technology or issues) (3 mentions), wanted better efficiency (2 mentions), were building a new house (1 mention), were adding an addition to their current house (1 mention), or the existing equipment was destroyed in a housefire (1 mention).

The most common way respondents found their contractor was through a personal referral or prior experience with them or their company (144 of 259; 52%) (Figure 17). Nearly one-quarter of surveyed homeowners (57 of 259; 24%) found their contractor online, either through a general web search such as Google or Yelp (17%), their utility's website (6%), or The Switch is On's "Find a Contractor" tool (1%)[33]—the latter representing a 5 percentage point decrease from the Time 1 Market Assessment.

[33] TECH uses the Switch is On website as a customer-facing educational website for heat pumps and other home electrification technologies.

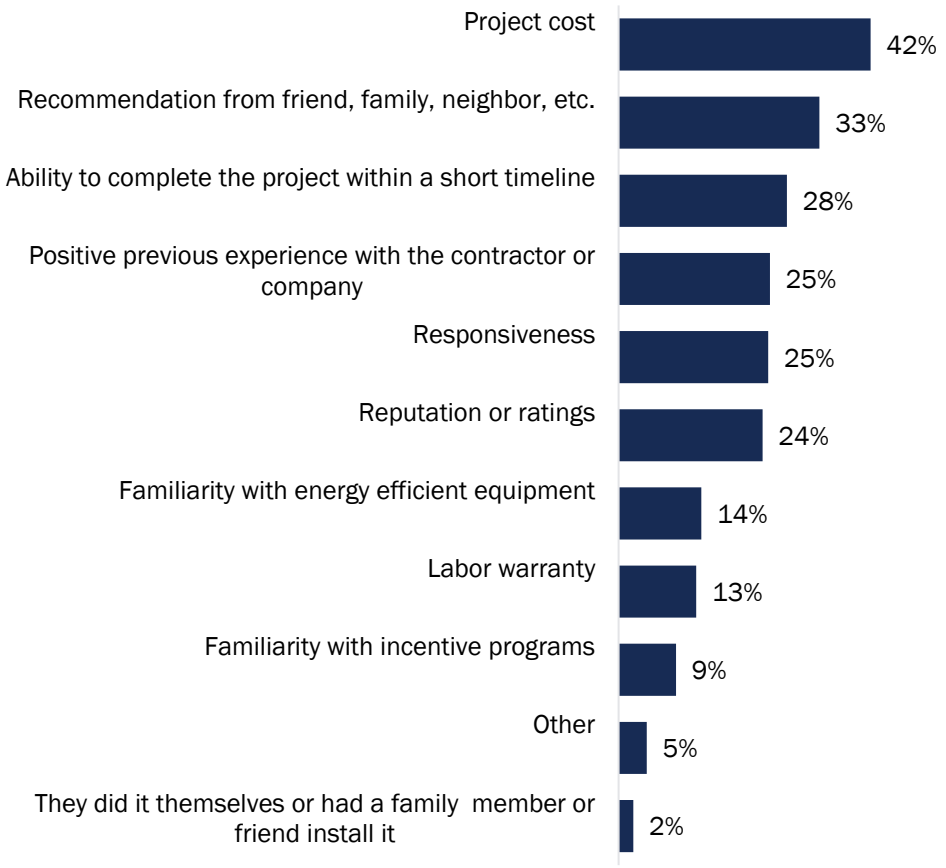
Figure 17. How Customers Found Contractor Who Installed Heating/Cooling Equipment (n=259)



Note: Asked of respondents who indicated they had either replaced their air conditioning or heating system or had a new one installed in their home. "Other" ways respondents reported finding their contractor included through local advertisements (4 mentions), door-to-door solicitation (2 mentions), the Yellow Pages (2 mentions), an insurance company (2 mentions), a home warranty company (2 mentions), the Bay Area Consumer Checkbook (1 mention), YouTube (1 mention), from collecting quotes (1 mention), or a referral from their existing contractor (1 mention).

The project cost offered by the contractor was the most common reason why surveyed homeowners selected them to install their HVAC equipment, though cost was not the only factor that mattered (107 of 259; 41%) (Figure 18). Other common reasons respondents reported for hiring their contractor included the contractor being recommended or referred (83 of 259; 33%), the contractor completing the project within a short timeline (72 of 259, 28%), previous positive experiences with the contractor/company (73 of 259; 25%), responsiveness (79 of 259; 25%), and their reputation or ratings (80 of 259; 24%). This suggests that homeowners value trustworthiness, reliability, and strong interpersonal skills when selecting a contractor to install their HVAC equipment. Only 14% of respondents (37 of 259) chose their contractor because of their familiarity with energy-efficient equipment, while even fewer (22 of 259; 9%) said their choice was based on the contractor's familiarity with incentive programs. A small proportion of respondents (6 of 259; 4%) installed the equipment themselves or had a family member or friend install it rather than hiring a contractor.

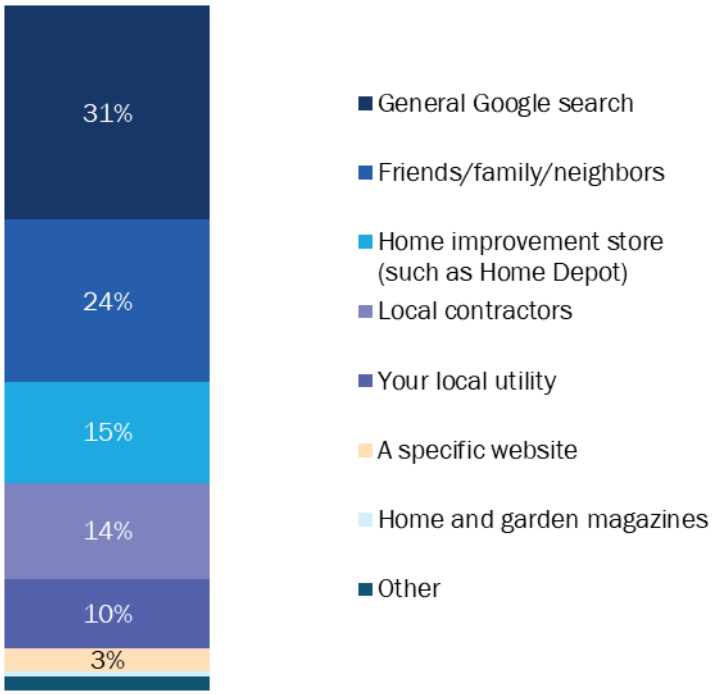
Figure 18. Reason For Choosing Contractor Who Installed Heating/Cooling Equipment (n=259)



Note: Asked of respondents who indicated they had either replaced their air conditioning or heating system or had a new one installed in their home. Multiple responses were allowed. "Other" responses included that the contractor was already doing other work in their home (3 mentions), that their insurance recommended them (2 mentions), that another contractor recommended them (2 mentions), that their home warranty company recommended them (1 mention), or that the contractor had worked for the company selling the equipment (1 mention). Three respondents stated that they did not recall.

If they were to consider upgrading their space heating or cooling system, surveyed homeowners were more likely to begin looking for information through their own online research and personal relationships rather than through industry professionals. Over half of respondents (297 of 500; 55%) shared they would first do a general Google search (169 of 500; 31%) or converse with friends, family, or neighbors (128 of 500; 24%) if they wanted to upgrade the heating or cooling system in their home. Fewer respondents would initially turn to an industry professional like a local contractor (70 of 500; 14%), home improvement store (58 of 500; 15%), or their utility (39 of 500; 10%) (Figure 19).

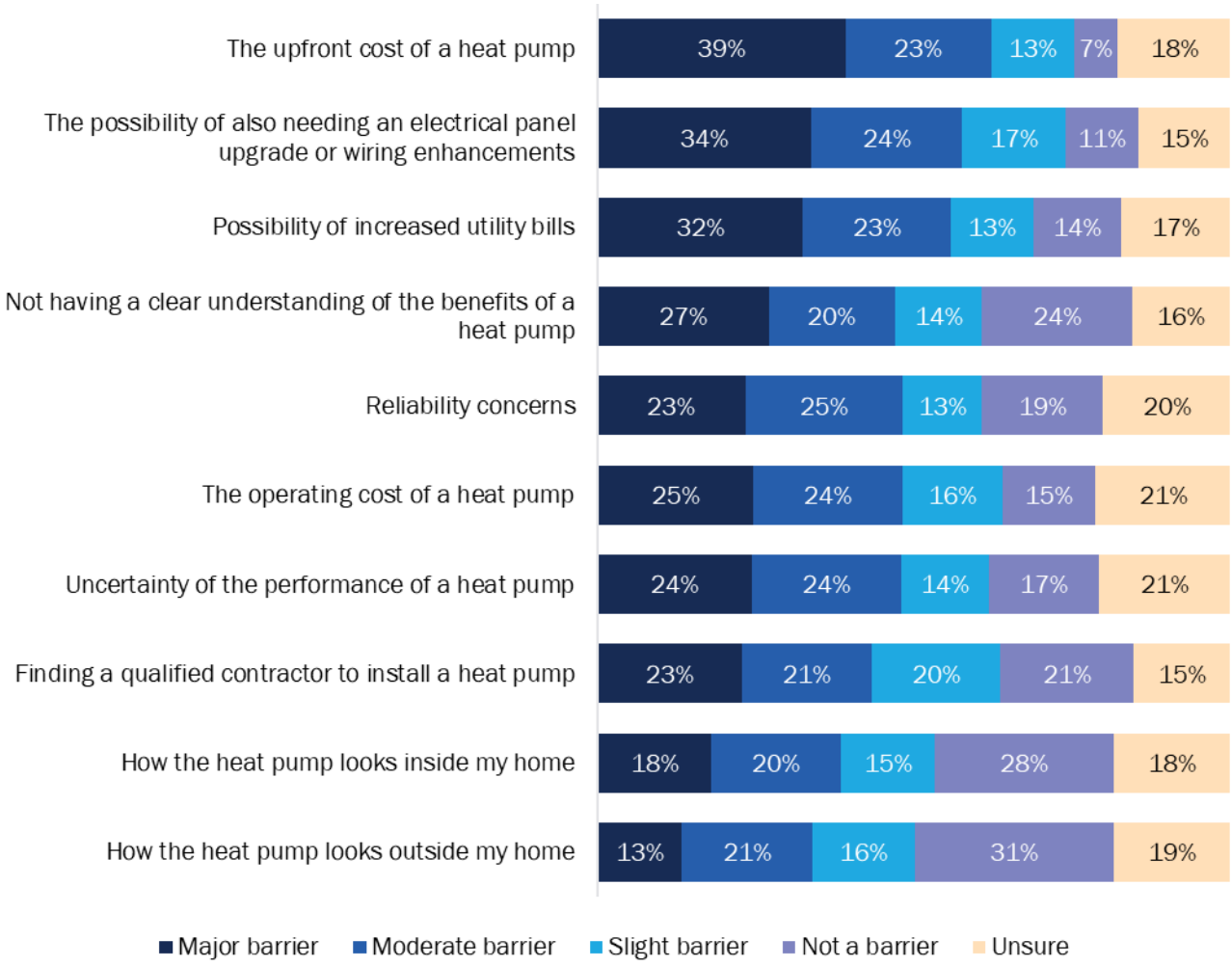
Figure 19. Where Customers Would Begin Looking for Heating/Cooling System Information (n=500)



Note: "Other" responses included their home warranty company, landlord, or utility company (3 mentions), the respondents' job (2 mentions), Costco or Bergesons (1 mention), the Yellow Pages (1 mention), consumer reports (1 mention), or a Bing search (1 mention). Those who said they would visit a specific website (17 of 500; 3%) provided the following sites they would visit: Angie's List, the Better Business Bureau, ChatGPT, Costco, Reddit, Yelp, and YouTube.

The upfront equipment costs and the possibility of required additional home upgrades were the primary barriers for surveyed homeowners to purchase an HVAC heat pump. Similar to Baseline and Time 1 Market Assessment responses, homeowners who had heard of a heat pump before most commonly cited the upfront cost of equipment (115 of 342; 39%), the possibility of needing an electrical panel upgrade or wiring remediation (109 of 342; 34%), and the possibility of increased utility bills (107 of 342; 32%) as the "major barriers" for them when considering purchasing a heat pump (Figure 20). Surveyed homeowners were least concerned about the look of the heat pump, both inside (92 of 342; 28% selected "not a barrier") and outside (122 of 342; 31% selected "not a barrier") of their home, and not having a clear understanding of the benefits of a heat pump (74 of 342; 24% selected "not a barrier").

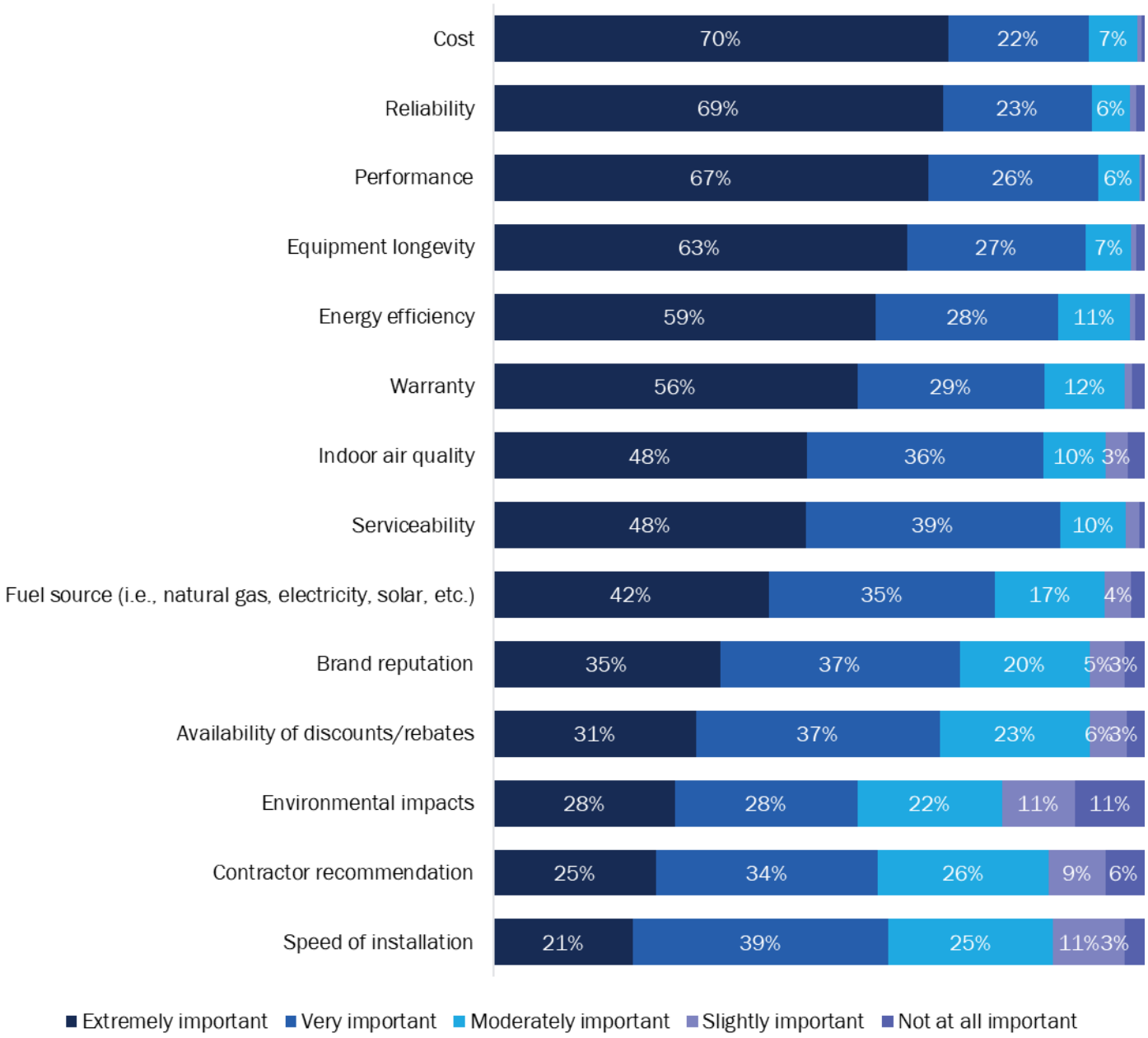
Figure 20. Barriers to Purchasing HVAC Heat Pumps (n=342)



Note: Asked of respondents who indicated they had heard of an HVAC heat pump or had one.

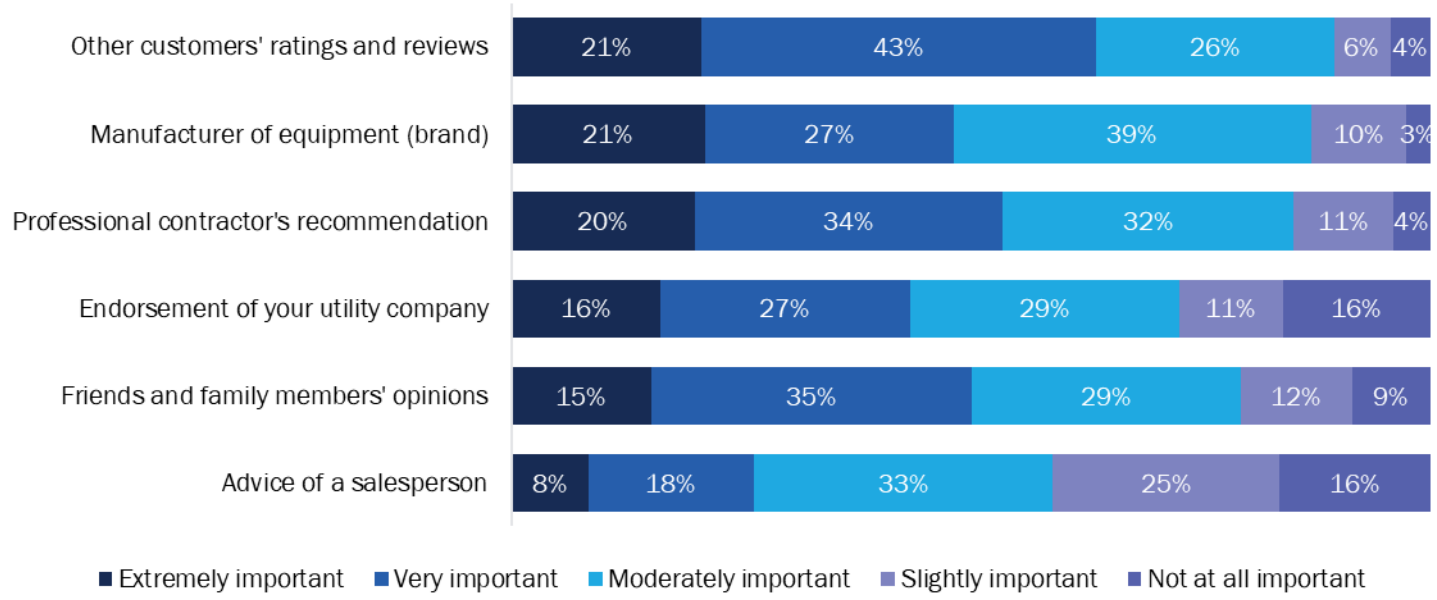
Surveyed homeowners rated equipment cost, reliability, and performance as the most important factors in their purchasing decision if they were to replace their HVAC equipment, as we observed in the Baseline Market Assessment and Time 1 Market Assessment (Figure 21). Equipment longevity and energy efficiency were also rated as highly important factors for respondents when considering purchasing new HVAC equipment, while environmental impacts were among the least important factors—11% of respondents indicated it was "not at all important". This suggests that although energy-efficient equipment is likely to have a smaller impact on the environment by decreasing energy use and thus producing fewer emissions, respondents were more focused on the potential monetary savings resulting from higher efficiency. Looking across communities, respondents in DACs were significantly more likely to rate cost as an "extremely important" factor (75%) if they were to replace their heating/cooling equipment than non-DAC homeowners (61%).

Figure 21. Importance of Factors When Replacing Heating and Cooling Equipment (n=500)



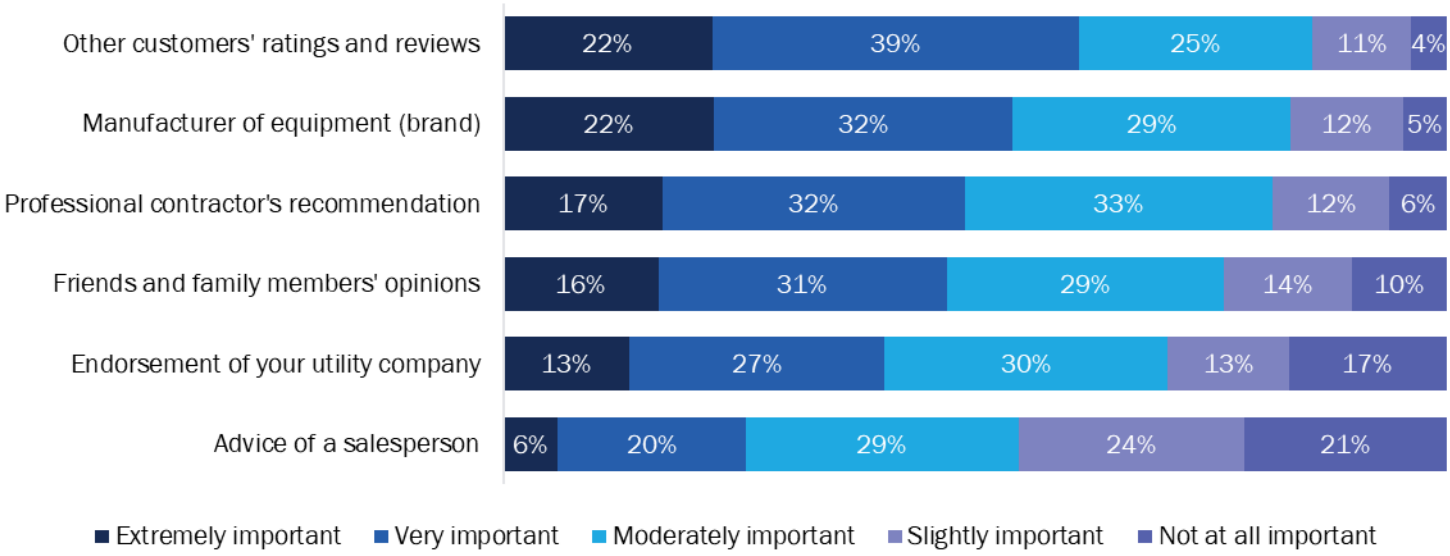
Other customers' reviews and a recommendation from a professional contractor were rated as the most influential sources to surveyed homeowners when considering purchasing a new heating system (Figure 22). We asked respondents how important various sources would be in influencing their decision about a new primary heating system. As observed in the Baseline and the Time 1 Market Assessments, more than half of respondents rated other customers' ratings and reviews (297 of 500; 64%), a professional contractor's recommendation (257 of 500; 54%), the opinion of friends and family members (232 of 500; 50%), and the equipment manufacturer (249 of 500; 48%) as "extremely" or "very important" in influencing their decision. Similarly, advice from a salesperson was again ranked as the least important source, with less than one-quarter of respondents (115 of 500; 26%) rating it as "extremely" or "very important" and a much larger proportion (241 of 500; 41%) sharing it was "slightly" or "not at all important" to them.

Figure 22. Influential Sources When Considering a New Primary Heating System (n=500)



We also asked respondents how important the same sources would be in influencing their decision to purchase a new cooling system. Again, we found other customers' equipment reviews, the equipment manufacturer, a recommendation from a professional contractor, and the opinions of friends and family members to be the most important sources of information to surveyed homeowners (Figure 23).

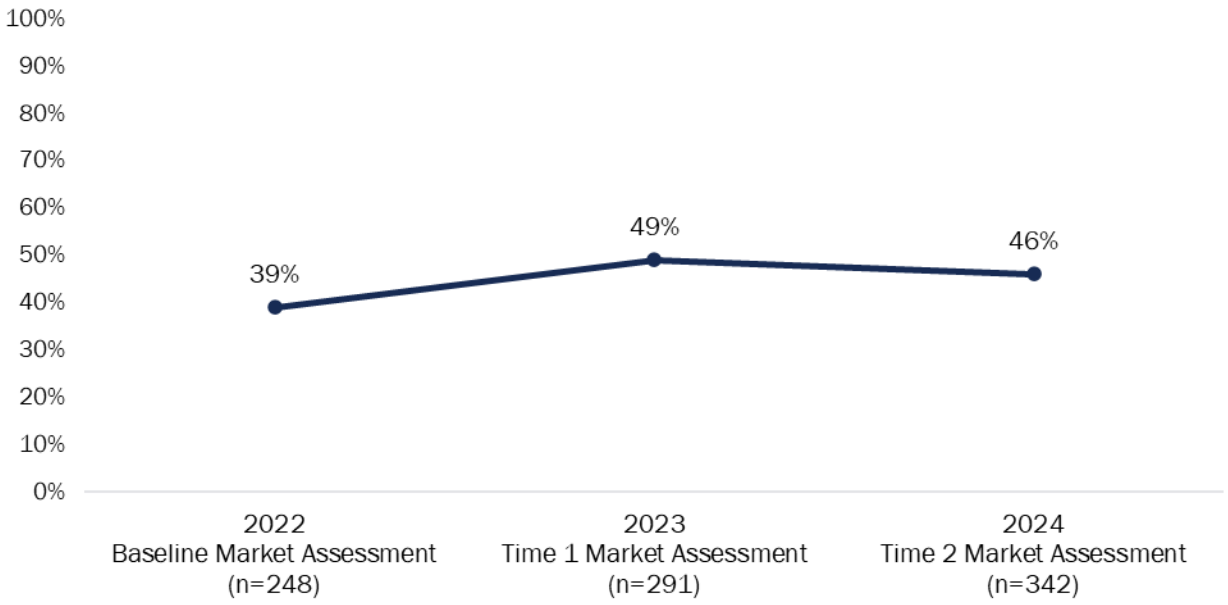
Figure 23. Influential Sources When Considering a New Primary Cooling System (n=500)



4.5 Incentive and Tax Credit Awareness

Of homeowners who were aware of HVAC heat pumps, less than half (161 of 342; 46%) were also aware that some organizations offer financial incentives for installing them—an increase of 7 percentage points since the Baseline Market Assessment, but a decrease of 3 percentage points since the Time 1 Market Assessment (Figure 24).

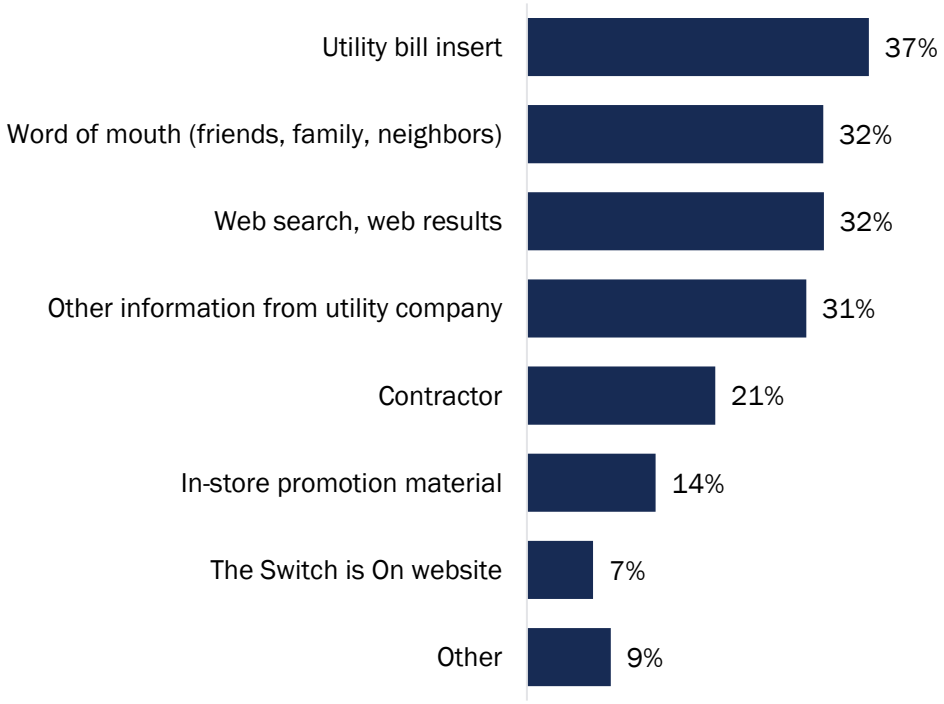
Figure 24. Awareness of Financial Incentives for HVAC Heat Pump Installations Over Time



Note: Asked of respondents who indicated they had heard of an HVAC heat pump or had one.

The most common ways for homeowners to hear about financial incentives for installing an HVAC heat pump were through the utility—either via bill inserts or other information—by word of mouth and through a general web search. About one-third of those who knew of incentives heard about them from utility bill inserts (62 of 161; 37%) or through other information from their utility (51 of 161; 31%) (Figure 25). Nearly one-third said they had heard about incentives through word of mouth (48 of 161; 32%) or a web search (53 of 161; 32%).

Figure 25. Where Homeowners Heard About Financial Incentives for Installing HVAC Heat Pumps (n=161)



Note: Asked of respondents who indicated they had heard of financial incentives available for installing an HVAC heat pump. Multiple responses were allowed.

We also asked homeowners who were aware of HVAC heat pumps if they knew they may be eligible for a federal tax credit of up to $2,000 for purchasing a heat pump for space heating/cooling. Just over one-fifth of these respondents (74 of 342, 21%) were aware of their eligibility.

4.6 Labor market

4.6.1 Availability of Qualified Trade Allies

The CSLB, under the Department of Consumer Affairs, protects California consumers by licensing and regulating the state's construction industry. The CSLB was established in 1929 and licenses about 290,000 contractors in 44 different licensing classifications today. All businesses or individuals who construct or alter any building, highway, road, parking facility, railroad, excavation, or other structure in California must be licensed by the CSLB if the total cost (labor and materials) of one or more contracts on the project is $500 or more. Licenses are issued to individuals, partnerships, corporations, joint ventures, and limited liability companies (LLCs). Each license requires a "qualifying individual" who must undergo a background check and meet experience and exam requirements. In addition, the licensee must submit documentation to prove they meet insurance and bond requirements. CSLB licenses are separated into three classifications: Class A (General Engineering Contractor), Class B (General Building Contractor), and Class C (Specialty Contractor). Within the Class C license classification, there are 42 Class C licenses for work that require specialized skills. Installing HVAC heat pumps requires specific knowledge and licenses. See Appendix A for a description of licenses. This section presents findings about the workforce installing HVAC heat pumps.

In 2024, there were 141,388 licensed contractors in California who held at least one of the CSLB specialty licenses necessary to replace a gas appliance with a heat pump. This is an increase of 5,163 licensed contractors compared to 2023 data. Depending on the specifics of the project, the following licenses may be required: a B-General Building Contractor license, a C-20 HVAC license, a C-36 Plumbing license, a D-34 Prefabricated Equipment license, and a C-10 Electrical license. As observed in the Baseline and Time 1 Market Assessments, contractors with Class B licenses continue to outnumber the other licenses. Additionally, licensed contractors with a business address outside of DACs outnumbered contractors with a business address inside of DACs (Table 10).

Table 10. Count of Licensed Contractors by DAC Classification

Classification	Contractors outside of DACs	Contractors in DACs	Total
C-10 Electrical	22,124	4,869	26,993
C-20 HVAC	8,798	2,496	11,294
C-36 Plumbing	13,296	3,282	16,578
D-34 Prefabricated Equipment	1,149	232	1,381
B-General Building	87,217	14,503	101,720
Total	**119,228**	**22,100**	**141,388**

Note: Contractors with more than one license type are represented more than once in table counts.

Climate zone 9 near Los Angeles had the most contractors with at least one of the licenses in Table 10 at 26,153 contractors, followed by climate zone 12 in the Central Valley, which had 19,541 licensed contractors. Climate zone 1 had the fewest (1,268). The number of licensed contractors by climate zone can be found in Appendix A.

4.6.2 Contractor Heat Pump Experience

Contractors sold more HVAC heat pumps in the past year compared to annual sales reported in the Baseline and Time 1 Market Assessments. About one-third of HVAC contractors' firms (26 of 90; 29%) sold more than 100 heat pumps in the past year (Table 11)—a 16 percentage point increase since the Baseline Market Assessment and a 19 percentage point increase since the Time 1 Market Assessment. Additionally, nearly half of respondents (47%) sold more than 50 HVAC heat pumps in the past 12 months, an increase of 27 percentage points since the Time 1 Market Assessment. Compared to both Market Assessments, we see more firms reporting larger numbers of heat pump sales and fewer firms reporting smaller numbers.[34] As such, respondents reported that, on average, 62% of jobs completed by their company in the last year involved heat pumps (n=67),[35] a 26 percentage point increase and a 20 percentage point increase from the Baseline and the Time 1 Market Assessments, respectively (Figure 26). According to these findings, contractors have sold more heat pumps in the past year than reported in both previous studies. Furthermore, AHRI data indicated an increase in residential HVAC heat pump shipments at the national level in 2024, suggesting more customers purchased a heat pump than in 2023.

[34] Those reporting selling 20 or fewer heat pumps in the past year decreased by 16 percentage points since the Baseline Market Assessment and by 26 percentage points since the Time 1 Market Assessment.

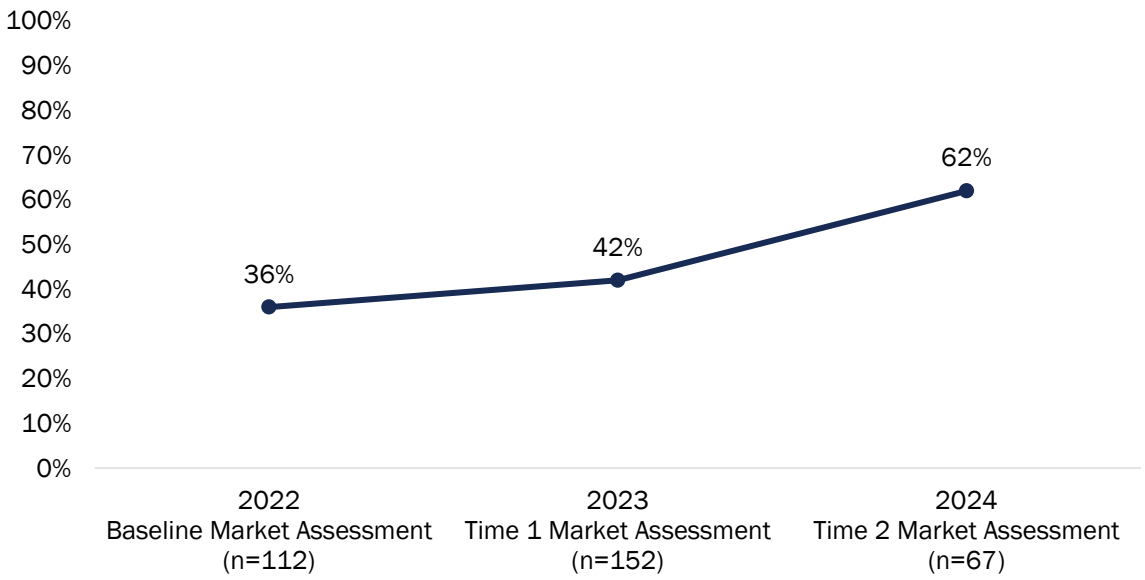
[35] Twenty-three HVAC contractors whose companies get less than half their business from completing HVAC installations were excluded from the average. One "don't know" response was also excluded from the average.

Table 11. Number of HVAC Heat Pumps Sold by Firms in Past Year (n=90)

Number of Heat Pumps	Count	Percent
None	2	2%
1–5	8	9%
6–20	18	20%
21–50	20	22%
51–100	16	18%
More than 100	26	29%

Note: There were 91 HVAC contractors in our sample, but one contractor opted out of this question.

Figure 26. Average Percentage of Installation Jobs That Were HVAC Heat Pumps Over Time

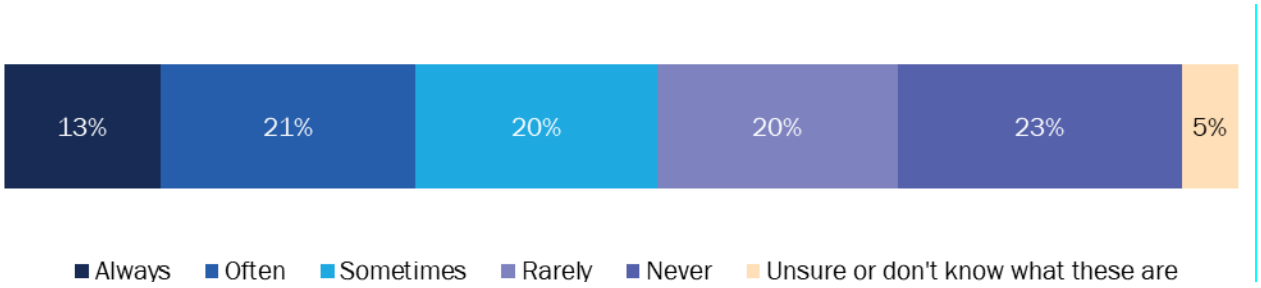


Contractors seem to be installing HVAC heat pumps with TOU controls more often. About two-thirds of HVAC contractors whose firm sold at least one heat pump last year (48 of 79; 61%) said that at least 50% of their heat pump sales included TOU controls—a 35 percentage point increase since the Baseline Market Assessment and a 14 percentage point increase since the Time 1 Market Assessment. A minority of contractors (11 of 79; 14%) reported none of their sales included these controls.[36]

About one-third of HVAC contractors frequently discussed demand response programs with their customers. Specifically, 33% (29 of 87) of contractors whose company had sold at least one heat pump in the past year indicated that they "always" or "often" engage in these conversations (Figure 27). A larger proportion of HVAC contractors (37 of 87; 43%) "rarely" or "never" address demand response programs with their customers. This indicates that there is still a significant opportunity to raise awareness of demand response programs and increase enrollment.

[36] One contractor opted out of this question. Eight contractors responded "don't know" and were excluded from the calculation.

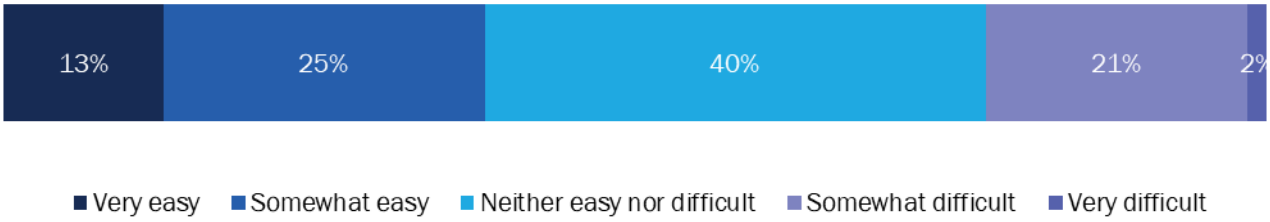
Figure 27. Frequency of HVAC Contractors Discussing Demand Response Programs with Customers (n=87)



Note: Asked of HVAC contractors whose firms had sold at least one HVAC heat pump over the past year.

HVAC contractors who discuss demand response programs with their customers generally find this conversation "neither easy nor difficult." Among contractors whose company had sold at least one heat pump in the past year and who indicated they discuss demand response programs with their customers, two-fifths (25 of 63; 40%) report that these conversations are "neither easy nor difficult" (Figure 28). A similar proportion of HVAC contractors (24 out of 63; 38%) feel that these discussions are "somewhat" or "very" easy.

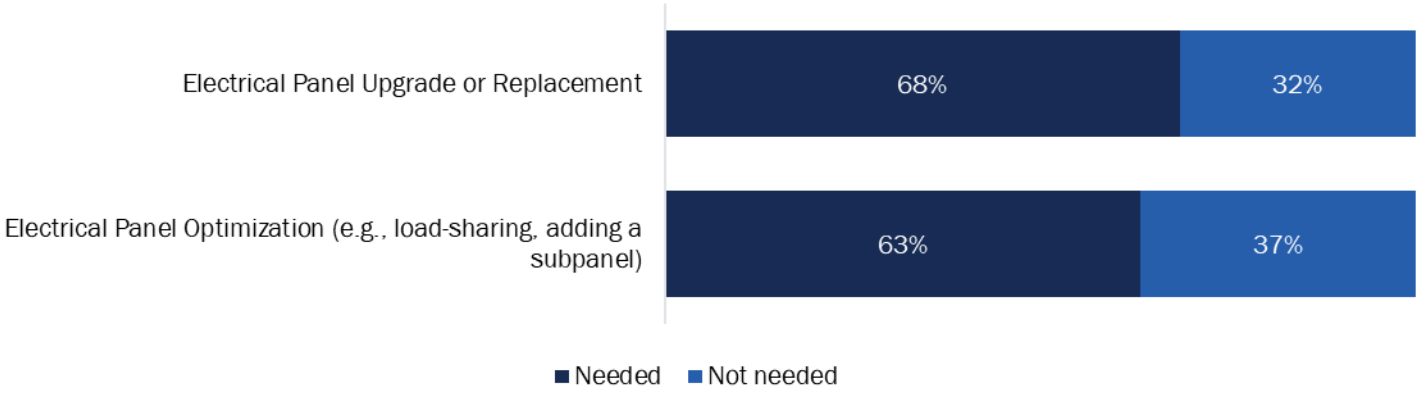
Figure 28. Level of Difficulty Discussing Demand Response with HVAC Customers (n=63)



Note: Asked of HVAC contractors whose firms had sold at least one HVAC heat pump over the past year and who discuss demand response programs with their customers.

Many contractors encountered situations where customers needed panel upgrades to accommodate a new heat pump. Over two-thirds of contractors (52 of 76; 68%) had at least one HVAC heat pump installation in the last year that required an electrical panel upgrade or complete replacement to accommodate the additional electrical load required for a new heat pump installation (Figure 29). A similar proportion of contractors (48 of 76; 63%) had at least one HVAC heat pump installation in the last year that required some sort of panel optimization, such as load-sharing or adding a subpanel.

Figure 29. Percent of Contractors Reporting Whether an HVAC Heat Pump Installation Required a Panel Upgrade or Optimization in the Past Year (n=76)



Note: Asked of HVAC contractors whose firms had sold at least one HVAC heat pump over the past year. Eleven contractors reported being unsure about the percentage of customers requiring an electrical panel upgrade or optimization and were excluded from the calculations.

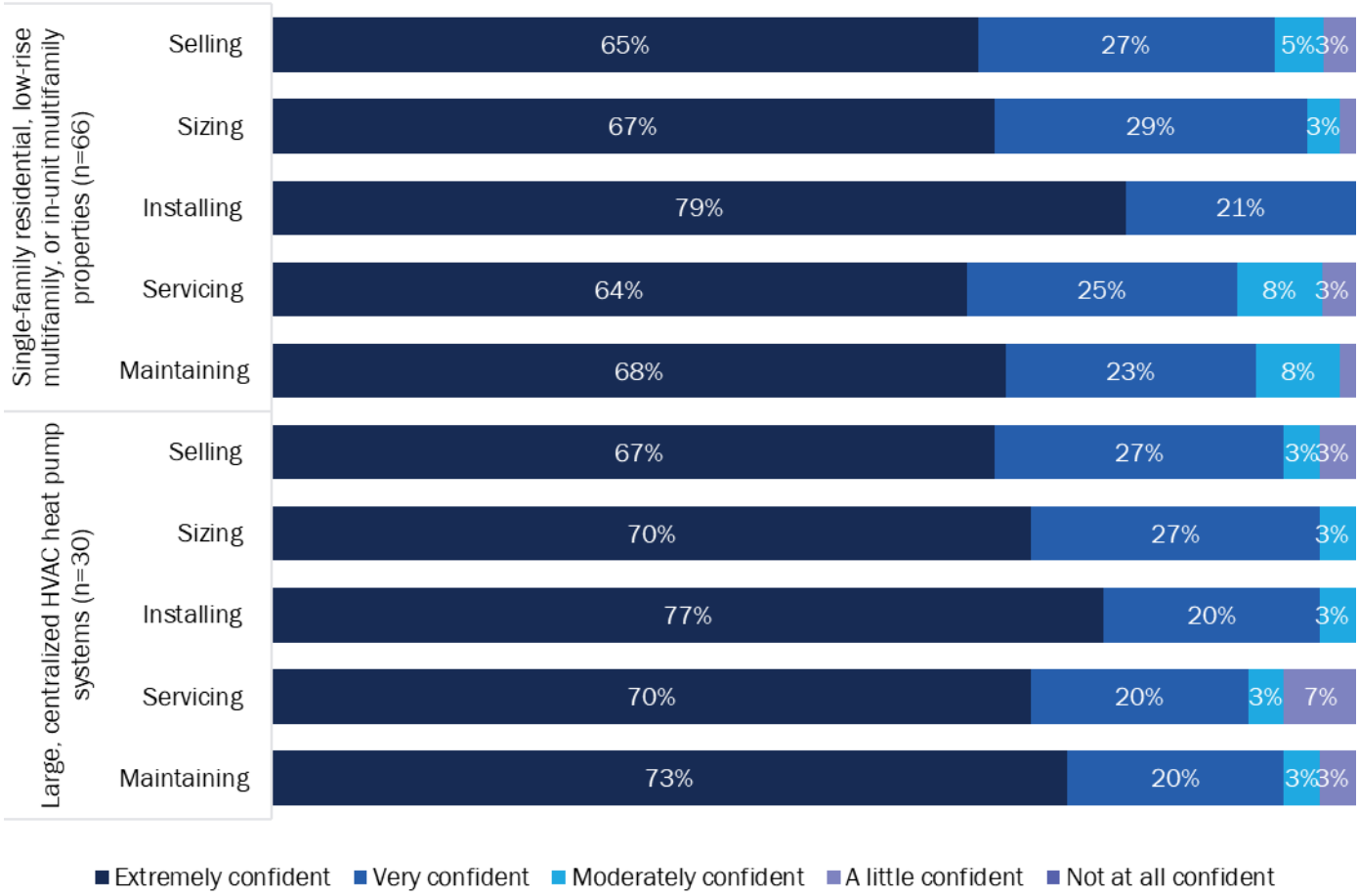
The median and average length of time needed to complete an HVAC heat pump installation was similar to the Baseline and Time 1 Market Assessments, at two days. Although the majority of responses ranged from one to five days to complete an installation, two respondents reported the average length of time their firm needed was ten days. One of these respondents works for a firm that serves both small and large multifamily properties and is comprised of only five to nine employees. The combination of more complex projects at large properties and limited staff likely contributed to the longer timeline.

Surveyed HVAC contractors had more experience with heat pump installations for single-family and smaller, in-unit multifamily properties than with centralized HVAC heat pump systems for larger multifamily properties. Similar to the Baseline Market Assessment, almost all respondents (66 of 68, 97%) said their company has experience installing HVAC heat pumps for single-family residential, low-rise multifamily, and in-unit multifamily properties—a 5 percentage point increase since the Time 1 Market Assessment. In contrast, about half (30 of 68, 44%) reported their company has experience with HVAC heat pump installations in large, centralized systems like those existing in high-rise multifamily buildings—similar to what was observed in both previous market assessments.[37]

Surveyed HVAC contractors with experience in heat pump installations in both property types indicated similar confidence in their ability to install both large, centralized HVAC heat pump systems in high-rise multifamily buildings and HVAC heat pumps in single-family residential, low-rise multifamily, or in-unit multifamily properties. Contractors reported similar confidence levels in selling, sizing, installing, servicing, and maintaining HVAC heat pump equipment in single-family homes and high-rise multifamily buildings (Figure 30). Over two-thirds of all contractors (between 64% and 79%) reported being "extremely confident" in selling, sizing, installing, servicing, and maintaining heat pumps regardless of property type. This shows an improvement in the level of confidence contractors have when it comes to HVAC heat pump installations compared to what they showed in the Time 1 Market Assessment. With the exception of installing HVAC heat pumps in single-family homes, the Time 1 Market Assessment found that less than half of contractors (between 33% and 48%) were "extremely confident" in selling, sizing, servicing, and maintaining heat pumps in either type of property.

[37] These findings come from companies that get more than half their business from completing HVAC installations.

Figure 30. Confidence in the Ability to Sell, Size, Install, Service, and Maintain HVAC Heat Pumps



Note: Asked of HVAC contractors whose companies get more than half their business from completing HVAC installations. Contractors who indicated any of these actions did not apply to them were excluded from the calculations.

On average, respondents' firms with two or more employees reportedly hire five installers or technicians in a typical year—one more than found in the Baseline Market Assessment and three more than in the Time 1 Market Assessment. Most contractors (48 of 74; 65%) reported their firm typically hires between one and four installers annually. The number of hires overall ranged between zero and 50 hires per year. Less than one-tenth (3 of 74; 4%) reported zero hires in a typical year at their firm.[38]

Heat pump experience is desirable when hiring new installers and/or technicians. Most respondents who sell HVAC equipment (77 of 86; 90%) reported heat pump experience is at least moderately attractive when looking to hire a new installer or technician—a 3 percentage point increase since the Baseline Market Assessment and a 9 percentage point increase since the Time 1 Market Assessment (Figure 31). About two-thirds (66%) said it was "very attractive". A minority of surveyed contractors (9 of 86; 10%) found heat pump experience to be minimally important or not important at all to them when hiring.

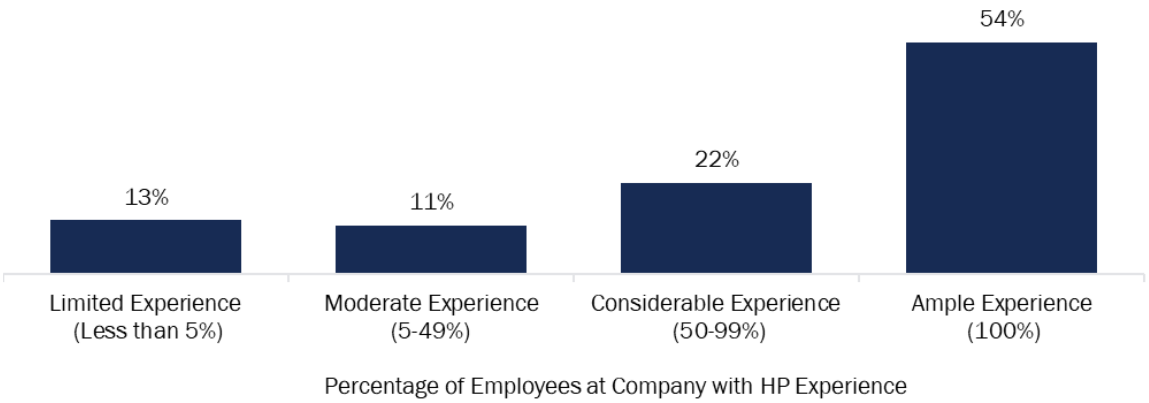
[38] Nine contractors responded "don't know" and were excluded from the calculation.

Figure 31. Attractiveness of Heat Pump Experience When Hiring (n=86)

Note: Analysis excluded five respondents who reported they do not hire others or that they do not know.

Most HVAC contractors said at least 50% of their staff have installed or worked on HVAC heat pumps in the past year (Figure 32). Contractors who worked for a company with at least two employees were asked what percentage of technicians at their firm have installed or worked on HVAC heat pump equipment in the past year. Over half of respondents (43 of 79; 54%) shared that all their staff had experience working with heat pumps, and about three-quarters (60 of 79; 76%) said that at least 50% of their staff did. A minority of contractors (10 of 79; 13%) reported that less than 5% of their staff had worked with the equipment. In the Baseline Market Assessment, similar to what is observed now, 72% of contractor companies (70 of 97) reported at least 50% of their staff installed or worked on HVAC heat pumps in the past year; however, the Time 1 Market Assessment showed 62% of contractors (71 of 114) reporting the same level of experience in their staff—a 14 percentage point decrease.

Figure 32. Proportion of Contractors' Staff with HVAC Heat Pump Experience (n=79)



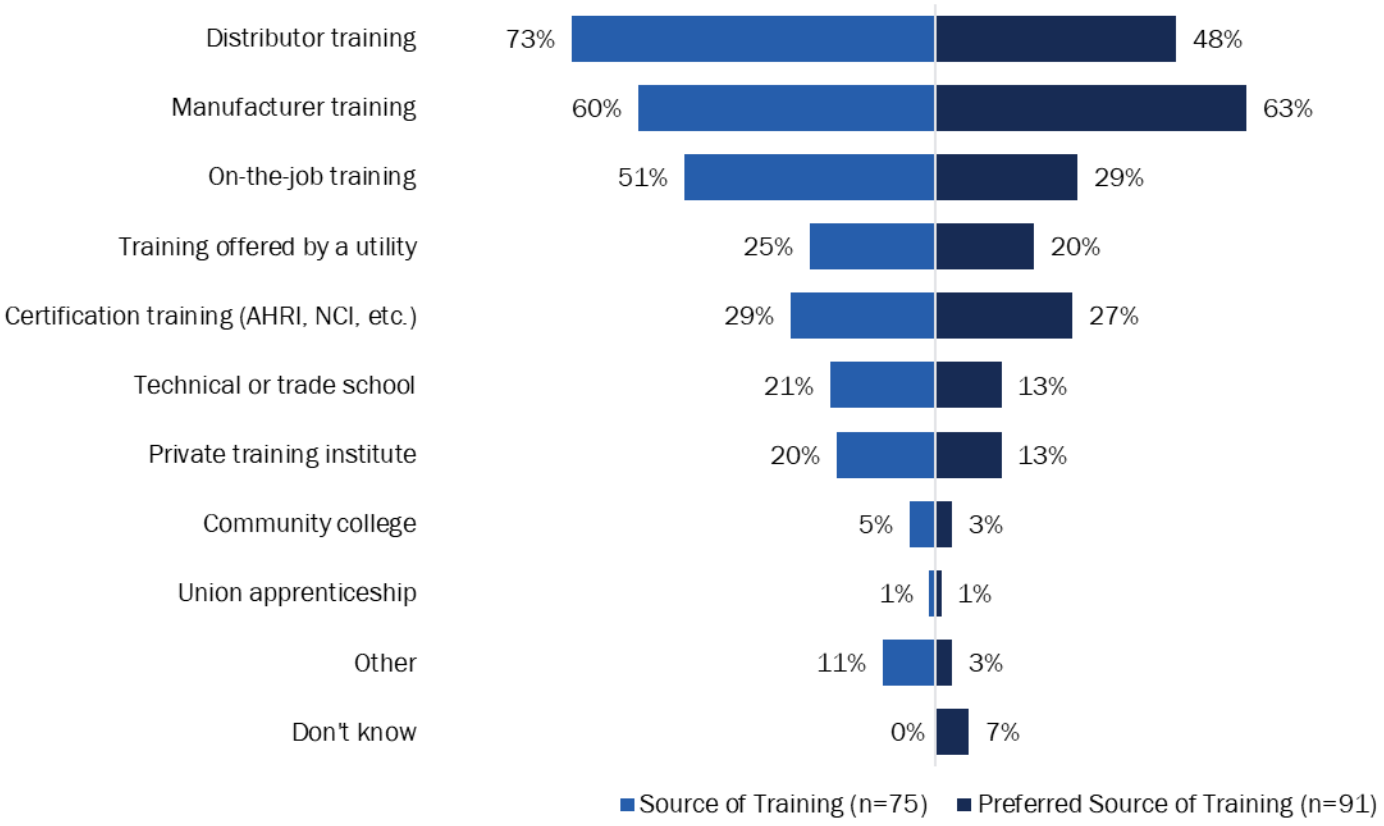
Note: Asked of HVAC contractors whose firms had two or more employees. Analysis excludes four "don't know" responses.

4.6.3 Contractor Heat Pump Training

Most surveyed HVAC contractors have received heat pump equipment training, most commonly from distributors and manufacturers. Over three-quarters of HVAC respondents (75 of 91; 78%) have received heat pump equipment training—a 12 percentage point increase since the Baseline Market Assessment and an 8 percentage point increase

since the Time 1 Market Assessment. Of those who had received heat pump equipment training, over two-thirds did so either through a distributor (55 of 75; 73%) or through a manufacturer (45 of 75; 60%) (Figure 33). This was unlike the Baseline and Time 1 Market Assessments, where contractors most commonly received heat pump training while on the job. Even though contractors most commonly received training through a distributor, they preferred training provided by a manufacturer (57 of 91; 63%).

Figure 33. Sources of Heat Pump Training Versus Preferred Sources for Training



Note: Multiple responses were allowed.

About three-quarters of HVAC contractors (68 of 91; 75%) valued in-person education, preferring either fully in-person training or a hybrid online and in-person model. A minority of respondents mentioned they prefer online training (14 of 91; 15%) or said they have no preference about the training mode (9 of 91; 10%).

5. HPWH Market Detailed Findings

In this section, we review the water-heating market and present findings about surveyed water-heating contractors' experience with HPWHs, their heat pump training, and the perceived value of training. We also discuss findings about California homeowners' familiarity with HPWHs, their decision drivers for water-heating equipment, and their awareness of incentives for heat pumps.

5.1 Market Overview

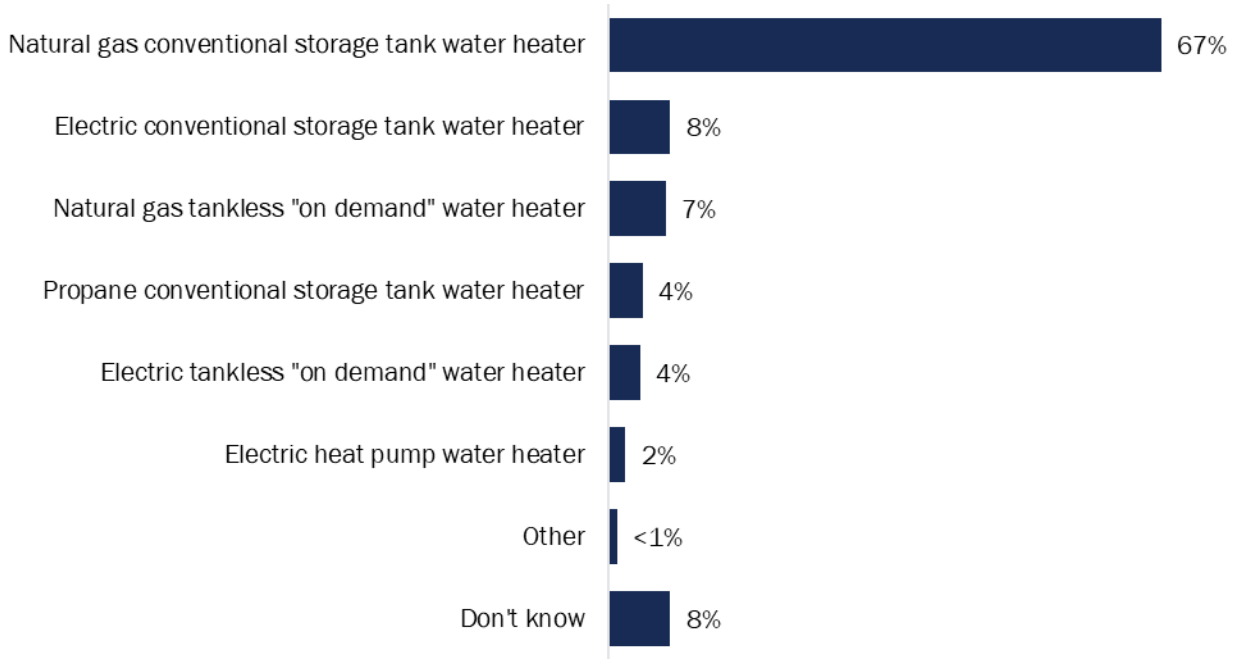
Demand for electric storage water heaters is growing compared to that of gas storage water heaters. AHRI reports roughly 5 million residential electric storage water heaters and 4.2 million residential gas storage water heaters were

shipped in the United States in 2024. Electric storage water heater shipments grew 3.1% between December 2023 and December 2024. Gas storage water heaters decreased 2.7% between December 2023 and December 2024. Unfortunately, AHRI does not make California-specific data available, and Opinion Dynamics has not found a source for California-specific residential water-heater shipment data.

5.2 Current Water-Heating Systems

Most surveyed homeowners (393 of 499; 78%) had a gas-powered water-heating system in their homes, a 2 percentage point increase since the Baseline Market Assessment. Most respondents (328 of 499; 67%) reported having a conventional natural gas storage tanked water-heating system (Figure 34). Similar to the prior market assessments, HPWHs remain the least common type of water heater, with a minority of respondents (13 of 499; 2%) reporting that a HPWH serves their home.

Figure 34. Water-Heating Systems (n=499)

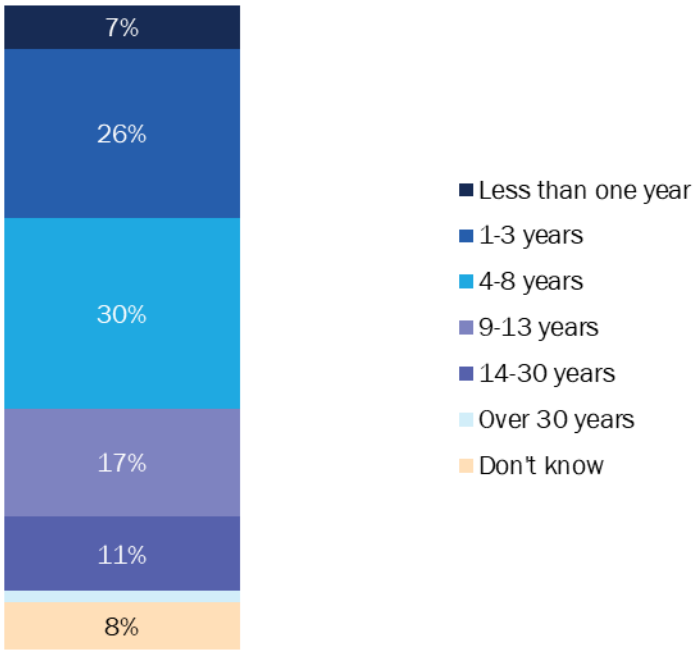


Note: One respondent did not provide an answer to this question, so they were excluded from this figure. "Other" responses included tankless propane water heaters (2 mentions), a vented natural gas system (1 mention), and a wood stove (1 mention).

Respondents' water-heating systems had a weighted average age of eight years. One-third of surveyed homeowners' water-heating systems (130 of 471; 33%) are fairly new—under four years old—5 percentage points higher than in the Baseline Market Assessment and 8 percentage points higher than since the Time 1 Market Assessment (Figure 35). Conversely, 13% of respondents' water-heating systems (72 of 471) were over 14 years old, a 4 percentage point decrease since the Baseline Market Assessment. Eight percent of homeowners reported they did not know the age of their water heater. When focusing specifically on gas water heaters, we observed that one-third (140 of 393; 31%) were nine years old or older, indicating that a significant proportion of California's water heaters will likely need to be replaced in the next few years.[39]

[39] The effective useful life for a gas storage water heater is 11 years and gas tankless water heater is 20 years.

Figure 35. Age of Water-Heating Systems (n=428)



Note: Asked of respondents who are aware of their water-heating system type.

5.3 Customer Awareness

Surveyed homeowners' awareness of HPWHs has generally remained the same over the last year, with a slight increase since the Baseline Market Assessment. In this Time 2 Market Assessment survey, we found that over one-third of respondents (182 of 500; 37%) were aware of HPWHs, a 5% increase from the Baseline Market Assessment (Figure 36). Respondents' awareness of HPWHs is notably lower than the 60% who had heard of HVAC heat pumps. This finding is consistent with what we observed in the Baseline Market Assessment. Figure 37 presents water-heating systems of which respondents were reportedly aware.

Figure 36. Awareness of HPWHs Over Time (n=500)

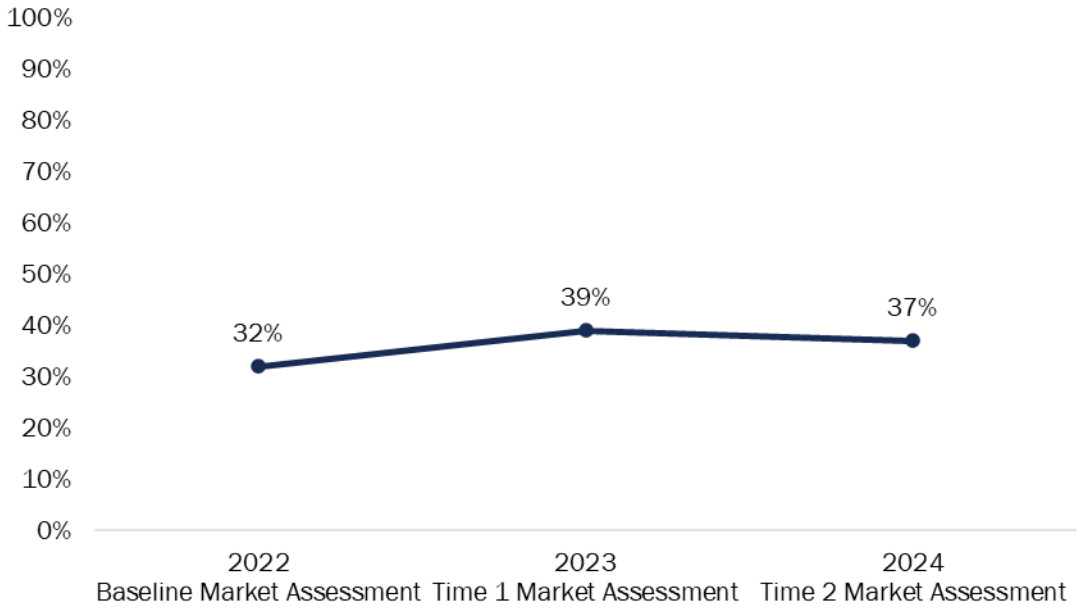
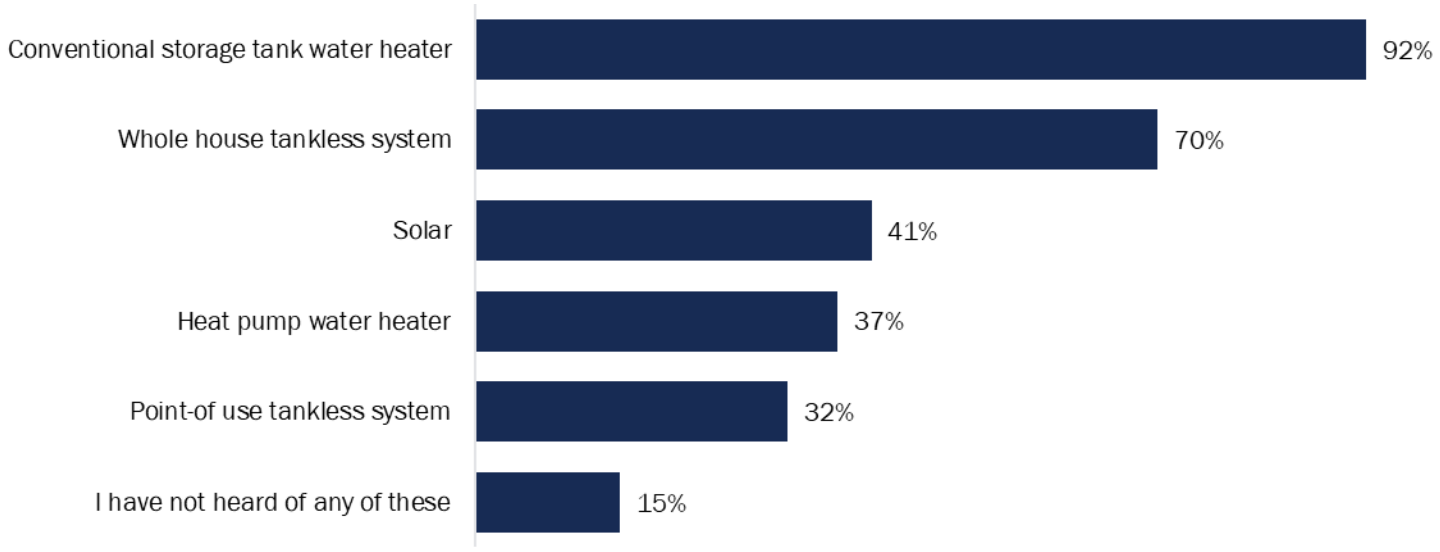


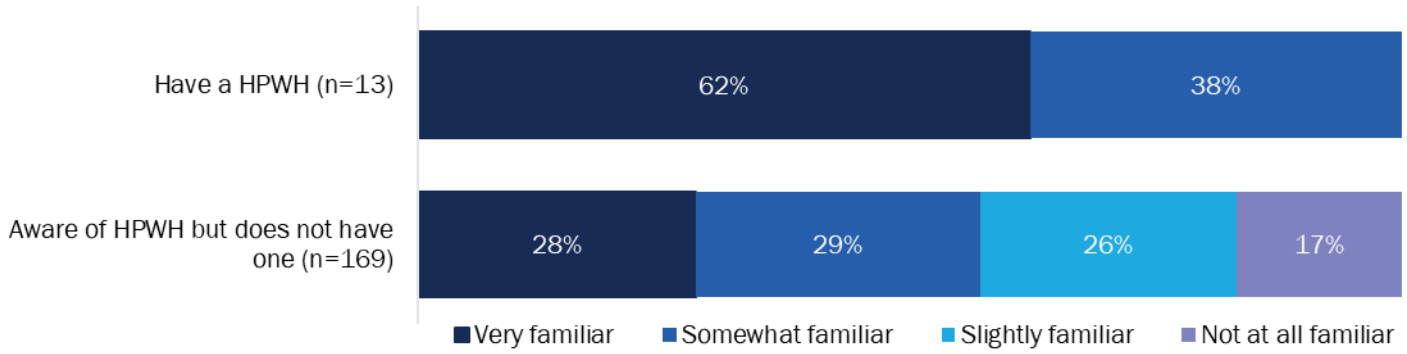
Figure 37. Awareness of Different Water-Heating Systems (n=500)



Note: Response option "I have not heard of any of these" is exclusive. Multiple responses were allowed.

Among respondents who were aware of HPWHs, whether they had one or not, about two-thirds (102 of 182; 60%) were "very" or "somewhat familiar" with the equipment. All homeowners who reported having a HPWH indicated being "very" or "somewhat familiar" with the equipment, while over half of respondents who were aware of HPWHs but did not have one (89 of 169; 57%) were "very" or "somewhat familiar" with the equipment. Less than half of those who were aware but did not have a HPWH in their home were "slightly" or "not at all familiar" (80 of 169; 43%) (Figure 38).

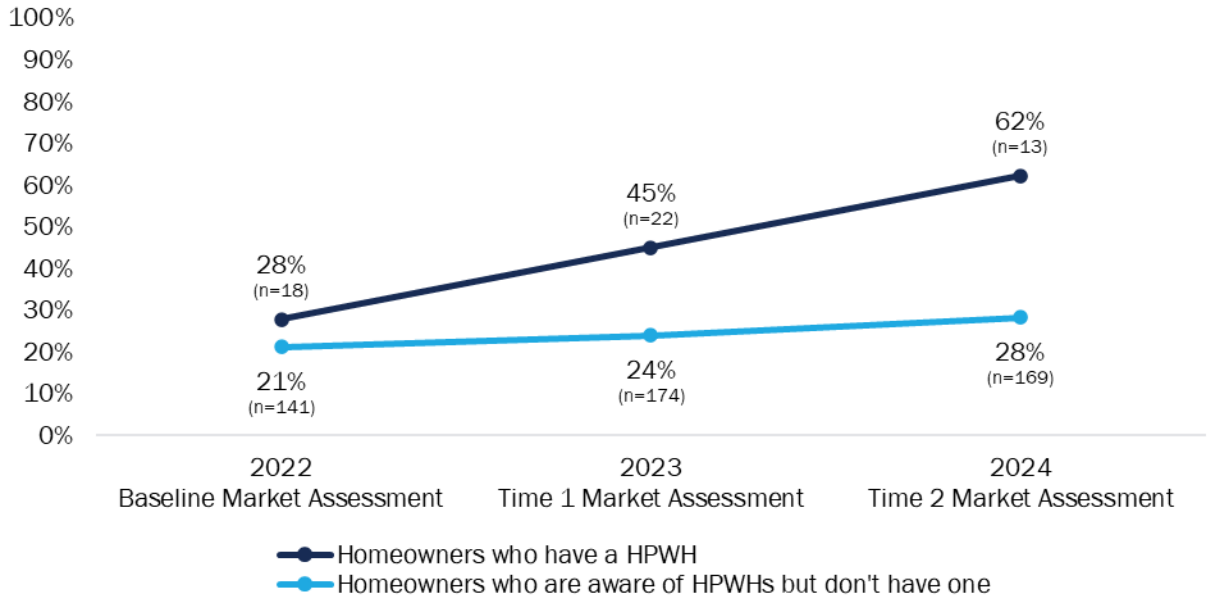
Figure 38. Familiarity with HPWHs



Note: Asked of respondents who indicated they either owned or had heard of a heat pump water heater.

Familiarity with HPWHs, specifically respondents who indicated they were "very familiar" with the equipment, saw a 34 percentage point increase since the Baseline Market Assessment and a 17 percentage point increase since the Time 1 Market Assessment among respondents who have a HPWH (Figure 39). Moreover, the proportion of respondents who are aware of this technology but don't have it and stated they are "very familiar" with it increased by 7 percentage points since the Baseline Market Assessment and by 4 percentage points since the Time 1 Market Assessment. Similar to the Baseline Market Assessment, the most common sources for how respondents had heard about HPWHs were through word of mouth (41 of 182; 24%), news articles (32 of 182; 19%), and social media (27 of 182; 16%).

Figure 39. Respondents Who Are "Very Familiar" with HPWHs Over Time



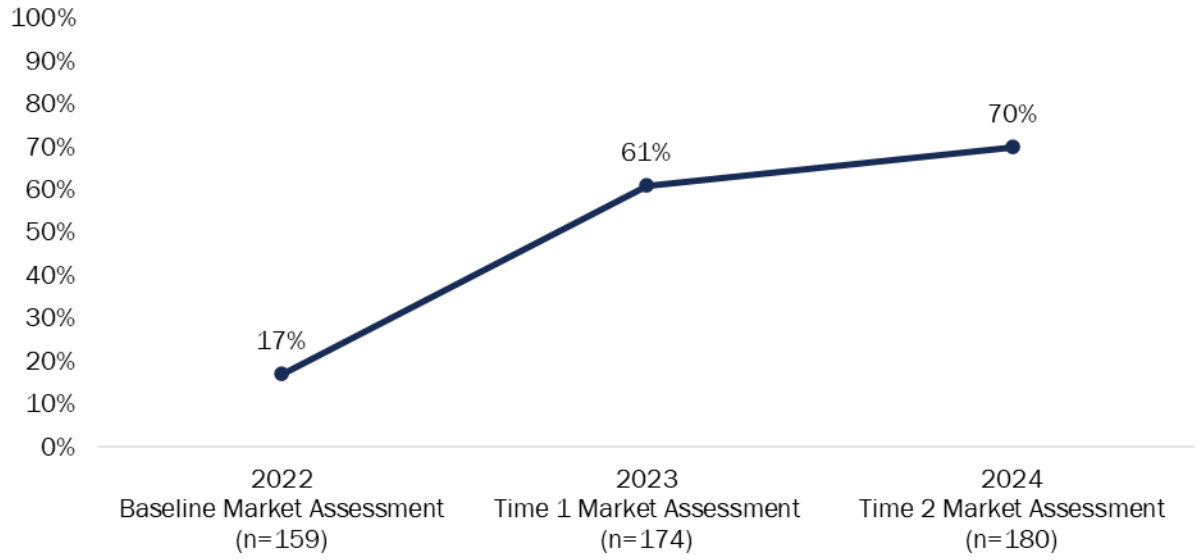
Note: Asked of respondents who indicated they either owned or had heard of a heat pump water heater.

Homeowners had more knowledge about the benefits of HPWHs than we observed in the Baseline Market Assessment two years prior. When the evaluation team asked respondents who had heard of a HPWH to identify the benefits of the system in an open-ended, unaided question, nearly one-third (50 of 180; 30%) reported that they did not know what benefits they offered (Table 12).[40] This represents a 53 percentage point decrease from the Baseline Market

[40] Two respondents did not provide responses to this question, so they were excluded from these calculations.

Assessment and a 9 percentage point decrease from the Time 1 Market Assessment. This suggests a considerable improvement in knowledge about the benefits (or drawbacks) of HPWHs in the last two years (Figure 40).

Figure 40. Awareness of Benefits or Drawbacks of HPWHs Over Time



Note: Asked of respondents who indicated they either owned or had heard of a heat pump water heater.

Approximately one-third of respondents (59 of 180; 32%) believed HPWHs were more efficient than alternative water heaters—an increase of 25 percentage points and 5 percentage points since the Baseline and the Time 1 Market Assessments, respectively—while a few (21 of 180; 13%) thought HPWHs were more cost-efficient compared to other water-heating systems (Table 12).

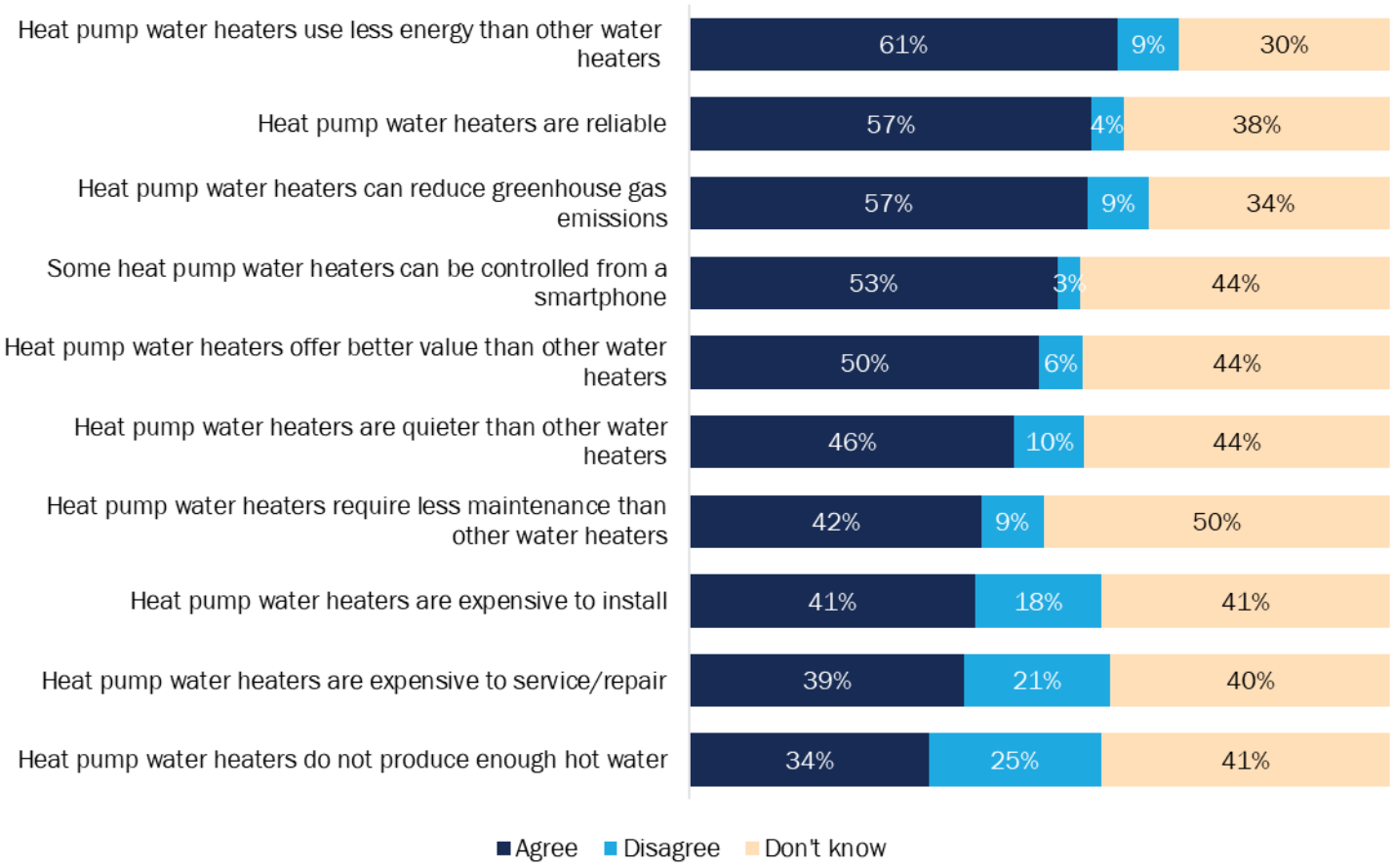
Table 12. Customers' Perceived Benefits of HPWH Over Other Water-Heating Systems (n=180)

Benefits	Count of Respondents	Percent of Respondents
Energy efficient	59	32%
Cost efficient	21	13%
Good performance	17	10%
Decreased environmental impact	16	9%
Reliable	2	4%
Electric (less reliance on gas)	4	1%
Easy to operate	4	1%
Other benefits	16	8%
No benefits	17	7%
Don't know	50	30%

Note: Asked of respondents who indicated they either owned or had heard of a heat pump water heater. Multiple responses were allowed. Two respondents did not provide responses to this question, so they were excluded from these calculations. "Other" benefits shared by respondents included easy installation (2 mentions), portability (1 mention), capacity to cool a space (1 mention), the ability to control the usage of the pump (1 mention), a smaller tank (1 mention), and improved comfort (2 mentions). Additional "Other" options were broader about the benefits of HPWHs, including that they "work amazing." "No benefits" and "don't know" responses were exclusive.

We then asked homeowners to agree or disagree with specific statements about HPWHs while offering a "don't know" option. Again, we saw a high incidence of "don't know" responses: between 30% and 50% of respondents for each question, as shown in Figure 41. About two-thirds of respondents (105 of 182; 61%) agreed that HPWHs use less energy than other water heaters—a 54 percentage point increase from the Baseline Market Assessment and a 34 percentage point increase since the Time 1 Market Assessment.

Figure 41. Benefits and Drawbacks to Heat Pump Water Heaters (n=182)

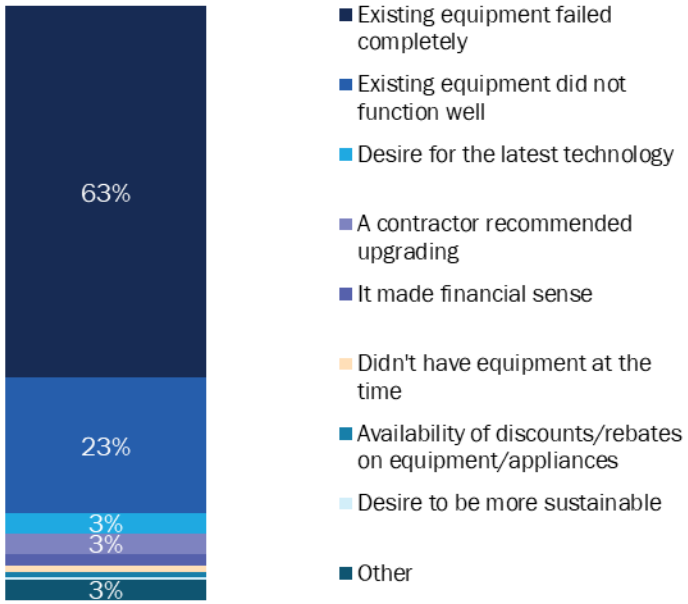


Note: Asked of respondents who indicated they owned or had heard of a heat pump water heater.

5.4 Customer Decision Drivers

About two-thirds of respondents (313 of 500; 60%) reported they had previously replaced their water-heating equipment or installed a completely new system at some point in their home. **Most of those respondents (86%) did so because the equipment either failed completely (194 of 313; 63%) or did not function properly (71 of 313; 23%)** (Figure 42)—the same two main reasons homeowners reported in the Time 1 Market Assessment (55% and 27%, respectively)**. Fewer respondents indicated replacing their water heater for reasons other than the functionality of the equipment**, such as the desire for the latest technology (12 of 313; 3%), the desire to be more sustainable (3 of 313; 1%), or because it made sense financially (4 of 313; 2%).

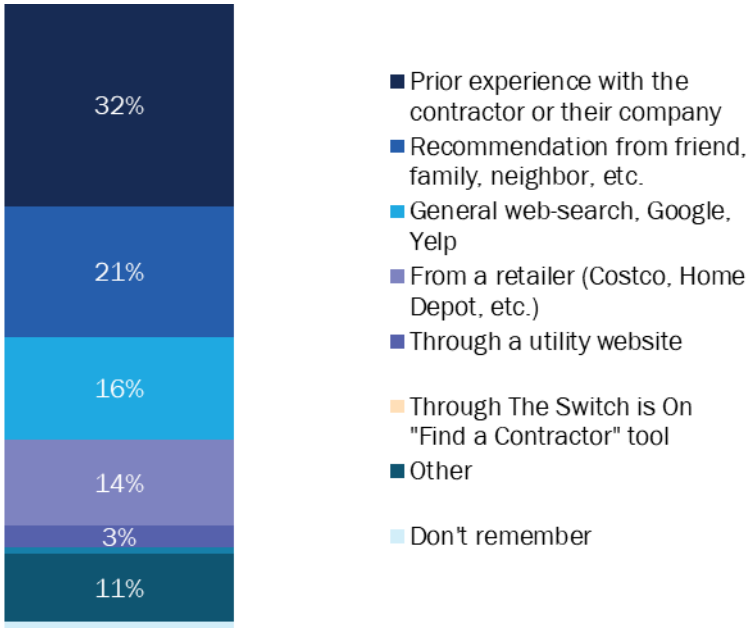
Figure 42. Reasons for Replacing Water-Heating Systems (n=313)



Note: Asked of respondents who indicated they had previously either replaced their water-heating system or had a new one installed in their home. "Other" reasons for replacing their water-heating system included wanting a larger tank or tankless system (3 mentions), their current system showing signs of aging (1 mention), or they were already undergoing other updates to their home (1 mention).

Nearly one-third of surveyed homeowners who had installed a new water heater either completed the installation themself (21 of 313; 8%) or had a family or friend install the new equipment (56 of 313; 22%). **Among respondents who reported hiring a professional contractor to install their new water heater, almost one-third (80 of 236; 32%) found their contractor through prior experience with them, and one-fifth (55 of 236; 21%) found them through a personal referral (Figure 43).** Over one-third of respondents (77 of 236; 34%) found their contractor through a general web search (16%), a retailer such as Costco or Home Depot (14%), or their utility website (3%), while one respondent found their contractor through The Switch is On "Find a Contractor" tool (1%).

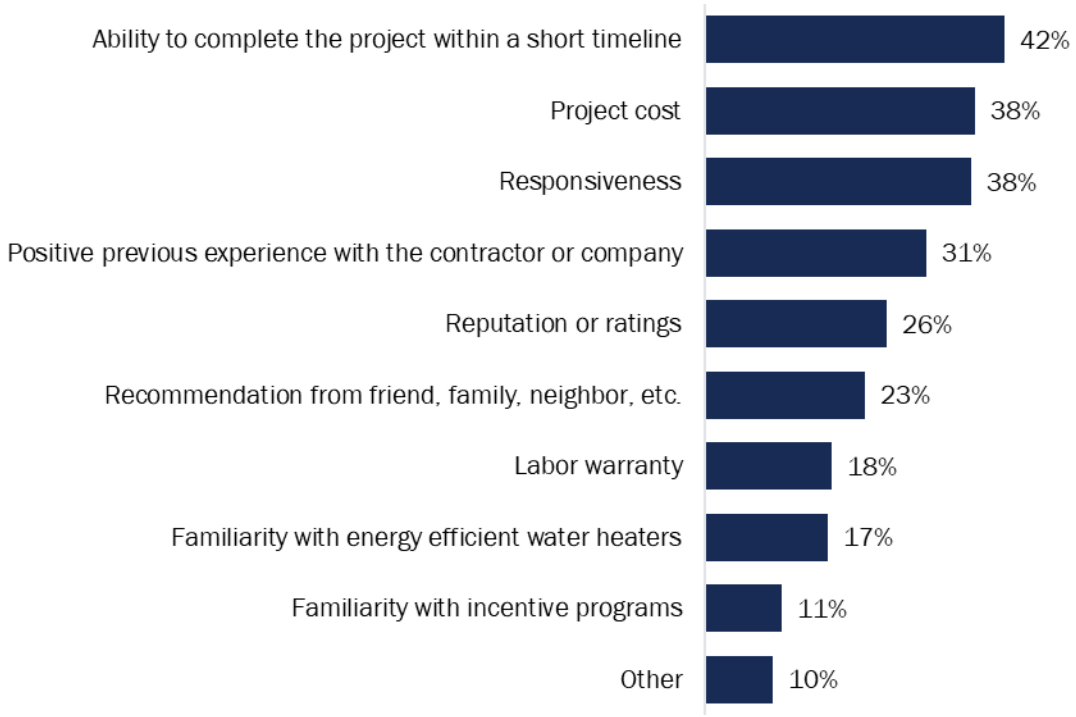
Figure 43. How Customers Found Contractor Who Installed Water-Heating Equipment (n=236)



Note: Asked of respondents who indicated they had either replaced their water-heating system or had a new one installed in their home and used a professional to install their new equipment. The equipment can be any type of water heater. "Other" ways in which respondents found their contractor were through their homeowner's warranty recommendation (8 mentions), directly from the manufacturer (4 mentions), or through the LEAP program (1 mention).

A contractor's ability to complete the project within a short timeline was the most common reason surveyed homeowners selected them to install their water-heating equipment (93 of 236; 42%) (Figure 44). Other common reasons respondents reported for hiring a contractor were the project costs (89 of 236; 38%), responsiveness (92 of 236; 38%), and positive previous experiences with the contractor/company (87 of 236; 31%).

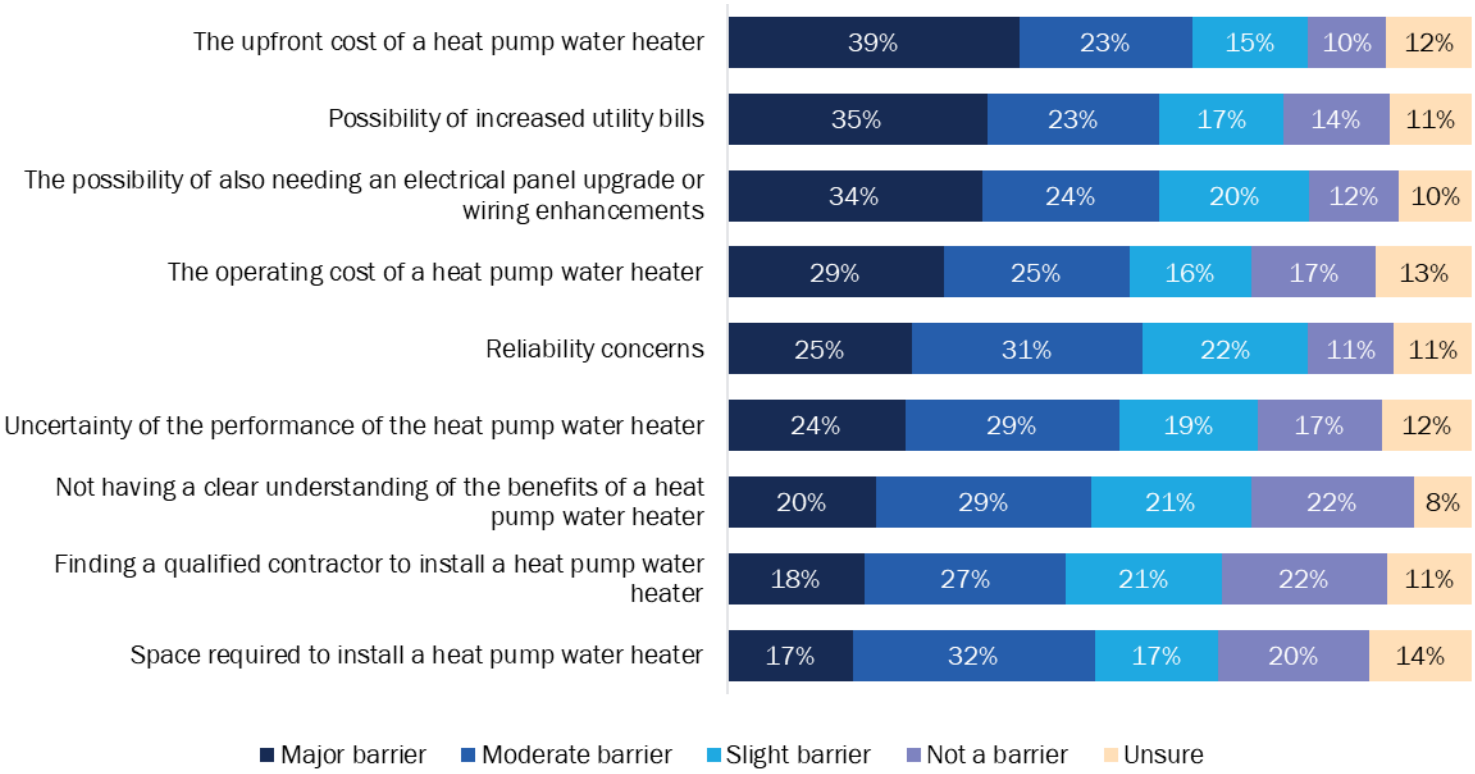
Figure 44. Reason for Choosing Contractor Who Installed Water-Heating Equipment (n=236)



Note: Asked of respondents who indicated they had either replaced their water-heating system or had a new one installed in their home and used a professional to install their new equipment. Multiple responses were allowed. "Other" responses included that the contractor was a recommendation from their home warranty company (7 mentions), that the contractor was already working on other projects in their home (4 mentions), that the contractor was a recommendation from a store, such as Home Depot (3 mentions), or that the installation was done through their gas company (2 mentions). Two respondents did not recall.

Surveyed homeowners rated equipment costs and the possibility of additional home upgrade requirements as the most important factors in their purchasing decision if they were to replace their water-heating equipment with a HPWH, similar to the Baseline and the Time 1 Market Assessments. Respondents most commonly identified the higher upfront cost of equipment (62 of 182; 39%), the possibility of increased utility bills (65 of 182; 35%), and the possibility of needing an electrical panel upgrade or wiring enhancement (58 of 182; 35%) as "major barriers" if they were to consider purchasing a HPWH. Respondents rating the upfront cost of a HPWH as a "major barrier" rose by 21 percentage points since the Baseline Market Assessment and by 8 percentage points since the Time 1 Market Assessment. Meanwhile, surveyed homeowners were least concerned about finding a qualified contractor to install a HPWH (38 of 182; 22% selected "not a barrier") and not having a clear understanding of the benefits of a HPWH (39 of 182, 22% selected "not a barrier"), which is somewhat consistent with the Baseline Market Assessment and Time 1 Market Assessment.

Figure 45. Barriers to Purchasing Heat Pump Water Heaters (n=182)

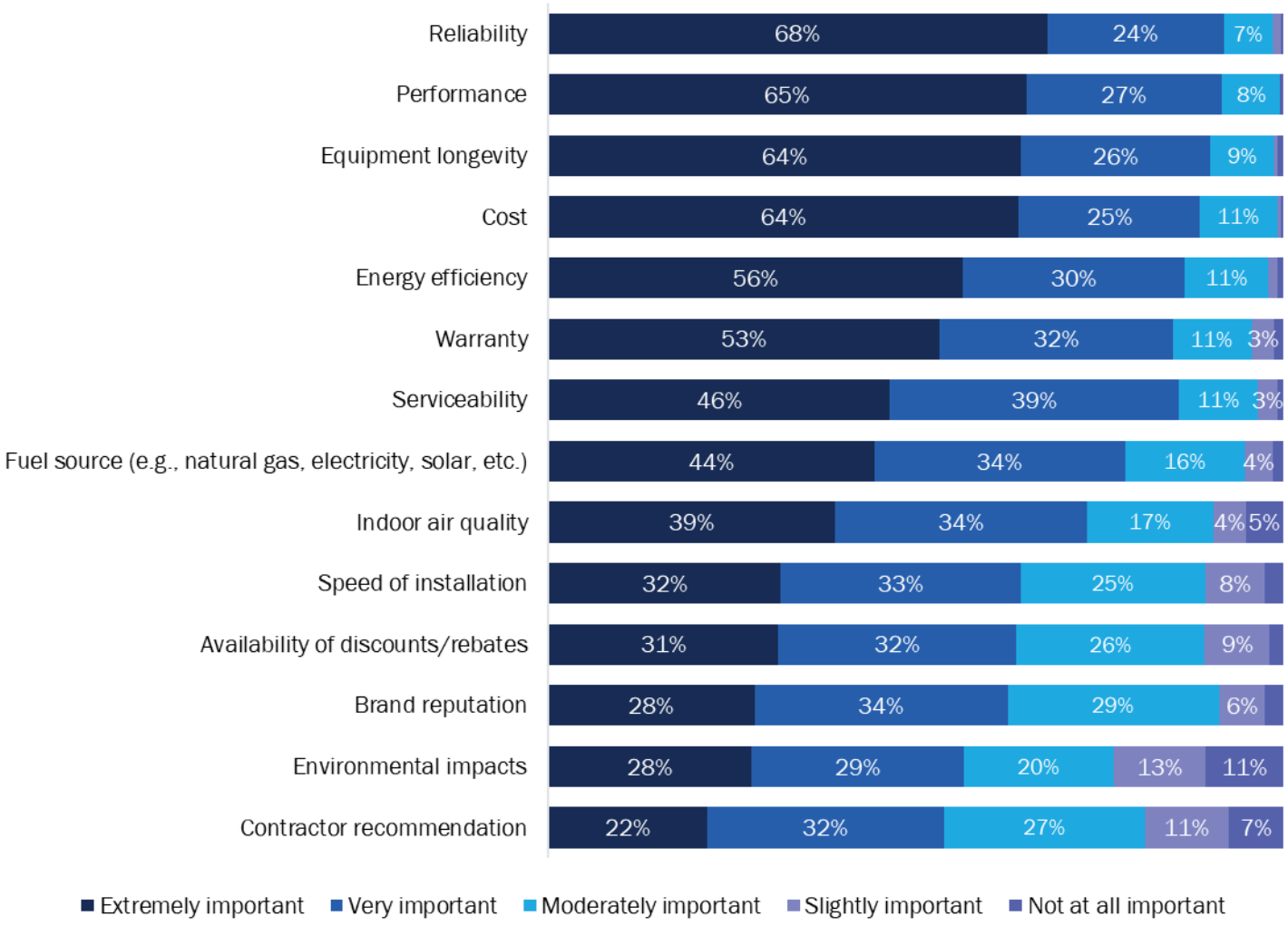


Note: Asked of respondents who indicated they owned or had heard of a heat pump water heater.

The most important factors to respondents when considering replacing their water heater were the system's reliability, performance, longevity, and cost (Figure 46), as observed in the Baseline Market Assessment and Time 1 Market Assessment. Over two-thirds of respondents (340 of 500; 68%) listed reliability as the most important factor in replacing their water-heating system, while a similar proportion listed performance (327 of 500; 65%), longevity[41] (309 of 500; 64%), and cost (302 of 500; 64%) as "extremely important". The system's energy efficiency level was "extremely important" for over half of respondents (272 of 500; 56%). In contrast, environmental impacts were the least important factor for respondents when replacing their water-heating system, with nearly one-quarter of respondents (117 of 500, 24%) rating it as "slightly" and "not at all important". Respondents who lived in DACs were significantly more likely than non-DAC respondents to rate cost and speed of installation as "extremely important" when considering purchasing a new water heater.

[41] Equipment longevity was added to the list of factors respondents could rate in the Time 2 Market Assessment.

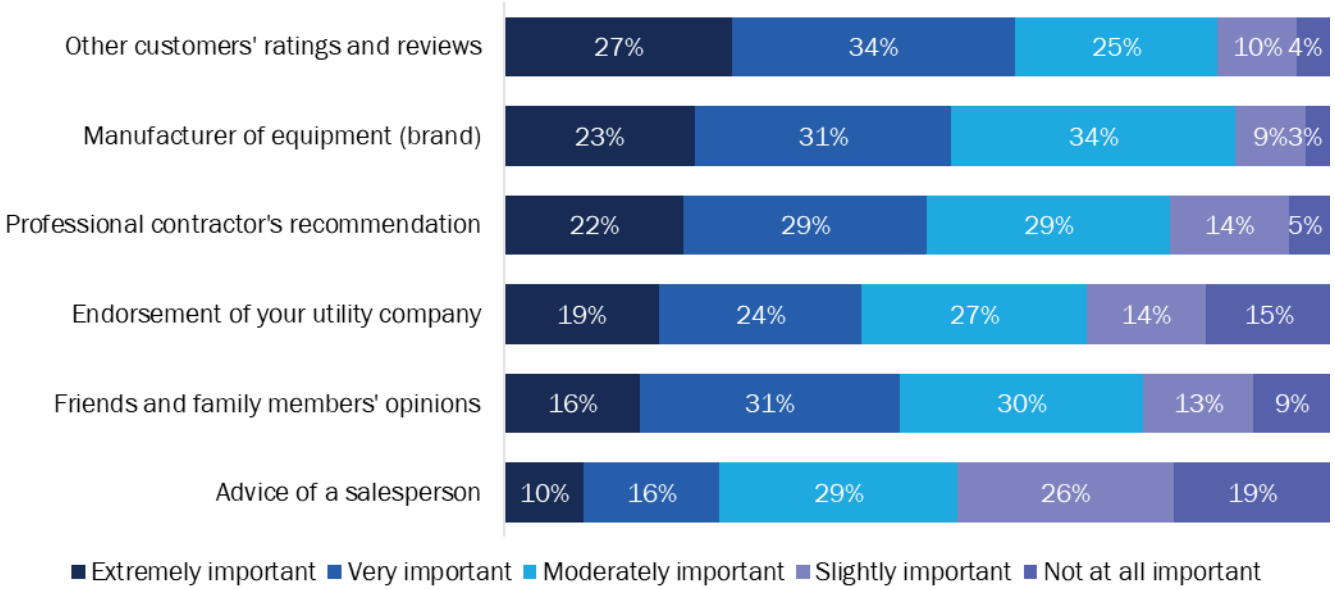
Figure 46. Importance of Factors When Replacing Water-Heating Equipment (n=500)



We also asked respondents how important various sources would be in influencing their decision about a new water-heating system. **Respondents rated other customers' reviews (116 of 500; 27%) as the most influential source, a 10 percentage point increase from the Baseline Market Assessment and a 5 percentage point increase from the Time 1 Market Assessment (Figure 47).** The second most influential source when considering a new water-heating system was the equipment manufacturer or its brand (100 of 500; 23%). Similar to both space-heating and cooling equipment, the

advice of a salesperson was rated as the least important source to surveyed homeowners, with nearly half of respondents (258 of 500; 45%) rating it as “slightly” or “not at all important” to them.

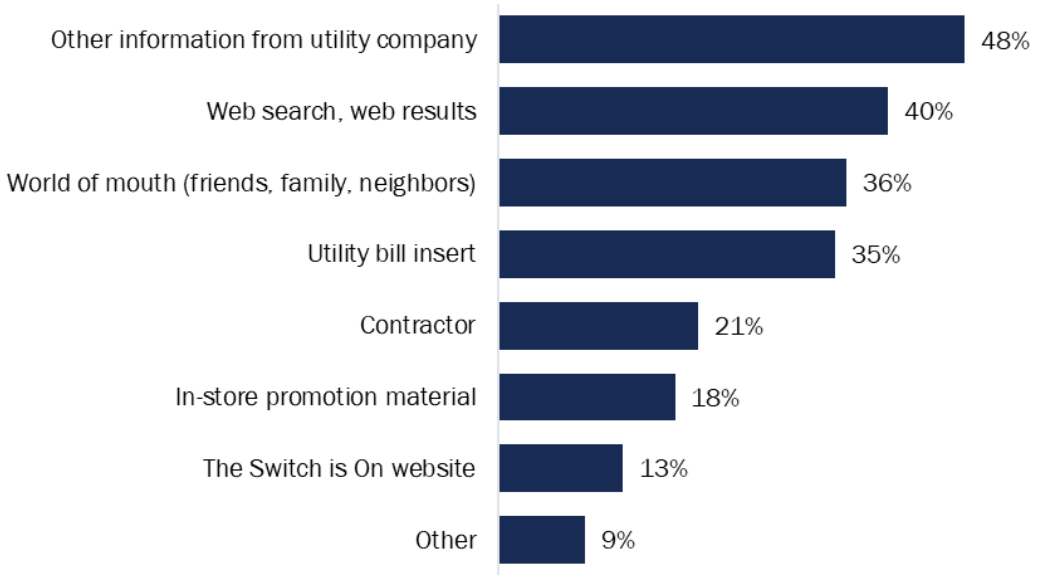
Figure 47. Influential Sources When Considering New Water Heater Equipment (n=500)



5.5 Incentive and Tax Credit Awareness

We asked homeowners who indicated they were aware of HPWHs if they were aware of the financial incentives some organizations offer for installing them. **Over two-fifths of those respondents (90 of 182; 44%) reported they were aware of incentive offerings, a 4 percentage point increase since the Baseline Market Assessment.** The most common ways respondents heard about the availability of HPWH incentives were similar to those for installing HVAC heat pumps. Most heard about the incentives from their utility, either via bill inserts (35 of 90; 35%) or through other information (37 of 90; 48%). Respondents also reported discovering the incentives through a web search (36 of 90; 40%) and by word of mouth (34 of 90; 36%) (Figure 48).

Figure 48. Where Homeowners Heard About Incentives for Installing a HPWH (n=90)



Note: Asked of respondents who indicated they had heard of financial incentives available for installing a HPWH. Multiple responses were allowed.

We also asked homeowners who were aware of HPWHs if they knew they may be eligible for up to a $2,000 federal tax credit for purchasing a HPWH. Nearly one-third of those respondents (60 of 182; 31%) said they knew of their eligibility.

5.6 Labor Market

5.6.1 Availability of Qualified Trade Allies

The most appropriate CSLB licenses for stand-alone installation of HWPH are C-20 HVAC or C-36 Plumbing. If electrical upgrades are required as part of the HPWH installation, C-20 HVAC and C-36 Plumbing contractors can self-perform or subcontract out any electrical work required to accommodate the HPWH, including installing a dedicated circuit for the water heater. General B Building Contractors are allowed to perform a HPWH installation only when the installation is part of a larger project involving two unrelated trades.

According to the CSLB, in 2024, 16,578 contractors in California had a C-36 Plumbing license; 3,282 of them were in DACs. Furthermore, 11,294 C20-HVAC contractors were in California in 2024, and 2,496 were in DACs. Manufacturers and distributors have anecdotally estimated that at least half of residential water heaters are installed by handypersons rather than licensed contractors.

5.6.2 Contractor HPWH Experience

Surveyed contractors had more experience with unitary HPWH installations in single-family or in-unit multifamily properties compared to centralized systems in large multifamily properties—among those for whom at least 50% of their water-heating business came from installation jobs (Table 13). Among contractors whose firms sell water-heating equipment and who attributed at least half of their business to water-heating installation jobs, a few (12 of 76; 16%) had no HPWH experience—a 12 percentage point decrease since the Baseline Market Assessment and an 11

percentage point decrease since the Time 1 Market Assessment. **This means that the proportion of businesses with HPWH experience is increasing in the market.**

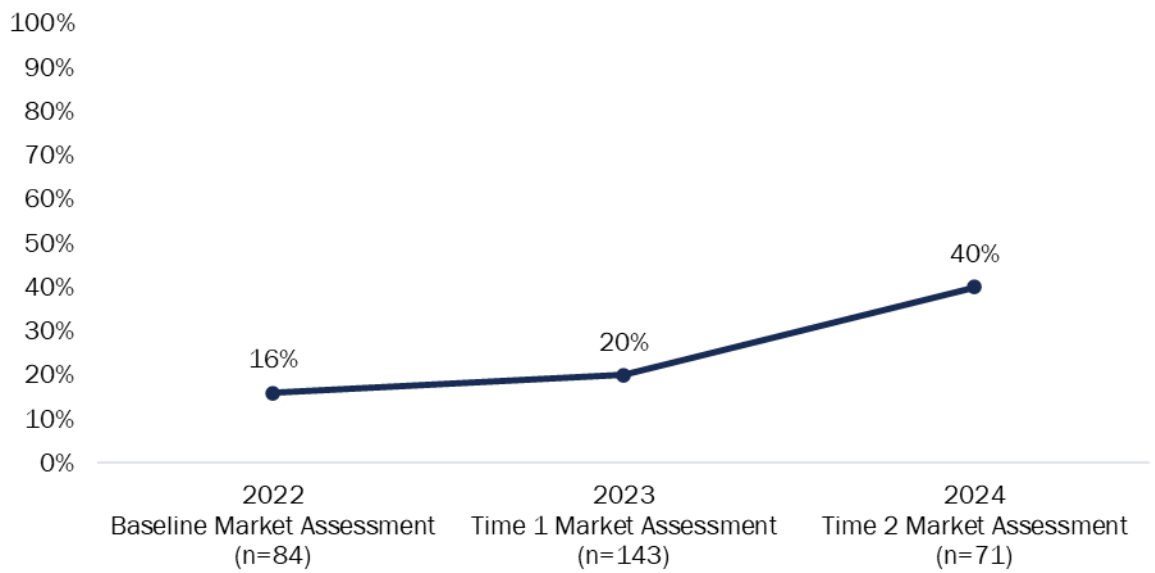
Table 13. Experience in HPWH Installations (n=76)

Building Type	Number of Installers with HPWH Experience	Percentage of Installers with HPWH Experience
Only Single-Family Residential, Low-Rise Multifamily, or In-Unit Multifamily	43	57%
Only Large, High-Rise Multifamily	0	0%
Both	21	28%
Neither	12	16%

Note: Asked of water-heating contractors whose companies get more than half their business from completing water-heating installations.

Of all water-heating installations completed by surveyed contractors in the last year, on average, 40% were HPWHs—among those for whom at least 50% of their water-heating business came from installation jobs. **This constitutes a 24 percentage point increase since the Baseline Market Assessment and a 20 percentage point increase since the Time 1 Market Assessment** (Figure 49). Under a fifth of respondents (12 of 71; 17%) had not installed any HPWHs in the past twelve months—a 15 percentage point decrease since the Baseline Market Assessment and an 11 percentage point decrease since the Time 1 Market Assessment. Nearly two-fifths of contractors (27 of 71; 38%) reported at least half of the installations they completed last year were HPWHs, while nearly one-fifth (13 of 71; 18%) indicated that all their installations were HPWHs.[42]

Figure 49. Average Percentage of Installation Jobs That Were HPWHs Over Time



Similar to the Time 1 Market Assessment, over half of surveyed contractors' firms (52 of 81; 52%) sold between one and 20 HPWHs in the past year (Table 14). However, over one-third of respondents' firms (29 of 81; 36%) sold more than 20 HPWHs within the past 12 months—a 29 percentage point increase compared to the Time 1 Market

[42] Analysis excludes five water-heating contractors who did not know the share of installations that were HPWHs.

Assessment. Similarly, we saw a decrease of 18 percentage points in the proportion of contractor firms that did not sell any HPWHs in this Time 2 Market Assessment (15 of 81; 19%) compared to the previous year.

Table 14. Number of HPWHs Sold by Firms in the Past Year (n=81)

Number of Heat Pump Water Heaters	Count	Percent
None	15	19%
1–5	20	25%
6–20	17	21%
21–50	14	17%
51–100	7	9%
More than 100	8	10%

Note: Analysis excludes five "don't know" responses.

We also asked the same sample of respondents whose firms had sold at least one HPWH over the past year about whether their equipment came with a few specific features, which are listed in Table 15. We describe each of these features below.

- **Thermostatic Mixing Valves (TMVs)**: TMVs are HPWH features used to increase usable hot water. The tank stores water at higher-than-normal temperatures; the valve automatically mixes the very hot water with cold water to deliver water at the desired temperature.
- **Connectivity**: Internet connectivity allows for greater control over a system's operation. Connectivity can enable greater savings if the end user is enrolled in specific programs their electric provider may offer, such as a demand response program.
- **TOU Controls**: TOU controls enable customers to schedule their water heater so that water heats during off-peak times when the lowest electricity rates are available.

On average, 67% of HPWH installations completed by surveyed contractors' firms included a TMV, the most common feature added during installation (Table 15). Although the average percentage of installations that included these actions was similar between the Baseline and Time 1 Market Assessments, averages increased for the Time 2 Market Assessment. The average installation of TMVs increased by 26 percentage points since the Baseline Market Assessment; internet connectivity increased by 20 percentage points since the Baseline Market Assessment; and the installation of TOU controls increased by 25 percentage points since the Baseline Market Assessment.

Table 15. Heat Pump Water Heater Actions

Heat Pump Water Heater Actions	Average Percent of Installs
Install Thermostatic Mixing Valve (n=61)	67%
Connect to Internet (n=62)	58%
Program Time-of-Use Controls (n=58)	53%

Note: Asked of water-heating contractors whose firms had sold at least one HPWH over the past year. Averages exclude "Unsure" responses.

Over half of contractors (34 of 61; 55%) reported all HPWH installations their firm completed in the past year included a TMV, while just over two-fifths (26 of 62; 42%) said internet connectivity was set up during all installations (Table 16).

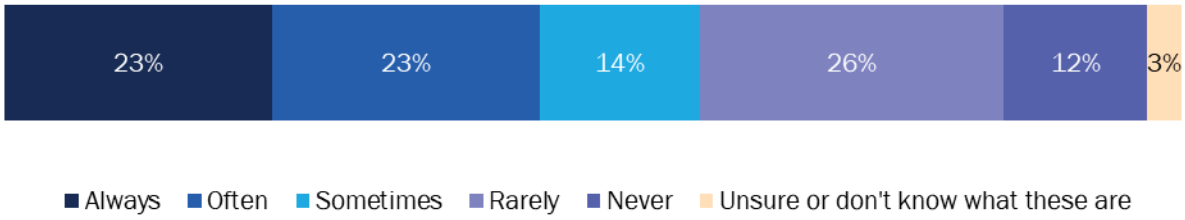
Table 16. Proportion of Surveyed Contractors Who Reported None or All of Firms' HPWH Installations Included Actions

Heat Pump Water Heater Actions	None	All
Install Thermostatic Mixing Valve (n=61)	6 (10%)	34 (56%)
Allow Internet Connectivity (n=62)	11 (18%)	26 (42%)
Program Time-of-Use Controls (n=58)	10 (17%)	19 (33%)

Note: Asked of water-heating contractors whose firms had sold at least one HPWH over the past year. Analyses exclude "Unsure" responses.

Nearly half of HPWH contractors frequently discussed demand response programs with their customers. Specifically, 46% (30 of 66) of contractors whose company had sold at least one HPWH in the past year indicated that they "always" or "often" engage in these conversations (Figure 50). Conversely, over one-third of contractors (25 of 66; 38%) "rarely" or "never" address demand response programs with their customers. This indicates that while many contractors interact with clients about these initiatives, there is still a significant opportunity to raise awareness of demand response programs and increase enrollment.

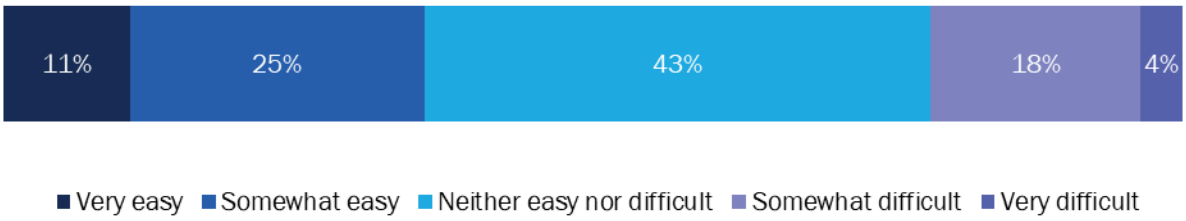
Figure 50. Frequency of HPWH Contractors Discussing Demand Response Programs with Customers (n=66)



Note: Asked of water-heating contractors whose firms had sold at least one HPWH over the past year.

Contractors who discuss demand response programs with their customers generally find this conversation "neither easy nor difficult". Among contractors whose company had sold at least one HPWH in the past year and who indicated they discuss demand response programs with their customers, about two-fifths (24 of 56, or 43%) report that these conversations are "neither easy nor difficult" (Figure 51). Just over one-third (20 out of 56, or 34%) feel that these discussions are "somewhat" or "very" easy.

Figure 51. Level of Difficulty Discussing Demand Response with HPWH Customers (n=56)



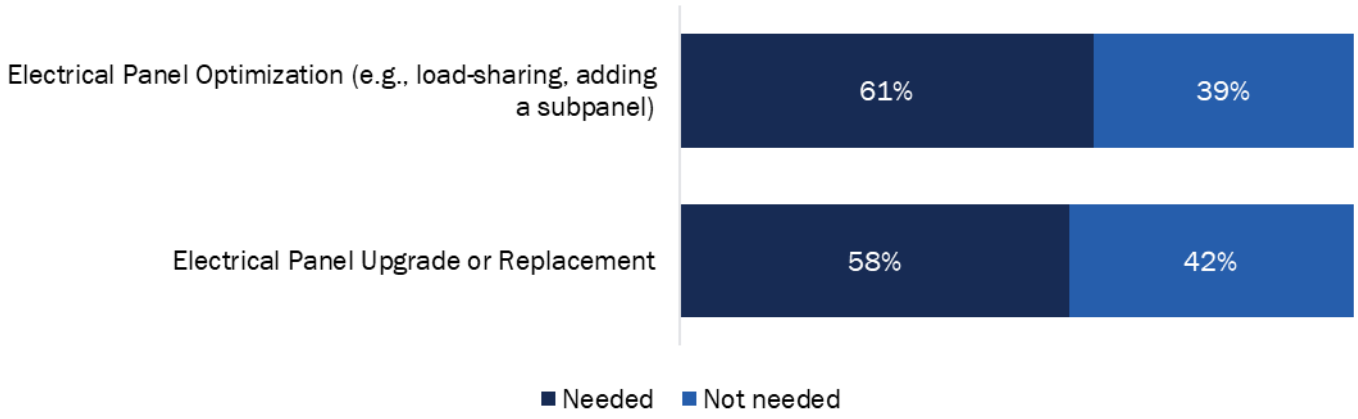
Note: Asked of water-heating contractors whose firms had sold at least one HPWH over the past year and who discuss demand response programs with their customers.

On average, contractors discuss the benefits of upsizing the system's tank with 64% of their HPWH customers. Of surveyed contractors whose company has experience with HPWH installations in single-family residential or low-rise, in-unit multifamily properties, over two-thirds (43 of 63; 68%) indicated they discuss the benefits of upsizing water-heating

tank size with at least half of their HPWH customers; nearly half of contractors (31 of 63; 49%) reported they discuss benefits with all of their customers.[43] This is a promising finding for the adoption of HPWHs, as this discussion can greatly help ensure a HPWH successfully serves a home as intended, creating a positive customer outlook on the equipment. This also potentially enables these HPWHs to provide grid benefits. Fourteen percent of contractors (9 of 63) never discuss these benefits with their customers.

Contractors regularly encounter situations where customers need panel upgrades to accommodate a new HPWH. Over half of contractors (33 of 57; 58%) had at least one HPWH installation in the last year that required a complete electrical panel upgrade or replacement to accommodate the HPWH (Figure 52). In fact, 23% of contractors (13 of 57) reported that a panel upgrade or complete replacement was necessary for at least 50% of their HPWH installations. Similarly, two-thirds of contractors (35 of 57; 61%) had at least one HPWH installation in the last year that required some sort of panel optimization, such as load-sharing or adding a subpanel.

Figure 52. Percent of Contractors Reporting Whether a HPWH Installation Required a Panel Upgrade or Optimization in the Past Year (n=57)

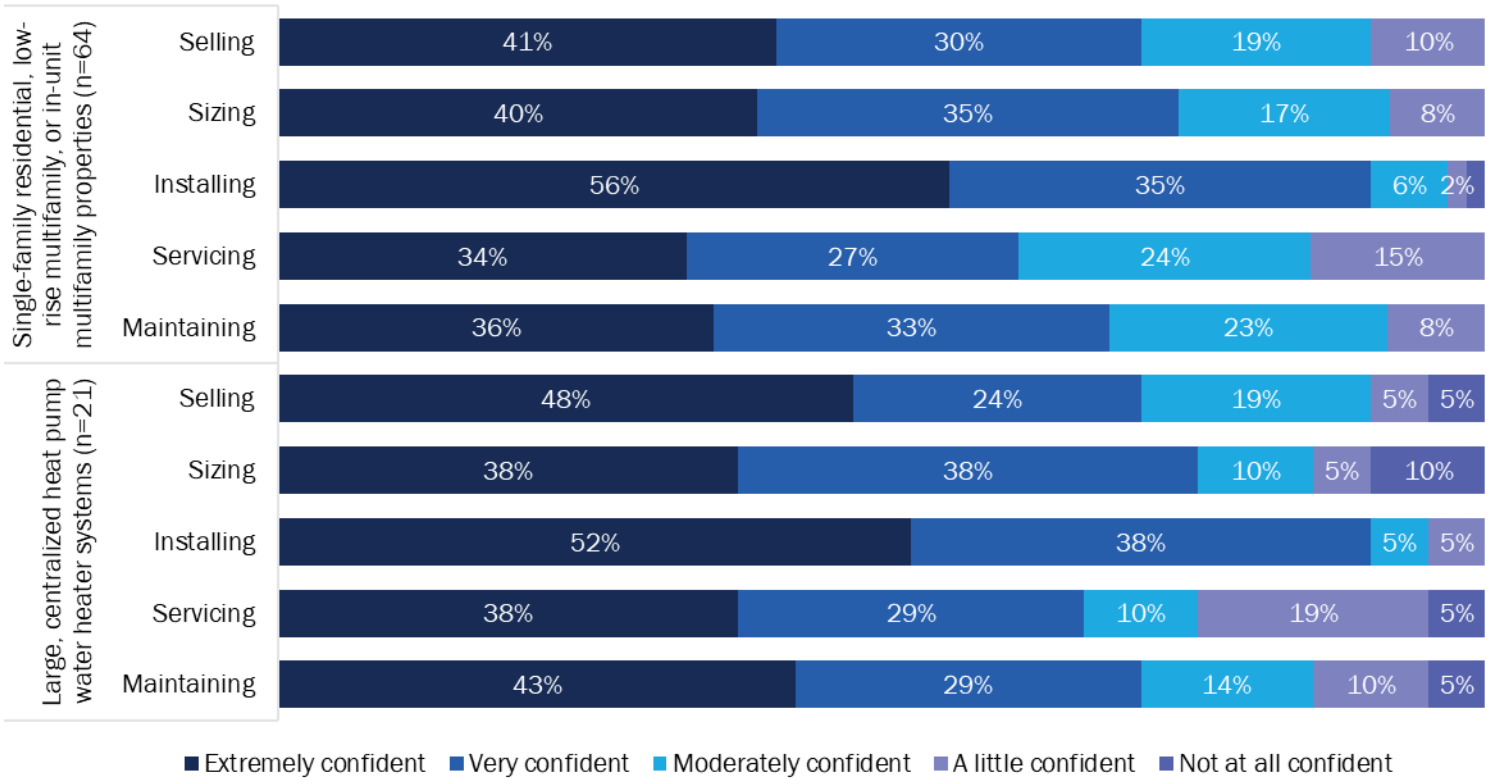


Note: Asked of water-heating contractors whose firms had sold at least one HPWH over the past year. Nine contractors reported being unsure about the percentage of customers requiring an electrical panel upgrade or optimization and were excluded from the calculations.

Surveyed contractors indicated similar confidence working with unitary HPWHs for single-family and low-rise or in-unit multifamily residential properties and large centralized HPWHs in large multifamily properties. Contractors reported similar levels of confidence in selling, sizing, installing, servicing, and maintaining HPWHs in single-family homes and high-rise multifamily buildings (Figure 53). Among the various tasks we asked about, contractors were most confident in their ability to properly install HPWH equipment and least confident in their ability to properly service HPWHs. Over half of all contractors (56% and 52%) reported being "extremely confident" installing HPWHs regardless of building type. This shows an improvement in confidence compared to what contractors showed in the Time 1 Market Assessment, especially when installing large centralized HPWHs in multifamily buildings (only 15% of contractors felt "extremely confident"). Furthermore, over one-third of respondents (between 34% and 48%) reported being "extremely confident" in selling, sizing, servicing, and maintaining HPWHs in either property type—also an improvement in contractors' confidence over the last year, especially when working with HPWHs in large multifamily properties.

[43] One contractor did not provide a response to this question.

Figure 53. Confidence in Ability to Sell, Size, Install, Service, and Maintain HPWHs



Note: Asked of water-heating contractors whose companies get more than half their business from completing water-heating installations. Contractors who indicated any of these actions did not apply to them were excluded from the calculations.

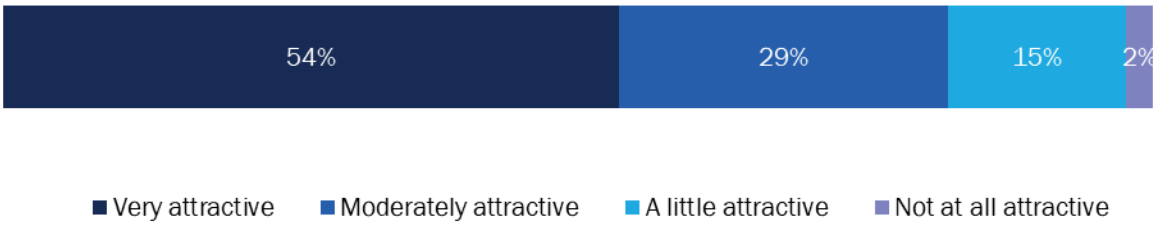
Surveyed contractors estimated that the installation of a unitary HPWH system serving single-family residential, low-rise multifamily, or in-unit multifamily properties would take two days on average, although contractor responses ranged from one to 10 days (n=57).[44] Conversely, on average, contractors said installing a larger, centralized system would take six days; three respondents noted it would take ten days or more (n=19).[45]

On average, respondents' firms with two or more employees hired five installers/technicians annually, compared to an average of four and two hires per year, as we found in the Baseline and Time 1 Market Assessments, respectively. **Most contractors (43 of 69; 62%) reported their firm typically hires between one and four installers annually**, although responses ranged from zero to 50 hires. A few respondents who worked for these firms (4 of 69; 6%) said their firm hires zero new installers or technicians in a typical year—a 22 percentage point decrease since the Time 1 Market Assessment.[46]

Heat pump experience is attractive when hiring a new water-heating installer or technician. Most surveyed water-heating contractors (69 of 84; 82%) indicated heat pump experience is at least "moderately attractive" when hiring installers and/or technicians—an 11 percentage point increase since the Time 1 Market Assessment (Figure 54). In contrast, approximately a quarter of respondents (15 of 84; 18%) said heat pump experience is either "a little" or "not at all attractive" in an installer/technician candidate.

[44] One "don't know" response was excluded from the average.
[45] Two "don't know" responses were excluded from the average.
[46] Six "don't know" responses were excluded from the average.

Figure 54. Attractiveness of Heat Pump Experience When Hiring (n=84)



Note: Analysis excludes one "don't know" and two "not applicable" responses.

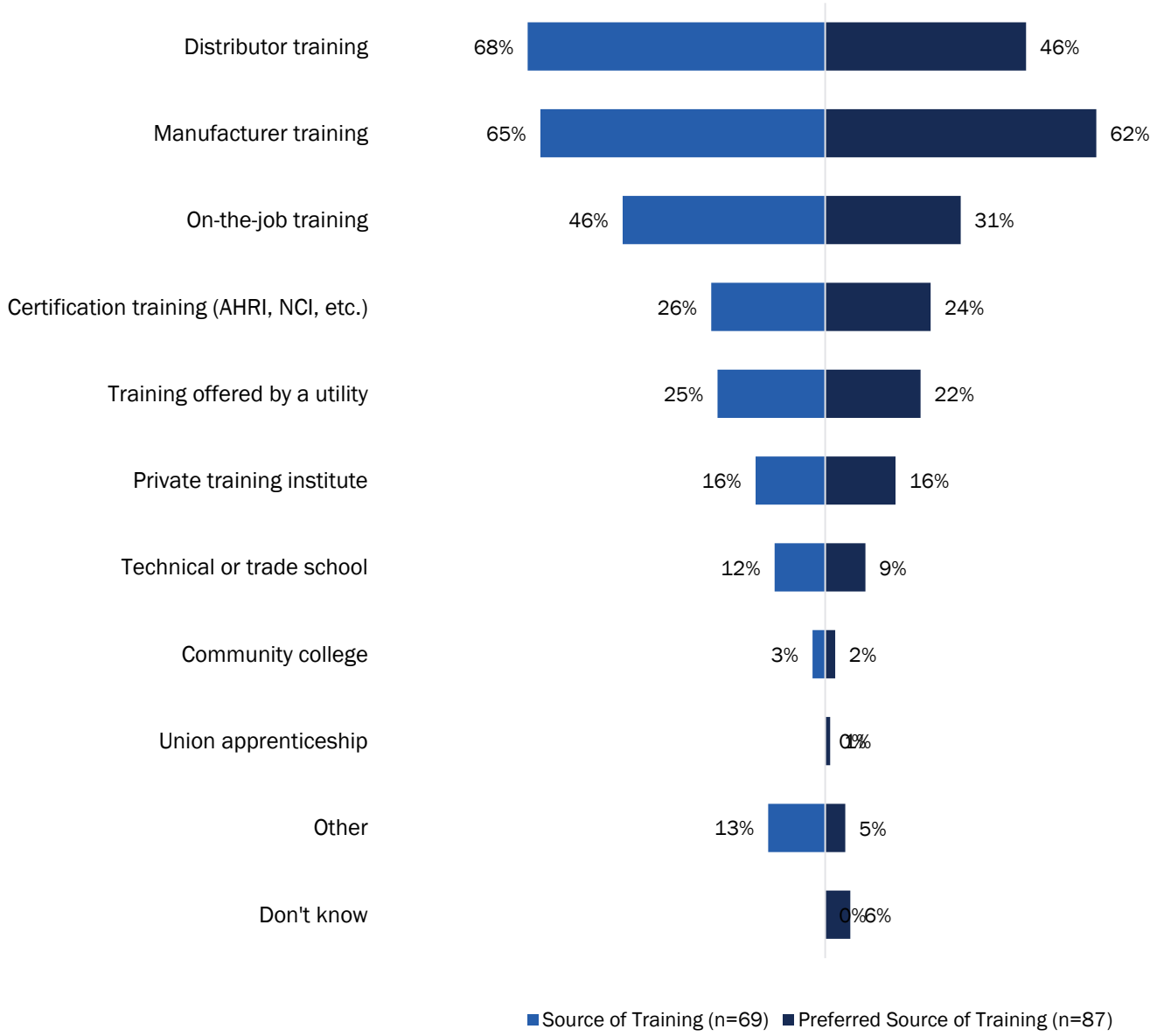
On average, about half of water-heating contractors said at least 50% of their staff have installed or worked with HPWH equipment in the past year. Contractors who worked for a company with at least two employees were asked what percentage of technicians at their firm have installed or worked on HPWH equipment in the past year. One-quarter of respondents (18 of 73; 25%) shared that all of their staff had experience working with HPWHs, and over half (40 of 73; 55%) said that at least 50% of their staff did. A minority of respondents (10 of 73; 14%) said 5% or less of their colleagues had worked with HPWH equipment in the past year, and a similar proportion of respondents (7 of 73; 10%) said none of their staff had worked with HPWH equipment in the past twelve months. The latter represents a 15 percentage point decrease since the Baseline Market Assessment and a 9 percentage point decrease since the Time 1 Market Assessment.[47]

5.6.3 Contractor Training

Over three-quarters of surveyed water-heating contractors (69 of 87; 79%) had received heat pump equipment training—a 27 percentage point increase since the Baseline Market Assessment and a 30 percentage point increase since the Time 1 Market Assessment. Water-heating respondents received heat pump equipment training most commonly through a distributor, a manufacturer, or while on the job, consistent with previous market assessments (Figure 55). Almost three-quarters of those respondents (51 of 69; 74%) received training from more than one source. Also consistent with previous studies, water-heating contractors preferred training provided through a manufacturer (54 of 87; 62%).

[47] Two "don't know" responses were excluded from average.

Figure 55. Sources of Heat Pump Training Versus Preferred Sources for Training (Multiple Responses Allowed)



As with HVAC heat pumps, most water-heating contractors (64 of 87; 74%) also indicated a preference for in-person education, preferring either a hybrid approach of in-person and online training or fully in-person training. Nearly one-fifth of contractors (16 of 87; 18%) prefer participating in online training, while a few (7 of 87; 8%) said they had no preference about the training mode.

6. Heat Pump Incentives and Financing Availability and Awareness

In this section, we review residential heat pump incentive offerings in California and present survey findings related to contractor heat pump financing offerings and homeowner awareness of available financing options.

6.1 Retrofit Incentive Programs

As of December 2024, 42 programs in California offered HVAC heat pump incentives for residential retrofit projects, six times as many as the seven programs observed two years ago in the Baseline Market Assessment. These programs primarily incentivized central ducted and ductless mini-split HVAC heat pumps, although a minority had offerings for packaged terminal heat pumps (PTHP) and ground source heat pumps (Table 17). These incentives were offered for both multifamily and single-family projects for income-qualified and non-income-qualified renters, homeowners, and contractors. While the majority of these programs were city or region-specific, four were offered across the entirety of California. Incentive amounts ranged from $100 to $13,500, although only four programs offered incentives above $5,000. The maximum incentive was for whole-home energy efficiency improvements, including heat pumps. According to Title 24, the minimum efficiency requirement for heat pumps is 14 SEER. Across incentive programs, the minimum efficiency requirement was commonly 15 or 16 SEER, while a few mandated at least 17 SEER (three programs), 18 SEER (two programs), or 20 SEER (one program).

Table 17. HVAC Heat Pump Incentive Programs by Equipment Type

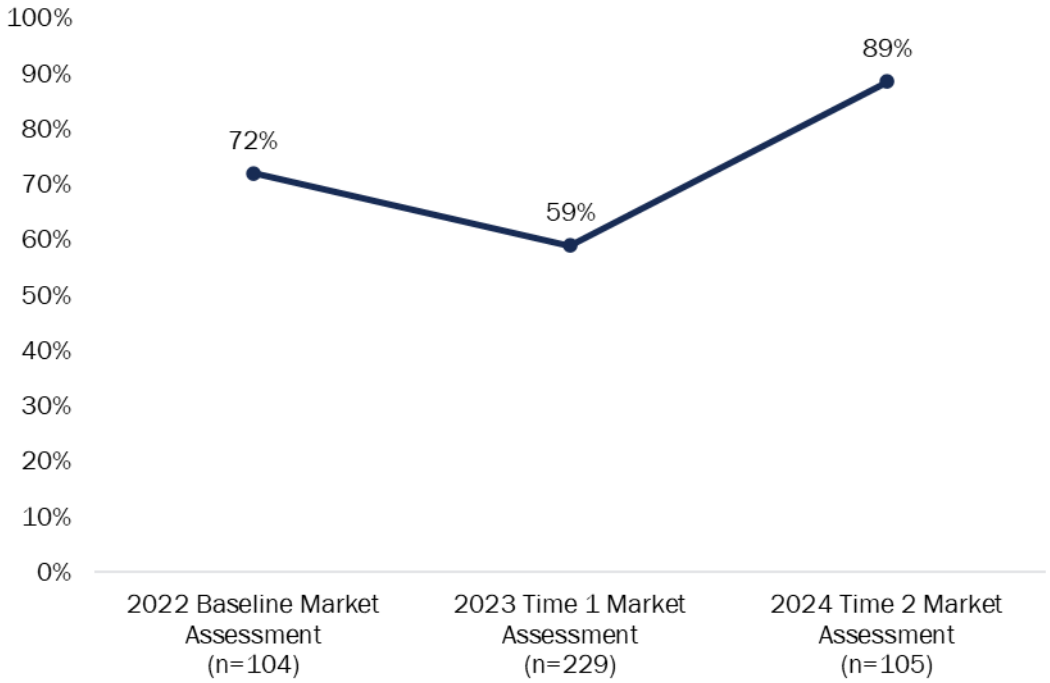
Equipment Type	Count
Central Ducted Heat Pump	39
Ductless Mini-Split Heat Pump	33
Packaged Terminal Heat Pump	3
Ground Source Heat Pump	2
Total	**77**

Note: Some of these programs may offer incentives for more than one technology, which is why the total is above the 42 HVAC programs total.

There were 35 programs that offered incentives for retrofit HPWH installations as of January 2025—nearly twice as many as the 18 that existed during the Baseline Market Assessment. Similar to the HVAC incentives, a limited number of programs were available across the entirety of California (two programs), while the majority were city- or region-specific. Six programs were specific for income-qualified contractors, homeowners, and renters. Incentive amounts ranged from $100 to $10,000, with twelve programs offering incentives of more than $1,000 and four programs offering incentives of more than $5,000. As of January 2025, there were also 12 programs in California offering incentives for electrical or panel upgrades to support a later installation of a heat pump, usually through local governments or utilities. These incentive amounts ranged from $100 to $2,000.

Among contractors whose firm sold at least one heat pump or HPWH last year, most (93 of 105; 89%) were aware of rebates or incentives available in California for space-conditioning and/or water-heating heat pump installations. This represents a 17 percentage point increase since the Baseline Market Assessment and a 30 percentage point increase since the Time 1 Market Assessment (Figure 56). Most contractors who were aware of incentives (89 of 93; 96%) said they promote them to their customers. Contractors working with HVAC equipment exclusively or water-heating equipment exclusively are similarly likely to promote incentives to their customers compared to contractors working with both.

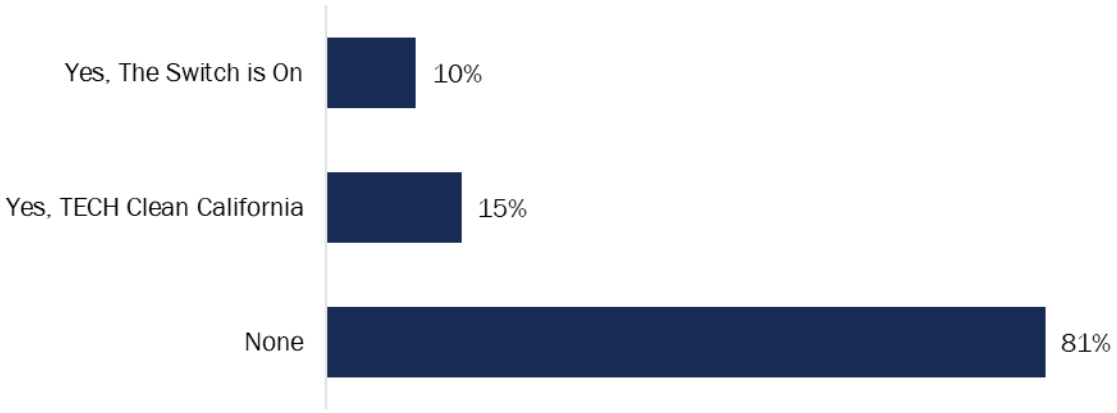
Figure 56. Contractors' Awareness of Rebates or Incentives in California Over Time



Note: Asked of contractors whose firms had sold at least one heat pump or one HPWH over the past year.

Relatedly, we wanted to know whether our homeowner survey respondents had heard of the TECH Clean California Initiative or The Switch is On website, which is designed to educate homeowners about home electrification. While most were unaware of both, a similar number of respondents had heard of The Switch is On (54 of 500; 10%) and TECH Clean California (63 of 500; 15%) (Figure 57). At the time of the survey, the Switch is On website and the TECH Clean California Initiative had been in the marketplace for about two years.

Figure 57. Homeowners' Awareness of TECH Clean California and The Switch is On (n=500)

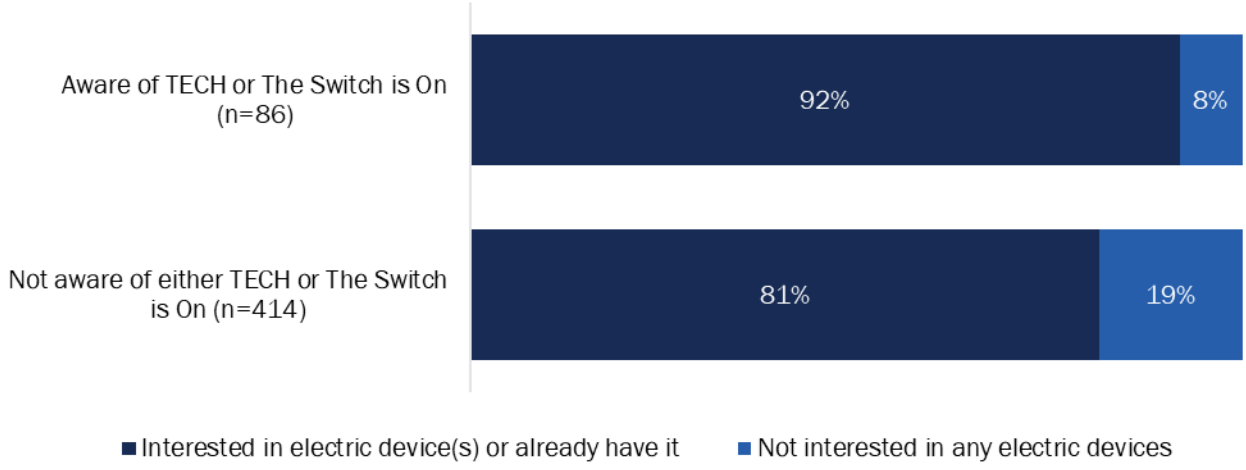


Note: Response option "None" is exclusive. Multiple responses were allowed.

Similar to what we observed in the Time 1 Market Assessment, we saw a strong correlation between having heard of TECH or the Switch is On and interest in electric devices. Almost all surveyed homeowners aware of TECH Clean California or The Switch is On expressed interest in purchasing at least one electric device or indicated already having

one (79 of 86; 92%) (Figure 58). Homeowners who were aware of the TECH Initiative or The Switch is On website were significantly more likely to own or be interested in purchasing an electric device than those who were unaware.

Figure 58. Homeowners' Awareness of TECH Clean California and The Switch is On by Interest in Electric Devices



6.2 Financing Availability

As part of the TECH Initiative, the implementation team partnered with the California Alternative Energy and Advanced Transportation Authority (CAEATFA). This partnership aimed to expand and universalize CAEAFTA's GoGreen Financing program. Funds invested by the TECH Initiative were used to create a loan loss reserve (LLR) to provide credit enhancement for loans to municipal utility customers who were formerly not eligible for GoGreen Financing and cover a portion of incremental costs associated with expanding GoGreen Finance program offerings. CAEAFTA began offering the expanded loan program on April 1, 2022.

As shown in Table 18, the number of heat pump projects financed through the GoGreen program that received TECH Clean California incentives decreased from 150 in 2023 to 50 in 2024. The total number of heat pump projects financed through GoGreen, however, increased annually. TECH Clean California's partnership with GoGreen ended in December of 2024, when the California Energy Commission took over funding of the LLR.

Table 18. Number of Financed Heat Pump Projects by Funding Source and DAC

Year	Total	Number of TECH-funded heat pumps financed through GoGreen in non-DACs	Number of TECH-funded heat pumps financed through GoGreen in DACs	Number of non-TECH-funded heat pumps financed through GoGreen in non-DACs	Number of non-TECH-funded heat pumps financed through GoGreen in DACs
2021	62	N/A	N/A	55	7
2022[a]	236	33	5	186	12
2023	608	139	11	449	12
2024	898	43	7	803	45

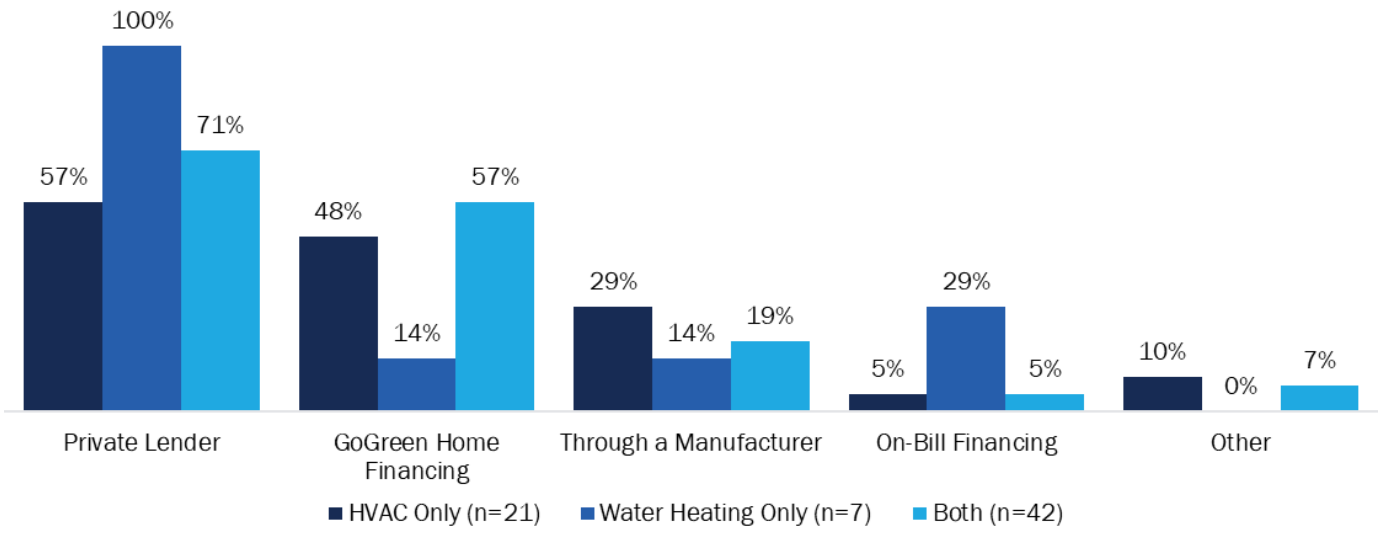
[a] Data are not available for the first quarter of 2022.

Over half (70 of 115; 61%) of surveyed contractors' companies offered financing options to residential customers who purchase new HVAC or water-heating equipment, an 11 percentage point increase since the Baseline Market Assessment and a 21 percentage point increase since the Time 1 Market Assessment. Respondents who worked with

HVAC equipment were more likely to offer financing options to their customers (63 of 91; 69%) compared to those who worked with water-heating equipment (49 of 87; 56%).

As observed in both market assessments, regardless of the equipment they worked with, the most common type of financing surveyed contractors offer to their customers is through a private lender (Figure 59). GoGreen Home financing is the second most common option contractors offer. Contractors who work with both types of equipment and those who work exclusively with HVAC are more likely to offer GoGreen Home financing to customers than those who work with water heating exclusively. At the same time, the latter group is more likely to offer on-bill financing to their customers. Other types of financing contractors mentioned they offer include Pure Clean Energy (1 mention), EGIA Clearing House (1 mention), GreenSky (1 mention), and Service Finance (1 mention). One contractor mentioned they do not offer any type of financing to customers.

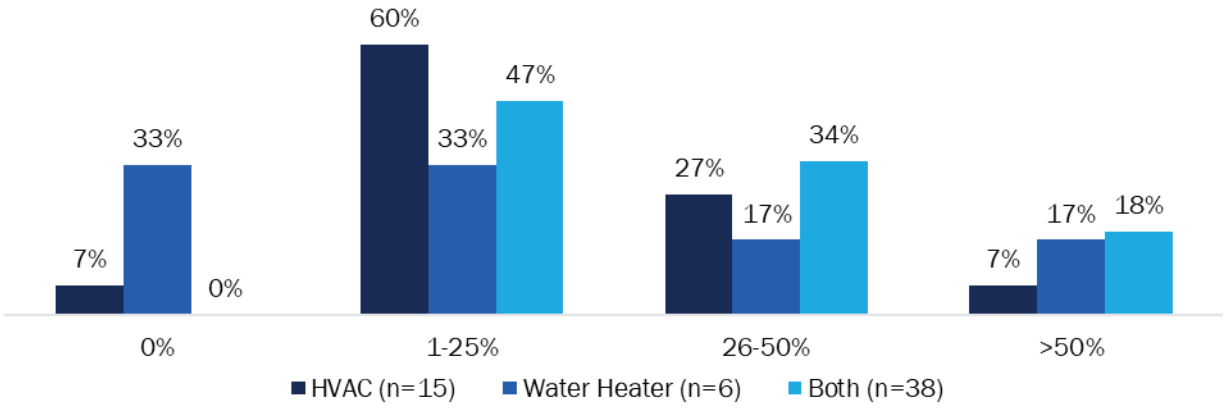
Figure 59. Financing Offered to Residential Customers



Note: Asked of contractors whose firms offer financing options to their customers. Multiple responses were allowed.

Heat pump equipment customers most frequently utilized financing when purchasing equipment from a contractor who works with both HVAC and water-heating equipment (Figure 60). Almost one-fifth of contractors who work with both HVAC and water-heating equipment, have heat pump or HPWH experience, and offer financing options (7 of 38; 18%) said 50% or more of their customers used financing to purchase their heat pump equipment—which represents an 11 percentage point decrease since the Time 1 Market Assessment. Over one-third of contractors who work with both equipment types (13 of 38, 34%) said 26% to 50% of their customers used financing. Fewer customers used financing when working with a contractor who specialized in only one type of equipment. Most of these contractors said 25% or fewer customers used financing to purchase their heat pump equipment.

Figure 60. Proportion of Customers Who Use Financing When Purchasing Heat Pump Equipment

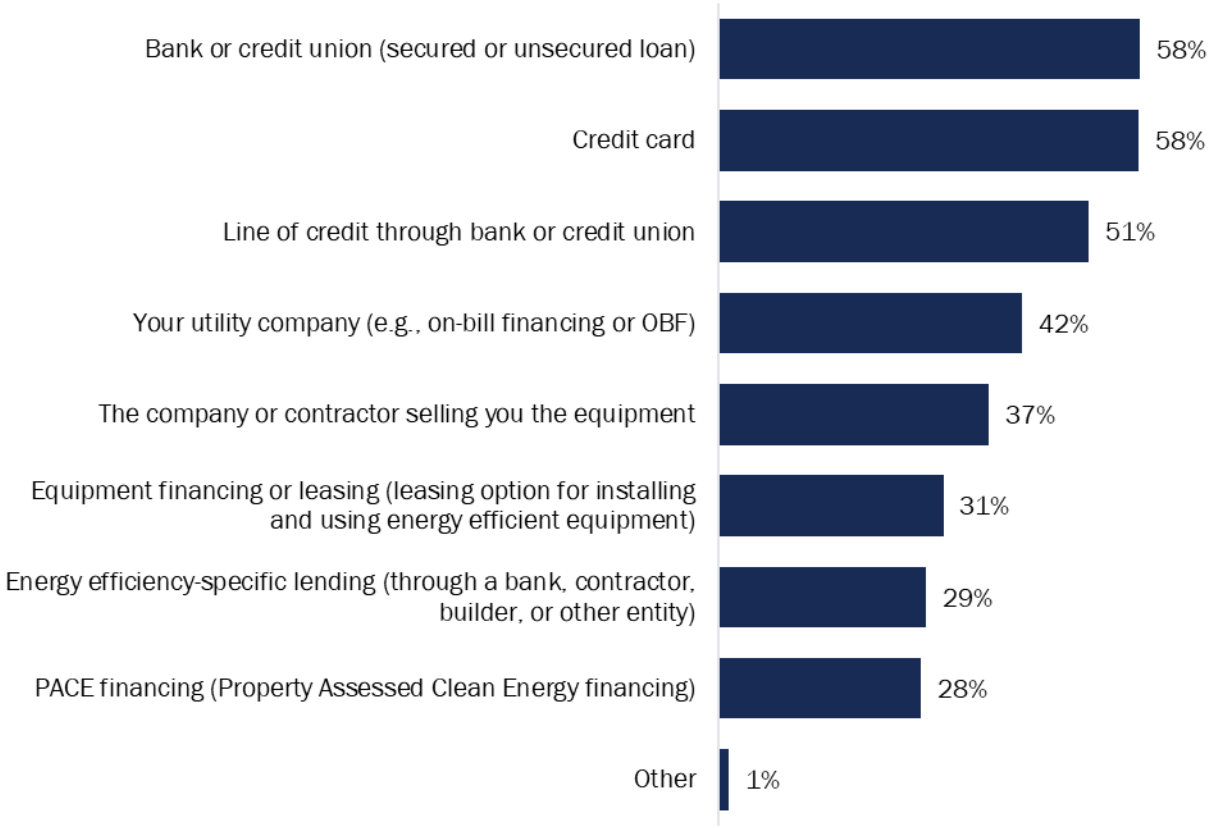


Note: Asked of contractors whose firms offer financing options to their customers with heat pump or HPWH experience. Three "don't know" responses were excluded from the calculations.

6.3 Customer Awareness of Financing Options

Although only a minority of customer respondents (168 of 500; 34%) were aware of financing options available to them to purchase new space heating/cooling or water-heating equipment, we observed a 2% increase since the Baseline Market Assessment. Surveyed homeowners who were aware of available financing options were asked about the specific type(s) of financing they knew (Figure 61). Respondents were most likely to be aware of general financing options, such as a credit card (103 of 168; 58%) or a loan through a banking institution (99 of 168; 51%). Financing options through entities other than banking institutions or options specific to efficiency level or equipment selection were less commonly known by respondents. Additionally, of those reportedly unaware of financing through their utility company, about one-third of respondents (32 of 91; 34%) had heard of on-bill financing. Overall, nearly half (241 of 500; 47%) of respondents were unaware of financing options available to them, and the remaining 19% (91 of 500) were unsure whether they knew about these options.

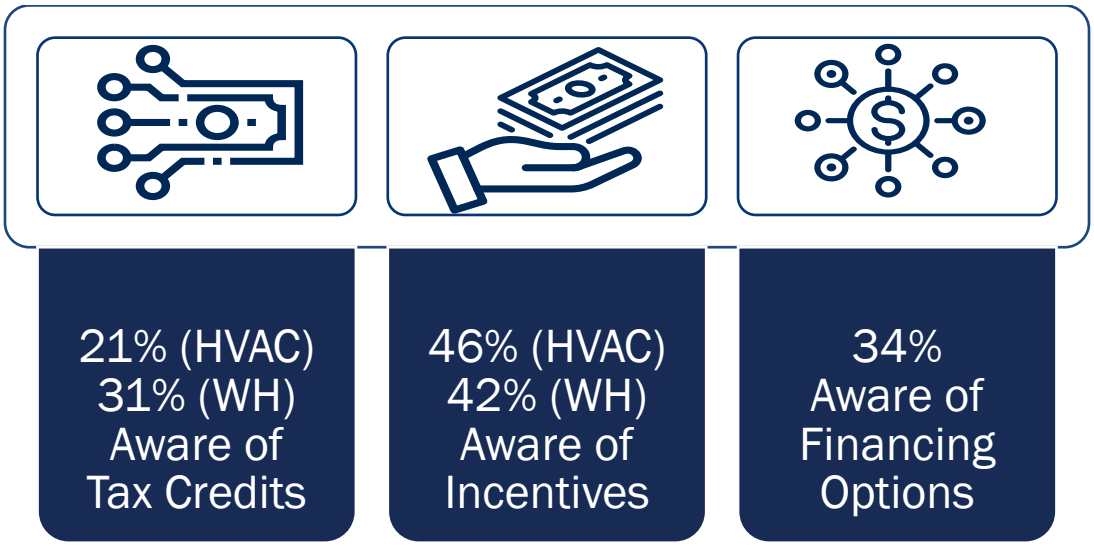
Figure 61. Homeowner Financing Option Awareness (n=168)



Note: Asked of homeowners who were aware of financing options available to them to purchase new space heating/cooling or water-heating equipment. "Other" responses include rebates and incentives through the Inflation Reduction Act (IRA).

Figure 62 summarizes homeowner respondents' awareness of financial options available to them when purchasing heat pump equipment.

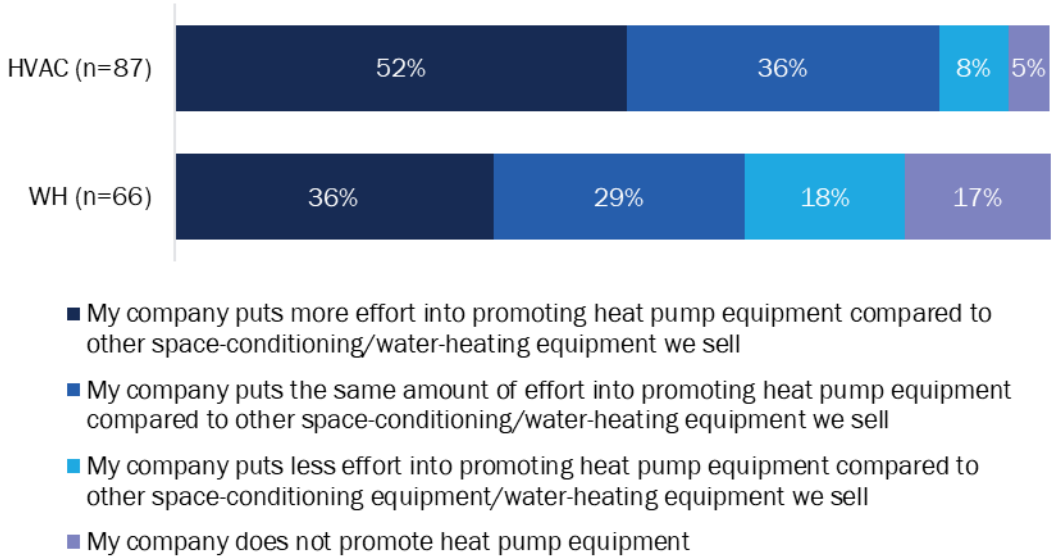
Figure 62. Homeowners' Awareness of Financial Resources for Heat Pump Purchases



7. Heat Pump Promotion and Marketing

Most firms that sell HVAC equipment promote heat pumps to some degree (83 of 87; 95%); while a smaller proportion of those that sell water heaters promote HPWHs to some degree (55 of 66; 83%). About one-third of firms that sell water-heating equipment (35%) said their company puts less effort into HPWH promotions than into promoting other water-heating equipment or puts no effort at all into promoting HPWHs (Figure 63). Firms that provide HVAC services are more likely to promote heat pump equipment above and beyond other equipment options (45 of 87; 52%) compared to firms that provide water heating services (24 of 66; 36%).

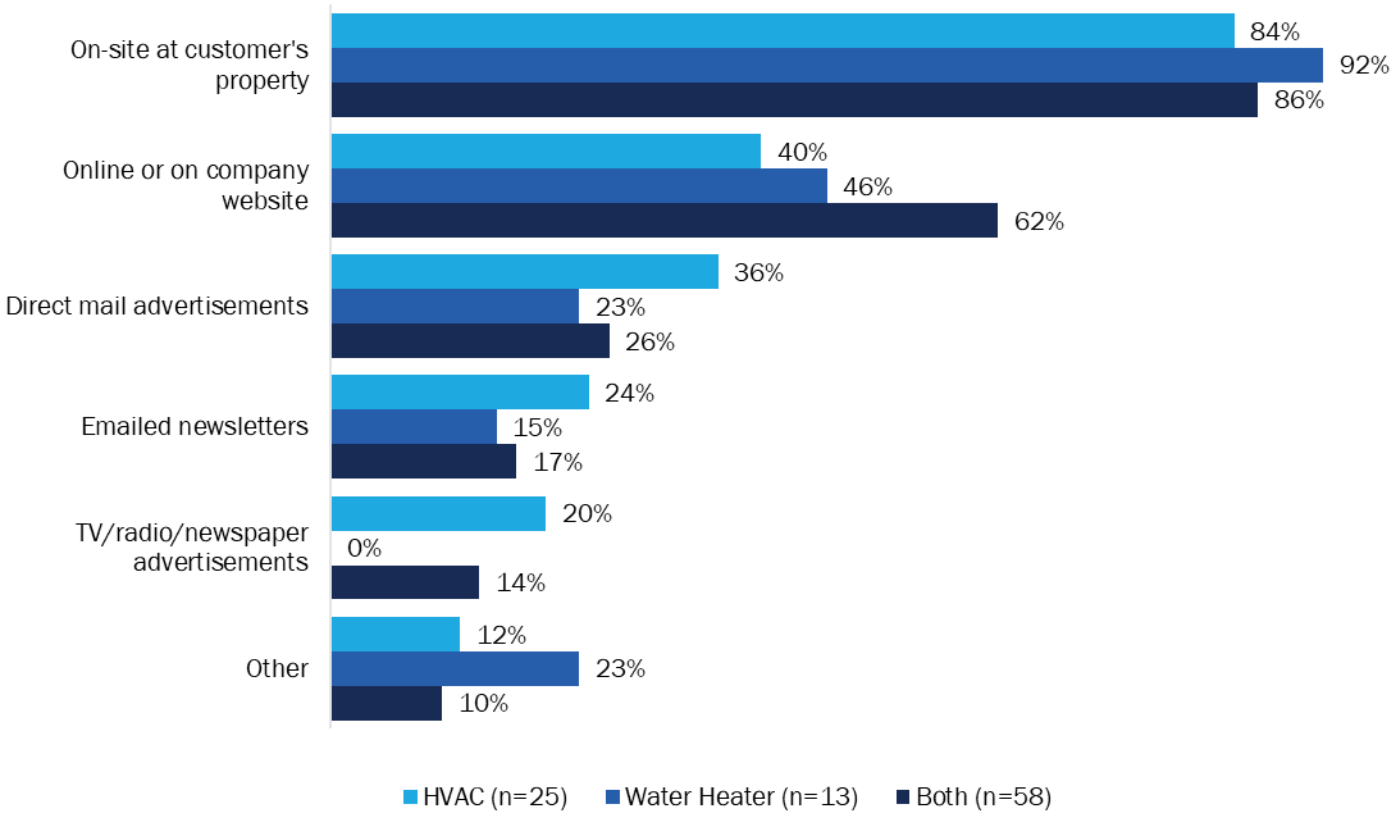
Figure 63. Effort Surveyed Contractors' Companies Put into Marketing Heat Pump Equipment Compared to Other Equipment



Note: Asked of contractors whose firms had sold at least one heat pump or one HPWH over the past year. Analysis excludes eight contractors whose firm didn't sell heat pump equipment and one contractor who did not know how many HPWHs their company sold in the past year.

Regardless of the type of equipment they work with, surveyed contractors' companies most commonly promote heat pumps while on-site at a customer's property (Figure 64). The other two common channels contractors used to promote heat pump equipment were online sources or their company's website and direct mail inserts, while the least common channels were TV, radio, or newspaper advertisements.

Figure 64. Channels Surveyed Contractors' Companies Promote Heat Pumps Through



Note: Asked of contractors whose firms had sold at least one heat pump or one HPWH over the past year. Analysis excludes nine contractors whose firm does not promote heat pump equipment. "Other" ways contractors mentioned their company promotes heat pump equipment included word of mouth (7 mentions), referrals (2 mentions), digital marketing (1 mention), and events, training, and workshops (1 mention). Multiple responses were allowed.

8. Conclusions and Recommendations

Based on the findings of this Time 2 Market Assessment, we offer the following conclusions and recommendations:

Conclusion: Homeowners in California are increasingly viewing HVAC heat pumps more favorably. More customers perceive heat pumps as offering better value compared to other systems and believe they won't cost more to install. Awareness of HVAC heat pumps is growing modestly, while understanding of their benefits is expanding at a faster rate. These positive views on heat pumps may be linked to the rise in homeowners' awareness of incentives for HVAC heat pumps. Although utilities are a primary source of information about these incentives, they are not a top source for general awareness of heat pumps. Word of mouth was the top source for heat pump awareness, suggesting that it has been influential in helping homeowners remember the term "heat pump."

> **Recommendation:** Since word of mouth has been a primary way of improving customer awareness for HVAC heat pumps, incentive providers could explore opportunities to collect and share customer testimonials reflecting their positive experience with heat pumps. Incentive providers' continued promotion of heat pump incentives is still crucial, as the upfront cost of heat pumps is one of the biggest barriers customers face when considering an HVAC heat pump.

Conclusion: We are seeing evidence of market transformation for HVAC heat pumps in California. Contractors are investing in their businesses to enhance their ability to offer their customers HVAC heat pumps. This is reflected in the substantial increase in the proportion of contractor firms attending HVAC heat pump trainings. Experience with heat pumps is becoming a valuable trait in technicians when hiring them, indicating that firms recognize the importance of this skill set. Contractor firms report that a growing percentage of their staff is involved in heat pump work, suggesting that it is becoming a more common task for their employees. Finally, contractors' self-reported confidence working with HVAC heat pumps has grown in the past few years.

> Recommendation: As the number of contractors who install HVAC heat pumps grows, it will be important for training providers to continue to offer heat pump courses for new staff being introduced to HVAC heat pumps.

Conclusion: It is uncommon for HVAC contractor firms to discuss demand response programs with their customers, potentially forgoing some greenhouse gas and customer bill savings. Despite contractor firms gaining experience with heat pumps, their engagement in demand response conversations lags behind. As more electric heat pumps are installed to replace gas end-uses, it is crucial for the increased electric load to be flexible, which allows demand to be shifted to times when the grid relies on cleaner energy sources. Contractors should be prepared to discuss demand response programs with customers to ensure HVAC heat pumps maximize their potential to reduce greenhouse gas emissions.

> Recommendation: We recommend that TECH Clean California and other HVAC heat pump incentive program administrators develop a toolkit for contractors. This toolkit should include customer-facing scripts, talking points, and educational materials that clearly explain the benefits of DR participation. With DR enrollment now required for customers receiving TECH Clean California incentives, contractors should be both informed and motivated to integrate these conversations into their sales and installation processes.

Conclusion: Contractor firms are showing increased interest in and savviness related to HPWHs, yet do not always discuss demand response with customers. The proportion of water-heating firms that did not sell any HPWHs in the past year declined, while the proportion of firms selling more than 20 HPWHs grew. We observed substantial growth in the proportion of water-heating contractors attending trainings, and appreciable growth in HPWHs installed with load shifting-enabling technologies, such as thermostatic mixing valves and Time-of-Use schedules. Together, these data imply that heat pump equipment is becoming a more common product for water-heating contractors to sell and install. However, a considerable number of water-heating contractor firms do not discuss demand response with their customers, indicating an opportunity to raise customer awareness and increase enrollment in demand response programs. A minority of contractors find demand response conversations with customers easy. At the same time, many HPWH programs in California are now requiring customers to enroll in demand response programs if they are not already in one, heightening the importance of contractors' ability to discuss these programs with customers.

> Recommendation: Water-heating contractors appear receptive to learning about heat pumps and load-shifting practices associated with HPWHs. In order for HPWHs to be an asset for the electric grid, HPWH customers will need to participate in demand response programs. We recommend that HPWH incentive program staff consider creating a "demand response toolkit" that includes scripts contractors can use in their conversations with customers to outline the benefits of demand response programs.

Appendix A.CSLB License Descriptions

Summaries of the relevant licenses for the installation of a residential heat pump are in Table 19.

Table 19. Description of CSLB Licenses[48]

License	Name	Description
B	General Building	The principal business is in connection with any structure built, being built, or to be built, requiring the use of at least two unrelated building trades or crafts in its construction.
C-10	Electrical	An electrical contractor places, installs, erects, or connects any electrical wires, fixtures, appliances, apparatus, raceways, conduits, solar photovoltaic cells, or any part thereof, which generate, transmit, transform, or utilize electrical energy in any form or for any purpose.
C-20	Warm-Air Heating, Ventilating, and Air-Conditioning	A warm-air heating, ventilating, and air-conditioning contractor fabricates, installs, maintains, services, and repairs warm-air heating systems and water-heating heat pumps, complete with warm-air appliances; ventilating systems complete with blowers and plenum chambers; air-conditioning systems complete with air-conditioning unit; and the ducts, registers, flues, humidity and thermostatic controls and air filters in connection with any of these systems. This classification shall include warm-air heating, ventilating, and air-conditioning systems that utilize solar energy.
C-36	Plumbing	A plumbing contractor provides a means for a supply of safe water, ample in volume and of suitable temperature for the intended purpose and the proper disposal of fluid waste from the premises in all structures and fixed works. This classification includes but is not limited to: (a) Complete removal of waste from the premises or the construction and connection of on-site waste disposal systems; (b) Piping, storage tanks, and venting for a safe and adequate supply of gases and liquids for any purpose, including vacuum, compressed air and gases for medical, dental, commercial and industrial uses; (c) All gas appliances, flues and gas connections for all systems including suspended space heating units (this does not include forced warm air units.); (d) Water and gas piping from the property owner's side of the utility meter to the structure or fixed works; (e) Installation of any type of equipment to heat water or fluids, to a temperature suitable for the purposes listed in this section, including the installation of solar equipment for this purpose; and (f) The maintenance and replacement of all items described above and all health and safety devices such as, but not limited to, gas earthquake valves, gas control valves, back flow preventers, water conditioning equipment and regulating valves. (832.36 CCR)
D-34	Pre-fabricated Equipment License	A prefabricated products/equipment contractor performs installations of prefabricated products/equipment, including but not limited to the following: (a) Theater stage equipment, school classroom equipment, playground equipment, bleacher bench/seat component parts (no installation or renovation of any supporting or structural member); store fixtures and display cases (either prefabricated or modular form); all forms and types of toilet/shower room partitions/accessories; and prefabricated closet systems. (b) Laboratory and medical equipment; dust-collecting systems; factory-built fireplaces and accessories (no masonry facing); major appliance installations and ventilating hoods in connection with existing fuel and energy lines which are installed by others. (c) Bus stop shelters, prefabricated phone booths; prefabricated sound-proof environmental clean rooms; panelized refrigerated walk-in boxes (not to include the work of refrigeration contractor); all types of modular office, institutional, or home improvement systems including, but not limited to all types of pre-finished and/or UL listed pre-wired wall panels.

[48] California Contractors State License Board. Description of Classifications. 2021. https://www.cslb.ca.gov/Resources/GuidesAndPublications/DescriptionOfClassifications.pdf.

In 2021, a total of 138,980 California contractors held at least one of the five license types shown in Table 20. In 2024, 18,986 more contractors had these licenses relevant to heat pumps. Except for a slight decline in the number of contractors with C-20 HVAC licenses, the number of contractors across all other licenses has increased since 2021.

Table 20. Licensed Contractors by Climate Zone

Climate Zones	License Classification					Total
	B	C10	C20	C36	D34	
1	945	132	38	109	8	1,141
2	4,379	909	271	538	48	5,779
3	10,773	2,428	570	1,652	121	14,040
4	5,040	1,199	540	707	64	6,833
5	1,501	326	109	262	9	2,036
6	8,172	1,827	545	1,305	75	10,980
7	4,956	1,087	392	831	77	6,764
8	8,161	2,531	1,116	1,689	115	12,057
9	15,614	4,473	2,084	2,845	126	22,437
10	9,551	2,973	1,536	1,733	176	14,555
11	4,464	971	390	506	55	5,871
12	12,266	3,045	1,656	1,720	198	17,181
13	3,366	1,092	615	498	64	5,049
14	1,588	485	265	333	17	2,460
15	1,264	396	311	208	10	2,013
16	2.987	672	217	447	26	4,025
Unable to match	2,038	596	220	363	27	3,004
Grand Total in 2024	**101,720**	**26,993**	**11,294**	**16,578**	**1,381**	**157,966**
Grand Total in 2023	**97,065**	**25,142**	**10,875**	**15,746**	**1,216**	**136,225**
Grand Total in 2021	**99,222**	**25,013**	**12,316**	**15,795**	**1,226**	**138,980**

Appendix B. Data Collection Instruments

Click on the icons to open the instruments.

Contractor and Installer Survey

Heat Pump Contractor Survey.p

Homeowner Survey

Homeowner Survey Wave 3.pdf

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