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# Northwest Heat Pump Water Heater Initiative Market Progress Evaluation Report #5

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# Executive Summary

On behalf of the Northwest Energy Efficiency Alliance (NEEA), NMR Group, Inc. (the team) completed the 5<sup>th</sup> Market Progress Evaluation Report (MPER) of NEEA's Heat Pump Water Heater (HPWH) Initiative. The Initiative aims to push the supply chain to more rapidly adopt HPWHs, close the first-cost price gap between HPWHs and conventional electric tanks, finalize the updated Advanced Water Heater Specification, and drive the adoption of a federal standard for HPWHs.

## MPER #5 overarching research objectives:

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**Review the Initiative's logic model and market progress indicators (MPIs)**



**Size the market for HPWHs, following the approach of MPER #4**



**Evaluate performance against key MPIs and explore key barriers to market uptake**

## Research activities:

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1. Reviewing the Initiative's logic model and MPIs
2. Updating market size estimates from MPER #4
3. Mystery shopping with water heater installers
4. Interviewing distributors
5. Conducting a synthesis session with NEEA staff about results
6. Conducting a survey with water heater installers from companies with a record of participation in Hot Water Solutions (HWS) HPWH training<sup>1</sup>

<sup>1</sup> All of the surveyed installers were recruited from HWS trainee lists. Though some of the respondents said they did not recall any HWS trainings, for the purposes of this report, we refer to the surveyed installers as trained by HWS.

## Key findings and recommendations:

- 1 **Market share and the rate at which HPWHs are installed in new versus existing homes are holding steady. Distributors are the dominant sales channel in the more populous states, and thus for the market overall.**

The estimated market share of HPWHs held relatively steady from 2017 to 2018, both across the region and by state. In 2018, HPWHs represented 7.7% of the electric water heater market in single-family homes, including both new and existing homes.

**Recommendation.** Continue to emphasize to utilities in the Northwest how dependent the retrofit market is on the existence of utility incentives. Encourage them to provide more generous rebates for replacement HPWHs than for those installed in new construction.

- 2 **Distributor stocking practices increase HPWH delivery time, impeding growth in the emergency replacement market – but evidence suggests that stocking larger-capacity HPWHs at the branch level could now be relatively common.**

While a majority of HPWHs installed in homes in 2018 were 55 gallons or smaller, none of the 14 distributors interviewed for this study reported keeping smaller-capacity HPWHs in stock at the branch level. However, three of the distributors stocked larger electric water heaters (i.e., over 55 gallons) at the branch level, almost all of which were HPWHs. The majority of HPWHs over 55 gallons and virtually all of the smaller-capacity HPWHs sold by interviewed distributors were shipped from corporate warehouses, lengthening the time it takes to get a unit to the installation site. This presents an impediment to customers choosing HPWHs in an emergency replacement scenario. Almost three quarters of the installers surveyed for MPER #5 (all of whom were trained by HWS) reported keeping water heaters on hand, but just 6% reported that they kept HPWHs on hand. This is another barrier to making inroads into the emergency replacement market.

**Recommendation.** Continue to look for opportunities to help distributors make it easier for installers to choose HPWHs, including opportunities to both drive demand and provide adequate supply.

- 3 **Almost half of HWS-trained installers commonly use workarounds to avoid installing HPWHs in place of large electric resistance tanks.**

All of the 70 installers surveyed for this study were employed by companies that have sent staff to HWS trainings. Only 40% of these installers reported that a HPWH was their typical replacement for large residential electric resistance water heaters, and almost one-half (48%) reported using workarounds to avoid installing HPWHs in that scenario. Based on the mystery shopping results, where only HWS-trained installers brought up HPWHs without prompting, the team expects that installers who have not participated in HWS trainings are even more likely to look for such workarounds. Additionally, one in six surveyed installers reported that they frequently get customer complaints after installing HPWHs, resulting in costly callbacks, which erode or negate any profit from the installation.

**Recommendation.** Consider providing an incentive directly to installers or their companies. Also, consider providing support to defray the cost of callbacks for installers to help eliminate this barrier to HPWH installation and increase the rate at which installers replace electric storage resistance water heaters with HPWHs. Conduct research to assess whether the HPWH market is starting to move past efficiency-minded early adopters, as early adopters may be more willing to accept performance issues in a new technology than a typical customer, and the relatively high rate of customer complaints here may be a sign of a shift of HPWHs being used by a new customer segment.

**Recommendation.** Slow recovery was the second-most cited consumer complaint in the installer survey, and this complaint can be mitigated by installing a HPWH with a larger tank. NEEA could educate installers about this through HWS training (if this topic is not already included in the training), and perhaps also as part of marketing through industry publications.

#### 4 **HWS-trained installers have positive perceptions of HPWHs and reasonably strong HPWH installation rates.**

HWS-trained installers reported that 13% of the electric resistance storage water heaters their companies installed in 2018 were HPWHs, nearly twice the estimated rate of 2018 HPWH installations in single-family homes by all installers across the region (7.7%). These installers also reported that 65% of all the HPWHs they installed in 2018 were replacement systems—considerably higher than the estimated percentage of replacement HPWHs installed in existing homes in the region in 2018 (47%), indicating that they install HPWHs in existing homes more than is common in the market. The study yielded anecdotal evidence that installers at companies that invest staff time in HWS training have more positive perceptions of HPWHs and install them at higher rates: HWS-trained installers who recalled their HWS training showed more positive associations with HPWHs than those who did not recall the training, and only HWS-trained installers brought up HPWHs to mystery shoppers without prompting.<sup>2</sup>

**Recommendation.** Working with manufacturers, build on the value of NEEA's existing pool of HWS trainees to create a branded, elite tier of installers backed by NEEA/HWS who can serve as customers' go-to choice for installing HPWHs. In line with NEEA's draft 2020 Operations Plan, continue to expand HWS training.

<sup>2</sup> Because the small number of installers who did not recall training was small, it was not possible to test for statistically significant differences between installers who recalled the training and those who did not.

**5 In addition to high callback rates, frequent installation challenges and a lack of qualified service technicians could temper installers' willingness to recommend HPWHs.**

MPER #5 found high rates of installation challenges that could temper installers' inclinations to recommend the technology to customers. Installers from multiple states identified a lack of qualified service technicians or training as a factor limiting their recommendations to install HPWHs.

**6 For most installation scenarios, HWS-trained installers recommend HPWHs about one-half of the time, while their customers agree to install one roughly one-third of the time it is recommended by the installer.**

HWS-trained installers reported recommending installing a HPWH in new construction 57% of the time, followed by 55% of the time for a failed water heater, and 53% of the time for a water heater that was very old or near failure. These installers estimated that four in ten new construction customers and three in ten existing home customers follow through when the installer recommends a HPWH. When asked in which situations customers were more likely to accept a HPWH recommendation, installers most often (n=9) cited instances where the customer was already aware of HPWHs, posing a challenge for installers with customers unfamiliar with HPWHs.

**7 Common installer commission structures pose a barrier to HPWH sales.**

HWS-trained installers reported that tankless water heaters, followed by HPWHs, are the most profitable water heaters for their company to install. However, in many cases, the installation technicians themselves may not share in that additional profit earned by the company. More than half of surveyed installers reported that technicians at their company develop estimates for customers, but less than one-third of the companies pay them commissions. Low rates of paying commissions could limit technicians' motivation to upsell customers to more efficient equipment.

**Recommendation.** Investigate ways to reward installers for installing HPWHs, such as through incentives to the recommending technician or salesperson.



# Background

## NEEA's 5<sup>th</sup> evaluation of progress in the HPWH market in the Northwest

**The NEEA Heat Pump Water Heater (HPWH) Initiative.** NEEA's HPWH Initiative operates with the ultimate goal of transforming the water heater market in the Northwest, such that efficient HPWHs become the product of choice for end-users and installers. Specific goals are as follows:

- **A more stringent federal standard for electric water heaters**, essentially requiring heat pump technology for 45+ gallon electric models by 2023.<sup>3</sup>
- **Increased supply, demand, and market adoption of HPWHs**, particularly those that meet the Advanced Water Heater Specification (AWHS)<sup>4</sup> for use in cold climates.
- **Reduced barriers to HPWH adoption**, such as the following (in no particular order):
  - high upfront cost
  - low product availability
  - lack of awareness/confidence from end-users and installers

For 2019, NEEA adjusted its program approach to focus on engaging more deeply with the wholesale side of the supply chain to better reach installers, who have substantial influence over the types of systems their customers install.

**Market Progress Evaluation Report (MPER) #5.** Achieving targeted market changes and long-term market transformation requires two key components: (1) consistent collection and analysis of market data, and (2) integrating that information into program design and operation.<sup>5</sup> By conducting periodic assessments of the HPWH market, NEEA follows evaluation best practices for achieving and documenting change in a complex market.

<sup>3</sup> If finalized in 2023, the rule would take effect in 2028.

<sup>4</sup> <https://neea.org/our-work/advanced-water-heater-specification>

<sup>5</sup> [http://www.calmac.org/publications/Market Effects and Market Transformation White PaperES.pdf](http://www.calmac.org/publications/Market_Effects_and_Market_Transformation_White_PaperES.pdf)

NEEA completes regular MPERs to measure and compare market changes against established baselines and to identify opportunities to improve its market interventions. As the single largest energy savings opportunity for the Northwest region, it is critical to NEEA’s mission that the HPWH Initiative is effective and that progress in this market is tracked appropriately.

## RESEARCH OBJECTIVES

The purpose of MPER #5 is to help NEEA assess progress in the HPWH market and explore key barriers to increased market uptake. This MPER has three overarching research objectives:



**Conduct a complete review of the Initiative’s logic model and market progress indicators (MPIs).** This review included suggesting revisions and identifying MPIs to measure in MPER #5.



**Size the market for HPWHs,** following the approach of MPER #4.









**Evaluate performance against key MPIs and explore key barriers to market uptake.** This broad research objective included measuring progress for MPIs identified in the logic model review and finding actionable ways to address persistent barriers.

## METHODOLOGY

The team undertook a variety of research tasks to address the research objectives. [Figure 1](#) shows the tasks that addressed each research objective.

**Figure 1: Research Tasks Addressing Research Objectives**

	Research Tasks					
						
	Background Research & IDs w/NEEA	Analysis of Sales Data	Mystery Shopping	Distributor IDs	Synthesis Session	Installer Survey
Review logic model and MPIs	●					
Size the market for HPWHs	●	●		●		●
Evaluate performance against MPIs and explore uptake barriers	●	●	●	●	●	●



More detail about the methodology of each research task can be found in the respective appendices. All interview/survey guides can be found in [Appendix G](#).

**Logic model and MPI review.** The logic model and MPI review included the following tasks:

- Conducting background research and examining HPWH initiative materials
- Reviewing past MPERs to determine which MPIs were previously measured and how they were measured
- Conducting three interviews with NEEA staff to better understand the current state of the initiative
- Providing input on the logic model and MPIs, informed by interviews and research
- Suggesting MPIs to measure in MPER #5
- Writing a summary memo and presenting results

**HPWH market size.** The team updated the market size estimates from MPER #4 with 2018 data, using raw market data and completed analyses from NEEA, secondary data sources, and additional primary data collection. The team analyzed HPWH sales and market penetration by the attributes included in [Table 1](#).

**Table 1: Attributes Included in Market Update**

Attributes
State
New construction vs. existing homes
Code-built new construction vs. above-code new construction
Supply channel (retail vs. distributor)
Utility incentive status (incented vs. non-incented)
Replacement type (emergency vs. planned)
Tank size ( $\leq 55$ or $> 55$ gallons)

**Installer mystery shopping (n=16).** Posing as residential customers in the market for a new water heater, team members conducted mystery shopping calls to installers to determine the typical flow of these initial conversations and if installers recommend HPWHs without prompting.

**Distributor interviews (n=14).** The team conducted in-depth interviews with water heater distributor branch managers. The interviews provided insight into distributors' own experiences with HPWHs and the experiences of their installer customers.

**Synthesis session.** On May 8, 2019, NMR and NEEA conducted a synthesis session in NEEA's office in Portland to discuss preliminary findings and identify market research questions to include in the survey with water heater installers.

**Installer survey (n=70).** The team conducted a web and phone survey with water heater installers. These installers were recruited from Hot Water Solutions (HWS) trainee lists, and are referred to as *trained* installers in this report. In some cases, the survey respondents recalled that they or a colleague from their company had attended a Hot Water Solutions training, while others did not recall any such training participation. The purpose of the survey was to learn about these staffers' experience with, and perspectives on, HPWHs.



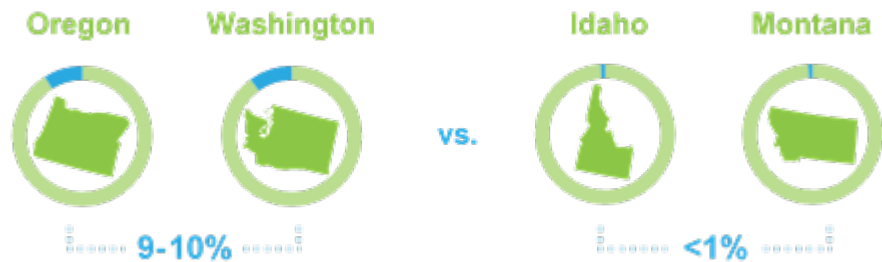
# Key Findings

This section summarizes the most important findings. For each key finding, the team offers related recommendations, if any, followed by detailed results that support the finding.

- 1 Market share and the rate at which HPWHs are installed in new versus existing homes are holding steady. Distributors are the dominant sales channel in the more populous states.**

The estimated market share of HPWHs held relatively steady from 2017 to 2018, both across the region and by state.

The market update conducted as part of this MPER estimates that HPWHs represented 7.7% of the electric water heaters installed in single-family homes across the region in 2018, including both new and existing homes. This is close to the estimate of 8.5% for 2017 reported in MPER #4. As in 2017, Oregon and Washington show much higher HPWH market shares (about 9% and 10%, respectively) than Idaho and Montana (less than 1% each). The blue portion of each ring graph below represents the portion of that state's electric water heater sales made up of HPWHs.



Because the estimates of overall market size for 2017 and 2018 were developed from an amalgam of values from various sources, they are not definitive. For this reason, minor changes over time in market share, which relies on overall market size as the denominator, should be interpreted with caution.

**1.1 The estimated market share of HPWHs held relatively steady from 2017 to 2018, both across the region and by state.**

Table 2 compares the state-level 2017 values from the MPER #4 market update with the 2018 values described in this MPER.

**Table 2: Market Share of NW HPWH Installations – By State**

State	2017			2018		
	Electric Water Heater Installations	HPWH Installations	HPWH Market Share	Electric Water Heater Installations	HPWH Installations	HPWH Market Share
<b>Total</b>	<b>156,900</b>	<b>13,353</b>	<b>8.5%</b>	<b>151,600</b>	<b>11,693</b>	<b>7.7%</b>
Washington	87,700	8,734	10.0%	84,100	8,117	9.7%
Oregon	40,200	4,179	10.4%	38,700	3,450	8.9%
Montana	12,000	71	0.6%	12,000	77	0.6%
Idaho	17,000	369	0.2%	16,800	49	0.3%

Table 3 provides a summary comparison of the MPER #4 and MPER #5 market update results. The table includes the split of HPWHs into the new construction and retrofit market segments<sup>6</sup> and within the retrofit market, the split between planned and emergency replacements.<sup>7</sup>

**Table 3: Market Share of HPWH Installations – New vs. Existing Homes**

Install Type	2017				2018			
	Electric Water Heater Market	HPWH Installs	Relative Market Share	Overall Market Share	Electric Water Heater Market	HPWH Installs	Relative Market Share	Overall Market Share
<b>Total</b>	<b>156,900</b>	<b>13,353</b>	<b>8.5%</b>	<b>8.5%</b>	<b>151,600</b>	<b>11,693</b>	<b>7.7%</b>	<b>7.7%</b>
<b>New</b>	<b>22,600</b>	<b>7,500 – 9,500</b>	<b>33 – 44%</b>	<b>5 – 6%</b>	<b>18,800</b>	<b>6,221</b>	<b>33.1%</b>	<b>4.1%</b>
<b>Existing</b>	<b>134,300</b>	<b>3,900 – 5,900</b>	<b>3 – 4%</b>	<b>2 – 4%</b>	<b>132,800</b>	<b>5,472</b>	<b>4.1%</b>	<b>3.6%</b>
<i>Planned replacements</i>	<i>76,250</i>	<i>2,900 – 4,500</i>	<i>4 – 6%</i>	<i>2 – 3%</i>	<i>74,763</i>	<i>4,268</i>	<i>5.7%</i>	<i>2.8%</i>
<i>Emergency replacements</i>	<i>58,050</i>	<i>975 – 1,400</i>	<i>1.7 – 2.5%</i>	<i>&lt;1%</i>	<i>56,037</i>	<i>1,204</i>	<i>2.1%</i>	<i>0.7%</i>

<sup>6</sup> MPER #4 estimated the split between 2017 installations in new and existing homes as a range, based on the responses of interviews with five distributors. MPER #5 relied on NEEA's ACE Model for this split, which is why MPER #5 does not present these values as a range.

<sup>7</sup> MPER #4 used the term "emergency replacement" to refer to replacements of completely failed systems that provide no hot water. For this MPER, the team continues this practice, but in the future, NEEA may consider the more neutral term "replace-on-failure" (ROF) instead, given that the 2018 NEEA market characterization described such scenarios as "an inconvenience, not a catastrophe." 2018 NEEA Water Heater Market Characterization Report, page 34.

## **1.2 The rate at which HPWHs are installed in new vs. existing homes is essentially unchanged.**

HPWHs represented nearly one-third (30%) of electric water heater installations in new homes in 2018, but continued to represent a low percentage (less than 4%) in existing homes. While NEEA calculations show that similar counts of HPWHs sold in 2018 were installed in new (53%) and existing (47%) homes, the much larger size of the existing homes market creates the disparity in HPWH penetration. There is much more opportunity in the existing market than in the new construction market, but there are far more decision-makers and market actors in the existing market, making it a more challenging market to influence. For example, in the new construction market, end users are usually not involved in selecting the water heater.

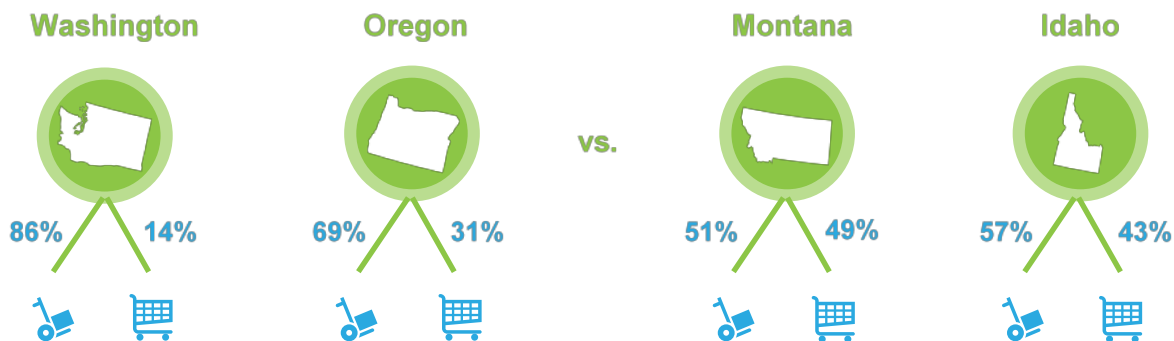
## **1.3 The market for HPWHs in new homes is strong even without incentives.**

There is a strong market for HPWHs in new homes even without incentives. The vast majority of HPWHs installed in retrofit applications received an incentive (81%), indicating a market that is likely heavily reliant on utility incentives. Only 38% of HPWHs installed in new homes were incentivized, suggesting a strong market for HPWHs even without incentives. The share of HPWHs in new construction may be driven by other programs for efficiency in new construction or by energy codes in some jurisdictions. One distributor said, “if a builder is trying to get builder credits in new construction or a rebate, [they may choose a HPWH].” In fact, one distributor had a customer who purchases large quantities of HPWHs because the customer puts HPWHs in all its new construction projects.

**Related recommendation.** Continue to emphasize to utilities in the Northwest how dependent the retrofit market is on the existence of utility incentives. Given that the retrofit market for HPWHs is larger than the new construction market, and the rate of HPWH installations is higher in the latter than the former, encourage utilities to provide more generous rebates for replacement HPWHs than for those installed in new construction – particularly those that serve Washington and Oregon, where HPWH installations are highest. If utilities must choose between incentivizing units for new construction or in existing homes, the latter may be the better option for achieving overall higher levels of savings due to the greater overall savings potential of the retrofit market.

#### 1.4 Distributors are the dominant sales channel in the more populous states, which also represent the majority of HPWH sales.

In Washington and Oregon, where the substantial majority of residential HPWHs are sold, 2018 sales were mostly through distributors (86% and 69%, respectively). In Montana and Idaho, where residential HPWHs sales are extremely low (fewer than 100 units installed in each of those two states, compared to thousands of units installed in Washington and Oregon), about one-half of 2018 sales were through retail channels (49% and 43%, respectively).



At the regional level, a slightly higher percentage of residential HPWHs were sold through distributors in 2018 than in 2017 (81% vs. 75%), and a slightly lower percentage were sold through retailers (19% in 2018 vs. 25% in 2017).

**Related recommendation.** Sales in Montana and Idaho are low enough that there is substantial work that can be done to increase adoption in both the distribution and retail channels. NEEA should continue to pursue its key account strategy over the long term, as it may help boost sales across the board.

**Related recommendation.** Ensure that sufficient HWS training is available to technicians in rural areas, either in person or online, to help them gain familiarity with HPWH installations. This may help drive adoption in areas with particularly low HPWH market share.

#### 2 -- Distributor stocking practices increase HPWH delivery time, impeding growth in the emergency replacement market – but evidence suggests that stocking larger-capacity HPWHs at the branch level could now be more common.

The market update found that a sizable majority (69%) of the HPWHs installed in homes in the region in 2018 were 55 gallons or smaller, and surveyed installers estimated that 45% of all HPWHs their companies installed in 2018 were this size. Yet, the distributor interviews suggest that keeping smaller-capacity HPWHs in stock at the branch level is a rare practice. Stocking practices appear not to have changed for smaller-capacity HPWHs since MPER #3, which found that “most distributors have not shifted their stocking strategies” and that “distributors typically order HPWH as they receive orders from installers, in contrast to electric resistance water heaters, which distributors usually have in stock.”

In 2015, updates to the National Appliance Energy Conservation Act (NAECA) substantially raised the federal minimum efficiency requirements of large residential electric water heaters (i.e., more

than 55 gallons), such that they could only be met with heat pump technology. Now that these standards have been in effect for a few years, distributors may have made more progress stocking larger-capacity units (i.e., those over 55 gallons) at the branch level, with three distributors reporting that their branch-level stocks of these large electric units were almost exclusively HPWHs.

Despite the apparent progress in stocking practices for larger-capacity HPWHs, the majority of HPWHs over 55 gallons and virtually all of the smaller-capacity HPWHs sold by these distributors in 2018 were shipped from a corporate warehouse, rather than from local branches. This practice lengthens the time it takes to get a unit to the installation site and is an impediment to customers choosing HPWHs in an emergency replacement scenario. As MPER #3 noted, this practice “points to planned replacements and new construction driving demand.” When coupled with the higher cost and greater complexity of installing a HPWH, the lack of immediate availability of the right HPWH for the job could mean the difference between a failed water heater being replaced with a HPWH or with an electric resistance-based workaround. In addition, HPWHs that are not in stock are also not likely to be available on the display floor to be seen and examined by installers who are new to the technology.

Almost three quarters of the HWS-trained installers surveyed for MPER #5 reported keeping some type of water heaters on hand. Just 6% of these installers reported that this included keep HPWHs. This comparatively low rate of keeping HPWHs on hand represents another barrier to making inroads into the emergency replacement market.

Distributor stocking practices highlight the importance of standards to moving the HPWH market: reasonably, distributors tend to stock the types of equipment that are mandated by the NAECA standards. NAECA does not require heat pump technology for small electric systems, and, accordingly, distributors keep few small HPWHs in stock at their local branches. NAECA *does* require heat pump technology for large electric systems, and therefore distributors tend to keep large HPWHs in stock at their branches. While distributor stocking practices for larger-capacity replacement HPWHs are still clearly a long way from being transformed, distributor stocking practices for smaller-capacity replacement HPWHs have even farther to go. While most of the HPWHs installed in 2018 were smaller units, the HPWH systems that distributors *keep in stock at local branches* tend to be larger capacity – when they stock them at all. So, while smaller HPWHs may be available from central warehouses, there is typically at least some delay to account for delivery. This delay represents an impediment to using smaller HPWHs to replace failed systems.

**Related recommendation.** NEEA should continue to look for opportunities to help distributors make it easier for installers to choose HPWHs. Distributors represent a key lever to influence the challenging installer market by helping to increase demand and providing the supply necessary to satisfy it. Helping distributors drive installers toward HPWHs involves a multi-pronged approach, many aspects of which could be mirrored in complementary efforts targeting installers. This approach could include the following:

- *Incentives to distributors for selling HPWHs, for prominently featuring HPWHs at their branches, and for biasing branch-level stock toward HPWHs to meet the needs of the emergency market*

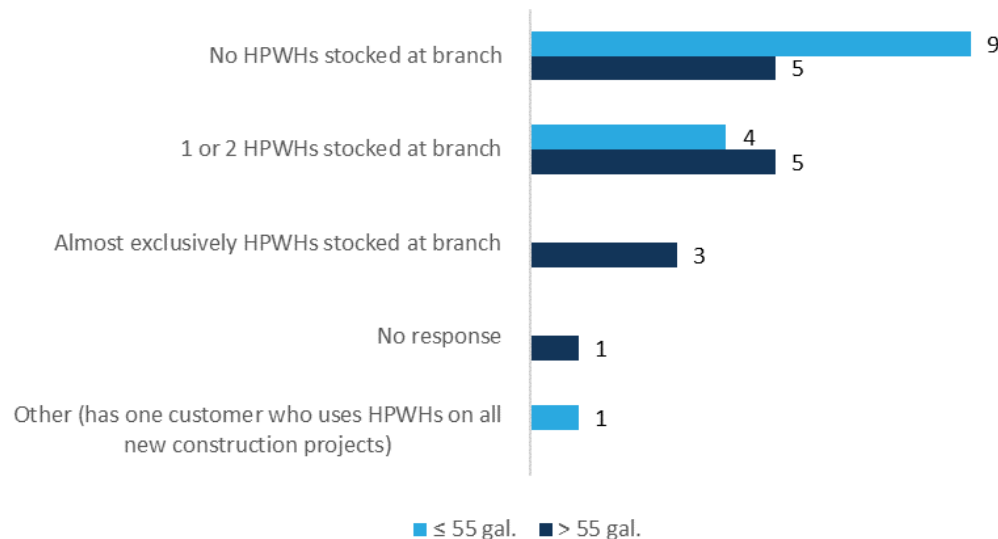
- *Technical training that focuses on showing installers how to handle challenging installation scenarios*
- *Sales training that explains that HPWHs are profitable to install (high margins)*
- *Sales training on how to frame HPWHs as the "best" of a "good, better, best" sales strategy (per findings in Key Finding 8)*
- *Training distributors to encourage their repeat customers to think about HPWHs for their next job, even if it is "too late" to get them to choose a HPWH for the immediate job*

## 2.1 Keeping smaller-capacity HPWHs in stock at the branch level continues to be a rare practice – but there is evidence that keeping larger-capacity HPWHs in stock may be relatively common.

Just one of the 14 distributors interviewed reported stocking more than one or two smaller-capacity (i.e., 55 gallons or less) HPWH units on a regular basis at their branch – and that distributor did so because of one customer who uses HPWHs in all their new construction projects. Four of 14 distributors reported keeping just one or two smaller-capacity units in stock at the branch level, and nine reported keeping none in stock (Figure 2).

Distributors appear to have made more progress stocking larger capacity HPWHs (i.e., those over 55 gallons) at the branch level. Three distributors reported that their stock of electric water heaters that were larger than 55 gallons were almost exclusively HPWHs.<sup>8</sup>

**Figure 2: Branch-Level Stocking by Capacity**

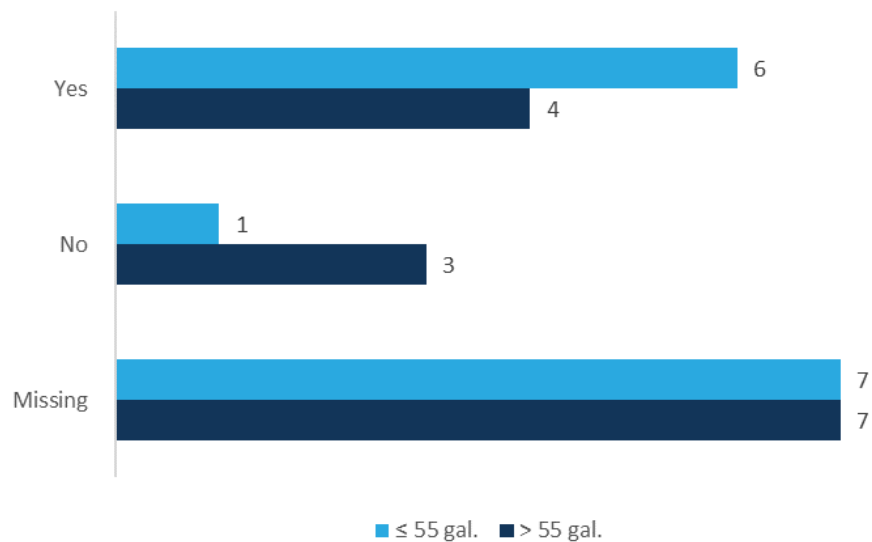


Distributors who stock few or no HPWHs at the branch level reported having access to more extensive stocks of equipment at corporate warehouses and noted that this is a common practice

<sup>8</sup> Large, residential electric resistance water heater were essentially eliminated from the market by NAECA, and yet, distributors indicated that they may still have such systems for sale, given that some reported that they had large, residential electric water heaters that were not HPWHs. The team suspects that they were referring either to lingering old stock or large commercial electric resistance tanks that the distributors essentially viewed as residential units.

for specialty products like HPWHs (as previously found in MPER #3). For customers in existing homes, this can mean a delay in installation because of the need to ship the product from a central location.

**Figure 3: Distributors Who Only Have HPWHs in Stock at Corporate Warehouses**

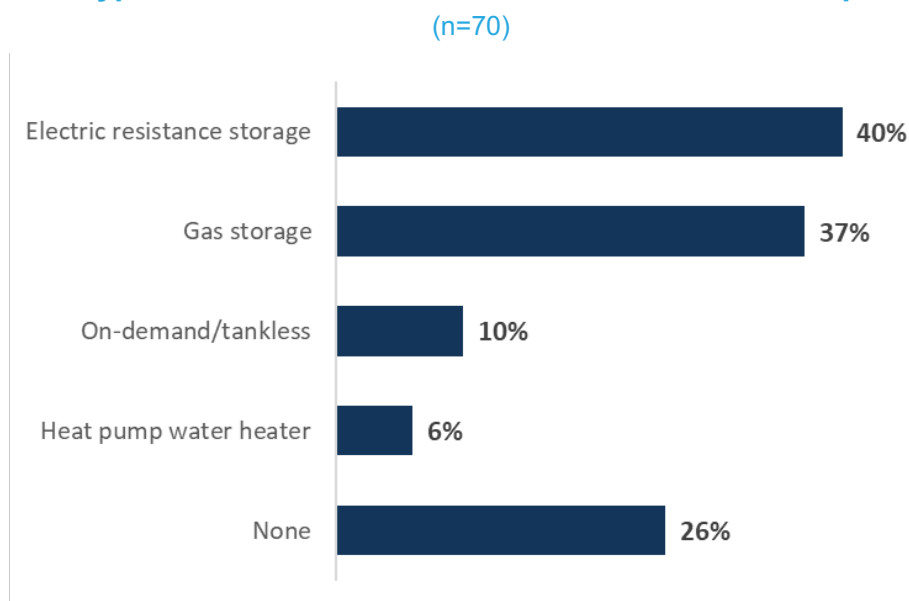


As one distributor interviewed for MPER #5 explained, “I don’t stock HPWHs, but if someone came in and wanted it [sic], I could tell the corporate office and I could have a HPWH the very next day.” While a one-day turnaround may be ample for new construction or planned replacement, it could be seen as a long wait by a family lacking a working water heater, especially if there is an in-stock option that can be installed right away. Distributors reported that end users in existing homes faced with a delivery delay occasionally purchase two 50 gallon electric resistance water heaters, a single large electric resistance commercial water heater, or a 50 gallon electric resistance tank with a mixing valve instead of waiting for a large HPWH to be delivered; this observation was corroborated by installers.

## **2.2 While almost three-quarters of HWS-trained installers keep water heaters of any kind on hand, only a very small percentage of these are HPWHs.**

Unlike MPERs #1 and #2, which found that most installers did not keep any water heaters on hand, almost three quarters (74%) of the HWS-trained installers surveyed for MPER #5 reported keeping some type of water heaters on hand. The rate at which the surveyed HWS-trained installers reported keeping HPWHs on hand is quite low compared to other types of water heaters. These installers most commonly reported keeping electric resistance tanks (40%), followed closely by gas storage tanks (37%). Just 6% of the surveyed installers reported keeping HPWHs on hand.



**Figure 4: Types of Water Heaters HWS-Trained Installers Kept on Hand**

**3** Almost half of HWS-trained installers commonly use workarounds to avoid installing HPWHs in place of large electric resistance tanks.

The 2015 NAECA updates that increased the performance requirements for large electric water heaters essentially removed the market for large residential electric resistance tanks. However, only 40% of the HWS-trained installers said that a HPWH was their typical replacement for these types of systems, and almost one-half (48%) reported using workarounds to avoid installing HPWHs in place of large electric resistance tanks.

To help understand why only 40% of the surveyed installers defaulted to installing HPWHs in scenarios where in the past they would have just been able to install a large electric resistance tank, the team compared their responses for selected questions to the remainder of surveyed installers who regularly used workarounds.<sup>9</sup> Installers who recalled that they or someone else at their company participated in HWS training<sup>10</sup> appear to be more likely to use HPWHs than their counterparts who did not recall any HWS training. Additionally, the installers who defaulted to HPWHs for large tank replacements were more likely to report that HPWHs were among the most profitable systems for them to install. Installers who recalled HWS trainings described feeling reasonably supportive of HPWH technology, but they acknowledged that they do not recommend or install them as much as that support would suggest, as discussed in the following sections.

<sup>9</sup> Because of the small number of respondents in each group, these findings should be considered as anecdotal. NMR did not test for statistical significance of the differences.

<sup>10</sup> Recalling participation includes those who were aware that they had colleagues at their company who had participated in a training.

**Related recommendation.** Given that driving installers to recommend HPWHs is one of the most fundamental aspects of increasing HPWH installations, the team encourages NEEA (or utility funders) to provide an incentive directly to installers or their companies. This would likely increase the rate at which installers replace electric storage resistance water heaters with HPWHs, helping them overcome their aversion to installing this newer type of water heater and keeping it on hand for use in emergency replacements. Directly incentivizing installers for HPWH installs may serve to boost recommendation rates and drive demand, further encouraging distributors to keep them stocked.

One in six surveyed installers reported that they frequently get customer complaints after installing HPWHs. These complaints are primarily that they cool down the room, are slow to recover, and are noisy. Customer complaints cause costly callbacks, which erode or negate any profit from the installation.

**Related recommendation.** Consider providing support to defray the cost of callbacks for installers to help eliminate this barrier to HPWH installation and increase the rate at which installers replace electric storage resistance water heaters with HPWHs.

**Related recommendation.** MPER #4 reported that HPWH purchaser satisfaction rates were above 90%, which is at odds with the relatively high rate of customer complaints reported in MPER #5 by installers. To better understand this dynamic, consider research to assess whether the HPWH market starting to move past efficiency-minded early adopters. Early adopters may be more willing to accept performance issues in a new technology than a typical customer, and the complaints here may be a sign of a shift of HPWHs being used by a new customer segment.

**Related recommendation.** Slow recovery (the second-most cited type of complaint reported in the installer survey) can be mitigated by installing a HPWH with a larger tank. NEEA could educate installers about this through HWS training (if this topic is not already included in the training), and perhaps also as part of marketing through industry publications.

### **3.1 Just four in ten HWS-trained installers say that a HPWH is their typical replacement for a large electric resistance tank.**

Only 40% of HWS-trained installers said that a HPWH was their typical replacement for a large electric resistance tank. Common workarounds included installing a small electric resistance tank (21% of installers), installing a commercial electric resistance tank not subject to the federal standard (10%), installing two small electric resistance tanks (7%), or using old stock and doing a like-for-like replacement (4%)<sup>11</sup> (Figure 5).

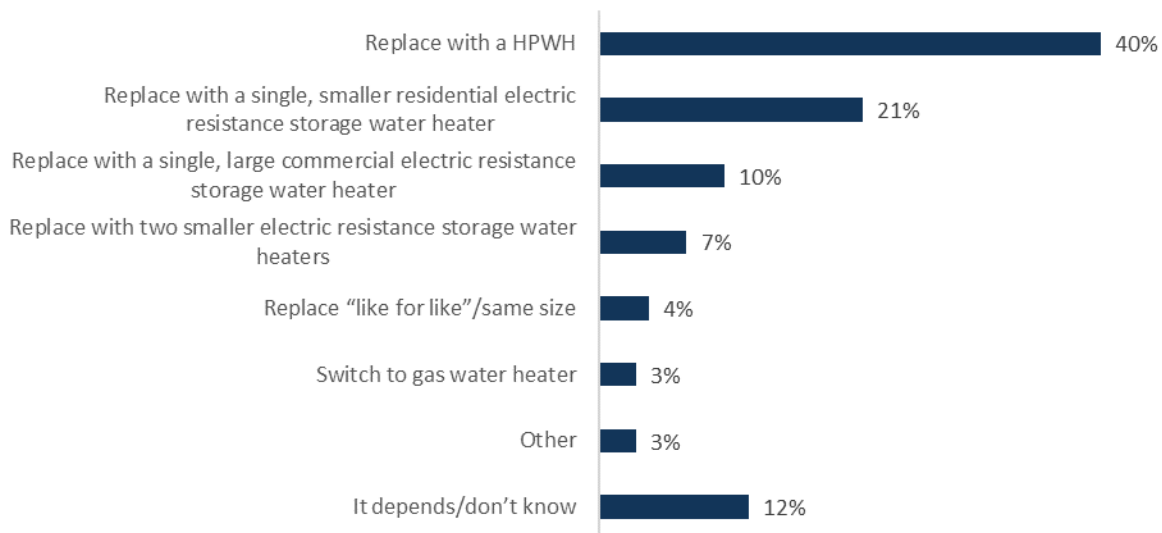
Other one-off strategies included boosting the temperature of a smaller electric resistance tank and adding a mixing valve to mimic the output of a larger tank set at a lower temperature, switching to a tankless water heater, and switching to a solar water heater.

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<sup>11</sup> Distributor interviews confirmed that there is still some availability of large, residential electric resistance water heaters that pre-date this standard.

**Figure 5: Replacement Strategies for Large Capacity Electric Water Heaters**

n=68



**3.2 The rate of workarounds may be higher among installers employed by companies that have *not* sent staff to Hot Water Solutions trainings. Profitability is likely a key driver of the rate of workarounds.**

The team investigated why fewer than one-half of the HWS-trained installers said that a HPWH was their typical replacement for a large electric resistance tank. For key questions, NMR isolated the responses of the 40% of surveyed installers who said that a HPWH was their typical replacement for a large electric resistance tank and compared their responses to those of installers who do something *other* than install HPWHs in these cases. The latter group of installers is generally working around the NAECA standards, installing something other than the large HPWHs that were mandated to replace large electric resistance tanks. Because of the small number of respondents in each group, these findings should be considered as anecdotal. NMR did not test for statistical significance of the differences.

Table 4 suggests that installers who did not recall HWS training may be less likely than installers who do remember these trainings to say that replacing a large capacity electric resistance storage water heater with a HPWH is their typical strategy.

**Table 4: Installers' Adherence to Federal Efficiency Standards by HWS Training Recollection**








	 Recalled Training	 Did Not Recall Training
Typically install HPWH to replace large electric resistance tank (n=27)	20	7
Typically install other type of water heater to replace large electric resistance tank (n=43)	23	20

Table 5 compares these two groups of surveyed installers (based on their typical replacement strategy for large electric water heaters) with the water heater type they identified as most profitable to install. The table suggests that profitability drives replacement strategy for about half of the surveyed installers, all of whom were HWS-trained.

**Table 5: Installers' Adherence to Federal Efficiency Standards vs. System Profitability**

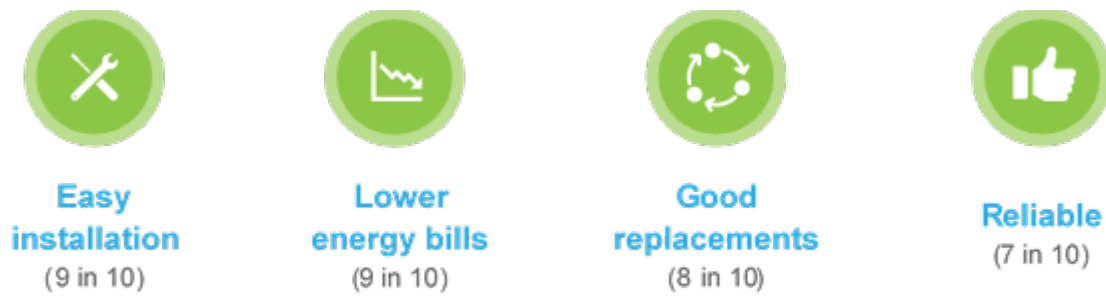
	Type of Water Heater Installers Reported Was Most Profitable to Install				
	 HPWH	 Electric Resistance	 Gas Storage	 On-Demand/ Tankless	 Other/Don't Know
Typically install HPWH to replace large electric resistance tank (n=27)	12	3	2	6	4
Typically install other type of water heater to replace large electric resistance tank (n=43)	5	6	8	18	6

Neither an installer's familiarity with HPWHs, as measured by how frequently they work with them, nor the company's sales structure appeared to be correlated with an installer using HPWHs as their go-to replacement option for large electric resistance tanks.

Overall, nine in ten HWS-trained installers agreed that their technicians can easily install HPWHs correctly (89%) and that replacing an electric resistance water heater with a HPWH will lower a

customer's energy bill (90%). Nearly eight in ten (79%) consider HPWHs good replacements for electric resistance water heaters. Seven in ten (70%) agreed that HPWHs are reliable. These attitudes are at odds with the rate at which HWS-trained installers reported using HPWHs to meet NAECA standards, given that so many reported installing some type of electric resistance system that avoided having to comply with NAECA's HPWH requirement for large tanks.

**Figure 6: Installer Attitudes Towards HPWHs**





The team looked for signs of relationships between adherence to federal standards and installer attitudes toward HPWHs by comparing the two groups' responses to attitudinal questions. This comparison was of the number who "somewhat" or "strongly" agreed with a statement and the number who "somewhat" or "strongly" disagreed.<sup>12</sup>

As [Table 6](#) shows, there are only differences between groups that seem large enough to be meaningful for two statements. Those who typically adhere to the federal standard appear to agree at higher rates than those who do not that "HPWHs are a good replacement for electric resistance storage water heaters" (which is to be expected). Those who typically adhere to the federal standard appear to agree at lower rates with the statement "We often get customer complaints or service requests soon after installing a heat pump water heater."

<sup>12</sup> As with the previous comparisons, because of the small number of respondents in each group, these findings should be considered as anecdotal. NMR did not test for statistical significance of the differences.

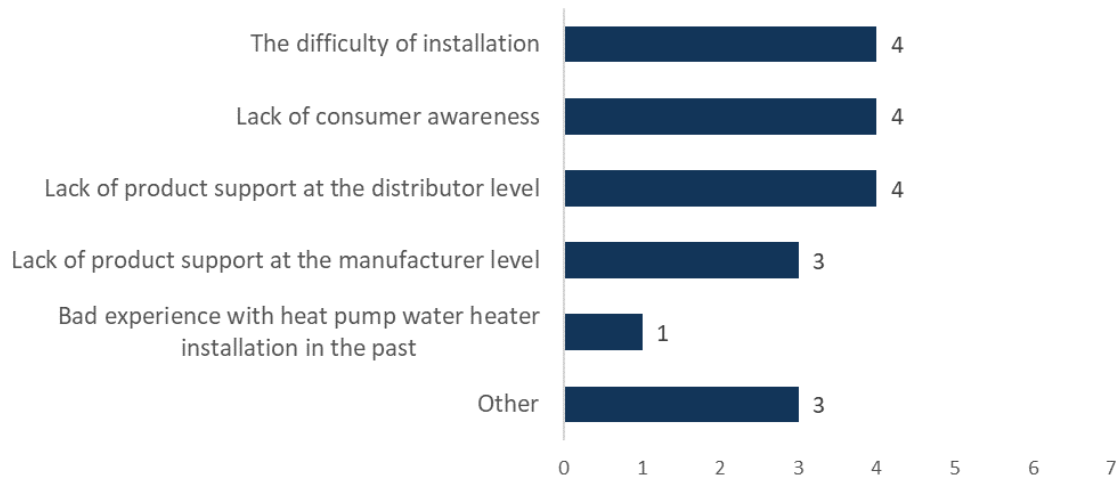
Table 6: Adherence to Federal Efficiency Standards by Attitudes Toward HPWHs

	 Somewhat or Strongly Agree		 Somewhat or Strongly Disagree	
	<i>Typically install HPWH to replace large electric resistance tank (n=27)</i>	<i>Typically install other type of water heater to replace large electric resistance tank (n=43)</i>	<i>Typically install HPWH to replace large electric resistance tank (n=27)</i>	<i>Typically install other type of water heater to replace large electric resistance tank (n=43)</i>
I prefer “tried-and-true” water heaters to newer water heater technologies.	5 (19%)	13 (30%)	16 (59%)	17 (40%)
Heat pump water heaters are reliable.	23 (85%)	26 (60%)	2 (7%)	5 (12%)
HPWHs are a good replacement for electric resistance storage water heaters.	26 (96%)	29 (67%)	1 (4%)	6 (14%)
My company’s installation technicians can easily install heat pump water heaters correctly.	26 (96%)	36 (84%)	1 (4%)	2 (5%)
We often get customer complaints or service requests soon after installing a heat pump water heater.	3 (11%)	8 (19%)	21 (78%)	19 (44%)
Heat pump water heaters remove heat from the room where they are located.	21 (78%)	27 (63%)	3 (11%)	7 (16%)
Replacing a standard electric resistance water heater with a heat pump water heater will lower a customer’s overall energy bill.	26 (96%)	37 (86%)	1 (4%)	3 (7%)
My company makes more money when we sell a larger number of low-cost water heaters than when we sell a smaller number of high-cost water heaters.	6 (22%)	14 (35%)	14 (52%)	19 (44%)

NMR gave the seven installers who disagreed with the statement “heat pump water heaters are good replacements for traditional electric resistance water heaters” an opportunity to explain their rationale. As [Figure 7](#) shows, these respondents most frequently cited installation challenges (4), lack of consumer awareness (4), and lack of support for HPWHs from distributors (presumably with installation challenges) (4). “Other” responses included technical issues (noise, poor performance, and cooling down the room in which they are located).

**Figure 7: Why Installers Do Not Think HPWHs Are a Good Replacement for Electric Resistance Water Heaters**

(n=7)

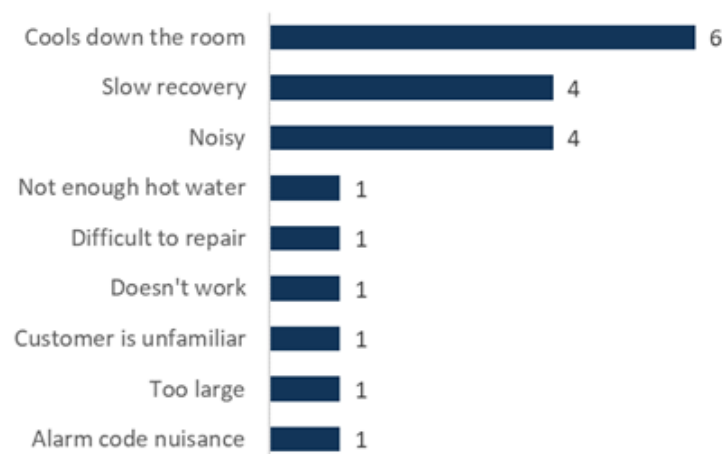


### 3.3 One in six HWS-trained installers agreed that they “are likely to get customer complaints or service requests soon after installing a heat pump water heater.”

As Table 6 showed, one in six HWS-trained installers (11 of 70) agreed that they “are likely to get customer complaints or service requests soon after installing a heat pump water heater.” NMR asked these 11 to describe the complaints they receive. They most commonly reported customers complaining that HPWHs cool down the room (6), that they have a slow recovery time (4), and that they produce too much noise (4) (Figure 8).

**Figure 8: Customer Complaints about Heat Pump Water Heaters**

(n=11; Multiple responses accepted)



#### 4 -- HWS-trained installers have positive perceptions of HPWHs and reasonably strong HPWH installation rates.

HWS-trained installers reported that 13% of the electric resistance storage water heaters their companies installed in 2018 were HPWHs.<sup>13</sup> This is nearly twice the estimated rate of 2018 HPWH installations in single-family homes by all installers across the region in the market update (7.7%). This suggests significant buy-in among companies that invested staff time in HWS training. In addition, these installers estimated that 65% of all the HPWHs installed by their companies were replacement systems. This is considerably higher than the estimated percentage of replacement HPWHs installed in existing homes in the region by all installers in 2018 (47%), indicating that these installers not only support this technology but are also doing so in the challenging retrofit market, making them particularly valuable to NEEA's market transformation efforts.

Together, comparisons between surveyed installers who recalled HWS training and those who did not and between the installer survey and mystery shopping results, provide anecdotal evidence that companies that invest staff time in HWS training have more positive perceptions of HPWHs and install them at higher rates.<sup>14</sup>

As would be expected with HPWHs' small market share, even some HWS-trained installers have limited HPWH experience – but anecdotal evidence suggests that installers who recalled HWS training are more familiar with HPWHs than installers who did not recall training. About one-third of surveyed HWS-trained installers (30%) reported working “regularly or frequently” with HPWHs, while 60% had limited experience, working with them “rarely or occasionally.” Only 10% had never installed a HPWH. Anecdotal evidence from mystery shopping suggests that HWS-trained installers are more knowledgeable about HPWHs than those who were not trained, and they appear to recommend them more frequently.<sup>15</sup>

Recalling HWS training participation also appears to be positively associated with installers being open to newer water heating technologies. Surveyed installers who did *not* recall HWS trainings are more likely to prefer “tried-and-true” water heaters (33% vs. 21%) and are much more likely to agree with the statement, “My company makes more money when we sell a large number of low-cost water heaters than when we sell a smaller number of high-cost water heaters” (41% vs. 21%). The installers who recalled HWS training are also more likely to view HPWHs as reliable: 77% vs. 59% of those who do not recall training. As described in [Section 3.2](#), surveyed installers who do not recall HWS training appear to be less likely to use a HPWH as their typical replacement option for a large electric resistance tank.

HWS-trained installers estimated that, about half the time, they are likely to recommend HPWHs for new construction and for replacing systems that have failed or are near failure. This is very high compared to the rate at which installers contacted for mystery shopping actually recommended HPWHs (3 in 16).

<sup>13</sup> Weighted value; represents water heaters installed across all survey installers, rather than an average value.

<sup>14</sup> Because the small number of installers who did not recall training was small, it was not possible to test for statistically significant differences between installers who recalled the training and those who did not.

<sup>15</sup> Sub-samples too small to test for statistically significant differences.



**Related recommendation.** Working with manufacturers, build on the value of NEEA's existing pool of HWS trainees to create a branded, elite tier of installers backed by NEEA/HWS who can serve as customers' go-to choice for installing HPWHs. These elite installers could bolster the HPWH market by providing their customers with strong, full-throated endorsements of the technology, helping inspire customer confidence. NEEA and its utility funders could provide support to these elite installers, such as additional training, sales support, technical support, a subsidy to offset the cost of call-backs, and an extended warranty for the end-user. Creating this elite tier of installers could follow a model in the air source heat pump market, with manufacturers such as Mitsubishi.<sup>16</sup> Given that HVAC companies have attended HWS trainings, NEEA may also consider reaching out to HVAC companies that install large numbers of air source heat pumps. These HVAC companies may be interested in installing HPWHs since they have already bought into the value proposition of heat pump technologies and they may have an existing customer base that is already supportive of this technology, helping to make inroads into the retrofit market.

**Related recommendation.** In line with NEEA's 2020 Operations Plan (still in draft form), NEEA should continue to expand its HWS trainings. As a means of continually improving the trainings over time, NEEA (or its HWS implementation contractor) could field surveys immediately after the training to assess the trainee's comprehension and then again well after the fact to assess the extent to which the material has been incorporated into their typical practices.

#### 4.1 HWS-trained installers reported that their companies installed HPWHs in 2018 at nearly twice the rate of the region overall. They also reported a disproportionate percentage of their HPWHs were replacement systems.

On average, HWS-trained installers reported that one-fifth (20%) of their electric water heater sales (as measured by installations) in 2018 were heat pump models. Across all installer respondents, 13% of all the electric storage water heaters installed by these companies in 2018 were HPWHs. This is nearly twice the rate of HPWH installations found in single-family homes across the region in the market update (7.7%).

**Figure 9: Percentage of Electric Storage Water Heaters That Are HPWHs**



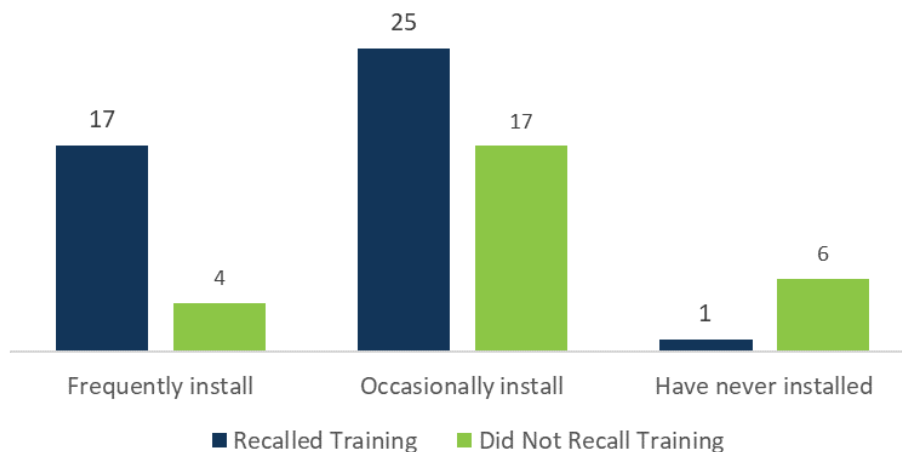
<sup>16</sup> <https://www.mitsubishicomfort.com/articles/personalized-comfort/the-diamond-contractor-a-homeowners-best-friend>

On average, surveyed installers said that 35% of their 2018 HPWH installations were in new homes, meaning that 65% of HPWHs installed by the installers' companies were replacement systems. This is considerably higher than the estimated percentage of replacement HPWHs installed in existing homes in the region in 2018 (47%).

#### 4.2 HWS-trained installers who recall HWS training reported installing HPWHs more often than those who do not recall training.

NMR asked HWS-trained installers about their level of familiarity with residential HPWHs. Nearly one-third (30%) said that they were very experienced with HPWHs, working with them “regularly or frequently,” while 60% had limited experience, working with them “rarely or occasionally.” Only 10% had never installed one. [Figure 10](#) breaks down this finding by the installers’ recollection of HWS training.<sup>17</sup> While the sample size for each group was too small to test for statistical differences between subgroups, respondents who recalled that they, or someone from their company, had been through HWS training appear to install HPWHs much more often than those who did not recall training.

**Figure 10: Experience Installing HPWHs**  
(n=70)



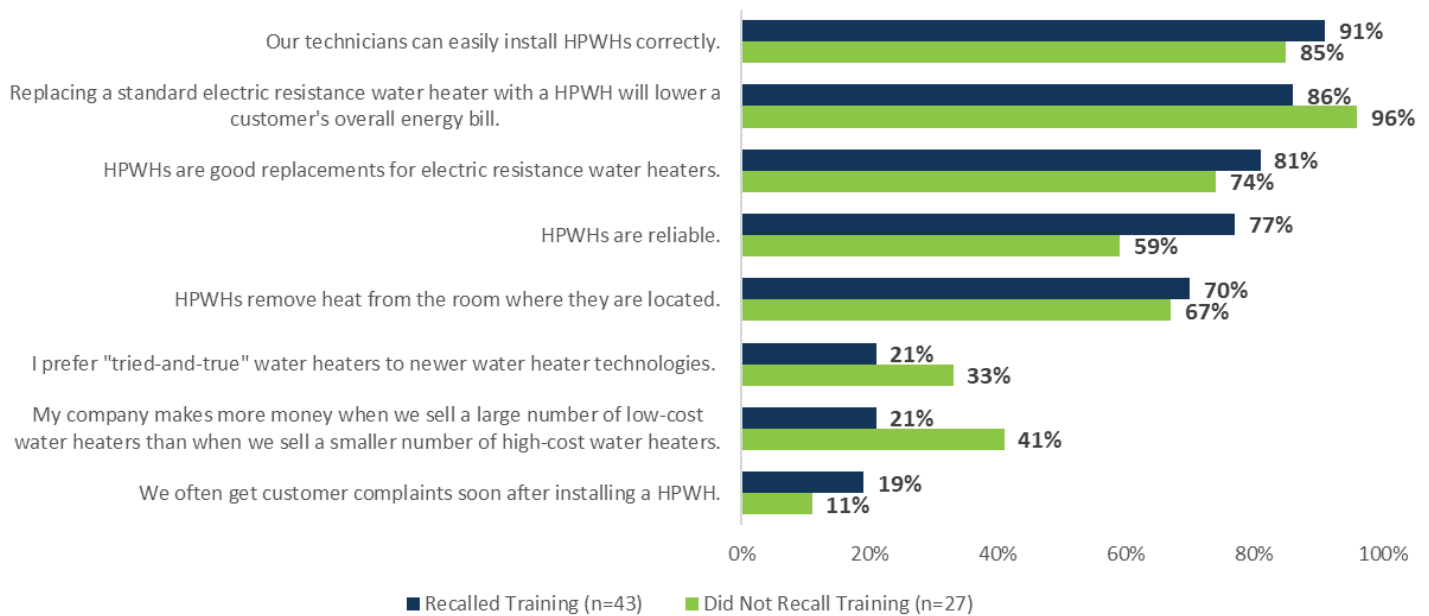
#### 4.3 HWS-trained installers who do not recall HWS training prefer “tried-and-true” water heaters to newer technologies, and see HPWHs as less profitable to install than other types of water heaters.

NMR compared agreement with a series of statements about the value proposition and performance of HPWHs statements between installers who recalled HWS training and those who did not. [Figure 11](#) shows the proportion of each group who “strongly” or “somewhat” agreed. While the number of installers in the group that did not recall training is too small to test for statistical significance, the results suggest that installers who did not recall training prefer “tried-and-true”

<sup>17</sup> Small sample sizes; not tested for statistical significance. Based on self-reported recollection of training.

water heaters to newer technologies (33%) at greater rates than installers who recalled training (21%). Installers who did not recall training were also much more likely to agree with the statement, “My company makes more money when we sell a large number of low-cost water heaters than when we sell a smaller number of high-cost water heaters” (41% and 21%, respectively).

**Figure 11: Agreement with Statements about HPWHs**



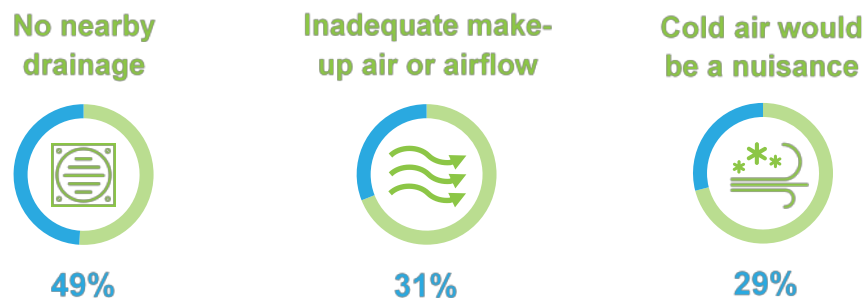
#### 4.4 HWS-trained installers estimated that they recommend installing HPWHs at much higher rates than found in mystery shopping.

When asked “What percent of the time would you recommend heat pump water heaters to a customer?,” HWS-trained installers reported that they would recommend installing HPWHs between 53% and 57% (depending on the application), or about one-half, of the time. Only three of 16 installers who completed mystery shopping calls brought up HPWHs before the shopper asked about them – and all three were from companies with HWS-trained staff. The installers contacted for mystery shopping offered mixed perspectives on HPWHs, and in general they were inclined to suggest like-for-like replacements.

- 5 In addition to high callback rates, high rates of installation challenges and a lack of qualified service technicians could temper installers' commitment to HPWHs, even among HWS-trained installers.

In addition to customer complaints, high rates of installation challenges could limit installers' willingness to recommend the technology to customers. Nearly one-half of installers (49%) said they encountered no nearby drain for condensate in at least one-half of their HPWH installations. Nearly one-third of installers (31%) said they encountered issues with inadequate make-up air or airflow or found cold air produced by the HPWH to be a challenge (29%) in at least one-half of their installations. Inadequate make-up air or airflow is particularly challenging in that it may require a workaround such as installing ducting, louvers, or changing the installation location.

**Figure 12: Common Installation Challenges Faced by Installers**



Surveyed installers from multiple states identified a lack of qualified service technicians or training as a factor limiting their recommendations to install HPWHs. The lack of qualified service technicians in rural areas in particular could be one factor in the much lower rates of HPWH installations found in Idaho and Montana than in the more populous states of Washington and Oregon in both this and previous MPERs. (Another likely factor is the lower rates of new home construction that would be expected in rural areas.)

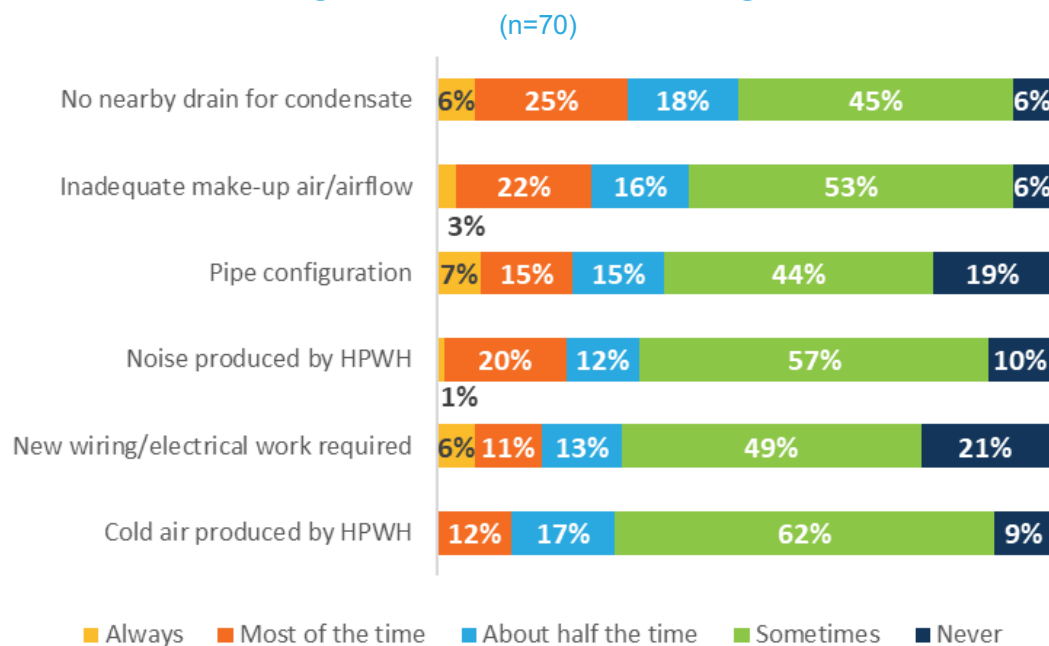
**Related recommendation.** In addition to incentivizing installers (as previously recommended), the team supports NEEA's desire to work with manufacturers to involve them in directly addressing the market barriers for the entire supply channel, as well as end users, either through educational efforts or technological changes to the equipment. Such a partnership would leverage the technical expertise of the manufacturers and allow NEEA to focus its resources on increasing adoption, rather than addressing barriers that may be easier for the manufacturers to tackle.

**5.1 According to HWS-trained installers, half of all homes they visit could readily accommodate a HPWH – but about half the time they undertake a HPWH installation, they face a challenge.**

The survey asked, “Excluding newly-built homes that are not yet occupied, what proportion of the homes that you visit do you find can readily accommodate a heat pump water heater?” HWS-trained installers indicated that one-half of all homes they visit (51%) could readily accommodate a HPWH, on average.

The survey presented HWS-trained installers with challenging installation scenarios identified in collaboration with NEEA and asked them how they face these challenges. Between one-third (29%) and almost one-half (49%) of the surveyed installers reported experiencing each installation challenge, at least half of the time they install a HPWH. See [Figure 13](#) for additional details.

**Figure 13: Installation Challenges**



**5.2 HWS-trained installers from three states cited a lack of qualified service technicians or training as a factor limiting the rate at which they recommend HPWHs.**

Lack of qualified service technicians or training for installation technicians in the area were cited as factors limiting recommendations by HWS-trained installers who planned to recommend HPWHs “at the same rate as they do now” (3) and by those who planned to recommend HPWHs “somewhat” or “much more often than they do now” (2). Respondents from multiple states, including Washington, Oregon, and Idaho, identified this as an issue.

**6 For most installation scenarios, HWS-trained installers recommend HPWHs about half the time, while customers agree to install one roughly one-third of the time it is recommended by the installer.**

HWS-trained installers reported that they recommend installing a HPWH in new construction 57% of the time, followed by 55% of the time for a failed water heater, and 53% of the time for a water heater that was very old or near failure.

Surveyed installers estimated that four in ten new construction customers and three in ten existing home customers follow through when the installer recommends a HPWH. For four different scenarios, the installers described how often customers agreed to install a HPWH when the installer recommended one. Installers said that new construction customers (usually builders or contractors) were the most likely to go forward with the recommendation (44% of the time), followed by customers replacing a water heater that had failed (33%) or was near failure (32%). This supports results from MPER #4, which reported customer acceptance rates between 30% and 50%, based on interviews with ten installers.<sup>18</sup>

When asked in which situations customers were more likely to accept their recommendation to install a HPWH (open-ended question format), HWS-trained installers most often cited cases where the customer was already aware of HPWHs, followed by scenarios where the space was appropriate for a HPWH, and scenarios where clients were concerned about efficiency or the environment.

As NEEA knows, HPWH market share can be increased simply by increasing the recommendation rate, even if there is no change in the rate at which customers follow through on these recommendations. By undertaking the recommendations in this report and following NEEA's thorough 2020 draft Operations Plan, NEEA should be in a position to help drive installer recommendation rates, and installers who are better able to communicate the value of HPWHs to their customers may be able to boost customers' acceptance of these systems as well, further driving market adoption.

**6.1 HWS-trained installers reported that they would recommend a HPWH about half the time for new construction and planned replacement scenarios.**

The team gave installers a series of scenarios and, for each scenario, asked them, "What percent of the time would you recommend heat pump water heaters to a customer?"

HWS-trained installers were most likely to recommend installing HPWHs in new construction (57%) and least likely when replacing a fully functioning water heater (42%). Respondents were likely to recommend a HPWH to replace systems that had failed or were near failure a little over one-half the time (55 and 53%, respectively) (Table 7).

<sup>18</sup> MPER #5 targeted installers from HWS trainee lists; MPER #4's installer interviews did not have this focus.

**Table 7: Rate of HPWH Recommendations by Installers**

Scenario	Mean	Median
<i>Percent of time you would recommend installing a HPWH in the following situation</i>		
New construction (n=61)	57%	75%
Replacing a failed water heater (n=68)	55%	50%
Replacing an old/near-failure water heater (n=68)	53%	50%
Replacing a fully functioning water heater (n=66)	42%	30%

## 6.2 HWS-trained installers estimated that customers agree to installing a HPWH roughly one-third of the time they recommend one.

For each of four scenarios, installers described what percentage of the time customers agreed to install a HPWH when they have recommended one. Installers said that new construction customers (i.e., builders or contractors) were the most likely to go forward with the recommendation (44% of the time), followed by customers replacing failed or near-failure systems (33 and 32%, respectively) and customers replacing functioning water heaters (28%) (Table 8).

**Table 8: Customer Acceptance of HPWH Recommendations**

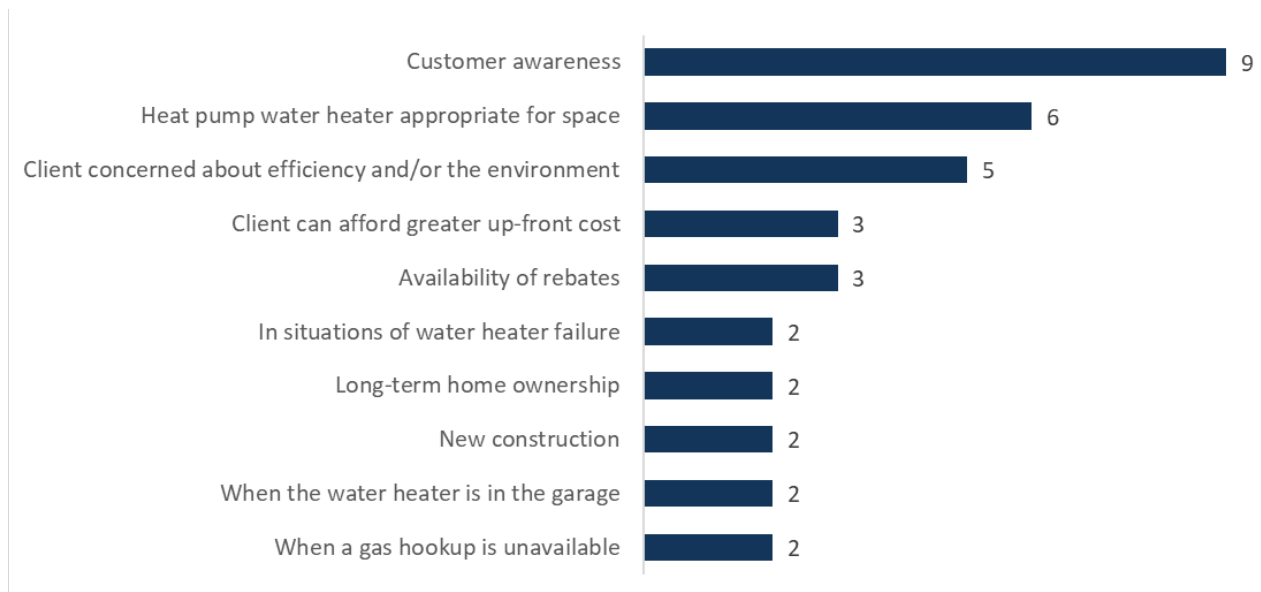
Scenario	Mean	Median
<i>When you make a recommendation to install a HPWH, how often does the customer go forward with the installation?</i>		
Replacing a fully functioning water heater (n=51)	28%	20%
Replacing an old/near-failure water heater (n=57)	32%	20%
Replacing a failed water heater (n=57)	33%	20%
Installation in new construction (n=41)	44%	35%

When asked in which situations customers were more likely to accept their recommendation to install a HPWH (an open-ended question), installers most often cited cases where the customer was already aware of HPWHs (n=9). Scenarios where the space was appropriate for a HPWH (n=5) and scenarios where clients were concerned about efficiency or the environment (n=5) were also commonly mentioned (Figure 14).<sup>19</sup>

<sup>19</sup> This question was only asked of web survey respondents (n=39).

**Figure 14: Reasons Customers Accept Installer's HPWH Recommendation**

(n=34; Multiple responses permitted)



### 7 Common installer commission structures pose a barrier to HPWH sales.

Distributors suggested that the compensation structure of installation companies drives installer recommendations of equipment. Some distributors thought that their customers (installers) were not financially rewarded for installing more costly systems, resulting in installers being indirectly encouraged to replace like-for-like, which results in the easiest and fastest installation. With this in mind, NMR asked installers about commission structures and profitability.

HWS-trained installers reported that tankless water heaters, followed by HPWHs, are the most profitable water heaters for them to install. They cited high equipment margins and increased billable installation time as the reasons for a HPWH's profitability.

However, in many cases, the installation technicians themselves may not share in that additional profit earned by the company. More than one-half of HWS-trained installers reported that technicians at their company develop estimates for customers, but less than one-third of the companies pay them commissions. Low rates of paying commissions could limit technicians' motivation to upsell customers to more efficient equipment.

**Related recommendation.** As previously described, investigate ways to reward installers for installing HPWHs, such as through incentives to the recommending technician or salesperson. Working with utilities to provide installer-focused midstream incentives may help make HPWHs more profitable to install, helping them overcome some of their hesitancy.



### 7.1 Few technicians have a direct financial motivation to recommend expensive water heaters: nearly 60% of HWS-trained installers use their technicians as the primary means of developing estimates for customers, but just 30% of companies pay commission to technicians.

When asked how their company typically sells water heaters to homeowners, 59% of installers said that their company's technicians or installers – the people who actually install the systems – develop the estimates for customers, and almost one-third (29%) said they rely on their dedicated sales team. Only 30% of installers' companies pay commissions to installation technicians; about one-half of companies with salespeople pay them commissions (Table 9). This indicates that in most cases, the technicians themselves are the ones making customer estimates and recommendations, but problematically, most of these technicians are not incentivized to upsell to more expensive equipment like HPWHs.

**Table 9: Compensation Structure**

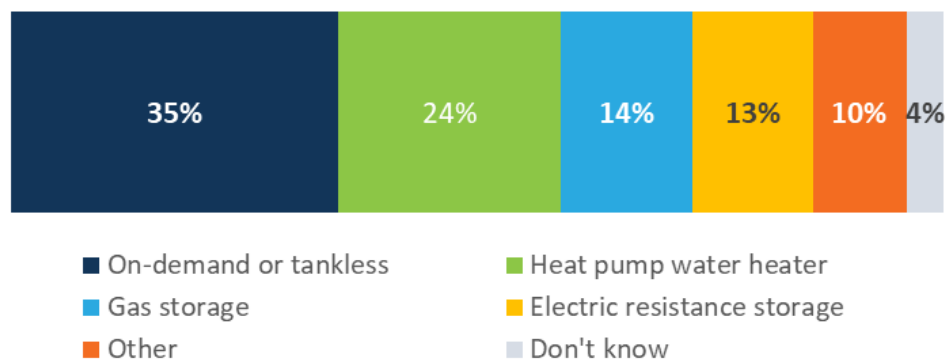
Compensation Type	Technicians/Installers (n=70)	Salespeople (n=40)
Hourly pay, no commission	56%	20%
Hourly pay plus commission	27%	8%
Salary, no commission	7%	25%
Salary plus commission	3%	38%
Commission only	--	3%
Don't know	3%	8%

### 7.2 HPWHs are the second-most profitable water heater for installers to install.

When asked which type of water heater was most profitable to install (Figure 15), HWS-trained installers most often reported on-demand or tankless water heaters (35%), followed by heat pump water heaters (24%).

**Figure 15: Most Profitable Water Heaters to Install**

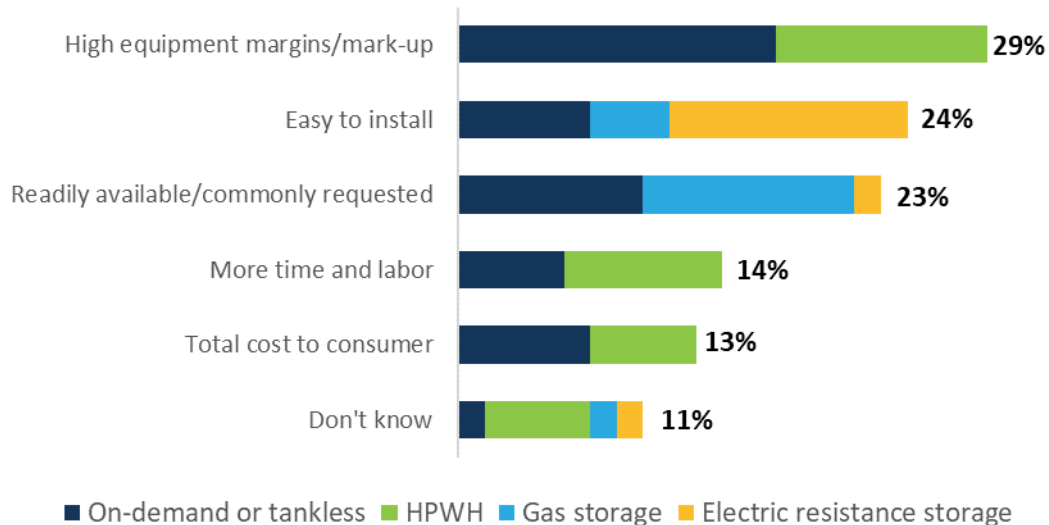
(n=70)



When surveyed installers were asked why the water heater type they named was the most profitable for their company, high equipment margins or mark-up was the most common reason offered (29%), followed by ease of installation (24%) and availability of the water heater (23%) (Figure 16). The HWS-trained installers who said HPWHs were the most profitable to install cited high equipment margins or mark-up and increased time and labor. Tankless water heaters also shared these profitability features, while being readily available and easy to install.

**Figure 16: Most Profitable Water Heaters – Reasons**

(n=70)



**Related recommendation.** NEEA is already on the right marketing track with its 2019 campaign and its plans for 2020. Consider these observations in planning the 2020 marketing campaign.



## Other Findings

### **Utility incentive usage rates increased dramatically.**

Though fewer HPWHs were installed in 2018 relative to 2017, the portion of HPWHs receiving incentives from utilities in 2018 jumped dramatically, from 34% in 2017 to 58%. In 2017, utilities in the BPA service area temporarily suspended incentives due to running out of funds before the two-year program funding cycle came to a close on September 30. The apparent increase in 2018 could be due to this. About two-thirds (65%) of incented units were installed in existing homes. Fifteen percent of incented HPWHs were installed through above-code new construction programs, and 20% were installed in new homes outside of new construction programs. The change in incentives from 2017 to 2018 disproportionately favored new homes built to code: these incentives more than doubled (from 612 in 2017 to 1,342 in 2018), while incentives for HPWHs installed in existing homes and above-code homes went up at roughly the same rate (40-45%).

### **Distributor stocks of larger-capacity residential electric resistance water heaters appear to mostly be exhausted.**

The distributor interviews suggest that distributor stocks of residential electric resistance water heaters over 55 gallons have largely been exhausted. On average, they reported that about 95% of the electric resistance water heaters in stock at their branches are 55 gallons or less.

### **Overall, distributors expect to see HPWH installations increase in the near future.**

Distributors cited technological improvements, favorable regulations, and strong performance in the new construction market as drivers of future growth in the HPWH market (50% of distributors). Those who thought sales would stay the same (29%) cited price and technological issues limiting sales growth. Technological issues included reliability in cold weather; installation requirements, such as lack of sufficient space; or other aspects, such as the noise of the compressor or output of cold air.

A majority of HWS-trained installers (59%) expected no near-term change in the rates at which they recommend HPWHs to customers, but for conflicting reasons. Some reported that they already recommend them whenever appropriate for the application or customer budget, while others reported that they recommend them only rarely, citing common barriers such as installation challenges and cost. Installers who said they planned to increase their HPWH recommendations (39%) cited improving technology, increased customer interest, and their own increasing experience with the equipment.

### **Distributors and installers offered a variety of insights to inform customer and installer marketing and education, and incentive design.**

According to distributor interviews, while understanding payback period is critical to customers overcoming the higher upfront cost of HPWHs, installers are not often able or willing to explain this to customers. Both distributors and installers noted that consumer awareness of HPWHs is low, indicating that, for now, customer demand is not the driving force in HPWH market adoption, and NEEA will likely need to rely on its market actors to help drive the market forward.

Distributors offered suggestions for shifting consumer awareness and perceptions of HPWHs and increasing the rate at which installers recommend HPWHs. These included the following:

- Encourage installers to use a “good/better/best” marketing strategy to increase customer awareness of the energy savings potential of HPWHs.
- Increase marketing of HPWHs. Distributors were not aware of much advertising of HPWHs and see this as an opportunity to promote the technology. (As this report was being written, HWS had just begun a consumer awareness marketing campaign and the NEEA HPWH Workgroup had developed plans to share retail strategies and best practices to increase incentive participation in retail channels.) The marketing approaches they suggested were to advertise in industry publications (e.g., plumbing magazines), other print media, social media, on the radio, or in the news. They also suggested marketing in home-improvement stores to increase consumer awareness of HPWHs before their water heating equipment fails. Finally, they suggested using neutral parties, such as utilities, to sponsor market efforts.
- Increase financial incentives for the retrofit market.

### **Call-center use to field initial customer inquiries appears to be common, but HWS-trained installers did not report doing so.**

HWS-trained installers reported that they do not use call centers to field initial customer inquiries during business hours. However, mystery shoppers encountered them, especially among Portland-based companies, where mystery shoppers found multiple instances of a HomeAdvisor answering service to field initial calls. In these instances, a shopper cannot get substantive information over the phone and must wait for a home visit. The installer survey did not ask questions to understand why installers chose not to use a call center.

**The logic model was clear and up-to-date and the MPIs generally appropriate; current and past MPIs are summarized in tables.**

The team reviewed the initiative logic model and MPIs. The logic model was clear and up-to-date and the MPIs generally appropriate.

The team measured one or more indicators for each of the five outcomes slated for measurement in MPER #5, for a total of 11 MPIs. [Table 32](#) in [Appendix F](#) displays the current values for these MPIs and how they were measured. [Table 33](#) displays the measurements and values of MPIs measured in MPERs #1 through #4.

**Related recommendation.** With each MPER, NEEA should update the MPI tables with any new MPI values that may have been collected as part of the MPER. Maintaining up-to-date tables or lists of MPIs and their measurements will facilitate NEEA's efforts to track market progress in the future and to compare the results with past measurements. Having a clear history of the MPI values, how they were operationalized in various MPERs, and by what method they were gathered, will also facilitate MPER and market research planning (as many MPIs can be measured in conjunction with other market research activities, and do not necessarily need to be measured as part of an MPER).

## Appendix A Distributor Interviews


This appendix is organized as follows:

- a summary of the data collection methodology for these interviews;
- a portion of a memo describing qualitative findings presented to NEEA in advance of the first synthesis session with NEEA staff in May 2019; and
- findings from additional quantitative analysis conducted after the synthesis session.

### A.1 METHODOLOGY

In April 2019, NMR conducted in-depth interviews with 14 branch managers from distributors in the Northwest region.<sup>20,21</sup> [Table 10](#) shows the count of interviewees from each state. NMR used company-level quotas to avoid over representation of companies in any single state. The team conducted interviews over the phone that lasted about 30 minutes each. Respondents received a \$50 Amazon gift card for their participation. The team recruited respondents through cold calls to their branches and through email. The interview guide can be found in [Appendix G.1](#).

**Table 10: Distributor Interviewees by State**

State	 Respondents
Washington	7
Oregon	4
Montana	1
Idaho	2
<b>Total</b>	<b>14</b>

<sup>20</sup> The study targeted 15 complete interviews.

<sup>21</sup> The NEEA-provided sample included 170 branches from 13 companies. NMR conducted supplemental research to identify phone numbers, emails, and contact names for records with missing data. The overall response rate was 8%.

## A.2 QUALITATIVE ANALYSES PREPARED FOR SYNTHESIS SESSION

Section A.2 is an excerpt of a memo provided to NEEA on May 2, 2019, in advance of the first synthesis session conducted for this MPER.

### A.2.1 Distributor Interview Preliminary Results Summary for Synthesis Session

***[Beginning of memo excerpt.]***

- Overall impressions:
  - Most distributors have an overall positive impression of HPWHs, but most still don't sell many.
- Barriers to adoption:
  - Perception that HPWHs "steal heat" from surrounding area
  - Understanding payback period is critical to overcome upfront cost, and installers are the ones who need to be able to explain this to the end customer, but they often cannot or do not.
  - Value proposition not clear or accepted by all market actors, given high cost and concerns about performance trade-offs
  - Complex installation
    - Some installers need training on best practices.
    - The size and configuration of HPWH can be prohibitive in the retrofit market.
    - The risk involved for the distributor in selling a technology they are less familiar with discourages recommendations.
    - Service installers often get paid by the job, and thus are incentivized to replace like with like, or whatever installation will take the shortest time, even if HPWHs have higher sales price.
    - Airspace requirements limit installations in the retrofit market
  - Having a bad prior experience with HPWHs or another water heater innovation may lead installers not to recommend them or to be skeptical of claims.
    - In cooler segments of the Northwest region especially (further north and away from the coasts), the weather is seen as prohibitive to efficient operation. The cooler weather is also perceived by some as an issue with older models, less so with newer ones.
  - Gas water heaters enjoy a good reputation in the region, helping boost sales and customer demand. A comparison of the energy cost to operate a gas water heater versus a HPWH could be a useful tool for shifting consumer perception.
  - Higher-capacity electric resistance alternatives other than HPWH are being offered to customers despite 2017 NAECA standards phasing out residential models >55 gallons.

- Light commercial electric resistance water heater models are being offered
- Two, 50-gallon electric resistance water heaters are being installed
- Some installers use alternative installation methods to boost the capacity of a 50-gallon electric resistance tank, such as using a “tank booster”
- Benefits and features that distributors share with contractors are rarely passed along to the end user.
- None of the distributors were very concerned about noise as a significant problem, although some mentioned that it was with earlier models.
- New construction versus retrofit markets
  - HPWHs primarily installed in the new construction market because builders can get energy credits for installing them.
  - In the retrofit market, installers need more encouragement.
  - Changes to the cost of water heaters in general may make HPWH more attractive in the future. This is influenced by policy, such as California’s NOx policy.
- Strategies identified to increase adoption
  - Distributors not aware of much advertising and see this as an opportunity to promote the technology
    - Limited advertising in industry publications (e.g., plumbing magazines), or in print media, social media, on the radio, or in the news
    - Marketing in home improvement stores could make consumers aware of the technology before they are in an emergency situation
    - The message should come from a neutral, third party, such as a utility
  - Increase financial incentives, especially in the retrofit market
  - Customers must be made aware of the energy savings potential. Installers should use a good/better/best marketing strategy.
- Opinions on Hot Water Solutions
  - Many did not participate in or were not aware of the program.
  - Need more focus on payback period, venting strategies.
  - Trainings might be too intensive for some distributors to participate in given small market share of HPWHs
  - Existing training materials good but overly complicated. Simple materials to communicate where the product adds value would be helpful.
  - Trainings targeting installers would be critical.



## A.2.2 Distributor Interview Preliminary Details and Quotes for Synthesis Session

### Distributor Perceptions

- *Most distributors have an overall positive impression of HPWHs, especially as an efficient option, but most still don't tend to sell many.*
  - **“The concept seems to be pretty intriguing to people but when they look at the features and benefits the cost does not excite them or spur enough interest to have them pursue it. In my 11 years we have only sold a couple – like 2 in 11 years. And they are actually good water heaters. They are pretty neat. But our marketing area is certainly not a high end area, we have cheap electricity here in southeast Idaho, which probably lends itself to why they are not very intriguing for people.”**
  - *“I think they're the answer. It's not a 10-15% savings, it's a 3-times savings. It's silly that they don't set it in the code that this is mandatory, if you're going to use an electric water, it's got to be one of these, have them put in garages. They're even more efficient than a gas water heater and cheaper to use. Someone has to step up and make it so it has to be done.”*

### Barriers to HPWH Adoption

- *Perceptions about the impact that HPWH have on room temperature where the unit is installed (i.e., heat stealing)*
  - **“When you're providing someone with a [product with] efficiency that's three times better, you don't need to lower price, you need to sell technology. The only complaint that you usually hear is they exhaust cool air if they're not exhausted to an outside area. But, there is testing that says it doesn't change the room temperature – only less than a degree. People perceive it [the change in temperature] as a high cost. Testing [has been done] to show what cost of that is and it's very small.**
  - **“[Installers have] that initial thought, that they'll get complaints about the basement freezing, is why they don't recommend them.”**
  - *“A lot of the time they want to use these as replacements where they're going to pull a door or put louvers in, and it steals heat. In all the times I've sold them, that's the only gripe I've heard about it. Still, a plumber will put a few in and he'll get one or two complaints and then he'll think 'well I don't want all the complaints about my work.'”*
  - *“If people can figure out a way to pull the combustion air from somewhere that the customer isn't already paying to heat, that would be a killer move. ... If plumbers weren't concerned about stealing the heat, they'd feel more comfortable.”*
- *Understanding the payback period is critical to overcome the high upfront cost, and installers are the ones who need to be able to explain this to the end customer.*
  - **“Most people, especially in a change out situation, are looking at the bottom dollar, not at the long-term costs and goals of the heaters. They are just looking**

**at how much it costs me to put that in today. The lack of knowledge makes it unlikely to choose in a replacement situation. In terms of wholesalers, price drives everything.”**

- “It’s a pretty significant upgrade out of the box in terms of price point, so the biggest challenge the HPWH market has is educating the consumer about the payback over the lifetime of the project.”
- “People that buy them now, they are really conscious of energy savings, they are people that like to have sophisticated devices in their house. They are very conscious about the environment, which is great, and they have the money to buy the device that they can control with their smart phone.”
- *Installation is complicated.*
  - *Training might be required to overcome some of this barrier.*
    - **“A lot of these [installers] probably don’t even mention them. The training hasn’t been there for them.”**
  - *The size and configuration of HPWH can be prohibitive in the retrofit market.*
    - “They are both wider and taller because of the heat pump apparatus. ... You would have to re-pipe to get to the inlet and outlet, because the other ones are coming out the top [rather than the side].”
  - *The risk involved for the distributor in installing a technology they are less familiar with may lead some not to recommend it.*
    - **“It’s one of those things that’s new and costs more and so, “I’m not going to mess with it, I’m just going to go back to what I know.’ There’s an afraid-of-change thing I guess.”**
    - “At this point I wouldn’t say it’s common for plumbers to be knowledgeable or to mention [HPWH]. ... They know the products that they sell, and they do it well. ... [With new tech,] **an owner of a business is going to say, ‘well it’s more expensive and it takes twice as long to install because my guys aren’t up to date on it and don’t do it very often. Because we don’t do it very often, I know I might have a callback on it because something is done wrong. I’m not going to charge for that since its on us, so that money out of my pocket.’ So, it’s about selling to that business owner on the benefits of the product that they can feel comfortable: ‘okay you’ve proven to me that it will do the things it says it will so I won’t be getting callbacks from customers saying, ‘you said it would have all these savings that I’m not seeing’ and training the plumbers and technicians trained on the product.’ Unless that happens, I would say most people are not offering HPWHs because of the unknown.”**
    - “As tech improves, heat pump probably becomes more efficient at lower temps, that’s better. Takes time for contractors to warm up to tech; contractors don’t want to have to take calls from customers in the middle of winter.”

- *Service installers get paid by the job, and thus are incentivized to replace like with like, or whatever installation will take the shortest time.*
  - **“I don’t know if I’ve sold more than two over the past few years for replacement heaters. Most of the service guys get paid by the job, so the more jobs they can do during the day, the more they get paid. So any job where they have to go in and replumb, or rewire, or make more room, or anything like that, is money out of their pocket. For the most part what they’re trying to do is go in with the same water heater that is already there, hook it up and be gone.”**
- *Airspace requirements limits installations in the retrofit market*
  - **“[HPWHs are] starting to pick up in new construction. It’s so hard when a water heater is already in a closet, you don’t have the space to make up for it.”**
  - **“In ‘80s mechanical rooms, there’s not enough air space.”**
  - **“We’re having problems with tight closets.”**
- *Having a bad prior experience with HPWHs or another water heater innovation may lead installers not to recommend them or to be skeptical of claims.*
  - **“A lot of people decided to give it a try when it first came out and there were some issues giving people a bad taste in their mouth.”**
  - Sometimes the payback isn’t what was expected, and people end up wishing they hadn’t done it. We’ve seen that happen – for example with tankless water heaters that had great claims but failed for a number of reasons included very hard water here with people who can’t afford softeners.
- *In cooler segments of the NEEA region especially (further north and away from the coasts), the weather is seen as prohibitive to HPWH working efficiently. The cooler weather is also perceived by some as an issue with older models.*
  - **“In our area here, they don’t work as well as the do in other places. Our weather is too cold and they don’t draw ... They may have changed some things and work better now, but I’m not sure. ... I have quoted a few the last few years, but I have never sold any.”**
  - **“There is stigma that they do not work well in the winter time and that we are right on the edge of that line that the engineers draw across the country in terms of where it does and does not work.”**
- *Gas water heaters enjoy a good reputation in the region, which might lead some consumers to choose a gas water heater over a HPWH. A comparison of the energy cost to operate a gas water heater versus a HPWH would be a useful tool.*

- **“People like gas because recovery on a gas product is 3x faster than an electric product. If you run out of hot water, you get it back faster.”**
- “The places I’ve noticed HPWHs being installed is where there is not gas available – in this market, gas is still more cost-effective.”
- *Higher-capacity electric resistance alternatives other than HPWH are being offered to customers despite 2017 NAECA standards phasing out residential models >55 gallons.*
  - *Light commercial electric resistance water heater models are being offered*
    - **“[HPWH sales] just depends on how long these commercial 80-gallon tanks stick around that some these guys have just started using instead. And whether or not we can get people to think differently about HPWH and if we can make them less worried about it be an expensive thing that will steal the heat.”**
    - **“We have found a loop hole, and so we do sell a light-duty commercial 80 gallon water heater. That is reasonable, as it has a lifetime warranty since it has a stainless steel tank, and it prices out as less than a HPWH, and the main thing is that if it’s in the middle of the house in a conditioned space, it’s so difficult and expensive to put in a HPWH that has to be vented to the outside. Probably still 75% choose that commercial tank over the HPWH for those [high-capacity] scenarios.”**
  - *Two, 50-gallon electric resistance water heaters being installed*
    - **“It happens all the time that people just get two smaller water heaters. ... I can probably sell you two 50s for cheaper than the 80 and I can give it to you right now, while for the 80 gallon HPWH you would have to wait. We sell double water heaters either electric or gas all the time.”**
    - [T]he HPWH is way over double [in price] what you could buy two 50 gallons for. So, if you have the room, you just stack two water heaters.”
  - *Some installers use alternative installation methods to artificially boost the capacity of a 50-gallon electric resistance water heater, such as using a “tank booster”*
    - “If they’re replacing a bigger water heater that isn’t available anymore, they’re using a tank booster, a mixing valve so they can turn up the heat on a smaller water heater. This gives you a larger volume of hot water since you’re mixing it down as it comes out of the pipe.”
- *Benefits and features that distributors share with contractors are rarely passed along to the end user.*
  - **“[The] biggest challenge is the features and benefits that we share with contractors is rarely passed along to the end user, [who are] more focused on the price point.”**

## Why Installers Recommend HPWH, and Why Consumers Choose Them

- *HPWH are primarily sold and installed in the new construction market because builders can get energy credits for installing them.*
  - “The places I’ve noticed HPWHs being stalled it is if there is not gas available – in this market, gas is still more cost-effective, or if a builder is trying to get builder credits in new construction or a rebate in all electric market, we have sold a few.”
- *In the retrofit market, installers might need more encouragement to sell the product*
  - **“Requires selling! ... Most installers are not sales people.”**

## How to Increase HPWH Adoption

- *Marketing*
  - *Distributors aren’t aware of much advertising and see this as an opportunity to promote the technology*
    - **“If there is a way to lessen the pain [of high bills], that is a huge marketing tool for 90% of the population there.”**
    - “Marketing is always helpful. The more it’s advertised it drives business. Our stocking builds interest.”
    - “You don’t hear about HPWH much in terms of print media, or social media, or news. I don’t see in our publications, plumbing magazines that are sent to us for free. I have not seen any huge push to reignite the customer base towards HPWHs.”
  - *Marketing in home improvement stores could make consumers aware of the technology before they are in an emergency situation*
    - “People that need water heaters are typically people that are in a pinch and something has gone wrong. ... So that is why it could be good to target places like Home Depot or Lowe’s or people who already have the mindset of home renovation.”
  - *The message should come from a neutral, third party, such as a utility*
    - “Best avenue is through utility. ... If you promoted HPWH through electric utility website/media, as a neutral party, saying this is new technology out there that is 2x more efficient than a traditional, and say it’s better than a gas, it’s been a big job converting electric over to natural gas.”
    - “If you’re a neutral party sharing that message to the end user, referring them to certified installers, coming up with certified heat pump experts for people to call and get their questions answered... It’s a great product for a lot of situations in a household, getting over the fear of the unknown and any price objections.
- *Increase financial incentives, especially in the retrofit market*

- **“If they want to drive sales and make it easy, if they were just to rebate every tank sold, we could take that off the purchase price and make them more competitive.”**
- “New construction may continue in a steady state – builders already have these projects planned and they’re going to finish them, but without rebates it’s not going to increase in the new construction market moving forward.”
- *Customers must be made aware of the energy savings potential. Installers should use a good/better/best marketing strategy.*
  - “Some plumbers are good at marketing, they’ll do like a good-better-best, and those are the guys that sell the most of the HPWH because they’re offering at a sell-up as their best solution, and that’s what it’s all about, it’s about making more money, higher ticket option.”
  - “We have a lot of people out here who really care about efficiency and the environment and green standards and what not. The guys who recommend these are the guys who really know what they’re talking about not the people who are answering phones and dispatching service guys to swap water heaters. That’s a lot to do with it, the overall knowing. A lot of them do their own research and we’ll come in to talk about it. A lot though initially squawk at the price and the additional things you have to do to install it properly.”
  - “Every plumber has his niche, there are guys that are inexpensive, and there are guys that do quality work, and guys that are more into marketing than installation. Best contractors not necessarily the best plumbers, it’s those who do the best communication.”

### **Opinions about Hot Water Solutions Program, ideas for useful training**

- *More information on payback period, venting strategies, would be useful.*
  - “Trainings haven’t changed how we stock or sell, but as we become more familiar with different venting options, that might change our marketing strategy. It would help to be able to lay it out to a customer what the payback period, installation location is going to vary as well, if it’s going to be indoors, then you’ve got to vent it, and if it’s in a room, then the cool air will come out.”
- *The training might be too intensive for some distributors to participate in given that currently, HPWH represent a small portion of their business revenues*
  - **“Plumbing wholesalers are doing more with less, answering phones all day and going home with a longer work list than when they started that day. To sit down with the NEEA guys, who only have one focus, heat pumps, want to take two guys out of your branch and make them specialists, it just doesn’t make sense. If they were to stop in every once in a while, and say here’s what’s new, a 10-15 minute blast, that would be fine. But also we can’t get contractors to show up to those kinds of meetings. If there was piece of paper we handed them they probably would read it, but they don’t show up for meetings. If it’s HPWH only,**

- they won't drive an hour to go to a meeting for 15 mins and drive back – it's such a small segment of what they do.”**
- “Yes, we participated with NEEA rebate program last two years. ...Those guys, the Hot Water Solutions guys, their whole thing is about HPWH, we don't have the time to focus on what they would like us to do, which is sell HPWH, which is a small part of our business at a low margin. We haven't had the time to sit down, clear our minds and go through it as much as we should”
  - *Existing training material is good but may be overly complicated. Simple materials to communicate where the product adds value would be helpful.*
    - “NEEA training offers valuable material, sometimes less is more. Look at their sales literature is very informational, but I don't know that everyone reads and understands it all. Pin point what the biggest value adds are and get it across to the end user so they pick up the phone and ask questions, but also person at the other end of the phone who has to answer those questions. **NEEA provides valuable information, but it's hard to remember and regurgitate.”**

*[End of memo excerpt.]*

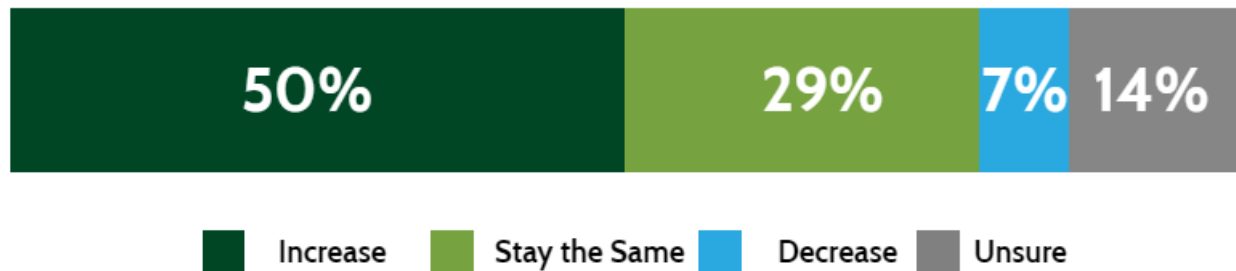
### A.3 QUANTITATIVE DISTRIBUTOR INTERVIEW RESULTS

This section summarizes findings from additional analysis conducted after the synthesis session.

#### A.3.1 Future of HPWH Market

One-half of distributors (50%) thought HPWH sales would increase in the future, 29% thought HPWH sales would remain constant, 7% thought HPWHs would decrease, and 14% were unsure (Figure 17). Those who thought the sales of HPWH would increase cited technological improvements and regulations as market drivers and expected most of the increase to occur in the new construction market. One distributor said, “As [the] tech[nology] continues to improve, the market will increase dramatically. Between that and tankless gas, standard tanks will likely disappear in the future.” According to another, “I can see the codes going to where HPWH would be required someday.” Those who thought sales would stay the same cited price and technological limitations. One distributor said, “I don't see time improving this situation much at all. Perhaps [sales would] increase if energy costs were so prohibitive that they made people look closer at that technology.” Those who thought it would decrease cited reduced rebate programs. For example, one distributor said, “Without the rebates, we'll sell less.”

Figure 17: Distributor Predictions for Future HPWH Sales



### A.3.2 Stocking

**Stock of all electric water heater types.** NMR asked distributors about the types and amount of electric water heaters they stock. While distributors keep a limited stock at their branch, they reported having access to larger stocks at corporate warehouses and noted that specialty products like HPWHs are often kept at a corporate warehouse instead of a local branch. This can cause delays in project installation in existing homes as the product is shipped from a central location.

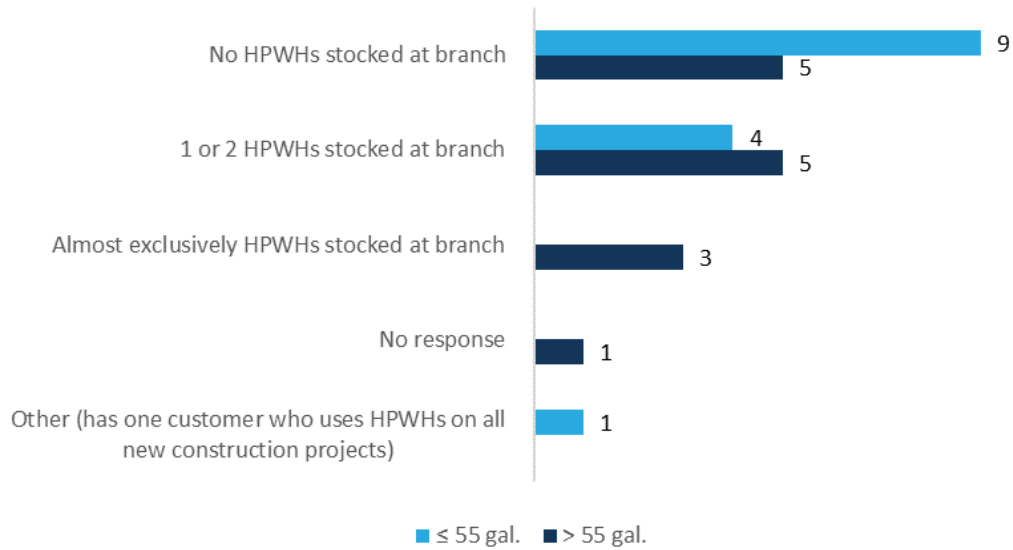
On average, distributors reported that about 95% of all electric water heaters in stock at their branches (i.e., electric resistance and HPWHs) are 55 gallons or less. They cited federal requirements for the lack of electric water heaters over 55 gallons. For example, one distributor said, “You can’t have an electric [resistance] water heater over 50 [sic] gallons anymore.” Instead of stocking HPWHs, which are the only residential electric water heaters allowed over 55 gallons, distributors like the one quoted above choose to only stock the smaller electric resistance water heaters and forego the larger HPWH units. While one distributor reported having no electric water heaters above 55 gallons at their branch, they also reported that 13% of electric water heaters at their corporate warehouse were above 55 gallons.

**Stocking of HPWHs.** Just one of the 14 distributors interviewed reported stocking more than one or two HPWHs that were 55 gallons or less on a regular basis at their branch – and that distributor did so because of one customer that uses HPWHs in all their new construction projects. Four of 14 distributors reported keeping just one or two HPWH units in stock at their branch, and nine reported keeping none in stock at their branch (Figure 18).

Distributors appear to have made more progress stocking larger capacity water heaters (i.e., those over 55 gallons) at the branch level. Three distributors reported that their stock of electric water heaters larger than 55 gallons were almost exclusively HPWHs.

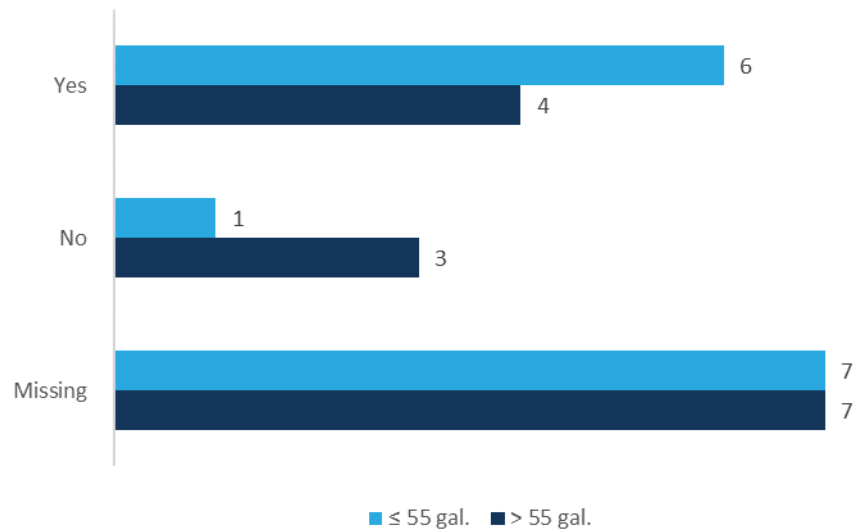


**Figure 18: Distributor Stocking of HPWHs at Branch Level, by Capacity**



Distributors who stock few or no HPWHs at the branch level reported having access to more extensive stocks of equipment at corporate warehouses and noted that this is a common practice for specialty products like HPWHs.

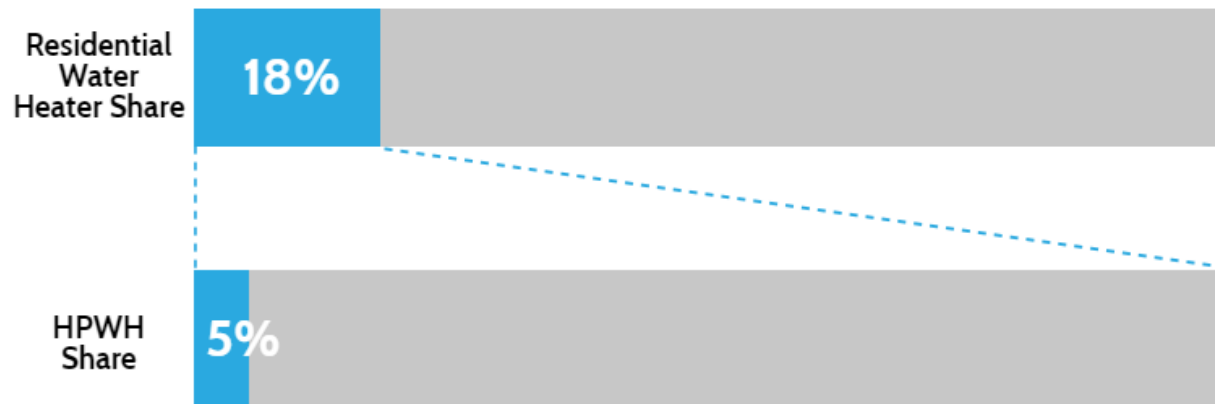
**Figure 19: Distributor Reliance on Corporate Warehouse for HPWHs, by Capacity**



### A.3.3 Sales

On average, respondents estimated that 18% of their total annual revenues were from residential water heaters and that 5% of their residential water heater revenues were from HPWHs (Figure 20). This indicates that not only are HPWHs generally a small contributor to water heater revenues, they are a particularly small portion of total revenues for many distributors. One distributor was an outlier, reporting that 35% of their residential water heater sales were from HPWHs. This distributor had one customer who used HPWHs in all their new construction projects. Excluding the outlying distributor, the average share of residential water heater sales resulting from HPWHs drops from 5% to 3%.

**Figure 20: Water Heater Share of Total Revenues**



NMR asked distributors to name the manufacturers with the largest shares of HPWH sales in the Northwest, not just at their own companies. AO Smith, Rheem/Ruud, and Bradford White each received 29% of mentions. AO Smith and Rheem/Ruud were the most likely to be the first manufacturer mentioned by respondents.

## Appendix B Installer Web Survey

NMR conducted a survey with HPWH installers to better understand the circumstances under which HPWHs are recommended to customers, note the barriers to adoption and installation, and size the market for heat pump water heaters. This appendix describes the detailed methodology and findings from that effort.

### B.1 METHODOLOGY

NMR conducted 70 mixed-mode surveys with HPWH installers in the Northwest region. The sample frame comprised emails and phone numbers of installers who were recorded as having participated in a NEEA-led HPWH training through the HWS program. This sample size of 70 is sufficient to achieve 90% confidence and 10% precision for the region. Participants received \$50 Amazon.com gift cards for completing the survey.

While the survey was originally planned as a web-only effort, to achieve the target number of completes, the team shifted to telephone surveys. Ultimately, 53% of respondents completed the survey online, while 47% responded via telephone. Because the sample frame only included 53 installers in Idaho and 20 in Montana, the team conducted additional outreach to maximize the number of respondents in these states. [Table 11](#): shows response rates by state.<sup>22</sup>

**Table 11: Survey Disposition**

State	Eligible Sample Frame	Respondents Active in Each State*	Response Rate
Washington	311	30	10%
Oregon	284	27	10%
Idaho	55	12	22%
Montana	36	7	19%
<b>Total</b>	<b>686</b>	<b>70*</b>	<b>10%</b>

\* State-level counts do not sum to 70 as six installers worked in more than one state.

More than half of respondents (57%) recalled having participated in a NEEA training themselves. That figure rises to 61% when including those who recalled that they *or someone else* in their company had attended training. Three in ten respondents (30%) did not recall anyone at their company, including themselves, having attended training. This could be because the person who attended the training had left the company, or because the survey request was redirected to someone other than the original trainee. Because the sample frame consisted of installers that participated in HWS training, we refer to installers as “HWS-trained installers” throughout to clarify that results are not generalizable to water heater installers in general. Given their experience with

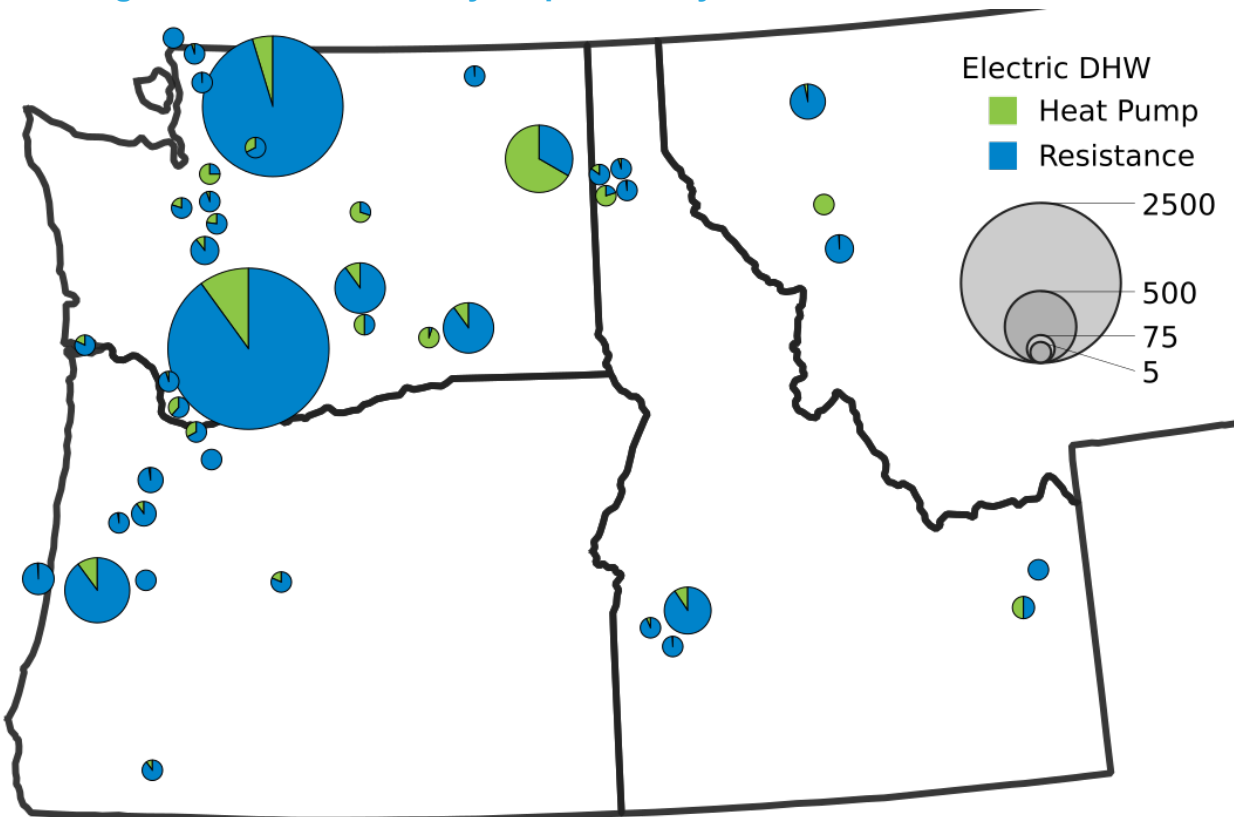
<sup>22</sup> Three installers worked in both Oregon and Washington, two installers worked in both Idaho and Washington, and one worked in both Idaho and Oregon.

HWS trainings, the team expects that these respondents may be more accepting of HPWHs than those who have not. Throughout the report, the team further clarifies where the “recall” question has been used to compare results by those respondents who recalled participating in trainings and those who did not.

All figures and tables are unweighted unless specified. For weighted market sizing questions, responses are weighted by the number of HPWHs reported to be installed by each company in 2018. The team estimated the number of HPWHs by multiplying the number of residential electric storage water heaters installed in 2018 by the percent that were HPWH.

Figure 21 plots the company headquarters of each of the installer respondents, showing their relative annual electric water heater sales, and the portion of those sales that were HPWHs, as described in Appendix B.5.

**Figure 21: Installer Survey Disposition by Electric Water Heater Sales**

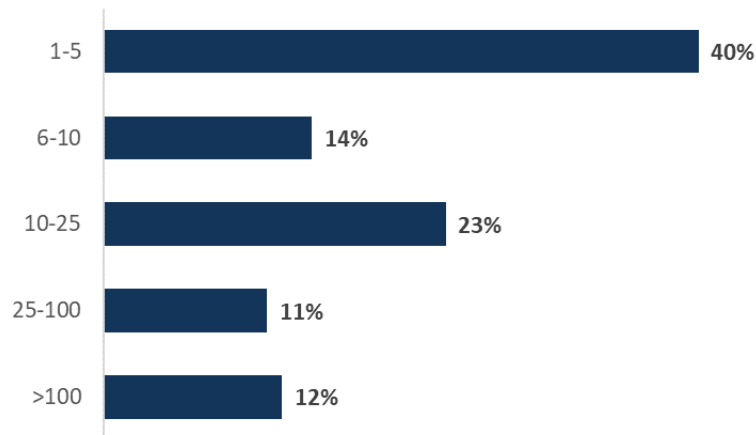


## B.2 FIRMOGRAPHICS

### B.2.1 Company Size

More than half (54%) of HWS-trained installers worked at companies that employed ten or fewer people (Figure 22), and 10% of respondents reported being the only employee at their company (i.e., self-employed).

**Figure 22: Number of Employees at Installer Company**  
(n=70)



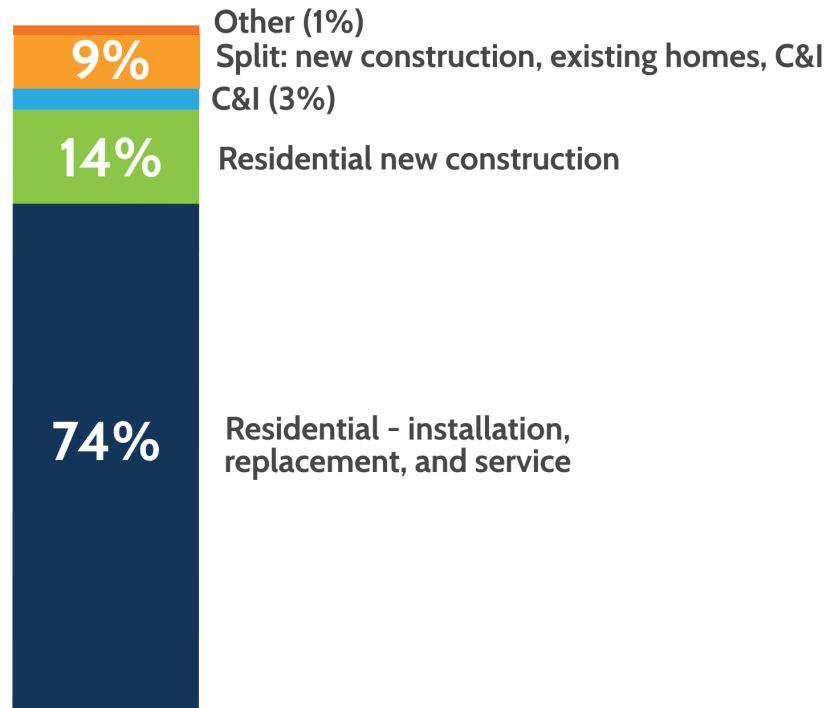
### B.2.2 Company Market Segment

Three-quarters of respondents' companies were primarily engaged in installation, service, and replacement of water heaters in existing homes (74%), followed by installation of systems in new construction (14%, Figure 23).<sup>23</sup> Respondents who do commercial work were directed to answer the survey based solely on their residential work.

<sup>23</sup> "Other" comprises one company that performs solar installations incorporating HPWHs for residential, commercial, and municipal customers.

**Figure 23: Company's Main Line of Business**

(n=70)

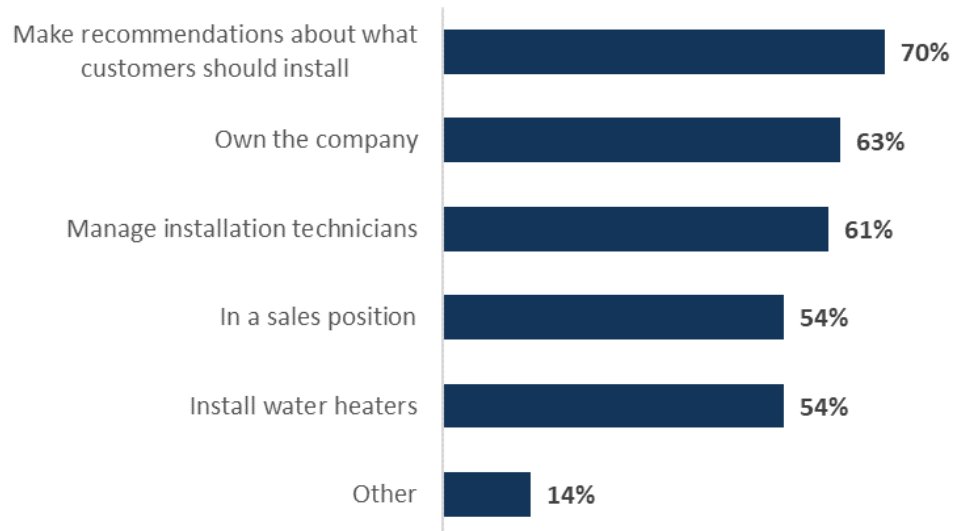


### B.2.3 Respondent Responsibilities

Respondents described their various roles at their companies. When given a list of options, most respondents reported having more than one responsibility. More than two-thirds (70%) made recommendations about what customers should install and more than half (54%) installed water heaters. Almost two-thirds (63%) also owned the company (Figure 24).<sup>24</sup>

<sup>24</sup> "Other" indicates respondents who also served as a general manager or department head (10%), office or administrative manager (3%), or marketing representative (1%).

**Figure 24: Most Common Respondent Role(s) at Company**  
(n=70)



### B.3 INSTALLER COMPENSATION

Distributors interviewed in this MPER suggested that the compensation structure of installation companies drives their technicians' equipment recommendations; the survey with HWS-trained installers sought to better understand this dynamic.

When asked how their company typically sells water heaters to homeowners, 59% said that their technicians or installers develop estimates for customers, while almost one-third (29%) said they rely on their dedicated sales team. Only 30% of respondents' companies pay commission to installation technicians; about half of companies with salespeople pay them commission. It seems likely that this would limit technicians' motivation to upsell customers to more efficient equipment (Table 12:).

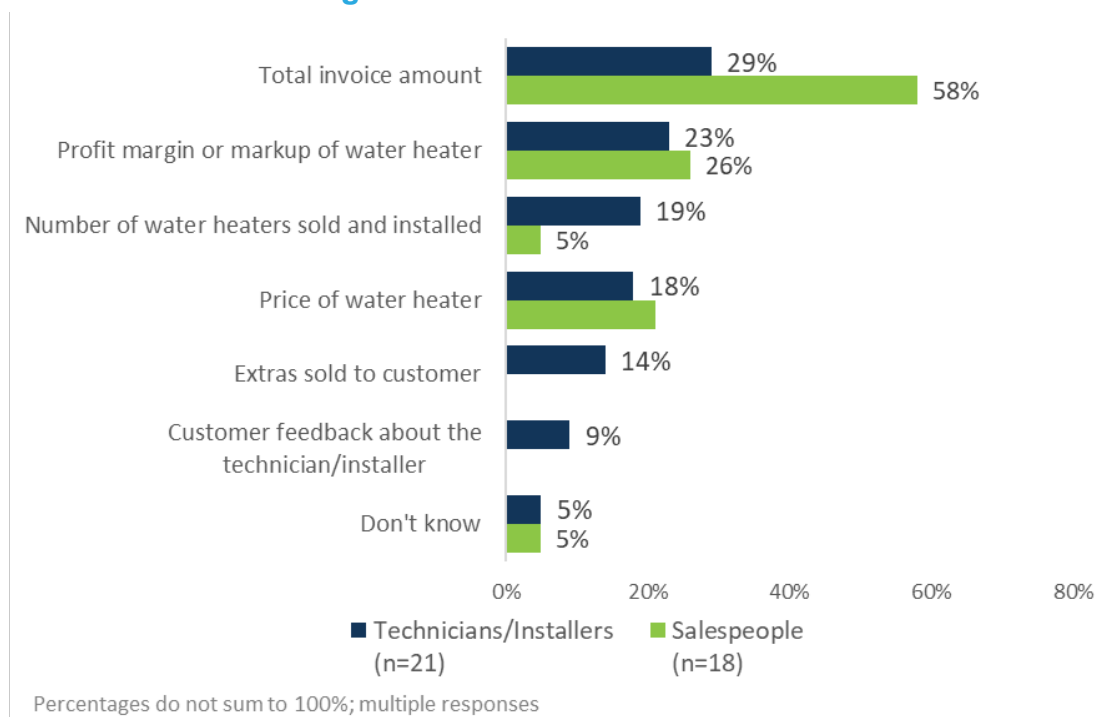
**Table 12: Compensation Structure**

Compensation Type	Technicians/Installers (n=70)	Salespeople (n=40)
Hourly pay, no commission	56%	20%
Hourly pay plus commission	27%	8%
Salary, no commission	7%	25%
Salary plus commission	3%	38%
Commission only	--	3%
Don't know	3%	8%

Respondents whose companies paid commission indicated that this is most commonly based on the total invoice amount (which could include installation), profit margin or mark-up for a given water heater, or water heater price (Figure 25).

Commission for salespeople is most likely to be based on total invoice amount (58%), while a broader array of factors contribute to technician commission. These include the number of units sold (19%), extras sold to the customer (14%), or customer feedback (9%). Of technicians who receive commission, a majority (70%) receive commission based on price in some way (total invoice amount, profit margin or markup, price). As HPWHs are more costly to buy and install than other varieties of residential water heaters, a structure based on price should favor the technology.

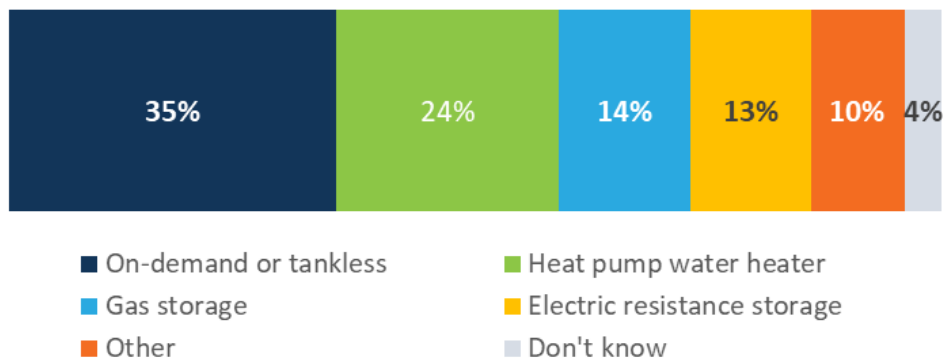
**Figure 25: Commission Structure**



NMR asked HWS-trained installers which type of water heater was most profitable to install (Figure 26). Respondents most often reported that on-demand or tankless water heaters were the most profitable to install (35%), followed by heat pump water heaters (24%).

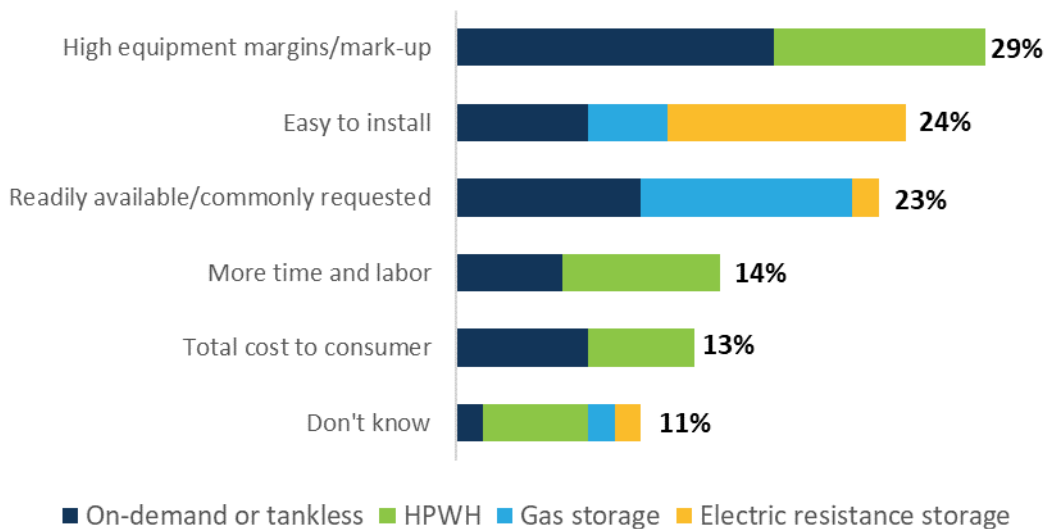


**Figure 26: Most Profitable Water Heaters to Install**  
(n=70)



When HWS-trained installers were asked why the water heater type they named was the most profitable for their company, high equipment margins or mark-up was the most common reason offered (29%), followed by ease of installation (24%) and availability of the water heater (23%) (Figure 27). Installers who said HPWHs were the most profitable to install cited high equipment margins or mark-up and increased time and labor. Tankless water heaters also shared these profitability features, while being readily available and easy to install.

**Figure 27: Most Profitable Water Heaters – Reasons**  
(n=70)



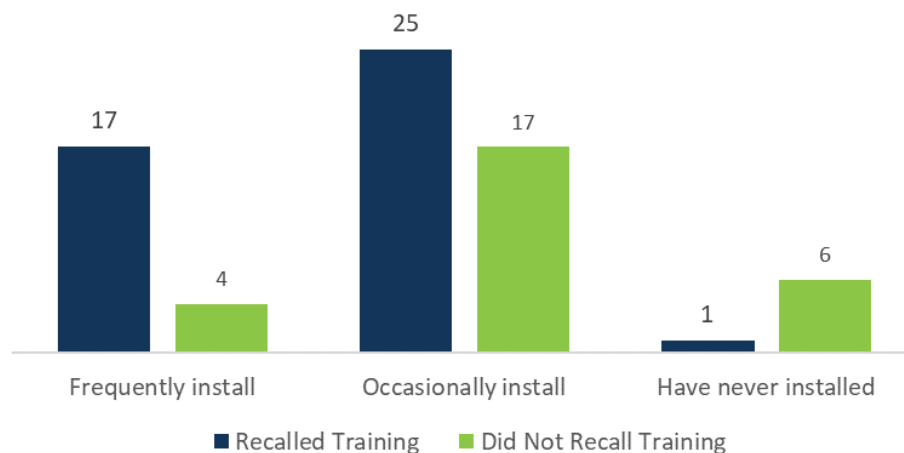
## B.4 DRIVERS AND BARRIERS TO INSTALLING HPWHs

### B.4.1 Installer Experience with HPWHs

As part of assessing MPI 1a, *trained installers report higher confidence in and awareness of HPWHs*, NMR asked surveyed installers about their level of familiarity with residential electric heat pump water heaters. Nearly one-third (30%) said that they were very experienced with HPWHs, working with them “regularly or frequently,” while 60% had limited experience, working with them “rarely or occasionally.” Only 10% had never installed a HPWH. [Figure 28](#) breaks down this finding by the respondents’ recall of HWS training participation.<sup>25</sup> While the sample size for each group was too small to test for statistical differences between subgroups, respondents who recalled someone at their company participating in a HWS training appear to install HPWHs much more often than those who do not recall any such HWS training participation.

**Figure 28: Experience Installing HPWHs**

(n=70)



### B.4.2 Installer Opinions about HPWHs

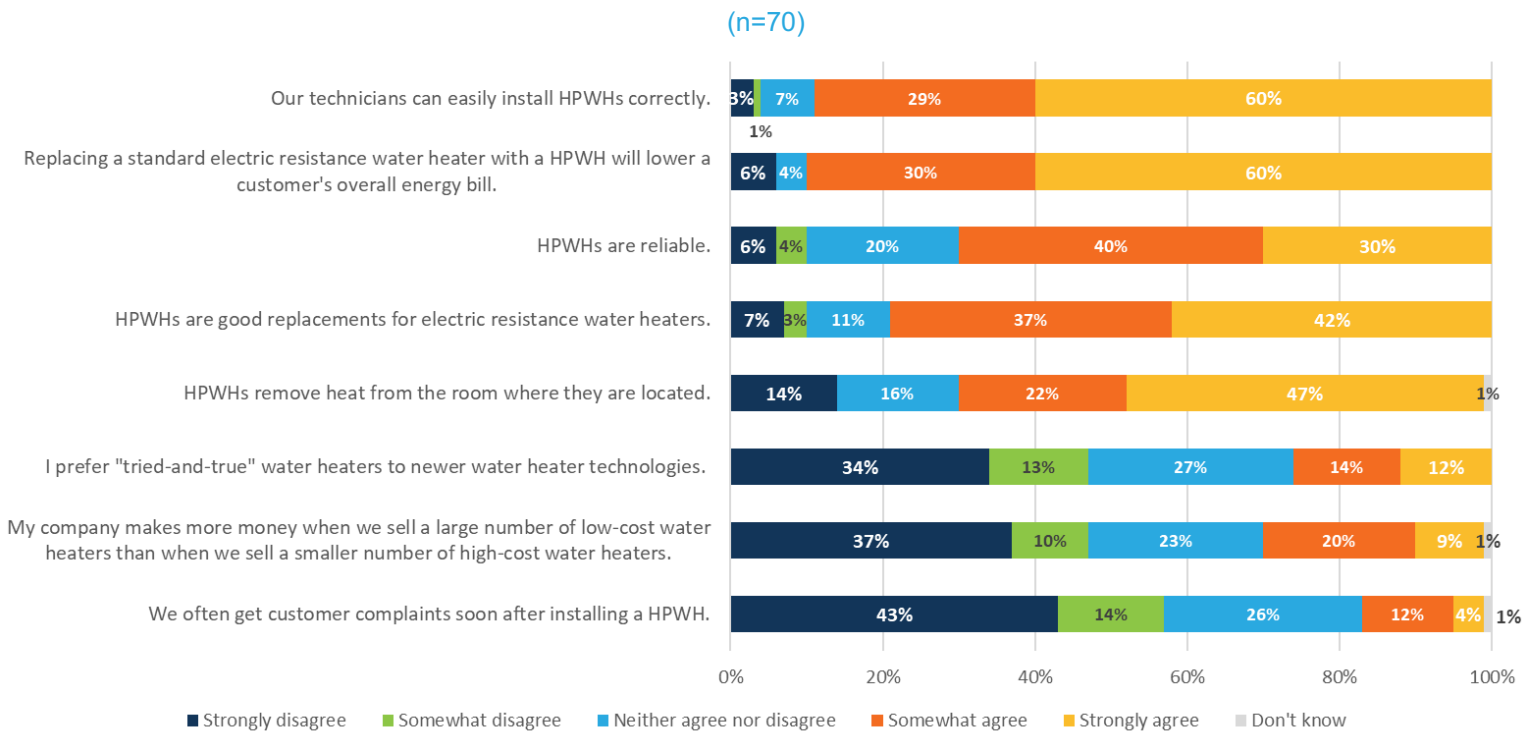
[Figure 29](#) shows the extent to which respondents agreed or disagreed with various statements about the value proposition and performance of HPWHs (MPI 1.a). Overall, the HWS-trained installers reported that they are comfortable installing HPWHs and view the technology as reliable and efficient.

- Nine in ten respondents agreed with the following statements:
  - Their technicians can easily install HPWHs correctly (89%)
  - Replacing an electric resistance water heater with a HPWH will lower a customer’s energy bill (90%)

<sup>25</sup> Small sample sizes; not tested for statistical significance. Based on self-reported recollection of training.

- Nearly eight in ten (79%) consider HPWHs good replacements for electric resistance water heaters.
- Seven in ten (70%) agreed that HPWHs are reliable.
- Sixteen percent reported that they often receive customer complaints about HPWHs.
- Sixty-nine percent of respondents correctly agreed with the statement that HPWHs remove heat from the room where they are located, indicating a strong level of understanding of how the technology works.<sup>26</sup>

Figure 29: Attitudes about HPWHs

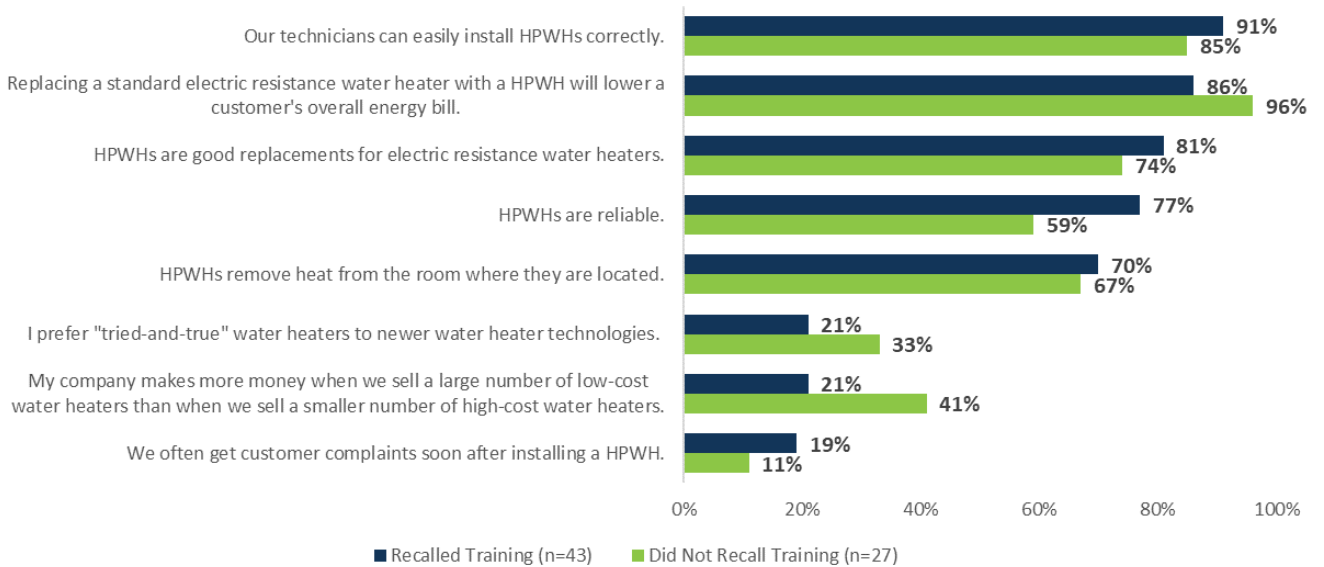


NMR compared agreement with these statements between installers who recalled that someone at their company had participated in HWS trainings and those who did not recall any participation – as a reminder, all of these respondents were recruited from NEEA’s HWS trainee lists. Figure 30 shows the proportion of respondents who “strongly” or “somewhat” agreed, based on their training recall. While the number of respondents who recall training is too small to test for statistical significance, the results suggest that the installers who do not recall HWS training were less likely to view HPWHs as reliable: 59% as opposed to 77% for the installers who recalled the training. Additionally, installers who do not recall training prefer “tried-and-true” water heaters to newer technologies (33%) at greater rates than installers who recall the HWS training (21%). The installers who did not recall training were also much more likely to agree to the statement “my

<sup>26</sup> The remainder could have misunderstood how the technology works, or they might also have been envisioning installation scenarios (such as the use of duct work) to minimize this effect.

company makes more money when we sell a large number of low-cost water heaters than when we sell a smaller number of high-cost water heaters” (41% and 21%, respectively).

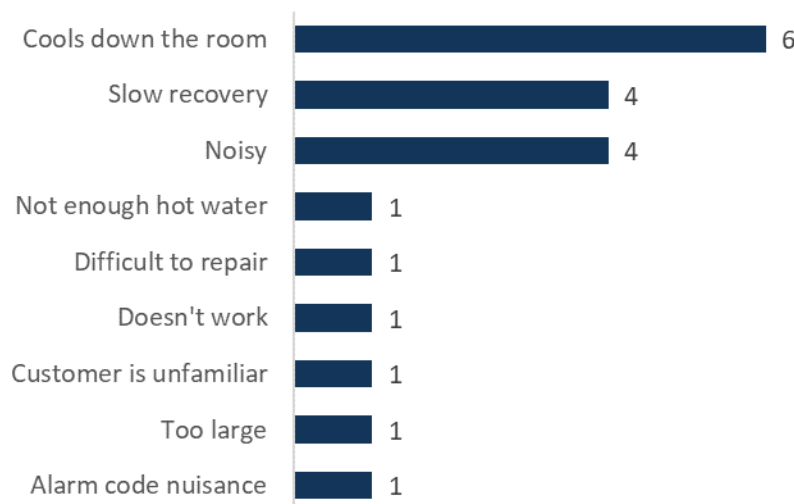
**Figure 30: Agreement with Statements about HPWHs**



### B.4.3 Customer Complaints

The 11 respondents who agreed that they “are likely to get customer complaints or service requests soon after installing a heat pump water heater” reported the following complaints: HPWHs cool down the room (6), they have a slow recovery time (4), and produce too much noise (4) (Figure 31).

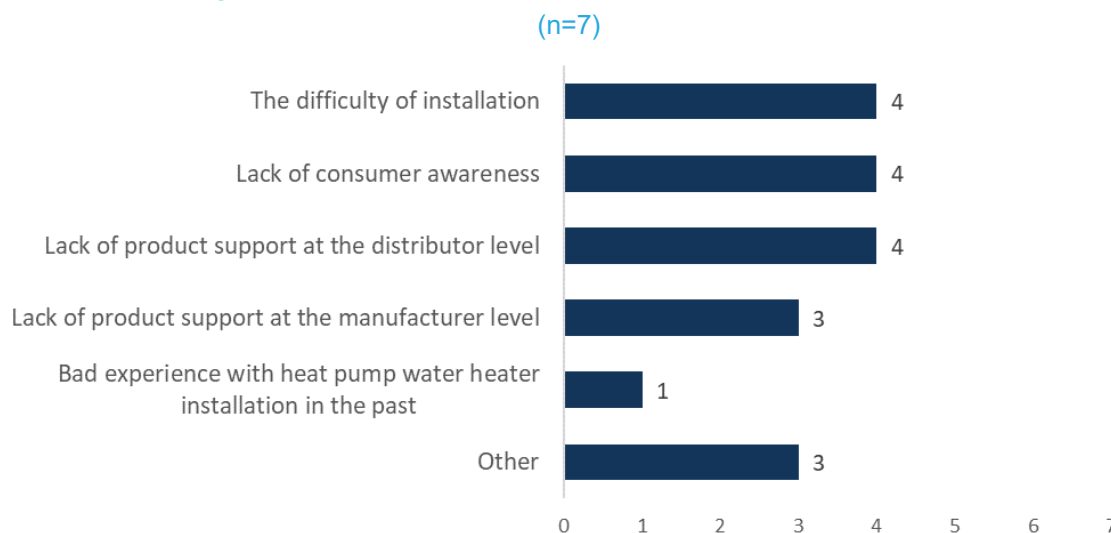
**Figure 31: Customer Complaints about Heat Pump Water Heaters**  
(n=11; Multiple responses accepted)



#### B.4.4 HPWHs as Replacements for Electric Resistance Tanks

The seven surveyed installers who disagreed with the statement “heat pump water heaters are good replacements for traditional electric resistance water heaters” most frequently reported that this was due to installation challenges (4), lack of consumer awareness (4), and lack of support for HPWHs from distributors (4). “Other” responses included technical issues (noise, poor performance, and cooling down the room in which they are located) (Figure 32). (This question is part of MPI 1a).

**Figure 32: Why HWS-Trained Installers Do Not Think HPWHs Are A Good Replacement For Electric Resistance Water Heaters**



#### B.4.5 Challenging Installation Scenarios

HPWH installation requirements can make them challenging to install in certain retrofit scenarios. Therefore, the survey asked, “excluding newly-built homes that are not yet occupied, what proportion of the homes that you visit do you find can readily accommodate a heat pump water heater?” Respondents indicated that half of all homes they visit (51%) could readily accommodate a HPWH, on average.

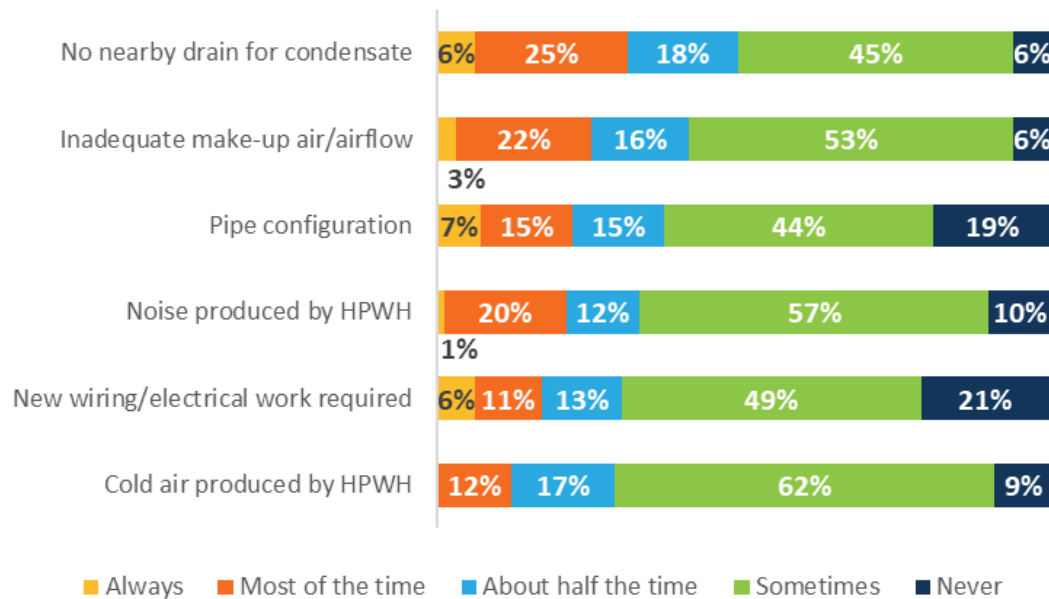
The survey also presented the HWS-trained installers with specific challenging installation scenarios provided by NEEA, and asked them how they face these challenges. For each installation challenge, between one-third (29%) and almost one-half (49%) of installers reported experiencing it at least half of the time they install a HPWH. These high rates of installation challenges could temper installers’ inclination to recommend the technology to customers. They are also somewhat at odds with HWS-trained installers’ high rate of agreement with the statement, “our technicians can easily install HPWHs correctly” (Figure 29).

The most common installation challenge reported was the lack of a nearby drain for condensate, with nearly half of respondents (49%) encountering this challenge on at least half of their installations. Nearly one-third reported that they encounter issues with inadequate make-up air or airflow at least half the time (31%), or found cold air produced by the HPWH to be a challenge (29%). Inadequate make-up air or airflow would require installers undertake a potentially complex

workaround to ensure that the water heater has access to enough make-up air (such as installing ducting, louvers, or changing the installation location). See Figure 33 for additional details (MPI 1a).

**Figure 33: Installation Challenges**

(n=70)



## B.5 HEAT PUMP WATER HEATER SALES

On average, HWS-trained installers reported that one-fifth (20%) of their electric water heater sales (as measured by installations) in 2018 were heat pump models (MPI 1.e). When weighted by the number of electric resistance storage water heaters that respondents said each company installed in 2018, the result is that 13% of all electric resistance storage water heaters installed by these companies in 2018 were HPWHs. Three-quarters of respondents (75%) reported that their company installed at least one HPWH in 2018. Surveyed installers reported that their companies each installed an average of 101 residential electric storage water heaters (including HPWHs) in 2018 (MPI 1.b), with a range of zero to 2,500,<sup>27</sup> and a median of 14.

NMR looked for relationships between installations and a number of other variables. Conceivably the number of employees and number of electric resistance storage water heaters installed in 2018 could be related to the number of HPWH installations, but both relationships were weak ( $r=0.27$  and  $r=0.22$ , respectively). Respondents whose company's main line of work is installing equipment in new construction ( $n=9$ ) reported installing an average of 34 HPWHs in 2018 – three times higher than the average of the 53 respondents whose company's main line of work is

<sup>27</sup> It is possible the installer that reported installing zero electric hot water heaters might exclusively work with another fuel type. Other survey responses from this respondent indicate that the company does install water heaters, so we did not exclude this respondent.

installing, replacing, or servicing equipment in existing homes or commercial or industrial facilities (11 HPWHs).

The data suggest that how installers' companies typically sell water heaters may affect HPWHs sales. Installers that reported having a dedicated salesperson or sales team installed an average of 22 HPWHs in 2018 – twice the average number installed by installers that reported their companies' technicians or installers develop estimates and serve as the sales team (11). Installers using a dedicated salesperson or sales team tend to work for larger firms (57 employees on average, compared 22 employees).

**Table 13: Installer Company Size by Typical Sales Structure**

	Dedicated sales person or sales team	Technicians or installers develop estimates and/or serve on a sales team
	<i>n=20</i>	<i>n=41</i>
Average # of HPWHs installed in 2018	22	11
Average # of employees	57	22

The data also suggest that commission structure may affect HPWH sales. Respondents who report that their salespeople and/or technicians are compensated through a commission structure reported installing an average of 17 HPWHs in 2018 (*n=27*), compared to an average of 11 HPWHs installed in 2018 at companies where salespeople and/or technicians do not receive commission (*n=44*).

**Table 14: HPWH Installations by Installer Commission Structure**

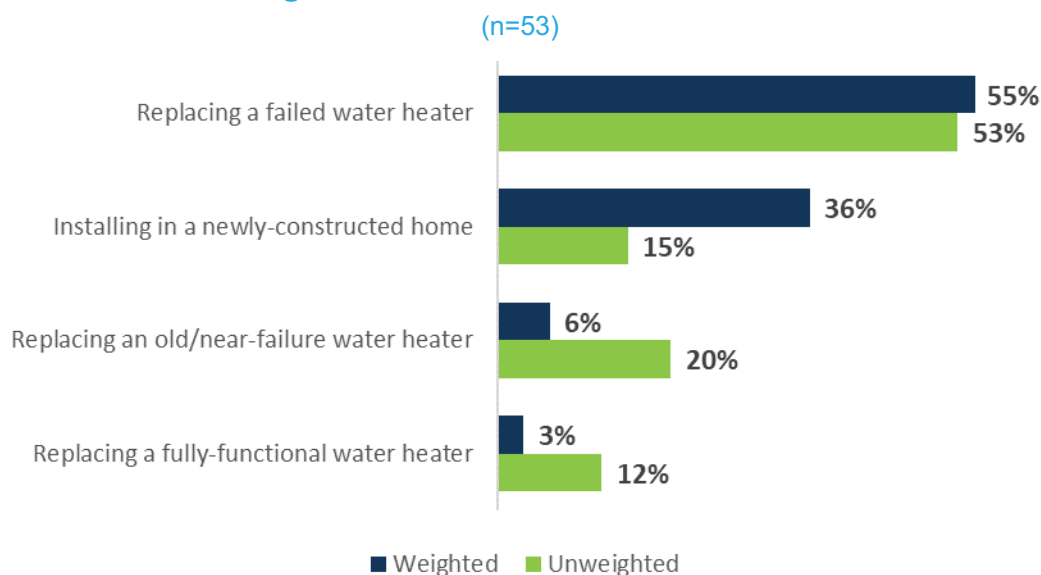
	Salespeople and/or technicians are compensated through a commission structure	Salespeople and technicians do not receive commission
	<i>n=27</i>	<i>n=44</i>
Average # of HPWHs installed in 2018	17	11

HWS-trained installers estimated that more than half (53%) of the HPWHs installed by their respective companies in 2018 replaced a failed water heater (Figure 34, MPI 1.b), one in five (20%) replaced an old or near-failure water heater, and 15% were installed in new construction.<sup>28</sup> When weighted by the relative number of HPWHs each respondent estimated to have installed, the proportion of HPWHs installed as replacements for old/near-failure water heaters and fully-functional water heaters decreased to 6% and 3%, respectively. The proportion of HPWHs installed in emergency replacement scenarios (53%) is higher than reported by the purchaser

<sup>28</sup> Not shown in figure.

survey in MPER #4 (10%).<sup>29</sup> In interviews, distributors suggested that HPWHs are primarily installed in new construction. Only 19% of the installers contacted via the mystery shopping task recommended HPWH to replace a fully failed system. Since the installers surveyed were from a sample frame of HWS training participants, they may be more likely to recommend HPWHs in failure scenarios than other water heater installers.

**Figure 34: HPWHs Installed in 2018**



### B.5.1 Replacement Strategies for Large Capacity Water Heaters

In 2015, federal standards raised the minimum efficiency requirements of large residential electric water heaters (i.e., more than 55 gallons). This was expected to push the market toward the adoption of HPWHs as the standards are well above the efficiency values of standard electric resistance tanks. Respondents estimated that 55% of all HPWHs their companies installed in 2018 were greater than 55 gallons (MPI 2 and MPI 3.a). However, HWS-trained installers also commonly reported using workarounds to avoid installing HPWHs in place of large electric resistance tanks. Only 40% of surveyed installers said that a HPWH was their typical replacement for a large electric resistance tank. Common workarounds included installing a small electric resistance tank (21% of installers), installing a commercial electric resistance tank not subject to the federal standard (10%), installing two small electric resistance tanks (7%), or using old stock and doing a like-for-like replacement (4%)<sup>30</sup> (Table 15).

Other one-off strategies included boosting the temperature of a smaller electric resistance tank and adding a mixing valve to mimic the output of a larger tank set at a lower temperature, switching to a tankless water heater, and switching to a solar water heater.

<sup>29</sup> Respondents to the purchaser survey who had purchased a HPWH for an existing home, said that they purchased a HPWH for an emergency replacement 22% of the time. When factoring in the share of HPWHs that went to new construction, this represents 10% of the total HPWH market.

<sup>30</sup> Distributor interviews confirmed that there is still some availability of large, residential electric resistance water heaters that pre-date this standard.



**Table 15: Replacement Strategies for Large Capacity Electric Water Heaters**

n=68

Replacement	Percent
Replace with a HPWH	40%
Replace with a single, smaller residential electric resistance storage water heater	21%
Replace with a single, large commercial electric resistance storage water heater	10%
Replace with two smaller electric resistance storage water heaters	7%
Replace “like for like”/same size	4%
Switch to gas water heater	3%
Other	3%
It depends/don't know	12%

To help understand why fewer than half of HWS-trained installers said that a HPWH was their typical replacement for a large electric resistance tank (i.e., they typically adhere to the federal replacement standard), NMR compared the responses to key questions of the 40% of surveyed installers who said that a HPWH was their typical replacement for a large electric resistance tank against those who did not say this. Because of the small numbers in each group, these are reported as counts rather than percentages, and NMR did not test for statistically significant differences between groups.

Respondents who did not remember that they or anyone from their firm participated in HWS training appear to be less likely to say that replacing a large capacity (>55 gallons) electric resistance storage water heater with a HPWH is their typical replacement strategy (Table 16).

**Table 16: Adherence to Federal Replacement Standards by Recollection of Participation in HWS Training**

	Recall Training	Do Not Recall Training
	<i>n (%)</i>	
Typically install HPWH to replace large electric resistance tank (n=27)	20 (74%)	7 (26%)
Typically install other type of water heater to replace large electric resistance tank (n=43)	23 (53%)	20 (47%)

Table 17 suggests that profitability drives replacement strategy for about half of HWS-trained installers. Given this, NEEA may want to consider encouraging utilities to provide an incentive to installers or their companies.

**Table 17: Adherence to Federal Replacement Standards by Profitability**

	HPWH	Electric resistance	Gas storage	On-demand/ tankless	Other/ Don't Know
	n (%)				
Typically install HPWH to replace large electric resistance tank (n=27)	12 (44%)	3 (11%)	2 (7%)	6 (22%)	4 (15%)
Typically install other type of water heater to replace large electric resistance tank (n=43)	5 (12%)	6 (14%)	8 (19%)	18 (42%)	6 (14%)

Familiarity with HPWHs does not necessarily result in regular adherence to federal replacement standards. MPER #3 speculated that stocking of HPWHs at the branch level “is potentially driven by installer comfort with HPWH.” [Table 18](#) shows adherence to federal replacement standards by familiarity with HPWHs, as measured by the frequency with which HWS-trained installers say they work with them. As the table indicates, a high level of familiarity with HPWHs does not appear to make much difference to installers' likelihood of saying that replacing a large capacity electric resistance storage water heater with a HPWH is their typical replacement strategy.

**Table 18: Adherence to Federal Replacement Standards by Familiarity with HPWHs**

	Worked with them regularly or frequently	Worked with them rarely or occasionally	Heard of them but never worked with them	Haven't heard of them
	n (%)			
Typically install HPWH to replace large electric resistance tank (n=27)	11 (41%)	15 (56%)	1 (4%)	0 (0%)
Typically install other type of water heater to replace large electric resistance tank (n=43)	10 (23%)	27 (63%)	5 (12%)	1 (2%)

How the company sells water heaters to homeowners appears *not* to be related to adherence to federal replacement standards ([Table 19](#)).

**Table 19: Adherence to Federal Replacement Standards by Sales Strategy**

	Sales team	Technicians/installers or other
	<i>n (%)</i>	
Typically install HPWH to replace large electric resistance tank (n=27)	8 (30%)	19 (70%)
Typically install other type of water heater to replace large electric resistance tank (n=43)	14 (33%)	29 (67%)

NMR also looked for signs of relationships between adherence to federal replacement standards and HWS-trained installer attitudes toward HPWHs. This analysis involved comparing the two groups by the number who “somewhat” or “strongly” agreed and the number who “somewhat” or “strongly” disagreed. As [Table 20](#) shows, for only two statements are the differences between groups that seem large enough to be meaningful. First, those who typically adhere to the federal standard appear to agree at higher rates than those who do not that “HPWHs are a good replacement for electric resistance storage water heaters,” and at lower rates with the statement “We often get customer complaints or service requests soon after installing a heat pump water heater.”

**Table 20: Adherence to Federal Replacement Standards by Attitudes Toward HPWHs**

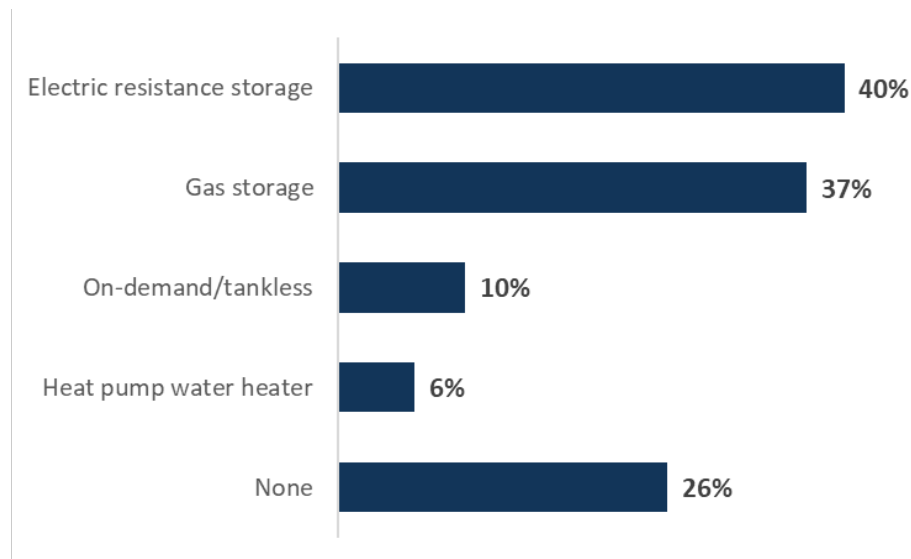
	Somewhat or Strongly Agree		Somewhat or Strongly Disagree	
	<i>Typically install HPWH to replace large electric resistance tank (n=27)</i>	<i>Typically install other type of water heater to replace large electric resistance tank (n=43)</i>	<i>Typically install HPWH to replace large electric resistance tank (n=27)</i>	<i>Typically install other type of water heater to replace large electric resistance tank (n=43)</i>
I prefer “tried-and-true” water heaters to newer water heater technologies.	5 (19%)	13 (30%)	16 (59%)	17 (40%)
Heat pump water heaters are reliable.	23 (85%)	26 (60%)	2 (7%)	5 (12%)
HPWHs are a good replacement for electric resistance storage water heaters.	26 (96%)	29 (67%)	1 (4%)	6 (14%)
My company’s installation technicians can easily install heat pump water heaters correctly.	26 (96%)	36 (84%)	1 (4%)	2 (5%)
We often get customer complaints or service requests soon after installing a heat pump water heater.	3 (11%)	8 (19%)	21 (78%)	19 (44%)
Heat pump water heaters remove heat from the room where they are located.	21 (78%)	27 (63%)	3 (11%)	7 (16%)
Replacing a standard electric resistance water heater with a heat pump water heater will lower a customer’s overall energy bill.	26 (96%)	37 (86%)	1 (4%)	3 (7%)
My company makes more money when we sell a larger number of low-cost water heaters than when we sell a smaller number of high-cost water heaters.	6 (22%)	14 (35%)	14 (52%)	19 (44%)

### B.5.2 Water Heaters Kept in Stock

Figure 35 shows that the most common type of water heater respondents reported keeping on hand were electric resistance storage water heaters (40%), followed closely by gas storage water heaters (37%). Only 6% of the surveyed installers reported keeping HPWHs on hand. One-quarter of respondents (26%) reported keeping no water heaters on hand.

**Figure 35: Types of Water Heaters Kept in Stock**

(n=70)



## B.6 HPWH RECOMMENDATIONS AND CUSTOMER UPTAKE

**Recommendation rates.** The team gave the HWS-trained installers a series of scenarios and, for each scenario, asked them, “what percent of the time would you recommend heat pump water heaters to a customer?”

Respondents were most likely to recommend installing HPWHs in new construction (57%) and least likely when replacing a fully functioning water heater (42%). Respondents were likely to recommend a HPWH to replace systems that had failed or were near failure a little over half the time (55 and 53%, respectively). (Table 21, MPI 1.d).

**Table 21: Rate of HPWH Recommendations**

Scenario	Mean	Median
<i>Percent of time you would recommend installing a HPWH in the following situation</i>		
New construction (n=61)	57%	75%
Replacing a failed water heater (n=68)	55%	50%
Replacing an old/near-failure water heater (n=68)	53%	50%
Replacing a fully functioning water heater (n=66)	42%	30%

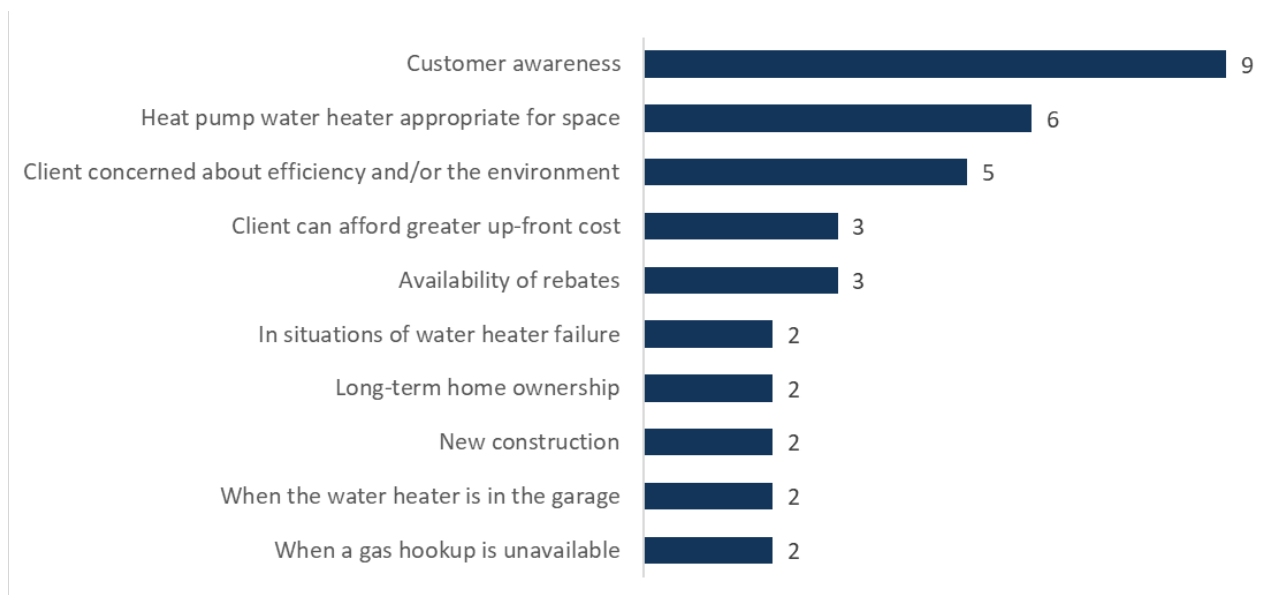
**Customer acceptance of recommendations.** For each of four scenarios (replacing a fully-functioning water heater, replacing an old/near-failure water heater, replacing a completely failed water heater, and installing one in a new), respondents described what percentage of the time customers agree to install a HPWH when they have recommended one. Respondents said that new construction customers (i.e., builders or contractors) were the most likely to go forward with the recommendation (44% of the time), followed by customers replacing failed or near-failure systems (33 and 32%, respectively) and customers replacing functioning water heaters (28%) (Table 22).

**Table 22: Customer Acceptance of HPWH Recommendations**

Scenario	Mean	Median
<i>When you make a recommendation to install a HPWH, how often does the customer go forward with the installation?</i>		
Replacing a fully functioning water heater (n=51)	28%	20%
Replacing an old/near-failure water heater (n=57)	32%	20%
Replacing a failed water heater (n=57)	33%	20%
Installation in new construction (n=41)	44%	35%

When asked in which situations customers were more likely to accept the installer's recommendation to install a HPWH (open-ended question format), respondents most often cited cases where the customer was already aware of HPWHs (n=9). Scenarios where the space was appropriate for a HPWH (n=5), and scenarios where clients were concerned about efficiency or the environment (n=5) were also commonly mentioned (Figure 36).<sup>31</sup>

**Figure 36: Reasons Customers Accept Installer's HPWH Recommendation**  
(n=34; Multiple responses permitted)

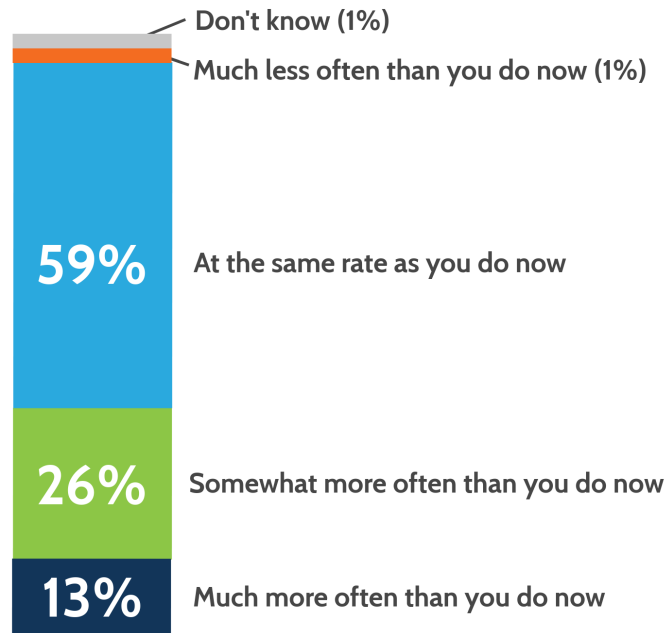


<sup>31</sup> This question was only asked of web survey respondents (n=39).

**Future trends.** That vast majority of HWS-trained installers anticipated that the rate at which they recommend HPWHs would remain steady (59%) or increase (39%) over the next two years (Figure 37, MPI 1.b). Only 1% indicated they expected to recommend HPWHs less often.

**Figure 37: HPWH Recommendations in Two Years**

(n=70)



HWS-trained installers who anticipated no change in the frequency at which they recommend HPWHs explained that they already recommend them as often as they can, or that other factors limit the growth of this market, including performance, cost, client needs, or lack of qualified technicians (Table 23).

**Table 23: Reasons for Expected Rate of HPWH Recommendation**  
(n=70)

<b>At the same rate we do now</b>	<p><i>Reasons for selecting this response:</i></p> <ul style="list-style-type: none"> <li>• Already recommending as often as possible (11)</li> </ul> <p><i>Factors limiting recommendation rates:</i></p> <ul style="list-style-type: none"> <li>• Depends on customer needs and/or location of unit (9)*</li> <li>• Concerns about performance (5)</li> <li>• Depends on customer budget (4)*</li> <li>• HPWHs not a company priority (4)</li> <li>• Lack of qualified service techs/training in the area (3)*</li> <li>• Don't know (4)</li> </ul>
<b>Somewhat/much more often than you do now</b>	<p><i>Reasons for selecting this response:</i></p> <ul style="list-style-type: none"> <li>• The technology is improving (5)</li> <li>• Customer awareness/interest in “green” products (4)</li> <li>• Installers gaining experience with HPWHs (4)</li> <li>• Price is dropping/rebates are available (2)</li> <li>• They benefit customers (2)</li> <li>• Survey reminded respondent about HPWHs (2)</li> <li>• HPWHs becoming easier to install (1)</li> </ul> <p><i>Factors limiting recommendation rates:</i></p> <ul style="list-style-type: none"> <li>• Depends on customer budget (2)*</li> <li>• Depends on customer needs and/or location of unit (2)*</li> <li>• Lack of qualified service techs/training in the area (2)*</li> </ul>

\*Limiting factors common to both groups.

Eleven respondents that plan to recommend HPWHs “at the same rate as they do now” over the next two years emphasized that they make recommendations based on customer needs and/or the suitability of HPWHs for the space.

However, some HWS-trained installers who plan to recommend HPWHs “at the same rate as they do now” are not recommending HPWHs to customers often, if at all. When asked why, one respondent said, “I don’t want to deal with any problems.” Another respondent observed that customers increasingly switch to or choose gas water heaters over electric ones. They noted that if that trend continues, they anticipate recommending HPWHs less often.

Surveyed installers who responded that they would install HPWHs “somewhat” or “much more often than they do now” most commonly cited improvements in HPWH technology (5). One respondent said, “improved reliability and major brands and retailers lend credibility to this technology.”

Lack of qualified service technicians or training for installation technicians in the area were cited as factors limiting recommendations by surveyed installers who planned to recommend HPWHs “at the same rate as they do now” (3) and by those who planned to recommend HPWHs “somewhat” or “much more often than they do now” (2). Respondents from multiple states, including Washington, Oregon, and Idaho, identified this as an issue.



### B.6.1 Additional Feedback

When the team asked whether they had anything else to add, two-thirds of the HWS-trained installers (66%) responded with advice or anecdotes. Some respondents who have HPWHs in their own home were more likely to recommend them, but others reported mixed experiences:

- “I have [a HPWH] and love it. My wife dislikes how long it takes to recover, [so] I am install[ing] a larger capacity [model].”
- “I have one in my house and it has been a great investment. Rebates were good when I purchased and the efficiency is great. The noise of the unit has been an issue but we are use[d] to it at this point.”

Other respondents reiterated concerns about HPWHs:

- “I know [HPWHs are] probably a good thing, [but] I am so busy I don’t want to deal with any problems [that] the water heater might have.”
- “Just a challenge with condensate and [the HPWH] putting out cooler air than it brings in, and the cost is twice as much than a standard.”
- “Not convinced they save energy.”
- “I have not seen savings worth the hassle [when I install] heat pump water heaters.”

Some respondents offered perspectives on the market and suggestions to improve the uptake of HPWHs:

- “A few years back... it seemed like they were really being marketed by the BPA on down in an effort to reduce energy consumption [in Washington]. Our market is the greater Portland metro area. The knowledge has not quite spread here about heat pump water heaters... most of our customers are not interested in what they see as a costly new technology solution. They want something that they know works and will not cost a lot to install.”
- “Once the price point goes down, I think [HPWH] will have greater footing in our market... In Montana, if it’s below zero outside, you have to decide which you want more [–] the highest efficiency or comfortability in the area of the water heater.”
- “I believe they are a good, sound product and I would like to see more efficiency data so we can share the information with the consumers.”
- “Please continue to develop and support a network of qualified service personnel to maintain and repair heat pump water heater[s] in the [Northwest].”

## B.7 USE OF CALL-CENTERS

During the mystery shopping effort (see [Appendix C](#)), the team noticed that even during business hours several installation companies used a third-party call center to field initial calls from customers. NMR called 33 installers in Oregon who had not participated in HWS trainings to conduct two mystery shopping conversations and seven of those (mostly in the Portland area) used a HomeAdvisor.com phone service to field initial inquiries during business hours.<sup>32</sup> However, all of the respondents to the installer survey indicated that someone on staff responds to initial customer inquiries; no one reported using a third-party call center during business hours, despite the mystery shopping experience.<sup>33</sup>

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<sup>32</sup> The mystery shopper only included one such conversation in the sample of 16 completes.

<sup>33</sup> One respondent is a general contractor that does not field inquiries about water heaters, but installs heat pump water heaters at his work sites.

## Appendix C Installer Mystery Shopping

This appendix is organized as follows:

1. The data collection methodology for installer mystery shopping.
2. An infographic describing the mystery shopping effort methods and outcomes.
3. A portion of a memo that was presented to NEEA in advance of the first synthesis session in May 2019.

### C.1 METHODOLOGY

In April of 2019, an NMR analyst – a “mystery shopper” – called plumbers in the Northwest and pretended to be a residential customer in the market for a new water heater. The shopper spoke to four companies in each state: two companies that had an employee who had participated in a HWS training and two companies who had no HWS trainees. The shopper completed a total of 16 mystery shopping conversations.<sup>34</sup> Of the companies that had an HWS trainee, there was no guarantee that the shopper was talking to the trainee.

The sample for companies with trainees came from HWS training participant records provided by NEEA. The sample for companies without trainees came from online web-scraping conducted by NMR. The shopper called companies from the sample in a random order until quotas were met for each state, and plotted company locations to ensure that responses were split between rural and urban areas. To satisfy state-level quotas, shoppers called 33 companies without trainees in Oregon – seven of those companies used HomeAdvisor.com as an answering service. Only one of those conversations was included in the mystery shopping sample and results. Overall, shoppers called 120 installers across all four states before achieving 16 complete conversations. Shoppers left messages and a call back number when forwarded to a voice messaging service.

NMR analyzed the flow of the conversation, logging how much prompting was needed for the installer or representative to mention HPWHs. NMR developed prepared responses for questions the installers might ask, with the goal being that the shopper would present the installer with a best-case scenario for a HPWH installation (i.e., the respondent already had a large capacity electric water located in a basement with adequate ceiling height and air volume for a HPWH). Shoppers used the following conversation procedure:

- The shopper first said they needed a new water heater
- If pressed for more details, the shopper identified the system as electric
- If pressed for more details, the shopper then identified the system as storage tank
- If pressed for more details, the shopper then identified system as 65 gallons
- If pressed for more details, the shopper then said the current system was in a large basement

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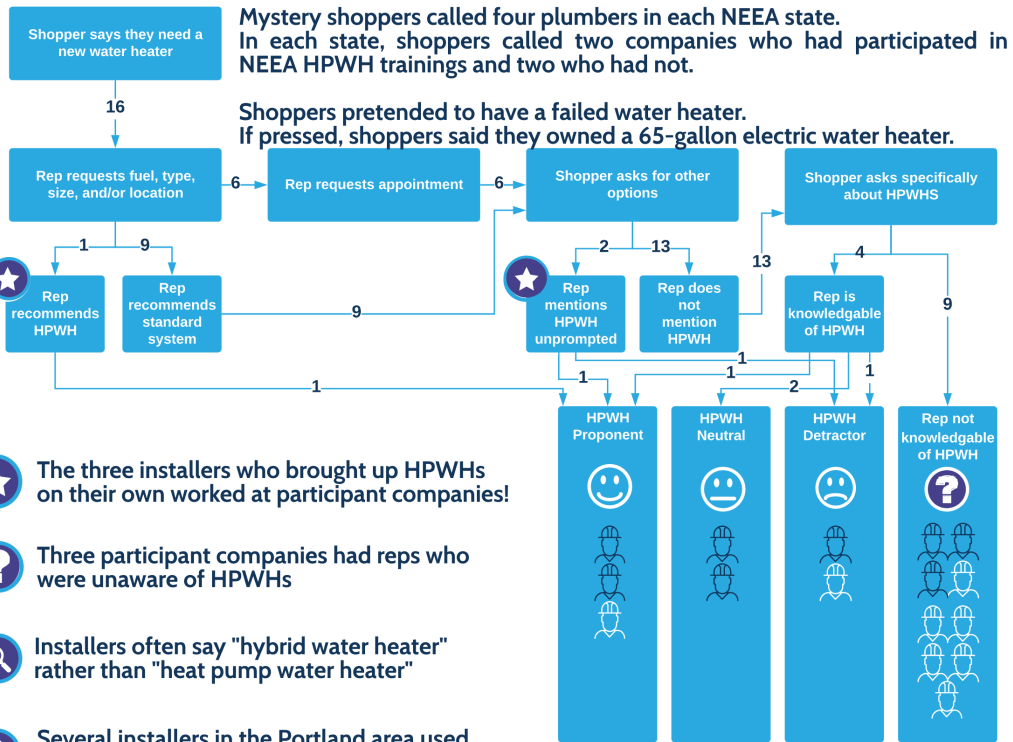
<sup>34</sup> NEEA provided training participant records for the trainee company sample.

- If a recommendation was not provided by this point, the shopper asked for a recommendation
- If HPWH was not mentioned by this point, the shopper asked for “additional options”
- If HPWH was still not mentioned, the shopper asked about HPWHs

C.2 GRAPHIC SUMMARY OF RESULTS



# Mystery Shopping



- ★ The three installers who brought up HPWHs on their own worked at participant companies!
- ❓ Three participant companies had reps who were unaware of HPWHs
- 🔍 Installers often say "hybrid water heater" rather than "heat pump water heater"
- 🔍 Several installers in the Portland area used the same answering service that could not provide recommendations

Companies with a HWS trainee

Companies without a HWS trainee

"You can definitely save money in the long run."

"It's your only option above 50 gallons."

"In the summer, they provide cooling."

"In the winter they are only as efficient as your heating system because they are stealing heat from the air."

"I am not up to date on the rebate but...I don't find the savings to be worth it usually in the end."

"It's like having an outdoor air conditioning fan in your basement. Its loud."

### C.3 DETAILED MYSTERY SHOPPING RESULTS

The remainder of [Appendix C](#) represents an excerpt of a findings memo previously provided to NEEA in advance of the first synthesis session, conducted with NEEA and NMR in May of 2019. The results below were discussed by NMR and NEEA, and they informed the design of the installer survey that was fielded after the mystery shopping effort was concluded.

#### C.3.1 When Installers Brought Up HPWHs

- Only three installers brought up HPWHs before the shopper asked about them
  - All three from participant companies (i.e., companies where someone attended a NEEA HPWH training)
  - Only one (a trainee) recommended a HPWH immediately
  - The other two had to be prompted for “more options” before mentioning HPWHs (one was a proponent, the other a detractor)

#### C.3.2 Installer Knowledge and Opinions about HPWHs

- Nine could not provide information about HPWHs when asked about them
  - Three from companies that had participated in the program
  - Sometimes the shopper could only speak to a scheduler and they would suggest all questions be answered by the plumber during on-site visit
  - Two thought “heat pump water heater” referred to a ground source heat pump used to heat space with an indirect tank; “hybrid water heater” was the preferred term for some installers.
- Installers from participant companies more aware/knowledgeable about HPWHs than those from non-participant companies, but perspectives were mixed
  - Three proponents (two participant, one non-participant)
    - “You definitely save money in the long run”
    - “It’s your only option above 50 gallons”
  - Two neutral (two participants)
    - “In the winter they are only as efficient as your heating system because they are stealing heat from the air, but in the summer they do provide cooling. There are really good things and bad things with heat pumps depending on the circumstance.”
    - “We can do it if you want, it costs \$[AMOUNT]. It’s up to you.”
  - Two detractors (one participant, one non-participant)
    - “Not enough hot water for a large family and it’s like having an outdoor air conditioning fan in your basement. It’s loud.”
    - “I am not up to date on the rebate but I don’t find the savings to be worth it in the end.”

### C.3.3 Other findings of interest

- Installers inclined to replace like-for-like
  - Some ask for model number to quote a similar system and do not talk about other options unless specifically asked
  - Only one mentioned an instantaneous water heater as an option, but did not recommend due to hard water
  - Some installers and plumbers in the Portland area have numbers that are redirected to a HomeAdvisor.com answering service. In these instances, a shopper cannot get substantive information over the phone and must wait for a home visit. Out of 33 calls made to companies without trainees in Oregon, seven used the HomeAdvisor answering service to field initial inquiries during business hours.

## Appendix D HPWH Market Update

To ensure consistent tracking of market progress over time, the team developed updated estimates of the size of the HPWH market in the Northwest region for 2018, following the methodology of MPER #4. The market sizing assessment breaks down HPWH sales by the attributes shown in [Table 24](#) and compares the results to those from MPER #4.

**Table 24: Attributes Included in Market Sizing Update**

Attribute
State
Home type: <ul style="list-style-type: none"> <li>• new construction vs. existing homes</li> <li>• Code-built new construction vs. above-code new construction</li> </ul>
Supply channel (retail vs. distributor)
Utility incentive status (incentivized vs. non-incentivized)
Replacement type (emergency vs. planned)
Tank size ( $\leq 55$ or $> 55$ gallons)

### D.1 METHODOLOGY

The market update relied on raw data from NEEA, completed analyses provided by NEEA, secondary data sources, the purchaser survey from MPER #4, and additional primary data collected as a part of this fifth MPER.

The team uses the term HPWH “market share” to represent the percentage of the electric water heater market that HPWHs comprise. “Market size” is an estimate of the number of HPWHs installed in a given year. As with MPER #4, this update assumes that only negligible quantities of residential HPWHs are installed outside of single-family homes. This assumption is supported by the lack of HPWHs in multifamily homes in the 2016-2017 RBSA.

The data used for the market update reflect unit sales in some cases (e.g., from manufacturers and distributors) and installations in others (e.g., in the case of installer self-reports). This MPER follows the practice of past MPERs and assumes that systems are sold and installed in the same year.