

February 9, 2022 REPORT #E22-435

Northwest Heat Pump Water Heater Market Progress Evaluation Report #6

Prepared For NEEA: Anu Teja, Sr. MRE Scientist

Prepared by: Monica Nevius, Director Jared Powell, Senior Project Manager Melissa Meek, Project Manager

NMR Group, Inc. 50-2 Howard Street Somerville, MA 02144

Northwest Energy Efficiency Alliance PHONE 503-688-5400 EMAIL info@neea.org

©2022 Copyright NEEA



Table of Contents

	imary	. 1
Section 1 NEEA's 6th ev Research Obje Methodology	Backgroundaluation of progress in the HPWH market in the Northwest	8 9 10
Section 2	Key Findings	13
Section 3	Other Findings	.34
Appendix A Methodology Findings Visitor Loca Visitor Origi Directory Vi Click-Throug Other Findir	HWS Web Traffic Review	.36 .37 .37 .40 .42 .43 .44
Appendix B	HPWH Market Update	45
Methodology		45
HPWH Marl HPWH Insta Supply Cha Utility Incen Replacemen Tank size HPWH Market New Construc Utility Incentive Supply Chann Tank Size	tet Share by State and Home Type	47 48 48 48 49 49 50 52 53 54
HPWH Marl HPWH Insta Supply Cha Utility Incen Replacemen Tank size HPWH Market New Construc Utility Incentive Supply Chann Tank Size	Retailer Web-Scraping	47 48 48 48 49 49 50 52 53 54 55



Methodology. 60 Graphic Summary of Results 62 Detailed Mystery Shopping Results 63 The Use of Call Centers 63 When Representatives Brought Up HPWHs. 64 Representatives' Knowledge and Opinions about HPWHs 64 Other findings of interest 65 Appendix E Homeowner Awareness Survey 67 Methodology. 67 Methodology. 67 Mater Purchase Factors 69 Awareness and Perceptions of, and Interest in, HPWHs 77 HWS Awareness 89 Attitudes about Technology and the Environment 91 Demographic Characteristics 93 Detailed Results 96 Appendix F Purchaser Survey Mater Heater Purchase Factors 117 Methodology 117 Methodology 117 Methodology 117 Methodology 117 Methodology 119 Water Heater Purchase Factors 112 Installation 132 Service and Repair 138	Appendix D	Mystery Shopping with Retailer-Affiliated Installers	60
Graphic Summary of Results	Methodology		60
Detailed Mystery Shopping Results .63 The Use of Call Centers .63 When Representatives Brought Up HPWHs .64 Representatives' Knowledge and Opinions about HPWHs .64 Other findings of interest .65 Appendix E Homeowner Awareness Survey .67 Methodology .67 Water Heater Purchase Factors .69 Awareness and Perceptions of, and Interest in, HPWHs .77 HWS Awareness .89 Attitudes about Technology and the Environment .91 Denographic Characteristics .93 Detailed Results .96 Appendix F Purchaser Survey .117 Methodology Methodology .117 Awareness and Perceptions .117 Methodology .117 Awareness and Perceptions .119 Water Heater Purchase Factors .122 Installation .132 Service and Repair .138 Satisfaction .142 Attitudes about Technology and the Environment .146 Demographic Characteristics .151 <tr< td=""><td>Graphic Sum</td><td>mary of Results</td><td>62</td></tr<>	Graphic Sum	mary of Results	62
The Use of Call Centers 63 When Representatives Brought Up HPWHs 64 Representatives' Knowledge and Opinions about HPWHs 64 Other findings of interest 65 Appendix E Homeowner Awareness Survey 67 Methodology 67 Water Heater Purchase Factors 69 Awareness and Perceptions of, and Interest in, HPWHs 77 HWS Awareness 89 Attitudes about Technology and the Environment 91 Demographic Characteristics 93 Detailed Results 96 Appendix F Purchaser Survey Methodology 117 Methodology 117 Methodology 117 Methodology 117 Methodology 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 </td <td>Detailed Myst</td> <td>tery Shopping Results</td> <td>63</td>	Detailed Myst	tery Shopping Results	63
When Representatives Brought Up HPWHs .64 Representatives Knowledge and Opinions about HPWHs .64 Other findings of interest .65 Appendix E Homeowner Awareness Survey .67 Methodology .67 Water Heater Purchase Factors .69 Awareness and Perceptions of, and Interest in, HPWHs .77 HWS Awareness .89 Attitudes about Technology and the Environment .91 Demographic Characteristics .93 Detailed Results .96 Appendix F Purchaser Survey Mthodology .117 Methodology .112 Installation .132 Service and Repair .138 Satisfaction .142 Attitudes about Technology and the Environment .146 Demographic Charac	The Use of	Call Centers	63
Representatives' Knowledge and Opinions about HPWHs .64 Other findings of interest .65 Appendix E Homeowner Awareness Survey .67 Methodology .67 Water Heater Purchase Factors .69 Awareness and Perceptions of, and Interest in, HPWHs .77 HWS Awareness .89 Attitudes about Technology and the Environment .91 Demographic Characteristics .93 Detailed Results .96 Appendix F Purchaser Survey Methodology .117 Methodology .117 Methodology .117 Methodology .117 Awareness and Perceptions .119 Water Heater Purchase Factors .122 Installation .132 Service and Repair .138 Satisfaction .142 Attitudes about Technology and the Environment .146 Demographic Characteristics .151 Detailed Results .154 Appendix G Additional MPI Measurements .203 Review of Qualified Products List .205 .225	When Rep	resentatives Brought Up HPWHs	64
Other findings of interest 65 Appendix E Homeowner Awareness Survey 67 Methodology 67 Water Heater Purchase Factors 69 Awareness and Perceptions of, and Interest in, HPWHs 77 HWS Awareness 89 Attitudes about Technology and the Environment 91 Demographic Characteristics 93 Detailed Results 96 Appendix F Purchaser Survey Methodology 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Review of Qualified Products List 205 CEE HPWH Survey 205 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Additional MPI Measurements 207<	Representa	atives' Knowledge and Opinions about HPWHs	64
Appendix E Homeowner Awareness Survey	Other findir	ngs of interest	65
Methodology. 67 Water Heater Purchase Factors 69 Awareness and Perceptions of, and Interest in, HPWHs 77 HWS Awareness 89 Attitudes about Technology and the Environment 91 Demographic Characteristics 93 Detailed Results 96 Appendix F Purchaser Survey 117 Methodology Awareness and Perceptions 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 1442 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Review of Qualified Products List 205 205 CEE HPWH Survey 205 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 207 Appendix I Survey Instruments 210	Appendix E	Homeowner Awareness Survey	67
Water Heater Purchase Factors 69 Awareness and Perceptions of, and Interest in, HPWHs 77 HWS Awareness 89 Attitudes about Technology and the Environment 91 Demographic Characteristics 93 Detailed Results 96 Appendix F Purchaser Survey 117 Methodology Awareness and Perceptions 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Federal Test Procedure 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Additional MPI Measurements 207 Additional MPI Measurements 207 Appendix I Survey Instruments 201 Purchaser Survey Guide 210 Purchaser Survey	Methodology		67
Awareness and Perceptions of, and Interest in, HPWHs 77 HWS Awareness 89 Attitudes about Technology and the Environment 91 Demographic Characteristics 93 Detailed Results 96 Appendix F Purchaser Survey Methodology 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Federal Test Procedure 203 Review of Qualified Products List 205 205 CEE HPWH Survey 205 Appendix H MPI Measurements 207 Additional MPI Measurements 207 Additional MPI Measurements 207 Appendix I Survey Instruments 201 Purchaser Survey Guide 210 Purchaser Survey Guide 222	Water Heater	Purchase Factors	
HWS Awareness 89 Attitudes about Technology and the Environment 91 Demographic Characteristics 93 Detailed Results 96 Appendix F Purchaser Survey 117 Methodology Awareness and Perceptions 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 144 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Review of Qualified Products List 205 205 CEE HPWH Survey 205 205 Appendix H MPI Measurements 207 Additional MPI Measurements 207 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 210 Purchaser Survey Guide 2210	Awareness a	nd Perceptions of, and Interest in, HPWHs	77
Attitudes about Technology and the Environment 91 Demographic Characteristics 93 Detailed Results 96 Appendix F Purchaser Survey 117 Methodology Methodology 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Review of Qualified Products List 205 205 CEE HPWH Survey 205 205 Appendix I MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 210 Purchaser Survey Guide 222 222	HWS Awaren	ess	
Demographic Characteristics 93 Detailed Results 96 Appendix F Purchaser Survey Methodology 117 Methodology 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Federal Test Procedure 203 Review of Qualified Products List 205 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 205 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 210 Purchaser Survey Guide 2210	Attitudes abo	ut Technology and the Environment	91
Detailed Results 96 Appendix F Purchaser Survey 117 Methodology 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements Review of Qualified Products List 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements 207 Additional MPI Measurements 207 Additional MPI Measurements 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 Purchaser Survey Guide 210	Demographic	Characteristics	
Appendix F Purchaser Survey. 117 Methodology 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements Review of Qualified Products List 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 Purchaser Survey Guide 221	Detailed Resu	ults	
Methodology 117 Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements Review of Qualified Products List 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 Purchaser Survey Guide 222	Appendix F	Purchaser Survey	117
Awareness and Perceptions 119 Water Heater Purchase Factors 122 Installation 132 Service and Repair 138 Satisfaction 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Federal Test Procedure 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 201 Homeowner Survey Guide 210 Purchaser Survey Guide 222	Methodology		
Water Heater Purchase Factors122Installation132Service and Repair138Satisfaction142Attitudes about Technology and the Environment146Demographic Characteristics151Detailed Results154Appendix G Additional MPI Measurements203Federal Test Procedure203Review of Qualified Products List205CEE HPWH Survey205Appendix H MPI Measurements207Additional MPI Measurements207Appendix I Survey Instruments201Homeowner Survey Guide210Purchaser Survey Guide210Purchaser Survey Guide222	Awareness a	nd Perceptions	
Installation132Service and Repair138Satisfaction142Attitudes about Technology and the Environment146Demographic Characteristics151Detailed Results154Appendix GAdditional MPI Measurements203Federal Test Procedure203Review of Qualified Products List205CEE HPWH Survey205Appendix HMPI Measurements Included in MPER #6207Additional MPI Measurements207Appendix ISurvey Instruments210Homeowner Survey Guide210Purchaser Survey Guide222	Water Heater	Purchase Factors	
Service and Repair. 138 Satisfaction. 142 Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Federal Test Procedure 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 Purchaser Survey Guide 222	Installation		
Satisfaction142Attitudes about Technology and the Environment146Demographic Characteristics151Detailed Results154Appendix G Additional MPI Measurements203Federal Test Procedure203Review of Qualified Products List205CEE HPWH Survey205Appendix H MPI Measurements Included in MPER #6207Additional MPI Measurements207Appendix I Survey Instruments210Homeowner Survey Guide210Purchaser Survey Guide222	Service and F	Repair	
Attitudes about Technology and the Environment 146 Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Federal Test Procedure 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 Purchaser Survey Guide 222	Satisfaction		
Demographic Characteristics 151 Detailed Results 154 Appendix G Additional MPI Measurements 203 Federal Test Procedure 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 Purchaser Survey Guide 222	Attitudes abo	ut Technology and the Environment	
Detailed Results 154 Appendix G Additional MPI Measurements 203 Federal Test Procedure 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 207 Homeowner Survey Guide 210 Purchaser Survey Guide 222	Demographic	Characteristics	
Appendix G Additional MPI Measurements 203 Federal Test Procedure 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 207 Purchaser Survey Guide 210 Purchaser Survey Guide 222	Detailed Resu	ults	
Federal Test Procedure 203 Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 207 Homeowner Survey Guide 210 Purchaser Survey Guide 222	Appendix G	Additional MPI Measurements	
Review of Qualified Products List 205 CEE HPWH Survey 205 Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 Purchaser Survey Guide 222	Federal Test	Procedure	
CEE HPWH Survey	Review of Qu	alified Products List	
Appendix H MPI Measurements Included in MPER #6 207 Additional MPI Measurements 207 Appendix I Survey Instruments 210 Homeowner Survey Guide 210 Purchaser Survey Guide 222	CEE HPWH \$	Survey	
Additional MPI Measurements	Appendix H	MPI Measurements Included in MPER #6	
Appendix I Survey Instruments 210 Homeowner Survey Guide 210 Purchaser Survey Guide 222	Additional MF	PI Measurements	
Homeowner Survey Guide	Appendix I	Survey Instruments	
Purchaser Survey Guide	Homeowner S	Survey Guide	
,	Purchaser Su	irvey Guide	



Executive Summary

On behalf of the Northwest Energy Efficiency Alliance (NEEA), NMR Group, Inc. (the team) completed the 6th Market Progress Evaluation Report (MPER) of NEEA's Heat Pump Water Heater (HPWH) Initiative. This Initiative works to push the supply chain to more rapidly adopt HPWHs, close the 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 #6 overarching research objectives:



Provide insight into barriers associated with retailer and consumers, including feedback from retailers, homeowners with electric water heaters, and HPWH purchasers.



Evaluate performance against key market progress indicators (MPIs), with a focus on those that have not been recently measured.



Size the market for HPWHs, following the approach of MPERs #5 and #4.

Key research activities:

- 1. Measure key MPIs
- **2.** Conduct staff interviews
- **3.** Review Hot Water Solutions web traffic
- **4.** Estimate size of HPWH market, for 2019 and 2020
- **5.** Web-scrape retailer sites to determine stocking practices
- 6. Conduct mystery shopping with retailers and affiliated installers
- 7. Survey homeowners with electric water heaters
- 8. Survey HPWH purchasers



Key findings and recommendations:

1

The HPWH market appears to be trending upward, primarily driven by installations in new homes. Installations in existing homes have remained relatively flat for the past few years. However, preliminary data from 2020 indicates a much smaller portion of 2020 installations may have received utility incentives than in the past, a positive signal that customers may install HPWHs even without utility subsidies.

The estimated market share of HPWHs (MPI 3a)¹ shows signs of growth in 2019 and 2020, the period covered in the market update portion of this study. In single-family homes in the Northwest, HPWHs represented about 10.2% of electric water heater installations in 2019 and 11.6% in 2020, up from 7.7% in 2018 (MPER #5) and 8.5% in 2017 (MPER #4). About 65% of HPWH installations in 2020 went into new homes, with the remainder in existing homes. Among new homes with electric water heaters, 59% were HPWHs, while HPWHs represented only about 5% of electric water heaters installed in existing homes. Note that trends based on 2020 data should be interpreted with caution, since the manufacturer data provided to NEEA and the MPER #6 team did not include all HPWH manufacturers. This meant that market estimates relied on various assumptions that were developed with NEEA's input.

Related recommendation. NEEA's HPWH Initiative and its logic model focus on HPWH adoption in existing homes, not in the new construction sector. However, HVAC contractors and plumbers who work in new homes usually also work in existing homes.² NEEA may consider seeking out successful HPWH installers active in new construction to identify the extent to which their HPWH installation work bleeds into their retrofit work, and how other contractors might learn from their experience with HPWHs.

Related recommendation. NEEA should continue its effort to gather full shipment data from all HPWH manufacturers. Gathering this information is critical for assessing market progress.

Retailers represent an important portion of the HPWH market, particularly for emergency replacements. Evidence suggests they are poised to increase their role in emergency replacement installations.

Retailers represent about 19% of the HPWH market, and the purchaser survey indicates that over three-quarters of respondents who purchased HPWHs for emergency replacement bought them at retail stores. This suggests that retailers have an outsized impact on the emergency

¹ Notations such as this can be found throughout the report. They identify measurements of MPIs from the logic model for NEEA's HPWH Initiative. Appendix H provides a full list of the MPIs measured in MPER #6, along with the results of each measurement.

² MPER #5 included a survey with HPWH installers; a majority of them described what they recommended in various existing home and new construction scenarios, indicating they work in both market segments.



and existing homes market. Additionally, an internal analysis of preliminary 2020 data performed by NEEA suggests that the retail share of the HPWH market may have increased to as much as 29% in 2020, further emphasizing the importance of retailers in helping to drive HPWH adoption.

Web-scraping confirmed that major retailers not only carry but also stock HPWHs in rural and urban areas. HPWHs represent about 4% of available electric water heaters offered by retailers (MPI 2) and about 8% of their in-stock units (MPI 1e).

Although major retailers do stock HPWHs at many of their locations, the retailers and their affiliated installers almost exclusively recommended electric resistance water heaters to mystery shoppers describing an emergency replacement scenario, even if the representative spoke favorably of HPWHs (MPI 1d).

Related recommendation. Continue to focus on developing relationships with retail partners to promote HPWHs to consumers. One goal of this effort should be to increase prioritizing HPWH models in online product listings relative to electric resistance models. Another should be increasing the consistency with which retailers stock HPWHs across their stores, as some stores had none in stock, while others had over 20% of their electric stock in HPWHs.

Related recommendation. Call centers processing installation inquiries represent a key leverage point for the retail side of the HPWH supply chain. NEEA should continue to work with retailers and their affiliated installer partners to shift their recommendation practices toward HPWHs. This would likely entail focused partnerships with retailers to learn more about the talking points they use in different scenarios and to identify opportunities for companies' incentive structures to better support HPWHs (or at least not present a barrier to them). Understanding the barriers to recommending HPWHs to electric water heater customers and designing an intervention to overcome them are important for reaching potential HPWH purchasers in the emergency replacement market. Retailers' representatives have clearly been trained about HPWHs and have positive things to say about them, which indicates an openness to promoting the equipment.

Related recommendation. The mystery shopper in MPER #6 targeted retailers and their affiliated installers, while MPER #5 included mystery shopping with traditional installers. In both cases, the mystery shopper described an emergency replacement scenario and saw low HPWH recommendation rates. Future NEEA research could investigate the shopping experience for planned replacement customers to see if real-world recommendations are substantially different for planned and emergency replacement customers. This research could identify additional opportunities to change recommendation practices by customer segment.



Related recommendation. To help capture more of the DIY emergency replacement market, NEEA should encourage retailer partners to provide information and instructions in-store and online about how to install a HPWH.

3 ··· Homeowner awareness of HPWHs has doubled since 2016.

In 2021, more than half of surveyed homeowners in the Northwest (57%) said they were aware of HPWHs (MPI 9), with the highest awareness levels in urban areas, Washington, and Oregon (60%, 62%, and 59%, respectively).

Related recommendation. NEEA should look for ways to increase HPWH awareness in rural areas, and in Montana and Idaho generally. Targeted advertisements and utility messaging are effective strategies to increase HPWH awareness. As HPWH adoption increases in these areas, word-of-mouth referrals can then help boost awareness and further adoption.

Related recommendation. NEEA should work with partners to continue to encourage installers to simply make the recommendation for a HPWH, given that many homeowners are likely to accept a recommendation. As seen in MPER #5, the likelihood of accepting the recommendation was highly correlated with a customer's previous pre-existing awareness of HPWHs. Now that awareness has grown substantially, there may be more opportunities for near-term market progress.

Related recommendation. In future surveys studying HPWH awareness, NMR recommends including an awareness verification question to verify that respondents who said they were familiar with HPWHs were not mistakenly thinking about another type of water heater. While surveys in MPER #1, MPER #2, and MPER #6 did not take this approach, NMR developed a survey method to calculate a correction factor for future survey efforts, and tested this approach in August 2021 in a survey conducted for another study. The results corroborated the high estimates of HPWH awareness that NMR found in this study.

Purchasers of HPWHs cite energy efficiency as a primary driver of their purchase decision. For homeowners without HPWHs, perceived cost and lack of familiarity with the technology are barriers to HPWH adoption.

Nearly nine in ten (87%) surveyed HPWH purchasers agreed that "Energy efficiency is my primary consideration when choosing mechanical systems for my home," compared to 74% of surveyed homeowners with electric water heaters. Among homeowners who were aware of HPWHs but had not considered buying one, common reasons for not doing so were that they were not familiar enough with HPWHs (21%) or that they were expensive (15%). Similarly, a sizable number of homeowners agreed with the statements, "HPWHs are expensive to install" or "HPWHs are expensive to service or repair" (each 41%). While over three-quarters of homeowners overall (76%) agreed with the statement "HPWHs are very efficient," there were



some differences across states. Notably, respondents in Idaho (46%) and Montana (55%) agreed less often than respondents in Washington (76%) and Oregon (74%) with the statement "HPWHs offer better value than typical electric water heaters."

Related recommendation. NEEA may want to consider further investigating differences in HPWH attitudes and barriers to adoption in different areas of the region in order to more effectively market to areas with lower HPWH adoption.

5 The homeowner awareness survey supports installers' claims from MPER #5 about the rates at which they recommend HPWHs in various scenarios. The survey results indicate that the rate at which installers recommend HPWHs in emergency replacement scenarios still lags behind the rates in other scenarios.

In the survey with homeowners who owned electric water heaters, 31% of surveyed homeowners reported having purchased a water heater in the previous three years. Nearly two-thirds (64%) of these homeowners said their installer or contractor had recommended a HPWH, and the overwhelming majority of this group (88%) had taken the recommendation (i.e., they reported owning a HPWH). Among homeowners who bought a water heater in the past three years, those whose primary motivation was to get a more efficient water heater received by far the highest HPWH recommendation rates from their contractors (93%). Homeowners who bought a new water heater because their previous one had failed or was near-failure said they received a HPWH recommendation over 60% of the time.

Other barriers to HPWH recommendation and installation include cost, availability, and installation location. While some of this information was available about the HPWHs installed by purchaser survey respondents, similar questions were not asked of self-reported HPWH purchasers in the homeowner awareness survey.

Related recommendation. The purchaser survey, while valuable, offers insights only into the purchase and installation experience of customers who received a rebate from their utility. Thirteen percent of respondents to the homeowner awareness survey self-reported owning a HPWH. To understand the experience of HPWH purchasers more broadly, the next MPER homeowner awareness survey should ask respondents who have a HPWH additional details about the purchase and installation of the HPWH, including where it was installed, who installed it, and whether they received a rebate or tax credit. The upcoming RBSA may also provide an opportunity to gather some of this information.

6 ···· Social media and online engagement strategies have been successful at increasing awareness of Hot Water Solutions and HPWHs among the target audience. There are opportunities to further increase the target audience's engagement with the Hot Water Solutions website.



Social media and online channels play a strong role in HWS and HPWH awareness, though word-of-mouth remains important. HWS awareness has increased since 2016, from 4% to 19%. Traffic to HWS from visitors in the Northwest has increased since 2019 but represents a small share of total visitors. YouTube videos and utility referral links drive the majority of traffic from the Northwest, while non-Northwest traffic comes primarily from search engines. That said, not all Northwest utilities link to the HWS site.

HWS also provides helpful installer and retailer directories to help consumers purchase HPWHs. Around four out of ten visitors to the installer directory click-through to installer sites, and around five out of ten visitors to the HWS retailer directory click-through to retailer websites. Additionally, visitors on mobile devices tend to have low site engagement, though they represent three-fifths of visitors. The HWS site also includes references to federal and state tax credits for HPWHs, but purchasers report low uptake.

Related recommendation. YouTube videos offer an effective means of reaching the target population in the Northwest – be it through partner organizations or via social media – but these visitors may require customized calls to action for NEEA to fully benefit from this traffic.

Related recommendation. Consider adding a mobile phone-optimized version of the website to retain phone users. This could be as simple as a custom style sheet for small screens.

Related recommendation. NEEA should work with utilities to ensure that as many utilities as possible in the Northwest direct their customers to the HWS site to learn more about the benefits of HPWHs and to help them identify relevant installers and retailers. NEEA should also consider interviews with utility partners as a part of the next MPER to assess opportunities for additional partnerships and for moving the HPWH market forward.

Related recommendation. Encourage utilities to include information about HWS in bill inserts and prominently link to the HWS website in digital communications.

Related recommendation. NEEA should use search engine optimization to increase traffic to the Hot Water Solutions website by engaging potential purchasers searching for water heaters.

Related recommendation. NEEA should enable the referral goals in Google Analytics to permit finer-grained analysis of click-through rates in the future. This will allow analysis of traffic from the date the goals are enabled onward.

Related recommendation. HWS could make information about the federal and state tax credits appear more prominently on the website. NEEA could make additional efforts to encourage utilities, contractors, and retailers to highlight the tax credits as well as incentives, sharing information about them at the point of sale or when they estimate installation costs.



7 Purchasers are highly satisfied with their HPWHs and are very likely to recommend them to friends and family.

Nine out of ten HPWH purchasers reported being "very" or "somewhat" satisfied with their HPWH (n=419, MPI 4a). The same percentage reported that they have recommended or would recommend HPWHs to others (MPI 4b), a sign of strong consumer satisfaction.

8 — Purchasers indicated their systems were reliable.

Only 5% of surveyed purchasers had contacted a professional to service or repair their HPWH, and only 4% were dissatisfied with their unit's maintenance requirements.



Section 1 Background

NEEA's 6th 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 to achieve the following:

- A more stringent federal standard for electric water heaters, essentially requiring heat pump technology for 45+ gallon electric models by 2023.
- Increased supply, demand, and market adoption of HPWHs, particularly those that meet the Advanced Water Heater Specification (AWHS) for use in cold climates.
- Reduced barriers to HPWH adoption, such as the following:
 - High upfront cost
 - o Low product availability
 - Lack of awareness/confidence from end-users and installers

Market Progress Evaluation Report (MPER) #6. 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. To help measure progress in the market, the NEEA HPWH Initiative uses a logic model to guide its work. The logic model methodically describes how NEEA's activities can lead to specific short, medium, and long-term market outcomes. NEEA reviews the logic model annually to ensure it remains up to date. The logic model also includes market progress indicators (MPIs) that represent metrics by which progress toward those outcomes can be measured.



By conducting periodic assessments of the HPWH market, NEEA follows evaluation best practices for achieving and documenting change in a complex market. 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 residential 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. Accordingly, MPER #6 follows and builds upon methodological approaches established in previous MPERs to allow for consistent comparisons of market progress across time. The research goals of each MPER vary depending on NEEA's immediate research needs and how much time has passed since a given market progress indicator has been measured. NEEA does not measure every market progress indicator within each MPER, and each MPER is tailored to the current state of the market.

Research Objectives

The purpose of MPER #6 is to help NEEA assess progress in the HPWH market and explore selected key barriers to increased market uptake. While MPER #5 focused on barriers associated with distributors and installers, MPER #6 focused on the retail and consumer side of the market. This MPER has three overarching research objectives:



Provide insight into barriers associated with the retail and consumer side of the market, including retailers themselves, the general population of homeowners with electric water heaters (the target consumer market), and households that had purchased HPWHs.



Evaluate performance against key market progress indicators (MPIs), with a focus on those that have not been recently measured.



Size the market for HPWHs, following the approach of MPERs #5 and #4.



Methodology

The team undertook a variety of research tasks to address the research objectives. More detail about the methodology of each research task can be found in the respective appendices. All survey guides can be found in Appendix I.

Core Study Tasks



Measure key market progress indicators. The research tasks described below were designed to measure various MPIs included in the NEEA HPWH Initiative's logic model. The MPIs included in this study and their specific measurements are summarized in Appendix H. Topics that represent MPI measures are also identified throughout the report, by MPI number.



Conduct staff interviews. The MPER included two interviews with NEEA staff to launch the study and learn about recent market activity and NEEA activities.

Review web traffic for Hot Water Solutions' installer and retailer directories. Hot Water Solutions (HWS)³ is NEEA's market-facing program that promotes the adoption of HPWHs, develops marketing materials and trainings, and provides modest incentives for distributors to report sales volumes to NEEA. The HWS website provides directories of local HPWH installers⁴ and retailers.⁵ The team reviewed web analytics to assess how visitors use the HWS site, with a focus on the directories. The review assessed the site traffic and user engagement with the directories. This analysis also assessed the rate at which site visitors click through to installers' websites (MPI 1f).⁶



Estimate the size of the HPWH market. The team developed market size estimates for both 2019 and 2020, relying on raw market data and completed analyses provided by NEEA, along with secondary and primary data collected as a part of this MPER. The team compared these results to those of MPERs #4 and #5, which covered 2017 and 2018, respectively. MPER market share updates usually focus on a single year. Given the timing of MPER #6, its market update was able to include two years' worth of data. However, some of the data sets for 2020 lacked data from

³ <u>https://hotwatersolutionsnw.org/</u>

⁴ https://hotwatersolutionsnw.org/installation/find-an-installer

⁵ https://hotwatersolutionsnw.org/retailers

⁶ As MPER #2 recommended that NEEA monitor HWS web traffic, NMR recognizes that this may have been previously reviewed internally by NEEA, separate from the MPER process.



all manufacturers, meaning that 2020 results should be interpreted with caution, as they rely on various assumptions developed with NEEA.

The analysis includes installation estimates by attributes such as state, retail vs. distributor supply channel, emergency vs. non-emergency replacement, and incented vs. non-incented.



Web-scrape retailer sites to determine stocking practices. The team *scraped* the electric water heater listings on the web sites of 21 of the 151 Home Depot and Lowe's branches in the four Northwest states to identify the portion of available listings and in-stock units that were HPWHs. The purpose of this effort was to better understand the extent to which units are readily available for emergency replacements through retailers.



Conduct mystery shopping with retailers and retailer-affiliated installers (n=16). Home Depot and Lowe's offer online portals for customers to request water heater installations, including for emergency replacement. For MPER #6, the team submitted online requests through these portals and conducted follow-up email and phone conversations with retailer representatives to assess how they field these requests, how much prompting it takes for representatives to talk about HPWHs, and what they say about HPWHs.



Survey homeowners with electric water heaters (n=411). The study conducted a web survey with homeowners with electric water heaters, focusing on their awareness of HPWHs and asking about their perspectives on energy efficiency and adopting new technologies. Comparable surveys were most recently completed for MPERs #1 and #2. Throughout the report, the survey is referred to as the *homeowner awareness survey* and respondents as *homeowners*.



Survey HPWH purchasers (n= 419). This MPER included a web survey with HPWH purchasers to measure their satisfaction with them. The MPER compares the results with findings from previous purchaser surveys conducted for MPERs #1, #2, and #4. Throughout the report, the survey is referred to as the *purchaser survey* and respondents as *purchasers*.



Other selected MPI updates. This MPER also measured other selected MPIs, including the following:



- a review of NEEA's work promoting updated federal test procedures for HPWHs to assess the extent to which NEEA's feedback has been incorporated into these federal processes, including an interview with relevant NEEA staff;
- confirmation that the HPWH Qualified Products List contains systems from all major manufacturers in multiple size categories; and
- counts of the number of utilities across the country that support HPWHs, using the most recent CEE HPWH program survey.



Synthesis sessions. NMR and NEEA conducted two synthesis sessions, one on July 19, 2021, and the other on September 27, 2021, to discuss preliminary findings and research needs.

Section 2 Key Findings

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

• The HPWH market appears to be trending upward, primarily driven by installations in new homes. Installations in existing homes have remained relatively flat for the past few years. However, preliminary data from 2020 indicates a much smaller portion of 2020 installations may have received utility incentives than in the past, a positive signal that customers may install HPWHs even without utility subsidies.

While market updates included in HPWH MPERs typically focus on a single year, the MPER #6 market update was able to include market estimates for both 2019 and 2020.



This MPER estimates that HPWHs represented approximately 10.2% of electric water heaters installations in the Northwest in 2019 and 11.6% in 2020 (MPI 3a), up from 7.7% in 2018 (MPER #5) and 8.5% in 2017 (MPER #4, Figure 1).



FIGURE 1: MARKET SHARE OF NW HPWH INSTALLATIONS

Consistent with previous MPER findings, annual HPWH installations in 2019 and 2020 were almost entirely in Oregon and Washington (thousands of installations in each state), with extremely few units installed in Montana and Idaho (fewer than 200 in Idaho and fewer than 30 in Montana). The blue portion of each ring graph in Figure 2 represents the portion of each state's 2020 electric water heater sales that were HPWHs.



FIGURE 2: HPWH MARKET SHARE BY STATE



While the trends do point to increasing market share, minor changes should be interpreted with caution, as full sales data for 2020 was not available from all manufacturers and market estimates rely on an amalgam of values from various sources and should not be considered a definitive measurement of installations.

1.1 The estimated market share of HPWHs in the Northwest grew in both 2019 and 2020, driven entirely by increased installations in Washington and Oregon.

Table 1 compares state-level HPWH market share estimates for 2017 through 2020 from this and previous MPERs. MPER #6 reviewed 2019 and 2020 data, though 2020 figures should be viewed with caution, as previously noted.

TABLE 1: MARKET SHARE OF NW HPWH INSTALLATIONS, BY STATE

2017 (MPER 4)		2018 (MPER 5)			2019 (MPER 6)			2020 (MPER 6)				
State	Electric WH Installs	HPWH Installs	HPWH Market Share									
Total	156,900	13,353	8.5%	151,600	11,693	7.7%	148,700	15,217	10.2%	150,200	17,442	11.6%
WA	87,700	8,734	10.0%	84,100	8,117	9.7%	82,700	9,198	11.1%	83,400	10,543	12.6%
OR	40,200	4,179	10.4%	38,700	3,450	8.9%	37,500	5,831	15.5%	38,300	6,684	17.5%
MT	12,000	71	0.6%	12,000	77	0.6%	11,900	28	0.2%	11,700	32	0.3%
ID	17,000	369	0.2%	16,800	49	0.3%	16,600	160	1.0%	16,800	183	1.1%

Sources: HPWH shipment counts from manufacturers in the Northwest (counts), U.S. Census: 2019-2020 American Community Survey (ACS) and Building Permits Survey, NEEA 2018 Water Heater Market Characterization Report, and 2017 NEEA Residential Building Stock Assessment (RBSA)



1.2 The new construction market for HPWHs appears to be growing steadily, while installations in existing homes have remained relatively flat.

The number of HPWH installations in new homes rose from around 6,000 units in 2018 to around 11,400 in 2020, a sizable increase. In contrast, during this same period, HPWH installations in existing homes remained relatively flat at around 5,500 to 6,000 annual installations (Figure 3).



FIGURE 3: HPWH INSTALLATIONS IN NEW AND EXISTING HOMES



Table 2 compares market share findings from MPER #5 and MPER #6. It provides estimates of the HPWH installations in new construction and existing homes (i.e., retrofit applications), and within the retrofit market, between planned and emergency replacements.⁷ HPWHs have become common in new homes, representing over half (59%) of electric water heater installations in new homes in 2020. HPWH installations in existing homes continue to represent a low percentage of the retrofit market: less than 5% in both 2019 and 2020. The market for electric water heaters in existing homes is about six times larger than that for new homes, but HPWH installations in new homes are increasingly outpacing adoption in the retrofit market, both in terms of market share and installation volumes.

TABLE 2: MARKET SHARE OF HPWH INSTALLATIONS – NEW VS. EXISTING HOMES

	2018 (MPER 5) ⁸				2019 (MPER 6)				2020 (MPER 6)			
Install Type	Electric WH Market	HPWH Installs	Relative Market Share	Overall Market Share	Electric WH Market	HPWH Installs	Relative Market Share	Overall Market Share	Electric WH Market	HPWH Installs	Relative Market Share	Overall Market Share
Total	151,600	11,693	7.7%	7.7%	148,700	15,217	10.2%	10.2%	150,200	17,442	11.6%	11.6%
New	18,800	6,221	33.1%	4.1%	18,300	9,022	49.3%	6.1%	19,200	11,413	59.4%	7.6%
Existing	132,800	5,472	4.1%	3.6%	130,400	6,195	4.8%	4.2%	131,000	6,029	4.6%	4.0%
Planned replacements	83,664	4,268	5.1%	2.8%	82,142	5,692	6.9%	3.8%	82,530	5,902	7.2%	3.96%
Emergency replacements	49,136	1,204	2.5%	0.8%	48,248	503	1.0%	0.3%	48,470	490	1.0%	0.3%

Sources: HPWH shipment counts from manufacturers in the Northwest, NEEA ACE Model results, U.S. Census: 2019-2020 Building Permits Survey, and Q36 "Why did you purchase a new water heater?" from the MPER #6 purchaser survey.

Related recommendation. NEEA's HPWH Initiative and its logic model focus on HPWH adoption in existing homes, not in the new construction sector. However, HVAC contractors and plumbers who work in new homes usually also work in existing homes.⁹ NEEA may consider seeking out successful HPWH installers active in the new construction sector to identify the

⁸ Includes an adjustment to the planned and emergency replacement electric water heater values from MPER #5.

⁷ Emergency replacement can be thought of as "replace-on-failure," where a system is replaced because it has completely failed and provides no hot water, regardless of whether or not a customer considers their situation an "emergency." The MPER #6 surveys also allowed respondents to identify if their water heater installations were true emergency replacements (i.e., completely failed systems), were old and/or not working well, or were fully functional. The latter two categories are grouped with "planned replacements," in line with previous MPER definitions.

⁹ MPER #5 included a survey with HPWH installers; a majority of them described what they recommended in various existing home and new construction scenarios, indicating they work in both market segments.



extent to which their HPWH installation work bleeds into their retrofit work, and how other contractors might learn from their experience with HPWHs.

Related recommendation. NEEA should continue its effort to gather full shipment data from all HPWH manufacturers. Gathering this information is critical for assessing market progress.

1.3 The majority of HPWHs installed in new homes from 2018 on did not receive utility incentives. In the same period, large majorities of HPWHs installed in existing homes received incentives. The percentage of incentivized HPWH retrofits in existing homes dropped in 2020, primarily for HPWHs larger than 55 gallons, but there was no corresponding drop in installations.

From 2018 to 2020, the majority of HPWHs installed in new homes did not receive utility incentives, indicating a strong market for HPWHs in new homes (a trend noted in MPER #5). In contrast, the majority of HPWHs installed in retrofit applications received utility incentives in this period: 81% in 2018, 89% in 2019, and 62% in 2020 (Figure 6).



FIGURE 4: UTILITY INCENTIVES IN NEW VS. EXISTING HOMES

Utility data provided by NEEA show that the drop in incentives issued in 2020 was primarily for HPWHs larger than 55 gallons. In April of 2015, updates to the National Appliance Energy Conservation Act (NAECA) raised the federal minimum efficiency requirements of large-tank residential electric water heaters substantially to efficiency levels that can only be achieved with



heat pump systems.¹⁰ Additional research is needed to determine if utilities have begun to reduce incentives for these large-tank systems, and if so, what effect that may be having on the sale of large systems. Regardless, the number of incentivized units installed in existing homes dropped by 33% from 2019 to 2020, but the total volume dropped by less than 3%. Over one-third of these HPWHs were installed without the benefit of a utility incentive in 2020. This indicates there is substantial interest in these products even without utility subsidies, assuming the 2020 data are reasonably representative of the market despite the challenges associated with these data.

2^{...} Retailers represent an important portion of the HPWH market, particularly for emergency replacements. Evidence suggests they are poised to increase their role in emergency replacement installations.

2.1 Across the Northwest, retailers not only carry but also stock HPWHs in both in rural and urban areas.

Compared to electric resistance water heaters, HPWH models are available for purchase, but not as widely stocked. They represent only about 4% of available electric models (MPI 2) and about 8% of in-stock units (MPI 1e), based on web-scraping a sample of Home Depot and Lowe's electric water heater product listings. These stocking patterns are impacted by the higher incidence of model proliferation among electric resistance units: the 216 unique electric resistance models scraped from these retailers' sites spanned 18 different tank sizes and multiple voltages designed for both the residential and commercial markets, but the nine unique HPWH models included only four tank sizes and voltages designed only for the residential market.

Related recommendation. Continue to focus on developing relationships with retail partners to promote HPWHs to consumers. One goal of this effort should be to increase prioritizing HPWH models in online product listings relative to electric resistance models. Another should be increasing the consistency with which retailers stock HPWHs across their stores, as some stores had none in stock while others had over 20% of their electric stock in HPWHs.

¹⁰ <u>https://www.ecfr.gov/current/title-10/chapter-II/subchapter-D/part-430/subpart-C/section-430.32</u>



2.2 While retailers moved a smaller portion of the HPWHs installed in 2019 than distributors (19% versus 81%), they have an outsized impact on the existing homes market.

The portion of residential HPWHs that moved through retailers in 2019, the most recent year for which this information was available, was 19% (MPI 2), versus 81% (MPI 3a) for wholesale distributors. However, the majority of HPWH installations occur in new homes, a market primarily served by distributors. As a result, retailers play a larger role in the existing homes market than their 19% overall market share would suggest. Additionally, an internal analysis of preliminary 2020 data performed by NEEA suggests that the retail share of the HPWH market may have increased to as much as 29% in 2020, further emphasizing the importance of retailers in helping to drive HPWH adoption.

2.3 Although HPWHs are available in-store for emergency replacement, retailers and their affiliated installers almost exclusively recommended electric resistance water heaters to mystery shoppers who described emergency replacement scenarios, even if the retailers or installers spoke favorably of HPWHs.

A mystery shopper reached out to retailers to request a quote for a new water heater, describing an emergency replacement scenario that was well suited to a HPWH installation. However, the retailers' representatives almost never recommended or even talked about HPWHs. Yet when the mystery shopper asked specifically about HPWHs, the majority of the representatives (10 out of 16) expressed largely positive opinions about HPWHs, even though all but two of them fell short of actually recommending them (MPI 1d). As the entire process from initial inquiry to full quote was conducted online and/or over the phone, representatives were generally unwilling to recommend HPWHs without an installer first going onsite to check for the presence of installation barriers.

Related recommendation. Call centers processing installation inquiries represent a key leverage point for the retail side of the HPWH supply chain. NEEA should continue to work with retailers and their affiliated installer partners to shift their recommendation practices toward HPWHs. This would likely entail focused partnerships with retailers to learn more about the talking points they use in different scenarios and identifying opportunities for companies' incentive structures to better support HPWHs (or at least not present a barrier to them). Understanding the barriers to recommending HPWHs to electric water heater customers and designing an intervention to overcome them are important for reaching potential HPWH purchasers in the emergency replacement market. Retailers' representatives have clearly been trained about HPWHs and have positive things to say about them, which indicates an openness to promoting the equipment.



Related recommendation. The mystery shopper in MPER #6 targeted retailers and their affiliated installers, while MPER #5 included mystery shopping with traditional installers. In both cases, the mystery shopper described an emergency replacement scenario and saw low HPWH recommendation rates. Future NEEA research could investigate the shopping experience for planned replacement customers, to see if real-world recommendations are substantially different for planned and emergency replacement customers. This research could identify additional opportunities to change recommendation practices by customer segment.

2.4 Most HPWH purchases for existing homes continue to be for planned replacements. Retail stores are the main source of HPWHs installed as emergency replacements.

In the survey of homeowners with electric water heaters, one-quarter (26%) of respondents who purchased a new water heater in the previous three years had done so because their old unit had failed completely (an emergency replacement). This is a much higher emergency replacement rate than that of surveyed HPWH purchasers (8%), down from the estimate of 22% among surveyed HPWH purchasers in MPER #4 (MPI 1e). That said, the MPER #6 HPWH purchaser survey allowed respondents to make a more granular assessment of the condition of the water heater they replaced with the HPWH.¹¹ While only 8% of respondents said their old unit had completely failed – a true "emergency replacement" scenario in line with the definitions of past MPERs – a full 35% said that the water heater they replaced was old, in need of repair, or close to failure. This 35% figure likely provides a better estimate of the number of emergency replacement installations, because the decision-making process for customers with units near failure may be more similar to that of the true emergency replacement customers than those customers who replaced systems in good repair.

TABLE 3: HPWH INSTALLATIONS IN EXISTING HOMES – CONDITION OF OLDWATER HEATER

Install Type	2019	9	20	20	
Total	15,21	17	17,442		
Installs in existing homes	6,19	5	6,0	29	
Previous water heater fully functioning (Planned replacements)	3,531	57%	3,437	57%	
Previous water heater near failure (Planned replacements)	2,168	35%	2,110	35%	

¹¹ MPER #5 asked contractors similar questions focused on all of their projects, in contrast to HPWH purchasers in HPWH #6 describing their specific installations.



Previous water heater failed completely	106	8%	182	8%
(Emergency replacements)	490	070	402	070

Sources: HPWH shipment counts from manufacturers in the Northwest and Q36 "*Why did you purchase a new water heater?*" from the MPER #6 purchaser survey.

Over three-quarters of the more than 3,000 HPWHs purchased for emergency replacement in 2020 (81%) were bought at retail stores, based on the results of the HPWH purchaser survey. The purchaser survey results suggest that about two-thirds (64%) of these respondents who purchased a HPWH for emergency replacement at a retail store installed the HPWH themselves.

Figure 5 shows the other types of water heaters that purchasers of HPWHs considered when they made their purchase, comparing those who planned their water heater replacement (planned replacement) with those who had replaced their water heater because of a failure (emergency replacement). Planned-replacement respondents reported having considered purchasing a standard electric storage water heater at a substantially lower rate than emergency-replacement respondents (37% versus 55%).



FIGURE 5: OTHER WATER HEATER OPTIONS HPWH PURCHASERS CONSIDERED

* Statistically different at the 90% confidence level

Homeowners in Oregon and Washington had the highest number of water heaters over ten years old (31% and 22%, respectively). Respondents to the homeowner awareness survey in Oregon and Washington were also significantly more likely than respondents in Idaho and



Montana to say they would purchase a new water heater to save energy, even if it still works, suggesting that the opportunity to replace failed or near-failure inefficient water heaters with HPWHs is greatest in Oregon and Washington.

Related recommendation. To help capture more of the DIY emergency replacement market, NEEA should encourage retailer partners to provide information and instructions in-store and online about how to install a HPWH.

3^{...} Homeowner awareness of HPWHs has doubled since 2016.

3.1 In 2021, more than half of homeowners in the Northwest (57%) said they were aware of HPWHs.

Homeowner awareness of HPWHs doubled in the past five years and is now over 50% (MPI 9). Higher awareness is driven by homeowners in urban areas (60% awareness, compared to 50% in rural areas), as well as in Washington (62%) and Oregon (59%).

Respondents to the homeowner awareness survey of homeowners learned about HPWHs through friends and acquaintances (29%), internet research (25%), and contractors and installers (11%). Survey respondents also frequently learned about HPWHs through utility sources, including utility newsletters (10%), bill inserts (9%) and websites (8%).

The homeowner awareness survey showed a statistically significant increase in the number of homeowners who had heard of any HPWH brands in 2021 (38%), compared to previous MPERs (20% in 2016 and 14% in 2015).

Related recommendation. NEEA should look for ways to increase HPWH awareness in rural areas, and in Montana and Idaho generally. Targeted advertisements and utility messaging are effective strategies to increase HPWH awareness. As HPWH adoption increases in these areas, word-of-mouth referrals can then help boost awareness and further adoption.

Related recommendation. NEEA should work with partners to continue to encourage installers to simply make the recommendation for a HPWH, given that so many homeowners are likely to accept a recommendation. As seen in MPER #5, the likelihood of accepting the recommendation was highly correlated with previous awareness of HPWHs. Now that awareness has grown substantially, there may be more opportunities for near-term market progress.

Related recommendation. In future surveys studying HPWH awareness, NMR recommends including an awareness verification question, to verify that respondents who said they were familiar with HPWHs were not mistakenly thinking about another type of water heater. While



surveys in MPER #1, MPER #2, and MPER #6 did not take this approach, NMR developed a survey method to calculate a correction factor for future survey efforts and tested this approach in August 2021 in a survey conducted for another study while the team also worked on this MPER. The results corroborated the high estimates of HPWH awareness that NMR found in this study.

Purchasers of HPWHs cite energy efficiency as a primary driver of their purchase decision. For homeowners without HPWHs, perceived cost and lack of familiarity with the technology are barriers to HPWH adoption.

Of respondents to the homeowner awareness survey who had purchased a water heater in the previous three years, HPWH purchasers were three times as likely to say they purchased their water heater because they wanted a more energy-efficient unit (41%) than homeowners who had purchased any other type of electric water heater (10%). Nearly nine in ten (87%) HPWH purchasers agreed with the statement that "Energy efficiency is my primary consideration when choosing mechanical systems for my home," compared with 73% of respondents to the homeowner survey who did not own a HPWH. Approximately one-third of respondents (32%) to the homeowner awareness survey who reported purchasing a water heater in the past three years considered a HPWH.

The homeowner awareness survey asked homeowners who were aware of HPWHs whether they had ever considered installing a HPWH. Among those who had *not* considered a HPWH, the most common reason was that their existing equipment worked fine (28%), followed by not being familiar enough with HPWHs (21%). This finding shows that awareness of HPWHs is not necessarily sufficient to trigger a purchase; additional customer engagement is needed to convert homeowners into purchasers. Other respondents cited the cost (15%), and that the HPWH would not fit their space (13%).

When shown a series of statements about HPWHs, respondents to the homeowner awareness survey in Idaho agreed least often with the statement "HPWHs are very efficient," compared to over three-quarters of respondents overall (76%). Respondents in Idaho (46%) and Montana (55%) agreed less often than respondents in Washington (76%) and Oregon (74%) with the statement "HPWHs offer better value than typical electric water heaters."

More than two-fifths of respondents in the homeowner awareness survey agreed with the statements "HPWHs are expensive to install" or "HPWHs are expensive to service or repair"



(each 41%), significantly more than HPWH purchasers (32% and 14%, respectively). Overall, while more than half of the homeowners were aware that HPWHs are eligible for tax credits and discounts from utility companies (58%), awareness of the financial assistance was significantly lower in rural areas (45%) than urban areas (62%). Nine in ten HPWH purchasers who recalled receiving a utility incentive in the purchaser survey said that it was "very" or "somewhat" important in their decision to purchase a HPWH.

Related recommendation. NEEA may want to consider further investigating differences in HPWH attitudes and barriers to adoption in different areas of the region in order to more effectively market to areas with lower HPWH adoption.

5... The homeowner awareness survey supports installers' claims from MPER #5 about the rates at which they recommend HPWHs in various scenarios. The survey results indicate that the rate at which installers recommend HPWHs in emergency replacement scenarios still lags behind the rates in other scenarios.

While the HPWH ownership rate from the homeowner awareness survey (13%)¹² is selfreported, it aligns with estimates from the market share analysis that 11% of all new water heater installations of any fuel type are HPWHs. Of the 31% of surveyed homeowners who reported having purchased a water heater in the previous three years, nearly two-thirds (64%) said their installer or contractor had recommended a HPWH, and the overwhelming majority of this group (88%) had taken the recommendation (i.e., they reported owning a HPWH).

Figure 6 shows the rate at which homeowner awareness survey respondents said a contractor recommended a HPWH, broken down by the reason that the homeowner wanted to replace their water heater. The subset of homeowner awareness survey respondents who said the reason was to install a more efficient unit reported that contractors recommended a HPWH 93% of the time, significantly higher than for any other replacement reason. The next highest HPWH

¹² While NMR cannot eliminate the possibility that some respondents to the homeowner survey who reported owning a HPWH may not actually own one, the team is reasonably confident in this estimate because all respondents viewed a definition of HPWHs before continuing through the survey. In the purchaser survey, the sample was largely from utility rebate lists and customer databases, and many of the purchaser survey respondents verified their HPWH purchase by providing model numbers and/or photos.



recommendation rate was for scenarios in which the respondent was installing the water heater to serve an addition to their home (75%).

FIGURE 6: SCENARIOS IN WHICH A CONTRACTOR RECOMMENDED A HPWH



Installers surveyed for the previous MPER (#5) said they typically recommended HPWHs to replace a failed water heater or a water heater near failure just over half of the time (55% and 53%, respectively). As Figure 6 shows, homeowners surveyed as part of MPER #6 reported that installers recommended a HPWH to replace a failed water heater, or one near failure, 62% and 66% of the time, respectively. While the two sets of measurements are not directly comparable, the homeowner awareness survey in MPER #6 supports what installers reported in MPER #5.¹³

Other barriers to HPWH recommendation and installation include cost, availability, and installation location. While some of this information was available about the HPWHs installed by purchaser survey respondents, similar questions were not asked of self-reported HPWH purchasers in the homeowner awareness survey.

Related recommendation. The purchaser survey, while valuable, offers insights only into the purchase and installation experience of customers who received a rebate from their utility. Thirteen percent of respondents to the homeowner awareness survey self-reported owning a HPWH. To understand the experience of HPWH purchasers more broadly, the next MPER homeowner survey should ask respondents who have a HPWH additional details about the purchase and installation, including where it was installed, who installed it, and whether they

¹³ The homeowner survey asked the contractor recommendation question to all respondents who had purchased a new water heater within the past three years without first asking who installed the water heater; therefore, these findings include an unknown number of respondents who may have self-installed their water heater.



received a rebate or tax credit. The upcoming RBSA may also provide an opportunity to gather some of this information.

6 Social media and online engagement strategies have been successful at increasing awareness of Hot Water Solutions and HPWHs among the target audience. There are opportunities to further increase the target audience's engagement with the Hot Water Solutions website.

6.1 Social media and online channels play a strong role in increasing awareness of HPWHs and the HWS program, though word-of-mouth referrals remain important.

Among electric water heater owners surveyed in the homeowner awareness survey, awareness of Hot Water Solutions (HWS) increased substantially between 2016 and 2021, from 4% to 19%. As Figure 7 shows, respondents to the purchaser survey reported that social media was the most common source of HWS awareness (39%), followed by friends or acquaintances (36%), television ads (35%), and internet research (28%).



FIGURE 7: SOURCES OF HWS AWARENESS



(n=66; Multiple responses permitted)

Twelve percent of those respondents to the homeowner awareness survey who were aware of HPWHs heard about them on the HWS website, while just 4% of respondents to the purchaser survey learned about HPWHs on the HWS website. Of this latter group, more than half (8 of 14 respondents) said that information on the HWS website was important to their decision to purchase a HPWH. Among purchasers who had their HPWH professionally installed, only 1% (2 respondents) reported finding their contractor through the HWS website – though 21% did say they found their contractor through a "utility contractor list," and it is possible that some number of these respondents mistook the HWS directory for a utility list if the utility linked to the HWS site.

Traffic to the HWS site has grown significantly in recent years, but an increasingly large share of traffic comes from search engines and from outside the Northwest. Traffic from the Northwest (the *target population* identified in Figure 8) has risen but represents a small share of total visitors. The temporary spike in traffic during the autumn of 2019, shown in the figure,

HWS_First. How did you hear of the "Hot Water Solutions" program?



corresponds to referrals from a 2019 NEEA YouTube campaign, indicating the significant impact on site traffic from such campaigns.



FIGURE 8: HOT WATER SOLUTIONS SITE TRAFFIC

While search engines represent the largest driver of HWS traffic overall, the web traffic review confirmed that YouTube videos and utility referral links drive the majority of traffic from the Northwest, as Figure 9 shows.

Target Populati	on	Non-Target Population	
YouTube	Direct Access		
Web Links	Search Engine	Search Engine	Web Links

FIGURE 9: HOT WATER SOLUTIONS VISITOR SOURCE CHANNEL



The installer and retailer directories are useful to consumers in the Northwest. Around four out of ten visitors to the HWS installer directory click through to installer sites, as the comparison of directory visitors and click-through rates shows in Figure 10. The NEEA YouTube campaign in late 2019 drove a large spike in traffic (both to the HWS site overall and to the installer directory), but there was no jump in click-through rates to installer websites. These campaigns drive traffic and likely HPWH awareness, but they may not get large numbers of people to the point that they are ready to make an immediate purchase.



FIGURE 10: INSTALLER DIRECTORY CLICK-THROUGH (MPI 1F)

Additionally, three-fifths of HWS traffic comes from mobile devices, but they are less engaged with the HWS site overall than visitors on traditional computers. They spend less time on the site, click-through to the installer and retailer directories less often, visit fewer pages, and so forth.

Related recommendation. YouTube videos appear to offer an effective means of reaching the target population—be it through partner organizations or via social media—but these visitors may require customized calls to action for NEEA to fully benefit from this traffic.

Related recommendation. Consider adding a mobile phone-optimized version of the website to retain phone users. This could be as simple as a custom style sheet for small screens.



6.2 Utilities are a key source of information for the target audience and drive traffic to HWS.

For many customers, utilities are a key source of information about energy-efficiency opportunities. Nearly one-quarter of respondents to the homeowner awareness survey who were aware of HWS reported learning about HWS through their utility website (23%). One in ten homeowners who were aware of HWS (10%) learned about HWS from a bill insert.

Additionally, links from utilities drive considerable traffic to HWS, especially to HWS' retailer and installer directories, where consumers can identify retailers and installers of HPWH equipment. However, the HWS web traffic review showed that some utilities in NEEA's service area do not currently link to the HWS site. The following are some examples of Northwest utilities (including NEEA supporters) that could be connected to HWS but that currently do not appear to direct traffic to HWS:

- Avista Utilities (a NEEA funder)
- Black Hills Corporation
- Montana-Dakota Utilities
- Montana Electric Cooperatives (some of which are NEEA supporters)
- Rocky Mountain Power

Related recommendation. NEEA should work with utilities to ensure that as many utilities as possible in the Northwest direct their customers to the HWS site to learn more about the benefits of HPWHs and to help them identify relevant installers and retailers. NEEA should also consider interviews with utility partners as part of the next MPER, to assess opportunities for additional partnerships and for moving the HPWHP market forward.

Related recommendation. Encourage utilities to include information about HWS in bill inserts, and prominently link to the HWS website in digital communications.

Related recommendation. NEEA should use search engine optimization to increase traffic to the Hot Water Solutions website by engaging potential purchasers who are searching for water heaters.

6.3 Selected Google Analytics metrics are currently disabled.

NEEA can use Google Analytics to track HWS traffic patterns and to measure one of the HPWH Initiative's MPIs (1f: "Increase in referral traffic from HotWaterSolutionsNW.org to oriented installer websites"). The Google Analytics metrics that would best measure that are currently disabled, requiring analytical workarounds.



Related recommendation. NEEA should enable the referral goals in Google Analytics to permit finer-grained analysis of click-through rates in the future. This will allow analysis of traffic from the date the goals are enabled onward.

6.4 Purchasers report receiving federal and state HPWH tax credits at low rates, suggesting low awareness of these credits, though they are mentioned on the HWS website.

Less than one-fifth of HPWH purchasers reported receiving a federal tax credit for their purchase (11% received a federal tax credit, 4% received a state tax credit, and 4% received both). As the federal tax credit is designed to be available to nearly all homeowners who install a qualified HWPH, and little additional effort is needed to apply for the credit, the rate at which purchasers reported receiving a federal tax credit suggests that awareness of this credit is also low. Customers who are unaware of the federal credit are also likely unaware of any credit available from their state. Information about the tax credits is linked from the main HWS website, but the website mentions the federal tax credit infrequently compared to utility incentives.

Related recommendation. HWS could make information about the federal and state tax credits appear more prominently on the website. NEEA could make additional efforts to encourage utilities, contractors, and retailers to highlight the tax credits as well as incentives, sharing information about them at the point of sale or when they estimate installation costs.

Purchasers are highly satisfied with their HPWHs and are very likely to recommend them to friends and family.

In the HPWH purchaser survey, nine in ten HPWH purchasers (89%) reported being "very satisfied" or "somewhat satisfied" with their HPWH (n=419, MPI 4a). The same percentage also reported that they have or would recommend HPWHs to others (MPI 4b).

Given HPWHs' small market share, this high satisfaction rate is critical to market progress as customers would understandably shy away from technologies with higher upfront costs and unhappy owners.



8 — Purchasers indicated their systems were reliable. Very few had contacted a professional to service or repair their HPWH, and only 4% were dissatisfied with their unit's maintenance requirements.

Consistent with past MPERs, only 5% of HPWH purchasers reported contacting a professional to service or repair their HPWH since purchasing it, though self-install rates were high, and some of those individuals may be able to handle some of their own repairs. Purchasers reported that the most common issue that triggered a repair was not enough hot water. Just 4% of HPWH purchasers expressed dissatisfaction with the maintenance requirements of their HPWH.

This finding is somewhat inconsistent with that of installers who were surveyed in MPER #5; 16% of these installers reported that they frequently received customer complaints after installing a HPWH. The most common complaints the installers recalled were that HPWHs cool down the room, have a slow recovery time, and are noisy. Possible explanations for the inconsistency between the two research findings (beyond simple sampling error) are that HPWH reliability may be improving as the technology evolves, that installer facility with installing these systems is improving, triggering fewer callbacks, or that homeowners who install their own heat pumps have different rates of complaints and issues from those who use professional installers.


Section 3 Other Findings

Nearly one-quarter of HPWH purchasers reported encountering installation challenges.

Overall, nearly one-quarter (23%) of HPWH purchasers reported challenges with their installation. Understandably, more respondents to the purchaser survey who self-installed HPWHs reported installation challenges (30%) than did those whose HPWH was professionally installed (15%). Purchasers who installed the HPWH themselves may have had issues due to inexperience. Purchasers who hired professionals may not have been told about the challenges by the installers or were less likely to remember challenges because they did not deal with them themselves. The most common challenges reported were pipe configuration (52%) and not having a nearby drain for condensate (48%). This is consistent with installer survey findings from MPER #5, in which nearly one-half of installers said they encountered no nearby drain for condensate in at least one-half of their HPWH installations. The most recent NEEA Residential Building Stock Assessment (RBSA)¹⁴ also quantified the fact that many homes have suitable environments for HPWHs, despite the presence of minor installation challenges. For example, 22% of single-family and manufactured homes with tank water heaters had a water heater within four feet of a drain (installs can accommodate greater distances), 58% had the water heater in a room with sufficient air volume (more than 1,000 cubic feet), and 60% had enough vertical clearance for the unit (more than eight feet).

One HPWH purchaser noted that the HPWH was advertised as "easy to install," but found it much more difficult than a traditional water heater installation. Several respondents to the purchaser survey also noted that the installation kit and ducting were not included with the unit, which made the HPWH more expensive.

¹⁴ <u>https://neea.org/data/residential-building-stock-assessment</u>



Purchasers identified few real-world issues with HPWH impacts on room temperature or heating use.

As designed, HPWHs remove heat from the air of the space in which they are located and transfer it to the water stored in the tank, which can make the room colder. The purchaser survey conducted for MPER #6 asked respondents to assess their satisfaction associated with this aspect of HPWHs. Only 12% of purchasers said they were "very" or "somewhat dissatisfied" with the temperature in the room where the HPWH is installed. Purchasers who had installed their HPWHs in conditioned locations were twice as likely to be dissatisfied with the temperature in the room than those who had installed them in unconditioned locations (19% compared to 9%).

Among purchasers who reported installation challenges, 12% experienced complications related to floorplan and cold air. Nearly all of those respondents indicated that they installed exterior ducting to vent the cold air out of their space. One respondent said that the fact the HPWH made their basement noticeably colder was an unwelcome surprise they had not known to consider when making the purchase. One respondent who stores fresh produce in their garage appreciated that the HPWH cooled down the surrounding space. Other respondents also appreciated that the HPWH had a dehumidifying effect on the surrounding space.

Purchasers were asked whether they noticed a change in their heating bill after purchasing a HPWH. Results indicate that some respondents may have misunderstood the question and considered their overall energy bill, including any reductions from the installation of the HPWH. Overall, the team did not observe any concerning findings indicating adverse effects of HPWHs on the heating load.

NEEA staff and stakeholders' use of the HWS site may slightly shift web traffic statistics.

Based on the team's review of the HWS web traffic, a small number of users who appear to be NEEA staff or partners represent a large number of HWS page requests. These page requests are included in the web traffic data and would slightly affect any analysis of how the general population uses the HWS site.

Related recommendation. NEEA might consider using a VPN for development and other interactions with the website to spoof their location so that this traffic is not counted alongside that of the target population. However, in the absence of this or some other isolating mechanism, this group's repeated visits distinguish them from most other visitors to the site, who do not visit the site so frequently. A VPN or similar mechanism, however, would make it simpler to remove NEEA staff from web traffic analytics.



Appendix A HWS Web Traffic Review

The Hot Water Solutions (HWS) website¹⁵ provides consumers with resources to make educated HPWH purchase and installation decisions. It also provides directories of local HPWH installers¹⁶ and retailers.¹⁷ As a part of NEEA's sixth HPWH MPER, NMR reviewed the web traffic for the HWS HPWH installer and retailer directories. The review included compiling metrics of site usage, such as the number of unique visitors and the rates of engagement with the directories, and measuring MPI 1f of the NEEA HPWH initiative's logic model: "Increase in referral traffic from HotWaterSolutionsNW.org to oriented installer websites." Though MPI 1f focuses on the installer directory, this review provides comparisons between the installer and retailer directories to better understand how users may use both of those supply chain channels to purchase and install HPWHs.

METHODOLOGY

Access to key site traffic data. NEEA provided the team with access to one month of server logs for the HWS directories. These server logs provided anonymized information about site users, including the date of the user's visit to the site, for February 21, 2021, to March 21, 2021. NEEA also provided NMR with access to its Google Analytics portal, which monitors HWS site traffic. Although Google Analytics includes traffic dating back to August 2015, NMR focused the analysis on the period from January 2019 through March 31, 2021, to provide insights about more recent usage of the website.

NMR compiled these data to assess the following aspects of traffic to the HWS website and to the installer and retailer directories in particular:

- Visitor location
- Number of unique and repeat visitors
- · How visitors find the HWS site and directories
- Click-through rates for the installer and retailer directories

Unfortunately, the Google Analytics functions that would permit a simple but granular review of the last two metrics, click-through rates for installers and retailers ("Installer Referral Link Clicked" and "Retailer Referral") are currently disabled. However, the team used a workaround to address these metrics, including a review of two Google Analytics dashboards ("Installer Exit

¹⁵ HotWaterSolutionsNW.org

¹⁶ https://hotwatersolutionsnw.org/installation/find-an-installer

¹⁷ https://hotwatersolutionsnw.org/retailers



Traffic" and "Retailers Exit Traffic") and the month of server logs, which together provided similar data to what would have been available via the two disabled Google Analytics functions. Using data from the Google Analytics platform, some forms of analysis are only possible at the pageview level and others only at the visitor ("user") level.¹⁸ Consequently, the basis for the statistics presented here shift for different topics. Unless noted otherwise, the web traffic analysis focuses on unique pageviews.¹⁹ This allows us to track how many times a given webpage was viewed but excludes potential double-counting from visitors navigating back in their history, accidentally clicking a link twice, reloading a page, and so forth.

FINDINGS

Visitor Location

Since 2020, most traffic to HWS is from outside NEEA's service area.

The HWS website's online presence expanded from September 2019 through March 2021, and an increasingly large share of traffic comes from search engines. Given this increased nationwide traffic, the relative proportion of visitors from the Northwest has decreased dramatically, even as the total number of Northwest visitors has increased in recent months.²⁰ Consequently, it is important to analyze traffic for visitors from the Northwest specifically. To do so, NMR isolated the "Target Population" segment, which includes visitors from Idaho, Montana, Oregon, and Washington.²¹ The peak in traffic during the autumn of 2019, shown in Figure 11, corresponds to referrals from a 2019 NEEA YouTube campaign.

¹⁸ The Google Analytics system employs a distinct lexicon to describe various aspects of traffic analysis, some of which has changed over time and may differ from industry standards.

 ¹⁹ <u>https://support.google.com/analytics/answer/1257084#pageviews_vs_unique_views</u>
 ²⁰ Especially the useful guide "<u>How to Determine the Age of Your Water Heater</u>," which draws 60–70% of all visitors, but only 16% of target population traffic.

²¹ This segmentation could potentially be confounded by visitors using VPNs. However, fewer than 1 in 5 Americans uses a VPN, and those that do generally use them for reasons that suggest origin analysis of traffic to HWS should be largely unaffected at present, such as breaking geo-blocking (vpnMentor, 2021). Analysis of traffic from the top-referring websites to HWS shows that 23 of 25 sites are based in NEEA's service area, and 89% of referred visitors are from the target population. This proportion increases to 93% when excluding two outliers: NEEA.org and SmallPlanetSupply.com, which draws traffic from a wider audience than local utilities and plumbers.

vpnMentor (Feb. 2021), "VPN Use and Data Privacy Stats for 2021" https://www.vpnmentor.com/blog/vpn-use-dataprivacy-stats/





FIGURE 11: HOT WATER SOLUTIONS VISITOR LOCATION

Washington and Oregon represent a large portion of visitors to the directories.

As Table 4 shows, the majority of directory visitors (90%) are from three metroplexes in Washington (Seattle-Tacoma) and Oregon (Portland and Eugene). These regions are based on designated market areas (DMAs), a system used in the advertising industry to segment the nation into local radio and television markets. The fourth largest grouping – Unknown – consists of visitors from an indeterminate DMA, and is principally composed of Washingtonians (>80%), but also includes a small number of visitors from Idaho and Montana.²² Although the installer-to-retailer ratio suggests that Oregonians strongly favor the installer directory, it is possible that this discrepancy is due at least in part to external websites directly linking to the installer directory page rather than true differences in visitor preferences.

²² This can be determined by comparing the sum of views for all DMAs within a state to the total views for the state.



TABLE 4: GEOGRAPHIC DISTRIBUTION (DMA) OF TARGET POPULATIONUNIQUE VIEWS

Metroplex	Installer		Ratio	Reta	ailer
Seattle-Tacoma, WA ¹	2,720	44%	1.2:1	2,194	61%
Portland, OR	1,652	27%	2.0:1	846	24%
Eugene, OR	1,163	19%	5.7:1	204	6%
Unknown ²	253	4%	1.8:1	140	4%
Yakima-Pasco-Richland-Kennewick, WA	119	2%	2.9:1	41	1%
Medford-Klamath Falls, OR	95	2%	4.1:1	23	1%
Bend, OR	40	1%	1.0:1	41	1%
Spokane, WA	42	1%	1.1:1	37	1%
Missoula, MT	14	<1%	0.5:1	28	1%
Boise, ID	22	<1%	1.6:1	14	<1%
Total, by State	6,120	100%		3,568	100%
Washington	2 261	750/	1 2.1	2,67	550/
(7.7 million, 52% of NEEA service area population) ³	3,304	75%	1.3.1	5	5570
Oregon	0.694	000/	2.2.4	004	440/
(4.2 million, 29% of NEEA service area population) ³	2,004	2370	5.5.1	024	44 70
Idaho	40	10/	1 2.1	20	10/
(1.8 million, 12% of NEEA service area population) ³	40	1 70	1.3.1	32	1 70
Montana	20	10/	0.0.1	27	10/
(1.1 million, 7% of NEEA service area population) ³	32	1 %	0.9.1	57	1 70

1. Includes 266 installer and 290 retailer views from visitors physically located in Oregon.

2. Mostly Washington (86% for installer, 81% retailer), with the remainder evenly split between Idaho and Montana. 3. U.S. Census Bureau. Change in Resident Population of the 50 States, the District of Columbia, and Puerto Rico: 1910 to 2020. <u>https://www2.census.gov/programs-surveys/decennial/2020/data/apportionment/population-changedata-table.xlsx</u> Accessed May 6, 2021.



Visitor Origination

Videos and referral links, especially from utilities, drive most target population traffic.

On average, 95% of target population visitors are new to the HWS site. Figure 12 shows the channels that these visitors use to reach HWS (right third of the rectangular *tree map*) differ from those of general traffic to the site (left two-thirds of the tree map). Two-thirds (65%) of the visitors from outside NEEA's territory reach the site via search engine compared to only one-sixth (16%) of the target population.²³ "Direct Access" visitors include those who used a bookmark, typed the URL in directly to access the website, or were already at HWS and clicked a link to another page on the HWS site. "Web Links" represents visitors who reach the HWS site from other websites besides search engines, YouTube, or social media.²⁴



FIGURE 12: HOT WATER SOLUTIONS VISITOR SOURCE CHANNEL

²³ There is limited data available regarding the search terms used. However, our analysis of the server logs and what is available in Google Analytics indicate that queries regarding water heater age feature prominently.

²⁴ Traffic the team identified as originating via email and social media is less than 1% of the total for both groups of visitors.



Utilities are the largest source of traffic to HWS from other websites (Table 5), followed by several installer and retailer websites. This list should not be construed as a ranking of the traffic from individual utilities since many operate multiple websites with links to HWS. For example, the top two referrers in the table are *SnoPUD*.com and *SnoPUD*offer.Techniart.com.

TABLE 5: TOP WEBSITES REFERRING TRAFFIC TO HOT WATER SOLUTIONS

Referrer	Visit	ors	Referrer	Visit	ors
snopud.com	775	5%	chelanpud.org	233	1%
snopudoffer.techniart.com	710	4%	cowlitzpud.upgrade.guide	213	1%
georgemorlan.com	617	4%	clallampud.net	173	1%
energysolutions.seattle.gov	615	4%	seattle.gov	158	1%
pse.com	596	4%	cpi.coop	151	1%
clarkpublicutilities.com	563	3%	pud3.org	122	1%
portlandgeneral.com	477	3%	smallplanetsupply.com	115	1%
neea.org	431	3%	stutzmanservices.com	93	1%
energysavings.opalco.com	412	3%	bpa.gov	91	1%
eweb.org	339	3%	gpconservation.com	91	1%
idahopower.com	331	2%	bentonpud.org	87	1%
mytpu.org	308	2%	TOTAL	7,701	48%



Directory Visitor Origins

The channels used by visitors to reach the retailer and installer directories in Figure 13 differ greatly from the website as a whole (Figure 12). While search engines and YouTube are significant contributors to HWS traffic overall, the primary channels visitors follow to reach the directories are direct access (including people navigating to the directories from other pages on Hot Water Solutions) and links from other web sites.



FIGURE 13: HOT WATER SOLUTIONS DIRECTORY VISITOR ORIGINS



Click-Through Statistics

Up to one half of directory visitors click links to installer and retailer websites. As the dotted linear trend line in Figure 14 shows, installers received an average of four visitors to their website for every ten visitors to HWS installer directory (MPI 1f; 4:10 in 2019, 3.8:10 in 2020, and 4.2:10 in early 2021). While this click-through rate has been relatively constant over time due to the correlation between referrals and directory traffic, the 2019 YouTube campaign appears to have contributed to an increase in directory traffic without a commensurate change in referrals (i.e., YouTube-originating visitors have lower click-through rates for the installer directory). However, this does not mean the campaign did not have other benefits, such as increased awareness.



FIGURE 14: INSTALLER DIRECTORY CLICK-THROUGH (MPI 1F)



Retailer directory traffic has increased since mid-2020, perhaps due to a greater interest in DIYoptions spurred by the pandemic (Figure 15). However, the level of referrals did not change over this period, continuing to average five referrals per ten visits (4.9:10 in 2019, 5.3:10 in 2020, and 4.9:10 in the first quarter of 2021). As with the installer directory, there was no rise in referrals in association with the 2019 YouTube campaign.



FIGURE 15: RETAILER DIRECTORY CLICK-THROUGH

Other Findings

Table 6 shows that three-fifths of traffic is from mobile devices – predominantly cell phones. However, these users remain on the website for less time than those on desktop computers, interact with the site less (i.e., have a higher bounce rate), visit fewer pages, and are less likely to access the installer and retailer directories.

TABLE 6: VISITOR DEVICES AND SITE ENGAGEMENT

Device	Sess	ions	Bounce	Pages	Duration	Installer	Retailer
Phone	25,311	52.9%	76.8%	1.5	0:00:47	5.1%	3.6%
Desktop	19,401	40.6%	45.4%	2.8	0:02:34	22.4%	12.0%
Tablet	3,102	6.5%	57.9%	2.3	0:01:44	15.9%	11.1%

Appendix B 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 2019 and 2020, following the methodology of previous MPER #4 and MPER #5. The market sizing assessment breaks down HPWH sales by the attributes shown in Table 7 and compares the results to those from MPER #4 and MPER #5.

TABLE 7: ATTRIBUTES INCLUDED IN MARKET SIZING UPDATE

Attribute
State
Home type:
New construction vs. existing homes
Code-built new construction vs. above-code new construction
Supply channel (retail vs. distributor)
Utility incentive status (incentivized vs. non-incentivized)
Replacement type (emergency vs. planned)
Tank size (≤ 55 or > 55 gallons)

METHODOLOGY

The market update relied on raw data from NEEA, completed analyses provided by NEEA, secondary data sources, the purchaser survey, and additional primary data collected as a part of this 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 each year. As with past MPERs, 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 and the results of the purchaser survey from this MPER, which showed 95% of purchasers in single-family homes.

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.



Table 8 identifies the data sources on which the team based the market update.

TABLE 8: DATA SOURCES INFORMING KEY MARKET ATTRIBUTES FOR 2019 AND 2020

Data Source	State	New vs. Existing	Code vs. Above-Code	Supply Channel	Utility Incentives	Emergency vs. Planned	Tank Size
Data provided by NEEA							
HPWH shipment counts from manufacturers for the Northwest region	٠	٠		٠			٠
Utility-provided HPWH rebate counts			٠		•		
Above-code new construction HPWH rebate data	٠		٠		٠		
Distributor water heater sales data (collected through NEEA HPWH special pricing agreement program (SPIF)	•						
NEEA ACE Model results	•	٠					
Secondary data							
U.S. Census: 2019-2020 American Community Survey (ACS) ²⁵	٠						
U.S. Census: 2019-2020 Building Permits Survey ²⁶	٠	٠				٠	
NEEA 2018 Water Heater Market Characterization Report ²⁷	٠	٠					
2017 NEEA Residential Building Stock Assessment (RBSA) ²⁸		٠					
Primary data from MPER #6							
Purchaser survey						•	

- https://www.census.gov/programs-surveys/acs
 https://www.census.gov/construction/bps/
 https://neea.org/img/documents/water-heater-market-characterization-report.pdf
 https://neea.org/data/residential-building-stock-assessment



HPWH Market Share by State and Home Type

The team calculated HPWH market share as the ratio of HPWH shipments to the NEEA region to estimates of all electric water heater installations in the NEEA region. The formula below describes the calculation. Descriptions of each variable follow.

HPWH sales. HPWH manufacturer records provided to NEEA included the number of HPWHs that were shipped to retailers and distributors in each of the four Northwest states in 2019. Partial 2020 data was available, but it excluded Rheem data.

All electric water heater installations. The team separately estimated electric water heater installations in new and existing single-family homes. As in past MPERs, the electric water installation estimates were rounded to the nearest hundred.

- New Construction. NEEA New Homes program participation records indicate a 37% saturation rate for electric water heaters in new construction for 2018, which is similar to the 36.3% assumption NEEA used in the 2019 and 2020 ACE Model. The team applied the 37% rate to the state-level Building Permits Survey (BPS) counts of new construction to estimate electric water heater installations in new, single-family homes.²⁹
- Existing Homes. The American Community Survey (ACS) provides state-level counts of single-family existing homes. The NEEA 2018 Water Heater Market Characterization study estimated electric water heater replacements for single-family and low-rise multifamily homes. The electric water heater estimates for the Market Characterization study were calibrated to 2019 and 2020 housing estimates from the ACS and Council Housing Stock forecast. The team estimated the count of multifamily installations using the estimates in the Council Housing Stock forecast for low-rise multifamily homes.

The team used the following method to estimate water heater installations in existing single-family homes:

Electric Installs in Existing SF Homes

- = Total Electric Installs (NEEA Market Characterization Study)
- New Construction Electric Installs (BPS RNC counts)
- Existing MF Electric Installs (Council forecasts)

²⁹ Note that MPER #4 relied on Council forecasts for single-family housing counts, but MPER #5 and MPER #6 deviated from this approach because Census data offered more accurate single-family home data, based on retrospective assessments of housing stock rather than on the Council's forward-looking forecasts made in 2012.



HPWH Installations in New vs. Existing Homes

NEEA staff provided the team with results from the NEEA ACE Model review, including an estimate of the portion of HPWH installations in new and existing homes (59% and 41% of HPWHs in 2019 and 65% and 35% of HPWHs in 2020, respectively). The team applied these ratios to the manufacturer HPWH sales figures to estimate the number of installations in new and existing homes. Following the methodology of MPER #4, this MPER used the purchaser survey to estimate the size of the retrofit market. (Note that MPER #5 did not have a purchaser survey and instead used results from the installer survey.)

Supply Channel

The team used HPWH manufacturer sales records provided by NEEA to estimate the market share by supply channel. The manufacturer sales records included a record of each electric water heater shipped, and whether the purchaser was a retailer or a distributor.

Utility Incentive Status

Above-code new homes. The team estimated the number of HPWHs installed in above-code new homes (i.e., homes that went through new construction programs run by utilities) from utility program participation records provided by NEEA for the following new construction programs:

- Energy Performance Score Program
- ENERGY STAR[®] Version 3 & 3.1 Program
- Utility Incentive V2 Single-Family Performance Path Program

To-code new homes and existing homes. NEEA provided counts of HPWHs that received incentives from utility programs in the Northwest, based on utility program participation records. The data included HPWH installations in new homes built to code levels (i.e., homes that did not participate in utility new construction programs) and existing homes.

Replacement Type

The team used the emergency replacement rate (37%) from NEEA's 2018 market characterization study to estimate the share of planned and emergency replacements in MPER #5 and MPER #6 for all electric water heaters installed in existing homes. For HPWHs specifically, NMR relied on the purchaser survey from MPER #6 to estimate the percentage of HPWHs installed in emergency scenarios (8%), down from the 22% used in MPERs #4 and #5, which relied on the HPWH purchaser survey from MPER #4.



Tank Size

The HPWH manufacturer sales records provided to NEEA included tank size information.

HPWH MARKET SHARE BY STATE

Table 9 provides HPWH market share figures from 2017 through 2020, which includes results from MPERs #4 through #6. This describes the number of electric water heaters installed, the subsets that were HPWHs, and the percentage of the electric water heater market represented by HPWHs (i.e., market share). Because the estimates of overall market size for 2017 through 2020 were developed from an amalgam of sources, they are not definitive. For this reason, minor changes over time in HPWH market share, which relies on overall market size as the denominator, should be interpreted with caution.

The share of all electric water heater installations in existing, new, and manufactured singlefamily homes in the Northwest market that is represented by HPWHs (MPI 3a) remains low (12% in 2020). This market share appears to be trending upward: (from around 8% in 2018). As noted above, however, minor changes in market share should be interpreted with caution. The rates of adoption in Washington and Oregon continue to be far higher than in Idaho and Montana, which have negligible HPWH market share – no more than 1% in any given year, with most years well below that.

	2017 (MPER 4)			2018 (MPER 5)			2019 (MPER 6)			2020 (MPER 6)		
State	Electric WH Installs	HPWH Installs	HPWH Market Share									
Total	156,900	13,353	8.5%	151,600	11,693	7.7%	148,700	15,217	10.2%	150,200	17,442	11.6%
WA	87,700	8,734	10.0%	84,100	8,117	9.7%	82,700	9,198	11.1%	83,400	10,543	12.6%
OR	40,200	4,179	10.4%	38,700	3,450	8.9%	37,500	5,831	15.5%	38,300	6,684	17.5%
MT	12,000	71	0.6%	12,000	77	0.6%	11,900	28	0.2%	11,700	32	0.3%
ID	17,000	369	0.2%	16,800	49	0.3%	16,600	160	1.0%	16,800	183	1.1%

TABLE 9: MARKET SHARE OF NW HPWH INSTALLATIONS, BY STATE

Sources: HPWH shipment counts from manufacturers in the Northwest (counts), U.S. Census: 2019-2020 American Community Survey (ACS) and Building Permits Survey, NEEA 2018 Water Heater Market Characterization Report, and 2017 NEEA Residential Building Stock Assessment (RBSA)



New Construction vs. Existing

HPWHs have become common in new homes, representing almost half (49%) of electric water heater installations in new homes in 2019 and over half (59%) in 2020 (Table 10). The new construction market for HPWHs appears to be growing steadily, rising from around 6,000 installations in 2018, to around 9,000 in 2019, to over 11,000 in 2020. Installations in existing homes has remained relatively flat in these years, hovering between about 5,500 and 6,200 annual installations. HPWHs continue to represent a low percentage of the retrofit market – less than 5% in both 2019 and 2020. The market for electric water heaters in existing homes is over six times larger than the new construction market, but HPWH installations in new construction appear to be increasingly outpacing HPWH installations in existing homes, both in terms of market share percentage and installation volumes. About 59% of the HPWHs sold in 2019 were installed in new homes and 41% in existing homes; in 2020, 65% of HPWHs were installed in in new homes and 35% were in existing homes.

In 2018, MPER #5 estimated that 22% of HPWH installations in existing homes were in emergency placement scenarios, relying on the results of the MPER #4 HPWH purchaser survey. Using the updated MPER #6 HPWH purchaser results, MPER #6 estimates this at 8% for 2019 and 2020. These changes should be interpreted with caution, as the survey sample for MPER #6 was derived from a limited selection of utility incentive lists (mostly from downstream incentive programs).

TABLE 10: MARKET SHARE OF HPWH INSTALLATIONS – NEW VS. EXISTING HOMES

	2018 (MPER 5) ³⁰					2019 (MPER 6)				2020 (MPER 6)			
Install Type	Electric Water Heater Market	HPWH Installs	Relative Market Share	Overall Market Share	Electric Water Heater Market	HPWH Installs	Relative Market Share	Overall Market Share	Electric Water Heater Market	HPWH Installs	Relative Market Share	Overall Market Share	
Total	151,600	11,693	7.7%	7.7%	148,700	15,217	10.2%	10.2%	150,200	17,442	11.6%	11.6%	
New	18,800	6,221	33.1%	4.1%	18,300	9,022	49.3%	6.1%	19,200	11,413	59.4%	7.6%	
Existing	132,800	5,472	4.1%	3.6%	130,400	6,195	4.8%	4.2%	131,000	6,029	4.6%	4.0%	
Planned replacements	83,664	4,268	5.1%	2.8%	82,142	5,692	6.9%	3.8%	82,530	5,902	7.2%	3.9%	
<i>Emergency</i> <i>replacements</i>	49,136	1,204	2.5%	0.8%	48,248	503	1.0%	0.3%	48,470	490	1.0%	0.3%	

Sources: HPWH shipment counts from manufacturers in the Northwest (counts), NEEA ACE Model results, U.S. Census: 2019-2020 Building Permits Survey, NEEA 2018 Water Heater Market Characterization Report, and 2017 NEEA Residential Building Stock Assessment (RBSA)



Additionally, the MPER #6 HPWH purchaser survey allowed respondents to make a granular assessment of the condition of the old water heater they replaced with the HPWH. While only 8% of respondents said their old unit had completely failed – a true "emergency replacement" scenario in line with the definitions of past MPERs – a full 35% said that the water heater they replaced was old, in need of repair, or close to failure. This customer segment falls into the planned replacement category described above, but some of these customers may be more akin to the emergency replacement customers than early replacement customers who replaced systems in good repair.

TABLE 11: HPWH INSTALLATIONS IN EXISTING HOMES – CONDITION OF OLD WATER HEATER

Install Type	20	19	2020		
Total	15,2	217	17,442		
Installs in existing homes	6,1	95	6,0	29	
Previous water heater fully functioning (Planned replacements)	3,531	57%	3,437	57%	
Previous water heater near failure (Planned replacements)	2,168	35%	2,110	35%	
Previous water heater failed completely (Emergency replacements)	496	8%	482	8%	

Sources: HPWH shipment counts from manufacturers in the Northwest and Q36 "*Why did you purchase a new water heater*?" from MPER #6 purchaser survey.

³⁰ Includes an adjustment to the planned and emergency replacement electric water heater values from MPER #5.



UTILITY INCENTIVES

In 2019, 59% of HPWH installations received incentives (MPI 5b). This dropped to 49% in 2020 (Table 12). Around two-thirds of incentivized HPWHs were installed in existing homes in 2019, but only about 43% of incentivized units were installed in existing homes in 2020, indicating an increase in the use of incentives for new homes with HPWHs over this period.

Incentive Status	2018		2019		2020	
Total	11,693		15,217		17,442	
Non-incentivized units	4,884	42%	6,298	41%	8,811	51%
Incentivized units	6,809 58%		8,919	8,919 59%		49 %
		% of incentives		% of incentives		% of incentives
Existing homes	4,415	65%	5,520	62%	3,723	43%
Above-code new homes	1,052	15%	1,608	18%	1,829	21%
To-code new homes	1,342	20%	1,791	20%	3,079	36%

TABLE 12: HPWH INSTALLATIONS BY UTILITY INCENTIVE STATUS

Sources: HPWH shipment counts from manufacturers in the Northwest (counts), utility-provided HPWH incentive counts, and above-code new construction incentive counts

Table 13 shows that the vast majority of HPWHs installed in retrofit applications received an incentive in 2019 (89%), and that in 2020 this dropped to about two-thirds of retrofit HPWHs (62%). Given that installations in existing homes changed little from 2019 to 2020, this indicates an increase in the overall rate at which HPWHs were adopted without incentives. This change can be attributed to a substantial decrease in incentives for large tanks installed in existing homes in 2020. Utility data from NEEA indicated that in 2020, far fewer utility incentives were issued for large tank HPWHs (greater than 55 gallons) (817) than were issued in 2019 (2,419). Future research could assess if the 2015 federal standards that increased efficiency standards for electric water heaters may be leading to reduced utility incentives for these large tanks, which are now essentially required to be HPWHs.

From 2019 to 2020 the percent of incentivized HPWHs installed in new homes rose from 38% to 44%. Despite this slight increase in incentive use among new homes, there is still a strong market for HPWHs for new homes without incentives.



Incentive Status	2018	2019	2020
Total	11,693	15,217	17,442
Installs in new homes	6,221	9,022	11,413
Incentivized units	2,394	3,390	4,980
% incentivized	38%	38%	44%
Installs in existing homes	5,472	6,195	6,029
Incentivized units	4,415	5,520	3,723
% incentivized	81%	89%	62%

TABLE 13: UTILITY INCENTIVES IN NEW VS. EXISTING HOMES

Sources: HPWH shipment counts from manufacturers in the Northwest (counts), utility-provided HPWH incentive counts, and above-code new construction incentive counts

SUPPLY CHANNEL

Table 14 presents a summary of HPWH installations by supply channel. The portion of residential HPWHs moving through wholesale distributors is estimated at 81% of manufacturer sales in 2019 (MPI 3a), while the portion moving through retailers is estimated at 19% (MPI 2). Washington, Idaho, and Oregon had higher percentages of HPWHs moving through distributors (92%, 80%, and 63%, respectively), while the retail supply channel was proportionally larger in Montana in 2019. The percentages in Idaho and Montana are based on negligible sales volumes (fewer than 200 in Idaho and fewer than 30 in Montana).

Since full sales data were not available for 2020, it was not possible for NMR to determine the supply channel distribution for that year. However, during the course of this MPER NEEA performed additional analysis based on preliminary 2020 data. The analysis suggests that the portion of the HPWH market moving through retail may have increased to approximately 29% of the market in 2020, up from the estimated 19% in 2018 and 2019.



TABLE 14: HPWH INSTALLATIONS BY SUPPLY CHANNEL – RETAIL VS.DISTRIBUTOR BY STATE

Stata	20	18	2019							
State	Retail	Distributor	Retail	Distributor						
Region Total	19% (2,264)	81% (9,429)	19% (2,890)	81% (12,327)						
Washington	14%	86%	8%	92%						
Oregon	31%	69%	37%	63%						
Montana	51%	49%	54%	46%						
Idaho	57%	43%	20%	80%						
Source: HPWH shipme	Source: HPWH shipment counts from manufacturers in the Northwest (counts)									

TANK SIZE

For the region as a whole, in 2019 more than two-thirds (68%) of the HPWHs installed were 55 gallons or less, while almost one-third (32%) were larger than 55 gallons (Table 15). This is similar to the breakdown in 2018. Data for 2020 were not available.

TABLE 15: HPWH INSTALLATIONS BY TANK SIZE

		2018		2019			
State	HPWH Installations	≤ 55 Gallons	> 55 Gallons	HPWH Installations	≤ 55 Gallons	> 55 Gallons	
Region Total	11,693	69 %	31%	115,217	68%	32%	
Washington	8,117	77%	23%	9,198	75%	25%	
Oregon	3,450	50%	50%	5,831	57%	43%	
Montana	77	55%	45%	28	50%	50%	
Idaho	49	63%	37%	160	81%	19%	

Source: HPWH shipment counts from manufacturers in the Northwest (counts)

Appendix C Retailer Web-Scraping

For HPWH MPER #6, NMR developed a software tool to *scrape* water heater listings from two major retailers' websites. The scraping tool downloaded detailed information from product listing pages, and the team compiled and analyzed this information to develop a picture of the HPWH stocking practices of these retailers. The web-scraping data allowed the team to discern both the portion of retailers' electric models that are HPWHs and the portion of their in-stock units that are HPWHs. While past MPERs, including MPER #5, focused on the share of HPWH installations that are emergency replacements (MPI 1e), this task focused on the extent to which *retailers* make HPWHs available to emergency replacement customers.

METHODOLOGY

In May 2021, NMR scraped electric water heater inventories from 21 big box store websites across two major retailers and the four states in NEEA's service area, based on the relative proportion of stores across the four states and the number of stores in rural vs. urban counties. Within these strata, NMR randomly sampled specific store branches in each state. The data scraped included equipment specifications and the number of items in stock. After collecting the data, NMR merged the scraped equipment data with store metadata. This merger made it possible to analyze where water heaters, HPWH or not, are commonly stocked in these states. Figure 16 maps the locations of retailers whose inventories the team scraped.



FIGURE 16: WEB-SCRAPED BIG BOX RETAILER BRANCHES (N=21)

Small capacity systems omitted. The analysis omitted models with a nameplate capacity of 20 or fewer gallons. These smaller-capacity systems are meant for point-of-use water heating applications and are not true competitors of standard-size HPWH products.



Commercial systems included. The analysis includes water heater models that the retailers identified as *commercial* models, given that many commercial electric resistance models can be used in residential applications.

Retailer names redacted. NMR provided NEEA with the results of this analysis by retailer. This report provides redacted results for the two retailers combined.

FINDINGS

HPWH models are a small percentage of retailers' listed inventory.

Overall, one in twenty-five (4%) electric water heater model listings on retailers' websites were HPWH models (MPI 2, Figure 17).³¹



FIGURE 17: PERCENT OF MODEL LISTINGS THAT WERE HPWHS

The 2,533 model listings NMR scraped included duplicates of the same models found at different stores. After NMR removed the duplicates, there were 225 unique model numbers, nine of which were HPWH models (4%). These figures include models identified as commercial units, but exclude small, point-of-use models (20 gallons of capacity or less).

Electric resistance models comprise the vast majority of model listings, but some of this is due to model proliferation among electric resistance units. The 216 unique electric resistance model numbers spanned 18 different tank sizes. By comparison, the nine unique HPWH model numbers spanned only four different tank sizes. The availability of similar commercial units offered as different models with different voltages also inflates the number of electric resistance models available.

³¹ The team treated each model listing downloaded as a unique listing; the same model number carried across two stores would be treated as two model listings for this analysis.



These retailers keep HPWHs in stock, but at low volumes.

HPWHs represented two in twenty-five (8%) of the electric water heaters listed as in-stock on retailers' websites (MPI 1e, Figure 18).

FIGURE 18: PERCENT OF IN-STOCK WATER HEATERS THAT WERE HPWHS





Most stores keep HPWHs in stock, but the portion of stock that is HPWH varies substantially, even across branches of the same retailer.

Three out of four branches (76%) had HPWHs in stock (Figure 19). All of Retailer A's branches had some number of HPWHs in stock, while over half of Retailer B's branches did not have any HPWHs in stock. Among the individual stores stocking HPWHs, HPWHs made up from 3% to 21% of the stores' in-stock water heaters. The wide variance likely reflects specific regional demand issues, such as the existence of utility rebates in some areas, which would likely drive demand for units to be kept in stock.

FIGURE 19: PERCENT OF IN-STOCK WATER HEATERS THAT WERE HPWHS, BY STORE





Commercial electric resistance products are widely available online, but rarely in-stock.

Retailers did not list any HPWH models as commercial products. However, the websites identified seven in ten (69%) electric models scraped as commercial products; one of the two retailers carried the vast majority of these commercial units (Figure 20). In other words, seven in ten of the gathered listings were for commercial models.³² Three in four (76%) of the electric models that retailer listed were commercial, compared to only 4% of the other retailer's models. Less than 1% of commercial models were listed as being in stock across all stores.



FIGURE 20: PERCENT OF MODEL LISTINGS THAT WERE COMMERCIAL

Small tank electric resistance models are available from retailers.

One in six (16%) water heater models initially scraped were rated at 20 or fewer gallons of capacity (671 small tank models, in total).³³ Only seven of these small water heaters were in stock. These small units were omitted entirely from the results described above.

³² The team identified models as commercial based on how they were categorized or labeled by the retailer. These commercial units represented 150 (67%) of the unique model numbers that the team scraped and included in this analysis (n=225) (i.e., after compiling duplicate model numbers across branches).

³³ These small systems represented 60 (21%) of the unique model numbers initially scraped (n=285).

Appendix D Mystery Shopping with Retailer-Affiliated Installers

This appendix is organized as follows:

- 1. The data collection methodology used for mystery shopping
- 2. An infographic summarizing the mystery shopping effort's methods and outcomes
- 3. Detailed findings of the mystery shopping process

METHODOLOGY

In May of 2021, an NMR researcher (a *mystery shopper*) submitted online water heater installation requests to two major retailers in the Northwest – Lowe's and Home Depot.³⁴ Both of these retailers offer online portals for customers to request a quote for a new water heater installation, including for fast-turnaround emergency replacement scenarios. In these online requests, the shopper pretended to be a residential customer in the market for a new water heater heater because theirs had completely failed. Through this process, the MPER sought to better understand the extent to which HPWHs are recommended to purchasers attempting to buy emergency replacement water heaters through the retail side of the supply chain, rather than directly from independent contractors.

The shopper completed 16 mystery shopping conversations: four with retailers in each of the four states, evenly split between rural and urban regions of each state, and evenly split across two major retailers – Home Depot and Lowe's. NMR randomly targeted specific store branches from the strata mentioned above (e.g., one randomly-selected urban Lowe's per state).

The online inquiries collected information from the shopper, including home address, phone number, email, and reason for the inquiry. The shopper used aliases and home addresses located within a reasonable distance of each targeted retail location. After filling out each online inquiry, the shopper was put in contact with a representative of the major retailer. In some cases, this representative worked for the retailer and in others they worked for an installation company contracted by the retailer. The shopper received a call back or email response within hours of filling out the initial inquiry.

³⁴ MPER #5 included mystery shopping directly with water heater installers; MPER #6 used a similar methodology, but focused on mystery shopping with retailers (and their affiliated installers) to learn about a different part of the supply chain.



NMR offered a best-case HPWH installation scenario to make it easy for the representative to recommend a HPWH. For each inquiry, the shopper provided the same scenario (i.e., the shopper owned a 15-year-old, 65-gallon electric water heater located in a basement that had reasonably tall ceilings and an available sink/drain). The shopper stated that their reason for replacing their current system was that the water heater had completely failed and was no longer functioning. The shopper used the following conversation procedure:

- The shopper confirmed that they need a new water heater.
- If pressed to schedule a consultation/appointment, the shopper mentioned that they wanted to discuss options over the phone first.
- If pressed for more details, the shopper identified the system as electric.
- If pressed for more details, the shopper identified the system as a tall, 65-gallon tank.
- If pressed for more details, the shopper mentioned that the current system is in a tall, unfinished basement.
- If pressed for the budget, the shopper made no indication that they had a budget in mind.
- If a recommendation was not provided by this point, the shopper asked for a recommendation.
- If a HPWH was not mentioned by this point, the shopper asked for *additional options*.
- If a HPWH was still not mentioned, the shopper directly asked about HPWHs.

Most of the results included in the MPER focus on the retailer representatives as a whole; the team excludes specific findings by retailer, which were provided to NEEA separately.



GRAPHIC SUMMARY OF RESULTS



For MPER #6, a *mystery shopper* submitted 16 online water heater installation requests to major retailers. The shopper pretended to be a residential customer whose water heater had completely failed. The shopper described a scenario amenable to a HPWH: they owned a large capacity electric storage tank water heater located in a large basement.

The shopper emailed and talked on the phone with representatives affiliated with Home Depot and Lowe's to better understand what products they recommended, how much prompting it took before they talked about HPWHs, and what they said about HPWHs.





DETAILED MYSTERY SHOPPING RESULTS

The Use of Call Centers

Mystery shopping showed that the retailers use different models to connect their customers with a retailer-affiliated water heater installer.

Lowe's: call centers as intermediary. Lowe's connected the shopper with a person in their "Quote Coordination Center," as opposed to an installation company. The Quote Coordination Center representative provided water heater recommendations and answered basic questions about the models. The representatives were not installers but were able to discuss water heater options. After speaking with the shopper, the Lowe's representative emailed an installation quote and contract providing the specifications and installation cost of the recommended water heater, including the estimated permit cost. An installer with an affiliation with Lowe's would be scheduled to perform the installation, but the customer had no need to interact with the installer as a part of the sales process.

Home Depot: direct connection to installers. In contrast, after submitting requests through the Home Depot portal, the mystery shopper was contacted by retailer-affiliated installation companies, rather than Home Depot representatives. Unlike the Lowe's call centers, they would not provide detailed quotes electronically or over the phone; these companies required an inhome consultation first.

Lowe's call center representatives appeared to have been trained to follow a consistent set of protocols for interacting with the customer and provided a relatively consistent customer experience from one interaction to the next. Home Depot relied on individual installation companies to reach back out to customers, yielding a more varied customer experience, which depended on the company fielding the inquiry.

The response time for the initial inquiries varied from two to twenty-four hours. Representatives from both retailers followed up with the shopper days later to see if the shopper wanted to continue with the installation process.



When Representatives Brought Up HPWHs

- Only two representatives brought up HPWHs before the shopper asked about them (MPI 1d).
 - Only one brought up HPWHs immediately (and recommended the technology outright).
 - The second representative recommended a HPWH only after being asked for additional options. (This person first recommended an electric resistance water heater.)
- The remaining 14 representatives only discussed HPWHs after the shopper specifically asked about them.
 - Representatives generally would not offer quotes for HPWHs unless an installer visited the home first. They recommended an in-home consultation with an installer to assess if the area was suitable for a HPWH.

Representatives' Knowledge and Opinions about HPWHs

- Only two of the 16 representatives had **no knowledge or opinions about HPWHs**.
 - When the shopper asked about HPWHs, they suggested an in-home consultation with an installer for additional information.
- **Two HPWH detractors.** These representatives essentially recommended against HPWHs, focusing on potential downsides:
 - "They are like hybrid cars. They provide efficiency for the home while saving you energy. However, they are very pricey...Hybrid tanks can be very noisy, and they need a lot of room at the top to work with. If electric water heaters are already working out for you, I recommend sticking to electric [resistance]."
 - "Hybrid tanks may not be the best option for you as they take a while to heat up the water."
- Two representatives provided an **overall neutral perspective**, neither in favor of nor against HPWHs:
 - "A plumber would have to come out to look at the area beforehand to make sure it has the proper space needed for installation, but if you would like to go that route, that's possible."
 - "Hybrid is an option, but it would be a lot more hassle to install and we would have to come in a look to see if your house is set up to handle a hybrid tank."



- **Ten positive portrayals of HPWHs**, including two who recommended HPWHs and eight who provided an overall positive view of HPWHs (MPI 1d), though they did not provide an actual recommendation for them:
 - "Those who own hybrid tanks like them a lot and they're very durable. They do cost more than the electrical tanks. However, over time, you'll start earning your money back from them."
 - "The hybrid tanks seem pretty good. The models we carry are ENERGY STAR, which means it is going to be energy efficient and save you some money in the long run."
 - "I think hybrids are fantastic options to add to your home, especially given that your current tank it is getting old. If the area is right, it's something you should consider."

Other findings of interest

- Notably, though ten of the 16 representatives could be described as providing generally positive comments about HPWHs, *only two actually recommended them to the mystery shopper*.
 - Representatives discussed positive attributes related to energy efficiency, costsavings, and ability to provide sufficient hot water.
 - Representatives highlighted the high initial cost of purchasing a HPWH, but they also described the associated bill savings, with one noting that they will be "earning their money back" down the line.
- The vast majority of representatives recommended an electric resistance water heater: 15 recommended those first. (One recommended a HPWH only after being asked for other options.)
- Representatives looked for alternatives to a large, electric resistance tank, given that those are no longer available (outside of commercial models).
 - No representative recommended an electric resistance tank over 55 gallons.
 - Most representatives asked if the shopper could settle with a smaller capacity, or if they would like two smaller electric resistance tanks.
 - Some of the representatives appeared aware that large electric resistance tanks had been discontinued, though others just reviewed their inventories to describe what was available.



- One representative mentioned that the store had 80-gallon HPWHs, but a special order would need to be placed to obtain one.
- To facilitate fast installation, some representatives noted that products were available instore, or could be pre-ordered and ready for pick-up within a week, rather than relying on delivery from a contractor.
- In conversations, most representatives were not familiar with the term "heat pump water heater," but instead knew them as "hybrid" water heaters.
- Six representatives were able to electronically provide full installation quotes for the water heater they recommended, allowing for customers to move forward quickly with a purchase decision.
 - Quotes included model number, unit pricing, and extended warranty options. They also cited the need for a permit; this was included in the costs.
 - Representatives who did not provide full quotes relied on installers to provide quotes when they visited a home.
- When the shopper asked for other options, five representatives mentioned that they also offered gas water heaters (though none ultimately recommended one). Representatives were more likely to mention gas water heaters than HPWHs, even *to a mystery shopper describing already having an electric tank*.
- Two representatives requested the model number of the shoppers' current water heater to attempt to replace with an identical model.
- One representative recommended against HPWHs due to the basement location of the current water heater. The representative recommended against HPWHs in basements and said that they are better suited to "open circulated" areas, such as the garage.

Appendix E Homeowner Awareness Survey

NMR conducted a survey of homeowners with electric storage water heaters to gauge consumer awareness of HPWHs and better understand the factors that affect water heater purchase decisions. This appendix describes the detailed methodology and findings from that effort.

Survey topics included the following:

- Awareness (MPI 9), interest, and perceptions of HPWHs, including customer satisfaction (MPI 4a and 4b)
- Common reasons for purchasing water heaters
- Awareness of HWS brand
- Attitudes about technology and the environment
- Water heater characteristics (size, age, etc.)
- Household characteristics and demographics

METHODOLOGY

NMR conducted 411 surveys of single-family homeowners with electric storage water heaters. The survey was fielded in March 2021 using panelists located in Washington, Oregon, Idaho, and Montana that were screened on region, home type, and water heater type. Single-family homes included detached, two-family attached homes, and apartment or condominium buildings with two to four units. Table 16 shows survey results by region. The team classified counties as rural or urban based on the 2013 Rural-Urban Continuum Codes.³⁵

Homeowner survey respondents in MPER #6 had significantly higher levels of educational attainment than respondents in MPER #1 and MPER #2, both of which also had higher levels of educational attainment than the general population. However, to maintain consistency with MPER #1 and MPER #2, the team weighted the survey data the same way as in the previous MPERs (i.e., by state, region [urban/rural], and home type).

MPER #1 and MPER #2 referred to this survey as a *general population* survey, as renters were included in both surveys (1% and 2%, respectively.) In MPER #6, the team screened out renters, mobile homes, and multifamily buildings with five or more units. To accurately reflect this group of respondents, the survey is referred to as the *homeowner awareness survey* throughout the report.

³⁵ U.S. Department of Agriculture Economic Research Service. *Rural-Urban Continuum Codes*. December 10, 2020. <u>https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx</u>.



Responses of "don't know" and "refused" were excluded from most tables in the MPER #2 report. When comparing MPER #6 results directly to those of MPER #2, the team excluded responses of "don't know" and "refused" as appropriate to allow for a direct comparison.

State	Strata	Target	Responses Achieved
Washington	Urban	102	114
	Rural	38	23
Oregon	Urban	103	107
	Rural	37	33
Idaho	Statewide	70	70
Montana	Statewide	70	64
Total		420	411

TABLE 16: SURVEY DISPOSITION

In the tables and figures that follow, where NMR performed tests of statistical significance between groups or states and found differences, each group or state is denoted by a lowercase letter. For each group or state, the group(s) or state(s) with results that differ significantly from other groups or states are marked with letter that corresponds to that group or state in the legend or table.



WATER HEATER PURCHASE FACTORS

Existing water heater age. All respondents had electric storage water heaters. As Figure 21 shows, over two-thirds (70%) of respondents' water heaters were between one and ten years old. Current (2021) respondents had fewer water heaters over ten years old (23%), and more water heaters between one and five years old (43%), than those in 2015 and 2016.



FIGURE 21: WATER HEATER AGE OVER TIME

14. WH_Age. Approximately how old is your water heater?

^a Statistically different from 2015 at the 90% confidence level

 $^{\rm b}$ Statistically different from 2016 at the 90% confidence level

 $^{\rm c}$ Statistically different from 2021 at the 90% confidence level


Table 17 displays 2021 respondents' water heater age by state, urban, and rural areas. Oregon residents had the most water heaters over ten years old (31%), followed by Washington (22%), Idaho (19%), and Montana (8%). These results suggest that the opportunity to replace failed or near-failure inefficient water heaters with HPWHs is greatest in Oregon and Washington.

Water Heater Age	Total	OR ^a	WA ^b	ID ^c	MT ^d	Urban ^e	Rural ^f
n	411	140	137	70	64	275	136
Less than 1 year	4%	4%	4%	4%	10%	3%	9%
1 to 5 years	43%	36%	44%	51%	44%	46%	33%
6 to 10 years	27%	25%	27%	26%	33%	26%	30%
More than 10 years	23%	31% ^{c,d}	22% ^d	19% ^{a,d}	8% ^{a,b,c}	22%	24%
Don't know	3%	4%	2%	0%	5%	2%	4%

TABLE 17: WATER HEATER AGE BY STATE AND REGION

14. WH_Age. Approximately how old is your water heater?

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

^c Statistically different from ID at the 90% confidence level

^d Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level ^f Statistically different from Rural at the 90% confidence level

datistically different from Rural at the 90% confidence level



HPWH recommendation rate among recent water heater purchasers. Just under one-third (31%) of respondents reported having purchased a new water heater in the past three years. The survey asked respondents who recently purchased a water heater and were aware of HPWHs³⁶ if their installer or contractor had recommended a HPWH to them. Almost two-thirds (64%) of these respondents said their installer or contractor recommended a HPWH (Figure 22).³⁷

FIGURE 22: CONTRACTOR RECOMMENDED A HPWH



A12. Did your installer or contractor recommend a heat pump water heater to you?

³⁶ Aware prior to survey participation.

³⁷ As the survey did not ask respondents to indicate whether they had self-installed their water heater before asking about the contractor recommendation, some respondents who did not use a contractor or installer may have answered this question.



Figure 23 shows how often contractors recommended a HPWH in different purchase scenarios. Respondents that were looking to install a more efficient water heater reported that contractors recommended a HPWH 93% of the time, which is significantly higher than for any other replacement reason. The next highest HPWH recommendation rate was for scenarios in which the respondent was installing the water heater to serve an addition to their home (75%).

FIGURE 23: SCENARIOS IN WHICH CONTRACTOR RECOMMENDED A HPWH





Why people bought new water heaters. Figure 24 displays the reasons why respondents purchased a new water heater. The most common reason respondents offered was that the water heater was old and/or close to failing (34%), followed by the water heater was working poorly and/or needed repair (22%) and the water heater was completely failing (20%) – a true *emergency* replacement.³⁸ Just over one-tenth (13%) of respondents purchased a new, functional water heater because they wanted a more energy-efficient one.

FIGURE 24: REASON FOR PURCHASING CURRENT WATER HEATER

(n=118)



A11. Why did you purchase a new water heater?

³⁸ MPER #4 and #5 used the term "emergency replacement" to refer to replacements of completely failed systems that provide no hot water, and MPER #6 continues this practice. NEEA may also consider using 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.



A subset of the homeowners indicated that they currently own a HPWH (see Figure 28). Figure 25 compares the reasons why respondents purchased a new water heater between those who said they purchased a HPWH and those who said they purchased a standard electric water heater. Respondents who said they purchased a HPWH were significantly more likely to say it was because their water heater was old and/or close to failing and were significantly less likely to say it was because their water heater worked poorly or was completely broken.

FIGURE 25: REASON FOR PURCHASING CURRENT WATER HEATER BY WATER HEATER TYPE



A11. Why did you purchase a new water heater?

* Statistically different at the 90% confidence level



Factors that trigger water heater purchases. The survey asked all respondents what would cause them to purchase a new water heater of any type. Table 18 shows that, unsurprisingly, the most common reasons were the water heater failing (83%) and needing repairs (43%). That said, around one-quarter of respondents indicated they would replace a working water heater early: 28% said they would purchase a new water heater to save energy and 24% said they would purchase a new water heater to lower utility bills. Oregon (30%) and Washington (31%) residents were more likely to consider purchasing a new water heater to save energy than Idaho (17%) and Montana (18%) residents. Respondents residing in urban areas (31%) were twice as likely to consider purchasing a new water heater to save energy than those residing in rural areas (15%). In contrast to early replacement to save energy, there were no significant differences among regions with respect to early replacement to lower utility bills.

	N N	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·				
What would cause you to purchase a new water heater?	Total	OR ^a	WA ^b	IDc	МТ ^d	Urban ^e	Rural ^f
n	411	140	137	70	64	275	136
lf it fails, breaks, or leaks	83%	83%	81%	86%	90%	81%	89%
If it has some issues but needs repairs to work well	43%	47%	40%	40%	54%	44%	39%
To save energy, even if it still works	28%	30% ^{c,d}	31% ^{c,d}	17% ^{a,b}	18% ^{a,b}	31% ^f	15% ^e
To lower utility bills, even if it still works	24%	26%	24%	18%	25%	24%	25%
If I was already renovating my home	23%	20%	26%	14%	27%	23%	21%
Other	2%	3%	2%	2%	1%	2%	2%
Don't know	1%	1%	2%	2%	1%	2%	1%

TABLE 18: REASONS FOR PURCHASING A NEW WATER HEATER

(Multiple responses permitted)

A13. What would cause you to purchase a new water heater (of any type)? Please select all that apply.

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

 $^{\rm c}$ Statistically different from ID at the 90% confidence level

^d Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level

^f Statistically different from Rural at the 90% confidence level



Information sources for mechanical equipment purchases. Figure 26 displays the information sources respondents said they typically consult when making decisions about purchasing mechanical equipment for their home, including water heaters. In line with past MPERs, the top three sources were internet research or reviews (56%), friends or acquaintances (40%), and contractors or installers (38%). These findings underline the importance of sustained, positive experiences with HPWHs, as these experiences will be conveyed via internet reviews and word of mouth.

FIGURE 26: SOURCES OF INFORMATION FOR MECHANICAL EQUIPMENT PURCHASES



(n=411)

22. A10. When making a decision about purchasing mechanical equipment for your home, such as a furnace or water heater, what are your typical sources of information regarding which product to purchase?



AWARENESS AND PERCEPTIONS OF, AND INTEREST IN, HPWHS

HPWH awareness. More than half of 2021 respondents (57%) said they had heard of HPWHs (MPI 9), compared to 28% in 2016 and 33% in 2015 (Figure 27). This survey, and previous MPERs that asked about HPWH awareness, did not give respondents the opportunity to confirm this awareness by providing them a description of a HPWH after asking the question. To better interpret this figure, the team used results from a follow-up survey of homeowners with electric water heaters to apply a *correction factor* to the HPWH awareness results. The follow-up survey, which was performed with a new sample of homeowners, asked the question in two parts. The first, or *unaided*, part asked respondents if they had heard of HPWHs. In the second, or *aided* part, the survey provided the definition of a HPWH to the respondents and asked them to reconsider their response to the question in light of this. Five percent of respondents who indicated they were aware of HPWHs on the unaided question changed their response to "No" or "I'm not sure" after being shown the definition. With this information, the team estimated a correction factor of -5.2%, with a 90% confidence interval (2.1%, 8.3%). Applying this correction factor to the 2021 Homeowner survey changes the overall awareness from 60% to 57%, with a 90% confidence interval (55%, 59%). The fact that the correction factor did not change the rate of awareness substantially indicates that the jump in HPWH awareness from the previous MPERs to the current MPER is not an anomaly.





FIGURE 27: HPWH AWARENESS OVER TIME

15. A1. Before today, had you heard the terms "heat pump water heater" or "hybrid water heater"?
16. A2. Based on that description, have you heard of "heat pump water heaters" or "hybrid water heaters"?
^a Statistically different from 2015 at the 90% confidence level
^b Statistically different from 2016 at the 90% confidence level
^c Statistically different from 2021 at the 90% confidence level

In addition to the effects of the NEEA HPWH Initiative, some possible reasons for this increase in HPWH awareness include increased media attention to heat pump technologies following recent heat waves, and higher levels of education among 2021 survey respondents than among 2016 and 2015 survey respondents.

Recent years – especially 2020 and 2021 – have seen an increase in the intensity of heat and an increase in the frequency and scope of wildfires and resulting damage and pollution, particularly in Western states. New climate modeling capabilities have been making clearer the connection between these events and global climate change,³⁹ spurring public awareness of climate change and interest in learning about solutions. The team has noticed a surge of articles over the last year or so about heating and cooling with electric heat pumps in national publications meant for the general population. The high awareness of HPWHs in the NEEA region could be driven in part by increased consumer awareness of heat pumps for HVAC.

The fact that respondents to the 2021 survey reported higher levels of income and education than respondents to the 2015 and 2016 survey (Table 19) could partly explain their higher awareness of HPWHs. The table compares key demographic characteristics for the 2015, 2016,

³⁹ "What Cutting-Edge Science Can Tell Us About Extreme Weather." Katherine Hayhoe and Federike Otto. *The New York Times,* August 17, 2021.



and 2021 Homeowner surveys that were conducted for MPER #1, MPER #2, and MPER #6, respectively. The differences in income and education between 2021 and 2015/2016 respondents were statistically significant. (Unlike the previous general population surveys, the 2021 survey screened out renters and respondents residing in mobile homes, which partly explains these differences.)

Demographics	2015 ^a	2016 ^b	2021 ^c
n	210	152	411
Income > \$120,000	8% ^c	13% ^c	21% ^{a,b}
College degree or higher	49 %℃	<mark>51</mark> %	58% ^a
Single-family detached	85% ^c	87% ^c	93% ^{a,b}
Own home	99%	98% ^c	100% ^b

TABLE 19: KEY DEMOGRAPHIC CHARACTERISTICS OVER TIME

^a Statistically different from 2015 at the 90% confidence level

 $^{\rm b}$ Statistically different from 2016 at the 90% confidence level

 $^{\rm c}$ Statistically different from 2021 at the 90% confidence level



Table 20 displays HPWH awareness by state, urban areas, and rural areas with the 90% confidence intervals shown in parentheses. Awareness was highest among Washington residents (62%), followed by Oregon (56%), Montana (49%), and Idaho (48%) residents. Additionally, awareness was ten percentage points higher among urban respondents (60%) than rural respondents (50%).

Heard of HPWH	n	%	90% Confidence Interval
Total	411	57%	55%-59%
OR^{a}	140	<mark>56</mark> %	55%-58%
WA ^b	137	62% ^{c,d}	60%-64%
ID ^c	70	48 % ^b	47%-50%
MT ^d	64	49 % ^b	47%-50%
Urban ^e	275	60% ^f	58%-61%
Rural ^f	136	50% ^e	48%-52%

TABLE 20: HPWH AWARENESS BY STATE AND REGION

15. A1. Before today, had you heard the terms "heat pump water heater" or "hybrid water heater"? 16. A2. Based on that description, have you heard of "heat pump water heaters" or "hybrid water heaters"?

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

^c Statistically different from ID at the 90% confidence level

^d Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level

^f Statistically different from Rural at the 90% confidence level



Figure 28 shows that the top two ways respondents heard of HPWHs were friends and acquaintances (29%) and internet research (25%). In addition, around one-fifth (21%) of respondents who were aware of HPWHs said they currently own one, and 8% said they previously owned one. Just under one-fifth (17%) of respondents heard of HPWHs from the hot water solutions website. Only 11% of respondents heard of HPWH from a contractor or installer.

The fact that the third most frequent way that 2021 respondents said they heard about HPWHs was the HWS website provides evidence that it is an important driver in HPWH awareness among homeowners.



FIGURE 28: SOURCES OF HPWH AWARENESS

(n=234; Multiple responses permitted)

17. A4. Where or how have you heard about heat pump water heaters?



Figure 29 shows that, while contractors and installers are still not a primary source of awareness, the percentage of respondents saying they heard of HPWH from a contract or installer has increased from 4% in 2016 to 11% in 2021.⁴⁰



FIGURE 29: SOURCES OF HPWH AWARENESS OVER TIME

17. A4. Where or how have you heard about heat pump water heaters? * Statistically different at the 90% confidence level



Satisfaction with HPWHs. Almost four out of five respondents (79%) who owned a HPWH at the time of the survey were satisfied with it overall (MPI 4a), as measured on a scale from 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied." Figure 62 shows the percentages of respondents who were "very satisfied" or "somewhat satisfied" with various aspects of their HPWH. Satisfaction with the different aspects varied only a little, with hot water supply and maintenance requirements receiving the highest levels of satisfaction (85% satisfied) and changes in electricity bill receiving the lowest (73%).



FIGURE 30: SATISFACTION WITH HPWH

18. A6. Please rate your satisfaction with the following aspects of your heat pump water heater.

Figure 31 shows that nearly all respondents (98%) who owned a HPWH are satisfied enough with the technology that they have recommended, or would recommend, one to a friend, colleague, or family member (MPI 4b).

FIGURE 31: WOULD RECOMMEND HPWH



19. A7. Have you, or would you, recommend a heat pump water heater to a friend, colleague, or family member?



Perceptions and Awareness of HPWH Capabilities. Figure 32 displays the percentage of respondents aware of HPWHs that agreed with a series of attitudinal statements about them.

A majority of respondents agreed with three positive perceptions HPWHs. About three-quarters (76%) of respondents agreed that HPWHs are very efficient. While this figure is relatively high, it indicates there is still opportunity to educate nearly one-quarter of consumers about HPWH efficiency. Around two-thirds of respondents believed that HPWHs offer better value (70%) and result in lower electric bills (65%) than typical electric water heaters.

A minority of respondents agreed with five negative perceptions of HPWHs. Around two-fifths (41%) of respondents believed that HPWHs were expensive to install, service, and repair. Less than one-fifth of respondents believed that HPWHs did not produce enough hot water (18%), were noisy (16%), or were unreliable (13%). These results suggest that higher costs to install and maintain HPWHs are a moderate barrier to wider adoption of HPWHs, while perceptions of technical drawbacks of HPWHs are a less significant barrier.

Over one-half of respondents (58%) indicated they were aware that HPWHs were eligible for tax credits and/or discounts from utility companies. Just under one-half (47%) were aware that HPWHs can be controlled with a smart phone.



FIGURE 32: PERCEPTIONS OF HPWHS (n=234)

21. A9. Please assess how much you agree or disagree with the following statements.



As Table 20 shows, perceptions of HPWHs varied by state and region. Compared to respondent overall, respondents in Idaho agreed less often with the statement "HPWHs are very efficient" (59% versus 76%). Respondents in Idaho (46%) and Montana (55%) agreed less often than respondents in Washington (76%) and Oregon (74%) with the statement "HPWHs offer better value than typical electric water heaters." These findings likely mirror the lower HPWH awareness levels in these areas; areas with higher awareness likely have had more product education and exposure to the benefits of HPWHs.

Percent Agree that HPWHs	Total	ORª	WA ^b	ID ^c	MT ^d	Urban ^e	Rural ^f
n	234	78	87	38	31	167	67
Are very efficient	76%	82% ^c	75% ^c	<mark>59%</mark> ^{a,b}	^{,d} 81% ^c	77%	71%
Offer better value	70%	74% ^{c,d}	76% ^{c,d}	46 % ^{a,b}	55% ^{a,b}	^o 74% ^f	59% ^e
Result in lower electric bills	65%	70%	62%	66%	75%	65%	68%
Are eligible for tax credits / utility discounts	58%	65% ^{c,d}	61% ^d	45% ^a	37% ^{a,b}	62% ^f	45% ^e
Can be controlled from a smart phone	47%	43%	52%	37%	43%	49%	41%
Are expensive to service / repair	41%	42%	42%	33%	48%	43%	35%
Are expensive to install	41%	46%	42%	31%	32%	42%	35%
Do not produce enough hot water	18%	18%	19%	13%	11%	20% ^f	8% ^e
Are noisy	16%	23% ^c	15% ^c	$3\%^{a,b,d}$	24% ^c	16%	20%
Are unreliable	13%	21% ^{b,c}	10% ^a	4% ^a	15%	14%	10%

TABLE 21: PERCEPTIONS OF HPWH BY STATE AND REGION

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

° Statistically different from ID at the 90% confidence level

^d Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level

^f Statistically different from Rural at the 90% confidence level



Demonstrated interest in installing HPWHs. The survey asked respondents who were aware of HPWHs but did not own one if they had ever considered installing one. Table 22 shows that almost one-third (32%) of respondents had considered installing a HPWH, a finding similar to that of past MPERs.⁴¹ Washington residents (39%) were more likely to have considered installing a HPWH than those in Oregon (26%), Idaho (21%), and Montana (26%). Additionally, respondents residing in urban areas (35%) were more likely to have considered installing a HPWH than respondents residing in rural areas (22%).

Considered Installing HPWH	n	%
Total	366	32%
OR ^a	125	26% ^b
WA ^b	117	<mark>3</mark> 9% ^{a,c,d}
ID ^c	64	21% ^b
MT ^d	60	26% ^b
Urban ^e	238	35% ^f
Rural ^f	128	22% ^e

TABLE 22: CONSIDERED INSTALLING A HPWH

A16. Did/Have you considered installing a heat pump water heater?

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

 $^{\rm c}$ Statistically different from ID at the 90% confidence level

^d Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level

^f Statistically different from Rural at the 90% confidence level

⁴¹ Twenty-nine percent in 2015 and 24% in 2016. Differences between years are not statistically significant.



Why respondents had not considered installing a HPWH. Figure 33 shows that the top two reasons respondents had not considered installing a HPWH were that their existing equipment worked fine (28%), and they were not familiar enough with them (21%). Just under one in ten respondents (9%) indicated that they may consider installing a HPWH in the future.



FIGURE 33: REASON FOR NOT CONSIDERING A HPWH

A15. What is the primary reason you did not consider installing a heat pump water heater?

HPWH brand awareness. Nearly two-fifths (38%) of respondents who were aware of HPWHs had heard of brands that make HPWHs (Figure 34), nearly twice as many as in 2016 (20%) and over twice as many as in 2015 (14%).

FIGURE 34: HEARD OF ANY HPWH BRANDS



^c Statistically different from 2021 at the 90% confidence level



Figure 35 shows that the top five HPWH brands respondents had heard of were Whirlpool (41%), General Electric (32%), American (31%), Electrolux (28%), and Kenmore (25%).⁴² Whirlpool and General Electric HPWHs likely benefit from high brand awareness of their other popular products, while it is possible that respondents might have thought of American Standard, a well-known brand that does not make HPWHs, when indicating they were aware of American HPWHs.

FIGURE 35: HPWH BRAND AWARENESS



(n=76; Multiple responses permitted)

A17. Which of the following heat pump water heater brands have you heard of, if any?

⁴² The team was unable to compare these findings to previous MPERs because the questions were not directly comparable; the MPER #6 survey prompted respondents to say whether they had heard of any brands that make HPWH before selecting the brands, while MPERs 1 and 2 were unprompted.



HWS AWARENESS

HWS awareness. Awareness of the HWS brand increased substantially between 2016 and 2021: from 4% to 19% (Table 23). Awareness among Oregon, Washington, and Montana residents was 20% or more, while only 9% of Idaho residents were aware of HWS.

Heard of	2	2016	2021					
HWS	n	%	n	%				
Total	147	4% *	411	19%*				
OR ^a	50	4%	140	22% ^c				
WA ^b	55	4%	137	20% ^c				
1D ^c	22	2%	70	9% ^{a,b,d}				
MT ^d	20	5%	64	24% ^c				
Urban ^e	92	4%	275	20%				
Rural ^f	51	4%	136	16%				

TABLE 23: AWARENESS OF HWS

HWS_Aware. Before today, had you heard of the "Hot Water Solutions" program?

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

 $^{\rm c}$ Statistically different from ID at the 90% confidence level

 $^{\rm d}$ Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level

^f Statistically different from Rural at the 90% confidence level



Figure 36 shows that the top three ways respondents heard of HWS were social media (39%), friends and acquaintances (36%), and television ads (35%). Only 14% of respondents heard of HWS from a contractor or installer, 12% heard of the it directly from the HWS website, and 10% heard of the program from a utility bill insert.



FIGURE 36: SOURCES OF HWS PROGRAM AWARENESS

HWS_First. How did you hear of the "Hot Water Solutions" program?



ATTITUDES ABOUT TECHNOLOGY AND THE ENVIRONMENT

Adopting new technology. The 2015, 2016, and 2021 homeowner surveys (conducted for MPER #1, MPER #2, and MPER #6, respectively) gauged the Northwest general population's tendency to accept new technology by reading or listing five statements and asking respondents to pick the one that best described them. The results, displayed in Figure 37 could suggest a shift towards early adoption of new technology since 2015 and 2016.⁴³ These results may also reflect the methodological differences between the surveys; homeowner surveys in MPER #1 and MPER #2 were conducted over the phone, while MPER #6 utilized a web survey, which may have captured more technologically-savvy customers. Higher proportions of 2021 respondents said they were the first among their friends to purchase new technology (13%) or purchased new technology sooner than most of their friends (24%) than in 2015 and 2016. Meanwhile, a lower proportion of 2021 respondents saying they are in the middle of the pack (around two-fifths) has remained stable over time.



FIGURE 37: NEW TECHNOLOGY ADOPTION

D1. Which of the following statements best describes you? ^a Statistically different from 2015 at the 90% confidence level

- ^b Statistically different from 2016 at the 90% confidence level
- ^c Statistically different from 2021 at the 90% confidence level



Attitudes about making major purchases and the environment. Figure 38 displays the percent of respondents who agreed with various statements pertaining to the process of making big purchases and consideration of environmental impacts.⁴⁴ Most respondents said they do research (89%), compare prices online (87%), and seek out expert recommendations (79%) before making big purchases. Around three-quarters of respondents agreed that they would spend money upfront to save in the long term (76%) and that energy efficiency was a primary consideration when choosing mechanical systems for the home (74%). Over two-thirds of respondents agreed that they were concerned about environmental issues (72%), they considered sustainability when making purchase decisions (69%), and their actions had an impact on the environment (69%).

FIGURE 38: PURCHASE PROCESS AND ENVIRONMENTAL CONSIDERATIONS



(n=411)

D2. Please rate your level of agreement with the following statements.

⁴⁴ The results show respondents who selected "strongly agree" or "somewhat agree" in response to these statements. This is a new question added in MPER #6.



DEMOGRAPHIC CHARACTERISTICS

This section presents demographic characteristics of the homeowner survey respondents. Most respondents reported they were white (93%), non-Hispanic (96%), and spoke English at home (97%). Just over one-half (58%) of respondents reported having a college degree (Table 24).

Characteristic	Total	ORª	WA ^b	ID°	MT ^d	Urban ^e	Rural ^f
n	411	140	137	70	64	275	136
White	93%	95% ^{b,c}	89% ^{a,c}	100% ^{a,b,d}	95%°	92%	95%
Non-Hispanic	95%	95%	94%	98%	95%	96%	91%
Male	51%	42% ^{b,c}	54% ^a	60% ^{a,d}	45% ^c	52%	46%
Speak English at home	97%	99% ^b	94% ^{a,c,d}	100% ^b	100% ^b	97%	97%
College Graduate	58%	55% ^c	65% ^c	42% ^{a,b,d}	57%°	61% ^f	49% ^e

TABLE 24: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

^c Statistically different from ID at the 90% confidence level

^d Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level

^f Statistically different from Rural at the 90% confidence level



Nearly three-quarters (72%) of respondents were between 25 and 64 years old (Table 25). Onequarter (25%) of respondents were 65 or older.

Age	Total	ORª	WA ^b	IDc	MT ^d	Urban ^e	Rural ^f
n	411	140	137	70	64	275	136
18 to 24	3%	4%°	3%°	a,b	3%	3%	3%
25 to 44	43%	31% ^{b,d}	49% ^a	39%	47% ^a	44%	38%
45 to 64	29%	37% ^{b,d}	25%ª	35%	24% ^a	28%	32%
65 and older	25%	28%	23%	26%	26%	25%	27%

TABLE 25: AGE OF RESPONDENTS

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

^c Statistically different from ID at the 90% confidence level

^d Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level

^f Statistically different from Rural at the 90% confidence level

Just under one-fifth (18%) of respondents' 2020 household income was less than \$40,000 (Table 26). Larger proportions of respondents residing in Oregon (25%) and Idaho (29%) earned less than \$40,000 than respondents in Washington (13%) and Montana (10%).

TABLE 26: INCOME

Household Income	Total	ORª	WA ^b	IDc	MT ^d	Urban ^e	Rural ^f
n	411	140	137	70	64	275	136
Less than \$40,000	18%	25% ^{b,d}	13% ^{a,c}	29% ^{b,d}	10% ^{a,c}	17%	22%
\$40,001 to \$80,000	30%	32%	28%	29%	38%	28%	35%
\$80,001 to \$120,000	29%	20% ^b	35% ^{a,d}	28%	23% ^b	30%	24%
Over \$120,000	21%	21% ^c	23% ^c	12% ^{a,b,d}	23% ^c	22%	16%
Don't know/Rather not say	3%	3%	2%	2%	5%	3%	2%

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

^c Statistically different from ID at the 90% confidence level

^d Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level

f Statistically different from Rural at the 90% confidence level



When compared to homeowners in the general population across Oregon, Washington, Idaho, and Montana, homeowner survey respondents across all years (MPER #1, MPER #2, and MPER #6) had higher levels of educational attainment (Table 27).⁴⁵ However, homeowner survey respondents in MPER #6 had significantly higher levels of educational attainment than respondents in MPER #1 and MPER #2. To maintain consistency with MPER #1 and MPER #2, the homeowner survey was weighted by state and home type.⁴⁶

TABLE 27: EDUCATIONAL CHARACTERISTICS OF RESPONDENTS COMPARED TO CENSUS

Education	Censusª	2015 ^b	2016 ^c	2021 ^d
n	3,657,660	205	132	140
Less than high-school graduate	5% ^{c,d}	5% ^d	2%ª	1% ^{a,b}
High school graduate	19% ^{c,d}	15% ^d	12%ª	10% ^{a,b}
Some college or associate's degree	34%	31%	34%	31%
Bachelor's degree or higher	42% ^{b,c,d}	49% ^{a,d}	51% ^a	58% ^{a,b}

^a Statistically different from OR at the 90% confidence level

^b Statistically different from WA at the 90% confidence level

° Statistically different from ID at the 90% confidence level

^d Statistically different from MT at the 90% confidence level

^e Statistically different from Urban at the 90% confidence level

^f Statistically different from Rural at the 90% confidence level

⁴⁵ U.S. Census Bureau. *Tenure by Educational Attainment of Householder American Community Survey 1-year estimates.* <u>https://censusreporter.org/data/table/?table=B25013&geo_ids=040]01000US#valueType|estimate</u>.
 Accessed August 11, 2021.

⁴⁶ Weighting for education did not produce any significant differences in overall awareness. If the MPER #6 homeowner survey weights were adjusted to account for education, overall HPWH awareness would be 54%, rather than the 57% reported in the survey findings.

DETAILED RESULTS

This section contains full results for all homeowner survey questions. Note that sample sizes (n's) are unweighted and percentages are weighted.

Survey Question	Paspansa Ontions	Тс	otal	C	R	V	VA		ID		МТ	Urban		Ru	ıral
Survey Question		n	%	n	%	n	%	n	%	n	%	n		n	
S_HomeType (n=411)	Single-family home	382	87%	131	85%	121	86%	68	89%	62	92%	252	86%	130	89%
What type of home do vou live	Townhouse/rowhouse	18	5%	5	5%	11	5%	1	4%	1	3%	16	5%	2	3%
in?	Apartment/condo (2-4 units)	11	8%	4	10%	5	8%	1	7%	1	5%	7	9%	4	8%
WH_Age (n=411) Approximately how old is your water heater?	Less than 1 year old 1 to 5 years old 6 to 10 years old More than 10 years old I'm not sure	22 162 116 98 13	5% 43% 27% 23% 3%	6 43 38 47 6	4% 36% 25% 31% 4%	5 59 38 31 4	4% 44% 27% 22% 2%	3 32 20 15 0	4% 51% 26% 19% 0%	8 28 20 5 3	10% 44% 33% 8% 5%	11 116 77 65 6	3% 46% 26% 22% 2%	11 46 39 33 7	9% 33% 30% 24% 4%
A1 (n=411) Before today, had you heard the	Yes	189	46%	59	44%	75	50%	34	47%	21	30%	136	49%	53	38%
terms "heat pump water heater" or	No	159	39%	56	39%	43	39%	27	42%	33	51%	95	36%	64	47%
"hybrid water heater"?	I'm not sure	63	15%	25	17%	19	14%	9	11%	10	19%	44	15%	19	14%
A2 (n=222)	Yes	45	21%	19	24%	12	22%	4	10%	10	19%	31	22%	14	18%

TABLE 28: DETAILED HOMEOWNER AWARENESS SURVEY RESULTS



Survey Question	Response Options -	Тс	otal	OR		V	VA		ID		мт	Url	ban	Rı	ıral
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Based on that description, have you heard of "heat pump water	No	162	73%	58	71%	45	70%	29	83%	30	73%	100	74%	62	70%
heaters" or "hybrid water heaters"?	I'm not sure	15	7%	4	5%	5	8%	3	7%	3	8%	8	4%	7	12%
A1 and A2 Combined (n=411)	Has heard of HPWHs	234	57%	78	57%	87	61%	38	53%	31	43%	167	60%	67	49%
Has respondent heard of HPWHs?	Has not heard of HPWHs	177	43%	62	43%	50	39%	32	47%	33	57%	108	40%	69	51%
	I currently own one	45	21%	15	28%	20	20%	6	15%	4	12%	37	23%	8	14%
	I previously owned one	15	8%	3	3%	9	11%	2	5%	1	3%	13	9%	2	2%
	From a friend or acquaintance	60	29%	19	29%	20	27%	10	31%	11	43%	41	28%	19	35%
	Utility print advertising or bill insert	13	9%	7	13%	5	9%	1	3%	0	0%	12	11%	1	1%
$\Lambda A (n=23A)$	Utility website	19	8%	8	9%	6	8%	2	6%	3	8%	14	8%	5	6%
Where or how	Smart Water Heat website	15	7%	4	10%	5	5%	0	0%	6	15%	10	7%	5	6%
have you heard	Hot Water Solutions website	17	10%	7	13%	4	8%	1	2%	5	22%	12	10%	5	9%
about heat pump	Retail store display	33	13%	13	15%	11	12%	6	14%	3	8%	22	12%	11	15%
water heaters?	Retail store salesperson	17	7%	8	10%	5	5%	3	9%	1	4%	13	7%	4	8%
Water Heatere.	Printed newspaper ad	10	5%	3	3%	5	8%	0	0%	2	5%	8	6%	2	2%
	Print newspaper story	7	5%	1	1%	4	6%	1	8%	1	3%	3	3%	4	12%
	Online news story	20	9%	6	7%	8	10%	3	12%	3	9%	14	9%	6	11%
	Television ad	28	15%	9	11%	14	19%	2	10%	3	11%	23	16%	5	12%
	Social media, such as Facebook, Instagram, or YouTube	30	17%	6	13%	14	20%	2	5%	8	32%	21	18%	9	16%
	Contractor or installer	27	11%	6	7%	9	10%	6	16%	6	16%	18	10%	9	14%



0		Т	otal	C	DR	V	VA		ID		мт	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	While researching on the Internet	50	25%	13	15%	23	33%	8	21%	6	15%	36	27%	14	19%
	Internet advertising	31	15%	8	10%	15	19%	4	10%	4	12%	25	17%	6	8%
	Utility newsletter	17	10%	9	15%	6	10%	2	5%	0	0%	15	12%	2	3%
	Other, please specify	10	4%	4	5%	5	5%	1	2%	0	0%	6	4%	4	7%
	I'm not sure	18	7%	9	10%	4	5%	4	11%	1	3%	13	7%	5	6%
A6a (n=44) Please rate your	Very dissatisfied	2	5%	0	0%	1	7%	0	0%	1	50%	0	0%	2	43%
satisfaction with the following	Somewhat dissatisfied	3	6%	1	6%	2	11%	0	0%	0	0%	2	4%	1	14%
aspects of your heat pump water heater The	Neither satisfied nor dissatisfied	3	7%	0	0%	3	14%	0	0%	0	0%	3	9%	0	0%
heater The sound level of the	Somewhat satisfied	6	10%	3	11%	2	7%	1	25%	0	0%	6	11%	0	0%
heater	Very satisfied	30	72%	11	83%	12	61%	5	75%	2	50%	25	76%	5	43%
A6b (n=40) Please rate your satisfaction with	Very dissatisfied	3	10%	0	0%	2	18%	0	0%	1	33%	2	5%	1	29%
the following aspects of your	Somewhat dissatisfied	2	3%	0	0%	1	5%	0	0%	1	33%	0	0%	2	14%
heat pump water heater The change in your	Neither satisfied nor dissatisfied	6	13%	1	6%	4	18%	1	20%	0	0%	5	13%	1	14%
electricity bill since installing	Somewhat satisfied	13	37%	6	44%	5	32%	2	40%	0	0%	12	41%	1	14%



0	Desmanas Ontions	Т	otal	C	DR	V	VA		ID		MT	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
the heat pump water heater	Very satisfied	16	38%	7	50%	5	27%	3	40%	1	33%	13	41%	3	29%
A6c (n=44)	Very dissatisfied	1	1%	0	0%	0	0%	0	0%	1	33%	1	2%	0	0%
Please rate your satisfaction with	Somewhat dissatisfied	2	3%	1	6%	0	0%	1	25%	0	0%	2	4%	0	0%
the following aspects of your	Neither satisfied nor dissatisfied	4	9%	0	0%	3	15%	0	0%	1	33%	2	4%	2	43%
heat pump water heater - Your hot	Somewhat satisfied	8	26%	2	28%	6	30%	0	0%	0	0%	7	27%	1	14%
water supply	Very satisfied	29	61%	12	67%	11	56%	5	75%	1	33%	24	62%	5	43%
A6d (n=43) Please rate your	Very dissatisfied	1	2%	0	0%	1	4%	0	0%	0	0%	0	0%	1	17%
satisfaction with the following aspects of your	Somewhat dissatisfied	1	4%	0	0%	1	7%	0	0%	0	0%	0	0%	1	33%
heat pump water heater The	Neither satisfied nor dissatisfied	5	10%	2	6%	3	14%	0	0%	0	0%	5	11%	0	0%
maintenance requirements of	Somewhat satisfied	9	17%	4	17%	4	18%	0	0%	1	50%	7	16%	2	17%
the heat pump water heater	Very satisfied	27	67%	9	78%	11	57%	6	100%	1	50%	23	73%	4	33%
A6e (n=44) Please rate your	Very dissatisfied	1	1%	0	0%	0	0%	0	0%	1	50%	1	2%	0	0%
satisfaction with the following	Somewhat dissatisfied	3	9%	0	0%	3	18%	0	0%	0	0%	1	4%	2	43%
aspects of your	Neither satisfied nor dissatisfied	6	10%	2	6%	3	11%	1	20%	0	0%	6	11%	0	0%



Survey Question	Response Options -		otal	OR		۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
heat pump water heater The heat	Somewhat satisfied	5	10%	2	6%	2	11%	1	20%	0	0%	4	11%	1	14%
pump water heater overall	Very satisfied	29	69%	11	88%	12	61%	4	60%	2	50%	24	71%	5	43%
A7 (n=45) Have you, or would you,	Yes, I have	30	69%	11	83%	12	59%	4	75%	3	67%	24	69%	6	71%
heat pump water heater to a friend, colleague, or family member? -	Yes, I would	13	28%	4	17%	8	41%	0	0%	1	33%	12	29%	1	14%
family member? - Selected Choice	No	2	3%	0	0%	0	0%	2	25%	0	0%	1	2%	1	14%
Selected Choice A9a (n=234) Please assess	Strongly disagree	6	3%	0	0%	2	2%	3	10%	1	5%	3	2%	3	6%
how much you agree or disagree	Somewhat disagree	7	3%	1	2%	2	2%	3	7%	1	5%	4	3%	3	4%
with the following	Neither agree nor disagree	44	19%	15	17%	16	20%	10	24%	3	10%	32	19%	12	18%
Heat pump water	Somewhat agree	113	50%	42	53%	45	52%	12	34%	14	48%	87	53%	26	39%
heaters are very efficient.	Strongly agree	64	26%	20	29%	22	23%	10	24%	12	33%	41	25%	23	33%
A9b (n=234) Please assess	Strongly disagree	7	3%	0	0%	2	3%	5	17%	0	0%	1	1%	6	14%
how much you agree or disagree	Somewhat disagree	15	8%	6	12%	5	7%	2	3%	2	5%	12	10%	3	4%



Survey Question		Total		OR		V	VA		ID		мт	Ur	ban	Rı	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
with the following statements	Neither agree nor disagree	52	23%	17	18%	23	28%	6	14%	6	20%	40	25%	12	14%
heaters result in lower electric bills	Somewhat agree	113	44%	39	45%	38	40%	19	48%	17	60%	77	42%	36	54%
than a typical water heater.	Strongly agree	47	21%	16	24%	19	22%	6	17%	6	15%	37	23%	10	14%
A9c (n=234) Please assess	Strongly disagree	3	2%	0	0%	1	1%	2	10%	0	0%	1	1%	2	6%
how much you agree or disagree with the following statements Heat pump water heaters are	Somewhat disagree	8	3%	1	2%	2	2%	5	10%	0	0%	5	3%	3	4%
	Neither agree nor disagree	92	37%	29	33%	31	36%	14	34%	18	63%	61	35%	31	45%
eligible for tax credits and/or	Somewhat agree	93	43%	34	48%	38	45%	13	34%	8	21%	70	46%	23	33%
utility companies.	Strongly agree	38	15%	14	17%	15	16%	4	10%	5	16%	30	16%	8	12%
A9d (n=234) Please assess	Strongly disagree	5	2%	0	0%	1	1%	3	11%	1	5%	1	1%	4	8%
Please assess how much you agree or disagree with the following statements Heat pump water	Somewhat disagree	11	3%	2	2%	1	1%	6	14%	2	5%	5	3%	6	6%
	Neither agree nor disagree	60	24%	21	25%	20	22%	11	29%	8	35%	43	24%	17	27%
heaters offer	Somewhat agree	111	48%	36	42%	45	54%	16	43%	14	40%	83	50%	28	43%



0		Тс	otal	C	R	V	A		ID		MT	Ur	ban	Rı	ıral
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
better value than typical electric water heaters.	Strongly agree	47	23%	19	32%	20	22%	2	4%	6	15%	35	24%	12	16%
A9e (n=234) Please assess	Strongly disagree	8	3%	3	5%	0	0%	4	13%	1	5%	3	1%	5	8%
how much you agree or disagree	Somewhat disagree	8	3%	2	2%	2	2%	3	10%	1	5%	7	3%	1	2%
with the following statements	Neither agree nor disagree	114	47%	45	51%	40	46%	16	40%	13	48%	81	46%	33	49%
Heat pump water heaters can be	Somewhat agree	68	32%	16	25%	28	35%	12	30%	12	33%	48	32%	20	29%
controlled from a smart phone.	Strongly agree	36	16%	12	18%	17	17%	3	7%	4	10%	28	17%	8	12%
A9f (n=234) Please assess	Strongly disagree	31	14%	10	17%	10	11%	7	21%	4	14%	24	15%	7	12%
how much you	Somewhat disagree	67	28%	16	19%	26	31%	14	38%	11	29%	47	29%	20	27%
agree or disagree with the following	Neither agree nor disagree	99	41%	36	41%	36	43%	16	38%	11	33%	68	41%	31	41%
statements	Somewhat agree	21	8%	8	9%	8	7%	1	3%	4	19%	14	7%	7	14%
Heat pump water heaters are noisy.	Strongly agree	16	8%	8	14%	7	7%	0	0%	1	5%	14	9%	2	6%
A9g (n=234) Please assess	Strongly disagree	40	18%	11	18%	12	13%	11	32%	6	20%	27	17%	13	19%
how much you agree or disagree	Somewhat disagree	80	37%	23	29%	34	41%	12	32%	11	40%	59	38%	21	33%
with the following statements, -	Neither agree nor disagree	82	33%	30	32%	30	35%	13	32%	9	25%	56	32%	26	38%
Heat pump water	Somewhat agree	19	7%	7	8%	7	7%	2	4%	3	10%	14	8%	5	6%



	Deenenee Ontione	Тс	otal	C	DR	V	A		ID		МТ	Ur	ban	Rı	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
heaters are unreliable.	Strongly agree	13	6%	7	14%	4	3%	0	0%	2	5%	11	6%	2	4%
A9h (n=234) Please assess	Strongly disagree	17	9%	4	9%	6	7%	5	17%	2	5%	12	9%	5	10%
how much you agree or disagree	Somewhat disagree	33	14%	9	11%	13	15%	7	17%	4	11%	22	13%	11	18%
with the following statements	Neither agree nor disagree	89	37%	30	34%	30	36%	14	34%	15	53%	62	36%	27	37%
Heat pump water heaters are expensive to install. A9i (n=234) Please assess how much you	Somewhat agree	70	31%	25	34%	28	32%	11	28%	6	21%	51	32%	19	29%
expensive to install. A9i (n=234)	Strongly agree	25	10%	10	12%	10	10%	1	3%	4	11%	20	11%	5	6%
A9i (n=234) Please assess	Strongly disagree	13	8%	2	8%	6	7%	3	13%	2	5%	8	7%	5	12%
how much you agree or disagree	Somewhat disagree	31	12%	6	6%	12	13%	6	13%	7	19%	18	11%	13	16%
with the following statements	Neither agree nor disagree	98	39%	39	45%	34	38%	16	40%	9	29%	72	40%	26	37%
Heat pump water heaters are	Somewhat agree	70	31%	20	23%	28	34%	12	30%	10	38%	53	32%	17	27%
expensive to service or repair.	Strongly agree	22	10%	11	18%	7	8%	1	3%	3	10%	16	11%	6	8%
A9j (n=234) Please assess	Strongly disagree	40	17%	11	12%	14	16%	10	29%	5	21%	26	15%	14	29%
how much you agree or disagree with the following statements	Somewhat disagree	68	30%	19	29%	25	30%	11	26%	13	42%	46	30%	22	31%
	Neither agree nor disagree	89	35%	36	40%	31	34%	13	32%	9	26%	64	36%	25	33%



Q	Designed Onting	Тс	otal	OR		WA		ID		МТ		Ur	ban	Rı	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Heat pump water heaters do not	Somewhat agree	19	9%	4	5%	10	13%	3	10%	2	5%	16	11%	3	4%
produce enough hot water.	Strongly agree	18	8%	8	14%	7	7%	1	3%	2	5%	15	9%	3	4%
	Friends or acquaintances	161	40%	53	37%	52	39%	24	40%	32	53%	105	39%	56	41%
	Utility print advertising or bill inserts	36	10%	16	14%	15	12%	2	3%	3	5%	27	11%	9	7%
A10 (n=411) When making a	Utility website	111	29%	46	34%	40	29%	13	23%	12	20%	84	31%	27	21%
decision about purchasing	Retail store – general	106	26%	33	23%	31	25%	23	31%	19	27%	73	27%	33	21%
mechanical equipment for	Retail store – displays	89	22%	37	27%	27	20%	13	18%	12	17%	60	22%	29	20%
your home, such as a furnace or	Retail store salespeople	107	27%	42	33%	36	27%	16	22%	13	20%	74	28%	33	25%
water heater, what are your	Newspaper ads	21	6%	6	4%	8	7%	2	5%	5	9%	16	6%	5	7%
typical sources of information	Print newspaper stories	17	5%	5	4%	7	6%	4	8%	1	1%	12	5%	5	6%
regarding which product to	Online news stories	43	12%	14	10%	17	14%	4	7%	8	12%	32	12%	11	9%
purchase?	Television ads	40	10%	14	9%	15	12%	4	7%	7	10%	28	10%	12	11%
	Social media, such as Facebook, Instagram or YouTube	52	17%	9	6%	28	23%	7	17%	8	12%	37	18%	15	14%
	From a contractor or installer	153	38%	49	39%	50	35%	30	48%	24	35%	101	37%	52	39%



Survey Question	December Onting	Т	otal	C	DR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Internet research or internet reviews	234	56%	92	62%	74	54%	33	50%	35	58%	159	56%	75	56%
	Internet advertising	49	16%	15	17%	21	17%	4	8%	9	19%	36	16%	13	15%
	Specific internet website	16	5%	2	1%	10	7%	2	3%	2	3%	11	5%	5	4%
	Utility newsletter	37	10%	16	10%	15	12%	3	4%	3	4%	25	10%	12	9%
	Other	5	1%	2	1%	1	1%	1	1%	1	1%	3	1%	2	1%
	I'm not sure	11	2%	5	3%	3	2%	2	3%	1	1%	7	2%	4	3%
	Consumer Reports	5	31%	1	50%	4	33%	0	0%	0	0%	3	25%	2	40%
	Amazon	3	21%	0	0%	2	20%	0	0%	1	50%	3	25%	0	0%
A10_site (n=16)	Google	3	20%	0	0%	2	20%	0	0%	1	50%	2	19%	1	20%
Specific internet	Home Depot	2	8%	0	0%	0	0%	2	100%	0	0%	1	16%	1	20%
website	Hometalk	1	3%	1	50%	0	0%	0	0%	0	0%	0	0%	1	20%
	This Old House	1	8%	0	0%	1	13%	0	0%	0	0%	1	13%	0	0%
	YouTube	1	8%	0	0%	1	13%	0	0%	0	0%	1	13%	0	0%
A11 (n=411) Have you	Yes	118	31%	31	26%	45	33%	19	28%	23	37%	83	32%	35	28%
purchased a new water heater in	No	290	68%	109	74%	90	65%	51	72%	40	61%	191	67%	99	71%
the past three years?	I'm not sure	3	1%	0	0%	2	1%	0	0%	1	3%	1	1%	2	1%
A12 (n=118)	My water heater was completely broken and did not provide any hot water	26	20%	9	21%	8	19%	6	29%	3	14%	19	21%	7	15%


0	Deen and Ontions	Т	otal	C	DR	V	VA		ID		МТ	Ur	ban	Rı	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Why did you purchase a new water heater?	My water heater worked poorly and/or needed repair	26	22%	8	21%	11	26%	1	6%	6	21%	18	23%	8	19%
	My water heater was old and/or close to failing	39	35%	6	28%	16	34%	6	35%	11	50%	25	31%	14	50%
	I wanted to install a more energy- efficient water heater	13	13%	4	21%	5	10%	3	12%	1	7%	10	15%	3	8%
	To serve an addition to my home	7	6%	3	7%	4	7%	0	0%	0	0%	7	7%	0	0%
	I wanted a bigger water heater	1	0%	0	0%	0	0%	1	6%	0	0%	0	0%	1	4%
	Came with newly built home	6	4%	1	3%	1	3%	2	12%	2	7%	4	4%	2	4%
A13 (n=85) Did your installer	Yes	50	64%	15	82%	24	64%	5	45%	6	38%	40	67%	10	59%
or contractor recommend a	No	30	29%	4	14%	10	25%	8	55%	8	63%	20	27%	10	35%
heat pump water heater to you?	I'm not sure	5	7%	1	5%	4	10%	0	0%	0	0%	4	6%	1	6%
A15 (n=411) What would	If it fails, breaks, or leaks	350	83%	121	83%	112	81%	60	86%	57	90%	227	81%	123	89%
cause you to purchase a new	If it has some issues but needs repairs to work well	179	43%	69	47%	54	40%	24	40%	32	54%	127	44%	52	39%



	Beere and Orthogo	Тс	otal	C	DR	۷	VA		ID		МТ	Ur	ban	Rı	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
water heater (of any type)?	To save energy, even if it still works	105	28%	39	30%	41	31%	13	17%	12	18%	83	31%	22	15%
Please select all that apply.	To lower utility bills, even if it still works	96	24%	37	26%	32	24%	12	18%	15	25%	65	24%	31	25%
	If I was already renovating my home	88	23%	28	20%	33	26%	11	14%	16	27%	59	23%	29	21%
	Other	9	2%	4	3%	3	2%	1	2%	1	1%	6	2%	3	2%
	Don't know	6	1%	2	1%	2	2%	1	2%	1	1%	5	2%	1	1%
A16 (n=366) Did/Have you	Yes	102	32%	30	26%	43	39%	13	21%	16	26%	76	35%	26	22%
Considered installing a heat	No	227	58%	82	64%	61	51%	49	75%	35	57%	141	56%	86	64%
pump water heater?	I'm not sure	37	10%	13	10%	13	10%	2	4%	9	17%	21	8%	16	14%
	Existing equipment works fine	24	30%	10	32%	10	34%	2	8%	2	20%	16	31%	8	27%
	Prefer a different kind	1	2%	0	0%	1	5%	0	0%	0	0%	1	3%	0	0%
A17 (n=83)	May/plan to in the future	5	8%	1	5%	3	12%	1	8%	0	0%	4	8%	1	5%
What is the	Cost	14	15%	6	23%	2	7%	5	23%	1	20%	7	12%	7	18%
primary reason	Not familiar enough with them	23	21%	12	36%	1	5%	7	38%	3	40%	13	19%	10	27%
you did not	Concerns about their performance	2	2%	0	0%	0	0%	2	8%	0	0%	1	2%	1	5%
consider installing	Does not fit in my space	7	13%	1	5%	5	22%	1	8%	0	0%	5	15%	2	9%
a heat pump water heater?	The installer/contractor did not mention them	4	5%	0	0%	2	7%	2	8%	0	0%	3	5%	1	5%
	I'm not sure	2	4%	0	0%	2	7%	0	0%	0	0%	2	5%	0	0%
	Not immediately available	1	1%	0	0%	0	0%	0	0%	1	20%	0	0%	1	5%
A19 (n=234)	Yes	76	38%	23	38%	34	41%	11	34%	8	25%	60	40%	16	31%



Summer Ouestien	Despanse Ontions	Тс	otal	C	DR	V	VA		ID		MT	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Have you heard of any brands that make heat	Νο	117	45%	40	45%	41	44%	17	41%	19	60%	77	43%	40	55%
pump water heaters?	I'm not sure	41	17%	15	17%	12	15%	10	24%	4	15%	30	17%	11	14%
	General Electric ("GE")	29	32%	9	31%	11	28%	6	58%	3	35%	20	28%	9	57%
	A.O. Smith	17	19%	6	20%	7	19%	2	18%	2	25%	15	21%	2	12%
	American	21	31%	6	32%	10	30%	3	40%	2	25%	18	33%	3	25%
	Kenmore	16	25%	3	23%	9	26%	3	27%	1	10%	13	26%	3	17%
	Reliance	15	18%	7	21%	5	17%	2	18%	1	15%	15	21%	0	0%
	State	13	19%	7	35%	4	14%	1	9%	1	10%	12	22%	1	3%
	Stiebel Eltron	7	13%	5	43%	0	0%	1	6%	1	15%	6	14%	1	4%
A20 (n=76)	U.S. Craftmaster	9	11%	4	16%	3	9%	1	6%	1	15%	6	9%	3	21%
following heat	Whirlpool	32	41%	11	51%	13	37%	6	45%	2	25%	23	38%	9	52%
pump water	AirGenerate	11	16%	4	26%	4	9%	3	37%	0	0%	9	16%	2	19%
heater brands	Electrolux	19	28%	6	36%	10	29%	1	6%	2	25%	13	27%	6	38%
have you heard	Rheem	20	23%	5	15%	9	26%	3	21%	3	40%	15	21%	5	32%
or, ir arry :	Bradford White	12	15%	7	23%	3	12%	2	15%	0	0%	10	15%	2	12%
	Sanden	7	10%	1	3%	4	12%	1	9%	1	10%	5	8%	2	18%
	Hubbell	6	6%	1	3%	1	3%	2	18%	2	30%	6	7%	0	0%
	Jetglas	4	5%	1	3%	2	6%	1	9%	0	0%	4	6%	0	0%
	Lochinvar	4	8%	1	17%	2	5%	0	0%	1	15%	4	9%	0	0%
	Ruud	9	14%	5	29%	4	10%	0	0%	0	0%	9	16%	0	0%
	Richmond	9	13%	3	9%	6	19%	0	0%	0	0%	7	13%	2	13%



Summer Ouestien	Deenenee Ontione	Тс	otal	C	DR	V	VA		ID		MT	Ur	ban	Rı	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Vaughn	11	22%	5	43%	3	11%	2	31%	1	10%	9	22%	2	18%
HWS_Aware (n=411) Before today, had	Yes	66	19%	22	22%	27	20%	5	9%	12	24%	50	20%	16	16%
you heard of the "Hot Water	No	327	76%	110	73%	103	75%	64	89%	50	74%	211	75%	116	82%
Solutions" program?	I'm not sure	18	5%	8	5%	7	5%	1	2%	2	3%	14	5%	4	2%
	Hot Water Solutions website	8	12%	2	6%	2	13%	3	40%	1	6%	5	12%	3	11%
	Friend or acquaintance	25	36%	6	18%	9	40%	2	34%	8	69%	16	32%	9	53%
	Utility print advertising or bill insert	5	10%	4	27%	1	4%	0	0%	0	0%	5	13%	0	0%
HWS First	Utility website	14	23%	7	36%	6	20%	1	17%	0	0%	12	25%	2	11%
_ (n=66) How did you hear	Retail store display	10	18%	4	27%	5	18%	0	0%	1	8%	10	23%	0	0%
of HWS program?	Retail store salesperson	8	13%	3	9%	5	19%	0	0%	0	0%	8	16%	0	0%
	Print newspaper ad	5	8%	2	6%	3	12%	0	0%	0	0%	5	10%	0	0%
	Print newspaper story	2	3%	1	3%	1	4%	0	0%	0	0%	2	4%	0	0%
	Online news story	13	20%	4	14%	7	24%	0	0%	2	30%	9	18%	4	32%
	Television ad	20	35%	8	41%	10	36%	1	43%	1	6%	18	39%	2	18%



0	Description of the second	Т	otal	(DR	۷	VA		ID		мт	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Social media, such as Facebook, Instagram or YouTube	24	39%	5	30%	10	41%	2	54%	7	48%	18	41%	6	31%
	Contractor or installer	10	14%	3	9%	5	18%	2	34%	0	0%	9	14%	1	14%
	Internet research	16	28%	7	53%	5	16%	1	11%	3	20%	9	24%	7	44%
	Internet advertising	10	20%	7	51%	2	6%	0	0%	1	8%	9	23%	1	7%
	Radio ad	1	1%	1	3%	0	0%	0	0%	0	0%	1	1%	0	0%
	I am the first among my friends to purchase new technology	42	12%	15	16%	18	14%	2	2%	7	11%	33	14%	9	5%
	l purchase new technology sooner than most of my friends	87	23%	24	17%	36	26%	11	20%	16	29%	60	23%	27	24%
D1 (n=411) Which of the following	I am typically in the middle of the group when purchasing new technology	163	39%	51	34%	54	38%	29	46%	29	42%	108	39%	55	39%
statements best describes you?	I purchase new technology after most of my friends have purchased it	52	12%	24	15%	13	11%	7	7%	8	11%	35	11%	17	13%
	I am one of the last people to purchase new technology	57	12%	23	15%	12	8%	19	23%	3	5%	31	10%	26	17%
	I'm not sure	10	3%	3	2%	4	3%	2	2%	1	3%	8	3%	2	1%



		Т	otal	(DR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Strongly disagree	3	1%	1	1%	2	1%	0	0%	0	0%	3	1%	0	0%
D2a (n=411) Please rate your level of	Somewhat disagree	9	2%	2	1%	4	3%	1	2%	2	3%	6	2%	3	3%
the following statements I do	Neither agree nor disagree	32	7%	8	5%	11	8%	9	12%	4	5%	22	8%	10	6%
research before making big purchases.	Somewhat agree	128	32%	41	28%	43	34%	23	30%	21	32%	84	32%	44	31%
	Strongly agree	239	58%	88	65%	77	53%	37	56%	37	61%	160	57%	79	59%
D2b (n=411) Please rate your level of	Strongly disagree	8	2%	2	1%	4	3%	1	2%	1	3%	5	2%	3	3%
agreement with the following	Somewhat disagree	9	2%	0	0%	4	3%	1	2%	4	5%	5	2%	4	2%
statements I compare prices	Neither agree nor disagree	35	9%	9	6%	14	11%	7	9%	5	8%	25	9%	10	6%
online for big purchases.	Somewhat agree	165	41%	57	41%	55	42%	32	43%	21	34%	111	41%	54	40%
	Strongly agree	194	46%	72	52%	60	42%	29	45%	33	50%	129	45%	65	48%
D2c (n=411)	Strongly disagree	3	1%	2	1%	1	1%	0	0%	0	0%	3	1%	0	0%



0	Deene and Ontione	Т	otal	C	DR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Please rate your level of	Somewhat disagree	14	4%	5	3%	6	6%	2	2%	1	3%	9	4%	5	5%
agreement with the following	Neither agree nor disagree	64	16%	20	15%	26	18%	10	14%	8	11%	45	17%	19	13%
statements I seek out expert	Somewhat agree	187	43%	67	45%	54	41%	37	47%	29	45%	120	42%	67	47%
recommendations for big purchases.	Strongly agree	143	36%	46	37%	50	34%	21	37%	26	42%	98	36%	45	35%
D2d (n=411)	Strongly disagree	7	3%	2	2%	4	3%	1	4%	0	0%	5	2%	2	4%
Please rate your level of agreement with	Somewhat disagree	9	3%	0	0%	5	4%	3	4%	1	3%	4	3%	5	3%
the following statements I	Neither agree nor disagree	73	19%	26	16%	25	21%	14	18%	8	13%	52	20%	21	13%
will spend money upfront to save money in the long	Somewhat agree	197	45%	72	55%	58	39%	36	48%	31	46%	128	44%	69	50%
term.	Strongly agree	125	31%	40	27%	45	33%	16	27%	24	38%	86	32%	39	29%
D2e (n=411) Please rate your	Strongly disagree	16	3%	6	4%	2	1%	5	7%	3	5%	11	3%	5	3%
level of agreement with	Somewhat disagree	29	8%	7	5%	12	10%	6	7%	4	5%	18	8%	11	9%
the following statements I	Neither agree nor disagree	77	17%	20	14%	25	17%	17	21%	15	21%	50	17%	27	17%
am concerned about	Somewhat agree	160	40%	59	39%	52	40%	24	41%	25	42%	106	39%	54	42%



Summer Ouestien	Designed Options	Тс	otal	C	DR	V	VA		ID		МТ	Ur	ban	Ru	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n		n	
environmental issues.	Strongly agree	129	32%	48	39%	46	31%	18	23%	17	26%	90	33%	39	29%
D2f (n=411) Please rate your level of	Strongly disagree	8	2%	2	1%	2	1%	2	4%	2	3%	6	2%	2	1%
agreement with the following	Somewhat disagree	27	6%	13	9%	6	4%	4	5%	4	5%	17	5%	10	8%
statements I consider	Neither agree nor disagree	93	23%	30	20%	27	21%	22	38%	14	21%	63	24%	30	22%
when making decisions about	Somewhat agree	178	43%	61	44%	62	45%	28	36%	27	39%	121	44%	57	40%
which products to purchase.	Strongly agree	105	26%	34	26%	40	28%	14	18%	17	32%	68	26%	37	30%
D2g (n=411) Please rate your	Strongly disagree	10	3%	4	3%	4	3%	1	4%	1	3%	7	3%	3	3%
level of agreement with the following	Somewhat disagree	23	6%	7	5%	9	8%	2	4%	5	8%	17	6%	6	5%
statements Actions taken by	Neither agree nor disagree	90	22%	25	16%	31	23%	18	28%	16	26%	51	21%	39	27%
individuals like me have an	Somewhat agree	174	41%	62	45%	59	41%	33	44%	20	31%	119	42%	55	41%
impact on the environment.	Strongly agree	114	27%	42	32%	34	25%	16	21%	22	33%	81	28%	33	24%
D2h (n=411) Please rate your level of	Strongly disagree	5	1%	2	1%	0	0%	3	4%	0	0%	4	1%	1	1%



Q		Тс	otal	C	DR	V	VA		ID		МТ	Ur	ban	Rı	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n		n	
agreement with the following statements Energy efficiency	Somewhat disagree	33	8%	10	6%	12	9%	7	9%	4	5%	22	8%	11	8%
is my primary consideration when choosing mechanical systems for my	Neither agree nor disagree	69	17%	23	15%	27	20%	8	11%	11	16%	43	16%	26	19%
home, like a furnace, air conditioner, or water heater.	Somewhat agree	180	44%	57	42%	64	46%	30	42%	29	47%	119	43%	61	47%
	Strongly agree	124	30%	48	35%	34	25%	22	35%	20	32%	87	31%	37	25%
D3 (n=411)	18 to 24	11	3%	5	4%	5	3%	0	0%	1	3%	9	3%	2	3%
Which of the	25 to 34	49	14%	8	8%	21	16%	10	21%	10	16%	34	15%	15	12%
following	35 to 44	107	28%	28	23%	47	33%	13	18%	19	32%	74	29%	33	26%
categories	45 to 54	53	13%	20	13%	17	14%	10	14%	6	8%	37	14%	16	11%
includes your	55 to 64	79	16%	36	24%	16	11%	17	21%	10	16%	48	15%	31	22%
age?	65 and older	112	25%	43	28%	31	23%	20	26%	18	26%	73	25%	39	27%
D4 (n=411)	Some high school	3	1%	0	0%	1	1%	1	2%	1	3%	1	1%	2	1%
following	High school graduate or GED	49	10%	20	14%	10	6%	9	12%	10	14%	31	9%	18	12%
describes the	Trade or technical school	24	5%	6	4%	7	4%	5	5%	6	8%	9	3%	15	11%
highest level of	Some college	110	26%	41	27%	34	24%	23	39%	12	19%	73	26%	37	27%



Sum and Outpution	Designed Options	Тс	otal	С)R	V	A		ID		MT	Ur	ban	Rι	ıral
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
education you have completed?	College graduate	120	31%	41	27%	45	35%	17	23%	17	30%	87	32%	33	26%
	Some graduate school	25	7%	6	4%	11	9%	4	5%	4	5%	17	7%	8	5%
	Graduate degree	79	20%	25	24%	29	20%	11	14%	14	22%	56	21%	23	17%
	I'd rather not say	1	0%	1	1%	0	0%	0	0%	0	0%	1	0%	0	0%
D5 (n=411)	Less than \$40,000	79	18%	37	25%	16	13%	19	29%	7	10%	47	17%	32	22%
Which of the	Between \$40,001 and \$60,000	67	14%	24	15%	15	10%	16	21%	12	18%	41	13%	26	17%
following categories best	Between \$60,001 and \$80,000	69	16%	24	16%	26	17%	7	9%	12	21%	45	16%	24	18%
describes your	Between \$80,001 and \$120,000	110	29%	31	20%	45	35%	19	28%	15	23%	80	30%	30	24%
approximate	Between \$120,001 and \$250,000	70	19%	18	16%	31	22%	7	10%	14	21%	50	20%	20	15%
income from all	Over \$250,000	5	2%	2	5%	1	1%	1	2%	1	3%	3	2%	2	1%
sources in 2020,	I'm not sure	1	0%	0	0%	0	0%	1	2%	0	0%	0	0%	1	1%
before taxes?	I'd rather not say	10	2%	4	3%	3	2%	0	0%	3	5%	9	3%	1	1%
D6 (n=411)	Yes	14	4%	7	5%	5	4%	1	2%	1	3%	8	3%	6	6%
Do you consider yourself Hispanic	No	393	95%	133	95%	130	94%	69	98%	61	95%	266	96%	127	91%
or Latino?	I'd rather not say	4	1%	0	0%	2	1%	0	0%	2	3%	1	1%	3	2%
D7 (n=411)	White	383	93%	132	95%	121	89%	70	100%	60	95%	255	92%	128	95%
How would you	Black or African American	9	2%	2	1%	6	4%	0	0%	1	1%	8	3%	1	1%
describe yourself? Please	American Indian or Alaska Native Asian	6 12	1% 4%	1 4	1% 3%	0 8	0% 6%	0 0	0% 0%	5 0	7% 0%	0 10	0% 4%	6 2	3% 1%



Survey Question	Boononco Ontiono	Тс	otal	C	R	V	/A		ID		MT	Ur	ban	Rı	ıral
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
select all that apply.	Native Hawaiian or Pacific Islander	2	1%	0	0%	2	2%	0	0%	0	0%	1	0%	1	2%
	Other	2	0%	2	1%	0	0%	0	0%	0	0%	2	0%	0	0%
	I'd rather not say	2	1%	0	0%	2	1%	0	0%	0	0%	1	0%	1	1%
D8 (n=411) How would you	Male	190	51%	52	42%	71	54%	39	60%	28	45%	130	52%	60	46%
describe yourself?	Female	221	49%	88	58%	66	46%	31	40%	36	55%	145	48%	76	54%
	English	403	97%	139	99%	130	94%	70	100%	64	100%	269	97%	134	97%
D9 (n=411)	Spanish	1	1%	0	0%	1	1%	0	0%	0	0%	0	0%	1	2%
What language is	Cantonese	1	0%	0	0%	1	1%	0	0%	0	0%	1	1%	0	0%
primarily spoken	Russian	1	0%	0	0%	1	1%	0	0%	0	0%	1	1%	0	0%
in your home?	Tagalog	3	1%	1	1%	2	1%	0	0%	0	0%	2	1%	1	1%
	Japanese	2	1%	0	0%	2	1%	0	0%	0	0%	2	1%	0	0%

Appendix F Purchaser Survey

NMR conducted a survey of individuals who recently purchased a HPWH to gain insights about HPWH purchaser satisfaction and decision-making.⁴⁷ This appendix describes the detailed methodology and findings from that effort.

Survey topics included the following:

- Satisfaction (initial and current) (MPI 4a)
- Willingness to recommend (MPI 4b)
- Installation type (emergency vs. planned, MPI 1e)
- · Complaints and problems experienced
- Installation challenges
- · Frequency, type, and cost of service/repair
- Installer awareness and skill
- Awareness and use of utility incentives
- Customer decision-making
- Other water heating systems considered
- · Household characteristics and demographics

METHODOLOGY

A subset of Northwest utilities who provided HPWH rebates from 2016 to 2020 provided customer contact information for 1,051 HPWH purchasers. Customers with an email address received an email invitation to complete the web survey and one follow-up reminder (853 customers). The team sent postcard invitations to the remaining 198 customers. Puget Sound Energy (PSE) and Mason PUD distributed the purchaser survey on NMR's behalf to customers who purchased HPWHs (1,166 and 40 customers, respectively). The team fielded the web survey from May 27 to July 12, 2021.

As Table 29 shows, the team achieved 428 completes for an overall response rate of 19%. Based on a review of the water heater photos and model numbers that respondents submitted, NMR determined that seven of the 428 respondents did not have a HPWH and excluded them

⁴⁷ The team invited respondents who recently moved into a home with a HPWH already installed to take the survey but did not ask them questions specific to the purchase or installation processes. These respondents represent less than 2% of the HPWH purchaser sample.



from the analysis. NMR also excluded two respondents who had purchased a HPWH but had not yet installed it. The final sample size was 419.

Some of the customer data provided by the utilities contained the HPWH brand, model number, year of purchase, rebate amount, and installation location. Respondents were asked to confirm this information in the survey. If this information was missing or incorrect, respondents were asked to self-report and upload a photo of the HPWH's manufacturer label for further confirmation.⁴⁸ The team leveraged these details to conduct analyses by HPWH brand and other relevant details.

The team did not weight survey results. This approach is consistent with the methodology in MPER #1, MPER #2, and MPER #4.

State	Eligible Sample Frame	Responses Achieved	Response Rate
Washington	1,672	312	19%
Oregon	582	113	19%
Idaho	1	2	*
Montana	2	1	50%
Total	2,257	428	19%
Invalid Responses	-	9	-
Total Valid Responses	-	419	19%

TABLE 29: PURCHASER SURVEY DISPOSITION

*One respondent was invited to participate by a Washington utility but responded to the survey as a resident of Idaho. The customer may have moved or been referred to the survey by the original recipient of the email.

⁴⁸ The team cleaned seven respondents from the sample because the picture and/or model number they provided for their water heater was not a HPWH model.



AWARENESS AND PERCEPTIONS

Sources of awareness. Figure 39 shows that the top three ways respondents heard of HPWHs were internet research (32%), utility websites (26%), and utility newsletters (22%). In addition, one-fifth (20%) of respondents heard of HPWHs from utility bill inserts. Utilities play a larger role in promoting HPWHs to purchasers than observed in the homeowner survey; this finding is not surprising as the purchasers have engaged with utility programs. Only 9% of respondents heard of HPWH from a contractor or installer.

FIGURE 39: SOURCES OF HPWH AWARENESS



(n=419; Multiple responses permitted)

30. SOURCE_AWARE. Where or how have you heard about heat pump water heaters?



Perceptions and Awareness of HPWH Capabilities. Figure 40 displays the percentage of respondents that agreed with a series of attitudinal statements about HPWHs. Five of the statements were positive and five of them were negative.

More than four-fifths of HPWH purchasers agreed with three of the positive perceptions of HPWHs: HPWHs are very efficient (84%), HPWHs result in lower electric bills (84%), and HPWHs offer better value (81%) than typical electric water heaters.

While HPWH purchasers were less likely to agree with the negative perceptions of HPWHs than the positive statements, nearly two-fifths of HPWH purchasers (38%) agreed that HPWHs are noisy and nearly one-third of purchasers (32%) agreed that HPWHs are expensive to install. Close to one-fifth of HPWH purchasers (16%) agreed that they do not produce enough hot water, 14% agreed that they are expensive to service or repair, and 7% agreed that they are unreliable. Purchasers who reported that they had their HPWH serviced or repaired were more likely to agree that they are expensive to service or repair (27%) than those who had not had it serviced or repaired (13%).⁴⁹

As is to be expected from purchasers who obtained a utility rebate for their HPWH, nearly fourfifths of HPWH purchasers (79%) were aware that HPWHs are eligible for tax credits and/or discounts from utility companies. About one-half (54%) were aware that HPWHs can be controlled with a smart phone.

⁴⁹ Difference is statistically significant at the 90% confidence level.



FIGURE 40: PERCEPTIONS OF HPWHS



31. Please assess how much you agree or disagree with the following statements.



WATER HEATER PURCHASE FACTORS

Why people bought new water heaters. Figure 41 displays the reasons why HPWH purchasers bought a new water heater and compares them to the reasons given by homeowner survey respondents who purchased standard electric water heaters. Among purchasers, the most common reason was wanting to install a more energy-efficient water heater (41%), followed by having a water heater that was old and/or close to failing (35%). HPWH purchasers were four times as likely to say they purchased their water heater because they wanted a more energy-efficient water heater (41%) than homeowners with standard electric water heaters (10%). On the other hand, homeowners with standard electric water heaters were around three times as likely as HPWH purchasers to have purchased a new water heater because their water heater worked poorly and/or needed repair (26% vs. 9%), or their water heater had completely broken (26% vs. 8%).

HPWH Purchasers Homeowners (n=412) (n=85) Wanted energy-efficient 41%* water heater Water heater old/ 35% close to failing Water heater worked 9%* poorly/needed repair Water heater 8%* completely broken Came with new home 2% To serve an addition Other 0%3

FIGURE 41: REASON FOR PURCHASING WATER HEATER BY POPULATION

36. Why did you purchase a new water heater? * Statistically different at the 90% confidence level



Figure 42 shows that HPWH purchasers' reasons for purchasing a new water heater varied by region. Respondents residing in urban areas were more likely to have purchased their HPWH because they wanted a more energy-efficient water heater (42%) or because their water heater had completely broken (8%) than respondents residing in rural areas (30% and 2%, respectively). On the other hand, rural respondents were more likely to purchase a HPWH because their water heater worked poorly and/or needed repair (17%) or because it came with their newly built home (9%) than urban respondents (8% and 1%, respectively).



FIGURE 42: REASON FOR PURCHASING HPWH BY REGION

36. Why did you purchase a new water heater? * Statistically different at the 90% confidence level

Figure 43 shows that planned replacements comprised a larger proportion of HPWH purchases in 2021 (92%) than in past MPERs.⁵⁰ Only 8% of HPWH purchasers in the 2021 survey were emergency replacements (MPI 1e), compared to 22% in 2018, 12% in 2016, and 14% in 2015.

⁵⁰ MPER #4 and MPER #5 used the term "emergency replacement" to refer to replacements of completely failed systems that provide no hot water, and MPER #6 continues this practice. NEEA may also consider using 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.



It should be noted that the definition of an emergency replacement varied between survey guides for the different MPERs. For MPER #1 and MPER #2, HPWH purchasers were asked, "Did you replace your previous water heater in an emergency situation, for example maybe it broke, or was it a planned replacement?" Before asking respondents if it was an emergency or planned replacement, the MPER #4 survey defined an emergency replacement as "the need to replace your previous water heater because it completely failed and was incapable of providing hot water for your home." Lastly, the MPER #6 survey did not ask respondents to differentiate between planned and emergency replacements, but instead presented "my water heater was completely broken and did not provide any hot water" as one of various response choices to the question "Why did you purchase a new water heater?"

Over three-quarters of emergency replacement HPWHs (80%) were purchased at retail stores, and nearly two-thirds of those HPWHs were self-installed (64%).



FIGURE 43: PLANNED AND EMERGENCY HPWH PURCHASES OVER TIME

36. Why did you purchase a new water heater? ^a Statistically different from 2015 at the 90% confidence level ^b Statistically different from 2016 at the 90% confidence level ^c Statistically different from 2018 at the 90% confidence level ^d Statistically different from 2024 at the 90% confidence level

^d Statistically different from 2021 at the 90% confidence level



HPWH age, brand, and model. Figure 44 displays the year in which respondents purchased their HPWH. Around one-quarter (26%) of HPWH were purchased in 2016 or 2017, two-fifths (40%) were purchased in 2018 or 2019, and 28% were purchased in 2020 or 2021.



FIGURE 44: YEAR PURCHASED HPWH

Figure 45 displays the brands of HPWHs that respondents purchased. Rheem was the most commonly purchased brand (59%), followed by General Electric (12%), AO Smith (11%), and other brands (7%).⁵¹ Rheem HPWHs included the Professional Prestige and Performance Platinum models. AO Smith HPWHs included the Signature Premier and Smith Voltex models. All GE HPWHs were the GeoSpring model.



⁵¹ Other brands include Ruud, Reliance, Bradford White, Stiebel Eltron, AirTap, Electrolux, Kenmore, Sanden, and State.

^{11.} In which year did you purchase/move into the home with the heat pump water heater?



81. What brand is your heat pump water heater?

Where respondents purchased HPWHs. Over one-half of respondents purchased their HPWH from a retail store (53%), down from 74% in 2018 (MPER #4). Nearly one-fifth of respondents purchased their HPWH directly from their utility (17%), a response category which was new for MPER #6.⁵² Over one in ten respondents obtained their HPWH from a contractor or installer (12%) or a utility marketplace (11%).



FIGURE 46: WHERE PURCHASED HPWH

39. Where did you purchase your heat pump water heater? ^a Statistically different from 2016 at the 90% confidence level

^b Statistically different from 2018 at the 90% confidence level

^c Statistically different from 2021 at the 90% confidence level

⁵² Includes HPWHs that were provided at no cost.



Incentives and tax credits. A large majority of HPWH purchasers (92%) received a rebate or discount from their utility, including 6% who received their HPWH for free. Most of the utility incentives were between \$250 and \$750, with an average of \$600. Around one-fifth of HPWH purchasers received a tax credit: 11% received a federal tax credit, 4% received a state tax credit, and 4% received both a federal and a state tax credit.

Other water heating options considered. Figure 47 displays the other water heating options respondents considered before purchasing their HPWH. Nearly one-half (47%) of HPWH purchasers considered tankless water heaters, and around two-fifths (38%) considered standard electric storage water heaters. Over one-quarter (27%) of respondents said they did not consider other types of water heaters. Figure 48 displays the reasons respondents gave for choosing HPWHs over other options they considered. HPWH purchasers most commonly cited efficiency as a factor in choosing HPWHs over other options (43%), followed by lower operating cost (21%) and lower purchase cost (21%).

FIGURE 47: OTHER WATER HEATING OPTIONS CONSIDERED



37. WH_OPTIONS. Besides heat pump water heaters, what other water heating options did you consider?



FIGURE 48: WHY RESPONDENTS CHOSE HPWHS



38. Why did you decide to install a heat pump water heater instead of the other water heating options you considered?



Factors important to decision to purchase HPWH. Using a scale from 1 to 5, where 1 was "not at all important" and 5 was "extremely important," HPWH purchasers rated the importance of a series of factors in their decision to purchase a HPWH. Figure 49 displays the percent of respondents who indicated that a factor was important by assigning a rating of 4 or 5. Four of the five most important factors were financial, including reducing energy bills (93%), the availability of utility rebates (88%), state tax credits (79%), and federal tax credits (75%). Non-financial factors ranked as follows: (1) ENERGY STAR label, (2) contractor's recommendation, (3) reducing environmental footprint, and (4) information on the HWS website.

FIGURE 49: HPWH PURCHASE DECISION FACTORS



(n=412; Multiple responses permitted)

40. HPWH_FACTOR. On a scale from 1 to 5, where 1 is "not at all important" and 5 is "extremely important," please rate how important each of the following factors was in your decision to purchase a heat pump water heater.



Previous water heater characteristics. Figure 50 shows that a large majority of HPWH purchasers (94%) had storage water heaters prior to purchasing a HPWH. Figure 51 shows that most (84%) respondents' previous water heaters were electric, and that around one-tenth (9%) of HPWH purchasers had switched away from fossil fuels.⁵³



FIGURE 50: PREVIOUS WATER HEATER TYPE

32. PREVIOUS_WH. What type of water heater did you have before you purchased the heat pump water heater?

FIGURE 51: PREVIOUS WATER HEATER FUEL





33. What fuel did that water heater use?

⁵³ Figure does not sum to 100% due to rounding.



Figure 52 shows purchasers' previous and current water heater sizes in gallons. One-half (50%) of HPWH purchasers said their previous water heater was less than 55 gallons, while 59% said their current HPWH was less than 55 gallons. While the differences between previous and current water heater sizes are statistically significant, previous water heater size is not something one would expect respondents to recall with great accuracy. However, it is relevant because sizing HPWHs appropriately to meet household hot water needs is critical to satisfaction with the product.

FIGURE 52: PREVIOUS AND CURRENT WATER HEATER SIZE



34. What was the size of the water heater you replaced with the heat pump water heater? 35. How many gallons is your current water heater?

* Statistically different at the 90% confidence level



INSTALLATION

HPWH location. Nearly all (98%) of the HPWHs were installed at respondents' primary residences.⁵⁴ Ninety-four percent were installed in an existing home, while 6% were installed in a newly built home. Over one-quarter (29%) of HPWHs were installed in a heated space. Figure 53 displays the part of the home where the HPWHs were located.⁵⁵ Over one-half (53%) of HPWHs were installed in a garage, around one-quarter (24%) were installed in a basement, and one-fifth (20%) were installed in a closet or utility room not located in a basement.





24. Where is the heat pump water heater located?

⁵⁴ One percent were installed at a vacation home and 1% were installed at a property rented to others.

⁵⁵ Figure does not sum to 100% due to rounding.



Installation Process. Over one-half (53%) of HPWH purchasers installed the HPWH themselves, while 44% hired a professional to install it (Figure 54).⁵⁶ This is comparable to the 61% of purchasers who installed HPWHs themselves in 2018 (MPER #4) and 53% who installed HPWHs themselves in 2016 (MPER #2).



Figure 55 shows that most HPWHs were installed in half a day or less. HPWHs installed by professionals were more likely to be installed in half a day or less (72%) than HPWHs installed by purchasers (61%).



(n=383)



49. About how long did it take to install the heat pump water heater?* Statistically different at the 90% confidence level

⁵⁶ Figure does not sum to 100% due to rounding.



Installation contractors. The most common way HPWH purchasers found a professional to install their HPWH was through a previous relationship with a contractor (39%), followed by a utility contractor list (21%) and a personal recommendation (18%, Figure 56).



FIGURE 56: HOW PURCHASERS FOUND INSTALLER

*45. How did you find the person or company that installed your new water heater?



Just over one-half (55%) of HPWH purchasers said their installer told them which water heater settings to use. This is comparable to the 57% of purchasers who said their installer told them which settings to use in 2018 (MPER #4) and is significantly lower than the 70% who said their installer told them which settings to use in 2016 (MPER #2).⁵⁷ Figure 57 shows that over one-half (55%) of installers recommended the hybrid or mixed operation setting, while around two-fifths (39%) recommended the heat pump only setting.⁵⁸





^{48.} Which water heater setting did your contractor encourage you to use?

The team compared satisfaction ratings by setting recommended by the installer. There were no statistically significant differences in HPWH satisfaction between respondents who were encouraged to use their HPWH in heat pump only mode versus hybrid operation mode.

⁵⁷ Difference is statistically significant at the 90% confidence level.

⁵⁸ Figure does not sum to 100% due to rounding.



Installation challenges. Overall, just under one-quarter (23%) of HPWH purchasers encountered challenges with the HPWH installation. Figure 58 shows that the incidence of installation challenges varied by the installer and brand of HPWH but did not vary significantly by the year in which it was purchased. Not surprisingly, individuals who installed HPWHs themselves were twice as likely to encounter challenges (30%) than those who hired professionals (15%). Purchasers who installed the HPWH themselves may have had more issues than a professional installer, but they may also be more capable of accurately recalling the challenges because they experienced the issue firsthand. Respondents who purchased AO Smith HPWHs were the most likely to encounter installation challenges (37%), while those who purchased GE HPWHs were the least likely to encounter installation challenges (10%).



FIGURE 58: ENCOUNTERED INSTALLATION CHALLENGES

50. INSTALL_CHALLENGES Did "your contractor / installer" / "you" encounter any challenges with the heat pump water heater installation? * Statistically different at the 90% confidence level

^a Statistically different from AO Smith at the 90% confidence level

^b Statistically different from Rheem at the 90% confidence level

 $^{\rm c}$ Statistically different from General Electric at the 90% confidence level

^d Statistically different from Other at the 90% confidence level



Figure 59 displays the types of installation challenges respondents encountered. The most common challenges purchasers encountered pertained to pipe configuration (52%) and lack of a nearby drain for condensate (48%). To resolve pipe configuration challenges, respondents typically added new pipe, replumbed, or rearranged the pipe configuration. To address condensate draining challenges, respondents typically installed a drain in the floor, installed a condensate pump, or ran a pipe outdoors. Nearly one-fifth of respondents who encountered challenges said the HPWH was too large to fit where the old water heater was located (18%) or that new wiring/electrical work was required (17%). The most common solution to size challenges was relocating the HPWH to a garage. The types of installation challenges respondents encountered did not vary significantly by HPWH brand.

FIGURE 59: TYPES OF INSTALLATION CHALLENGES



(n=90; Multiple responses permitted)

51. CHALLENGES_ENCOUNTER What challenges?



SERVICE AND REPAIR

HPWH Services. Overall, only 5% of HPWH purchasers had contacted a professional to service their HPWH since purchasing it, a finding consistent with that of past MPERs.^{59,60} Around one-quarter of those who needed their HPWH serviced (six respondents) said it was challenging to find a technician who knew how to service it. Most respondents who had had their HPWH serviced had only had it serviced once; six HPWH purchasers had their HPWHs serviced two or three times.⁶¹

Figure 60 shows that the likelihood of having the HPWH serviced varied by the installer and the year in which it was purchased but did not vary significantly by brand. Individuals who hired a professional to install their HPWH were more likely to have had it serviced (8%) than those who installed it themselves (3%). This difference is likely a combination of two factors: professional installers are likely to recommend regular service, and individuals who were capable of self-installing a HPWH may be handling their own service issues. Not surprisingly, HPWHs purchased in 2016 or 2017 were more likely to have been serviced (11%) than those purchased more recently (3% to 4%).

⁵⁹ A service is routine maintenance to keep the HPWH in optimal working condition (annual tune-ups, cleaning, inspecting, etc.).

⁶⁰ Five percent of Tier1 HPWHs and 21% of Tier2 HPWHs in 2015 (MPER #1); 5% in 2016 (MPER #2); not measured in 2018 (MPER #4).

⁶¹ All six were Rheem HPWHs that were purchased in 2016-2017 (3) or 2018-2019 (3).



FIGURE 60: HAD HPWH SERVICED

53. Since "purchasing" / "moving into the home with" the heat pump water heater, have you contacted a professional to service or repair the heat pump water heater? 54. NUM SERVICE1. Number of service-only visits?

56. NUM_SERVICE3. Number of visits with service and repair in the same visit? * Statistically different at the 90% confidence level

^e Statistically different from 2020-2021 at the 90% confidence level

^f Statistically different from 2018-2019 at the 90% confidence level

^g Statistically different from 2016-2017 at the 90% confidence level

Around one-half of the 5% of purchasers who had their HPWHs serviced had a warranty that covered all or part of the cost. Those responsible for paying some or all of the cost said they had paid, on average, \$147 per service visit.

HPWH Repairs. Overall, only 5% of HPWH purchasers had contacted a professional to repair their HPWH, the same percentage as in 2016 (MPER #2).^{62,63} Around two-fifths of those who needed their HPWH repaired (eight respondents) said it was challenging to find a technician who knew how to repair it. Most respondents who had had their HPWH repaired had only had it

⁶² A repair fixes equipment that is malfunctioning or not working.

⁶³ Not reported in 2015 (MPER #1) or 2018 (MPER #4).



repaired once; eight HPWH purchasers had their HPWHs repaired two or three times.⁶⁴ The most common reason a repair was necessary was not getting enough hot water (eight respondents), followed by the control board failing (six respondents),⁶⁵ error codes (five respondents), and noise/vibration (four respondents).

Figure 61 shows that individuals who hired a professional to install their HPWH were more likely to have had it repaired (6%) than those who installed it themselves (3%). Respondents who self-installed their HPWH may also be capable of handling repairs on their own. Another plausible explanation may be that HPWH purchasers are taking advantage a warranty or service contract offered by their installer or contractor. None of the respondents who purchased AO Smith HPWHs had contacted a professional to repair it.⁶⁶ HPWHs purchased in 2016 or 2017 were more likely to have been repaired (10%) than those purchased more recently (3% to 4%). These repair trends could be due to the age of the HPWH or might reflect performance improvements in more recent HPWH models.

⁶⁴ Six were Rheem, one was General Electric, and one was Ruud. They were purchased in 2016-2017 (5), 2018-2019 (2), 2020-2021 (1).

⁶⁵ All six respondents who experienced this problem owned Rheem HPWHs.

⁶⁶ Note that AO Smith HPWHs purchases were distributed equally over time (one-third in 2016-2017, one-third in 2018-2019, and one-third in 2020-2021).



FIGURE 61: HAD HPWH REPAIRED

53. Since "purchasing" / "moving into the home with" the heat pump water heater, have you contacted a professional to service or repair the heat pump water heater? 55. NUM_SERVICE2. Number of repair-only visits?
56. NUM_SERVICE3. Number of visits with service and repair in the same visit? * Statistically different at the 90% confidence level
^a Statistically different from Rheem at the 90% confidence level
^b Statistically different from AO Smith at the 90% confidence level
^c Statistically different from General Electric at the 90% confidence level

^d Statistically different from Other at the 90% confidence level

^e Statistically different from 2020-2021 at the 90% confidence level

^f Statistically different from 2018-2019 at the 90% confidence level

^g Statistically different from 2016-2017 at the 90% confidence level

Around two-thirds of the 5% of purchasers who had their HPWHs repaired had a warranty that covered all or part of the cost. Those responsible for paying some or all of the cost said they had paid, on average, \$139 per repair visit.


SATISFACTION

Satisfaction with HPWH. Almost nine out of ten (89%) HPWH purchasers were satisfied with the HPWH overall (MPI 4a), as measured on a scale from 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied." Figure 62 shows the percentages of respondents who were "very satisfied" or "somewhat satisfied" with this and other aspects of their HPWH. Purchasers who were very satisfied elaborated with comments, including, "So far I absolutely love mine," "It was the best big purchase item for my house," and, "Lots of hot water and lowered electric bill noticeably." Satisfaction with HPWHs and their various aspects did not vary significantly by brand.

Most respondents were satisfied with their hot water supply (86%) and the value of the HPWH (83%). Between two-thirds and three-quarters of respondents were satisfied with the sales process for buying their HPWH (74%), change in their electricity bill after installing it (72%), and the maintenance requirements of the HPWH. Aspects of the HPWH that respondents were least likely to be satisfied with were the sound level (58%) and temperature in the room where the HPWH was installed (55%).



FIGURE 62: SATISFACTION WITH HPWH

(n=419)

61. SATISFACTION1. Since [IF S_HPWH = 1 "purchasing"; S_HPWH = 2 "moving into the home with"] the heat pump water heater, how satisfied have you been with the following items on a 5-point scale, where 1 means "very dissatisfied" and 5 means "very satisfied."



Figure 63 displays aspects of HPWHs for which satisfaction has changed over time. While overall satisfaction is high, it has declined slightly (from 96% to 89%) since being measured in 2016 (MPER #2).⁶⁷ Satisfaction with the maintenance requirements and sound level of the HPWH have also declined slightly since past MPERs. While these changes are not dramatic, they are counterintuitive to the general expectation that manufacturers would improve their products over time. One possible explanation is that as HPWHs become more mainstream, purchasers have higher expectations for product performance.⁶⁸



FIGURE 63: SATISFACTION WITH HPWH OVER TIME

61. SATISFACTION1. Since [IF S_HPWH = 1 "purchasing"; S_HPWH = 2 "moving into the home with"] the heat pump water heater, how satisfied have you been with the following items on a 5-point scale, where 1 means "very dissatisfied" and 5 means "very satisfied."
^a Statistically different from 2016 at the 90% confidence level

^b Statistically different from 2018 at the 90% confidence level

 $^{\rm c}$ Statistically different from 2021 at the 90% confidence level

⁶⁷ Satisfaction in MPER #1 was reported as an average estimate on a scale from 1 to 5 (e.g., 4.2) and is not comparable to MPER #2 through MPER #4.

⁶⁸ MPER #6 assessed new technology adoption both for HPWH purchasers and homeowners with electric water heaters. However, past MPERs assessed new technology adoption only for the homeowner survey; therefore, assessing new technology adoption among HPWH purchasers over time is not possible.



Figure 64 shows that satisfaction with most aspects of HPWHs varied to a small degree by the year in which HPWHs were purchased.⁶⁹ Respondents who purchased HPWHs in 2020 or 2021 were more likely to be satisfied with the hot water supply and sales process than those who purchased HPWHs in 2016 or 2017. In contrast, respondents who purchased their HPWHs in 2020 or 2021 were less likely to be satisfied with the value of the HPWH, maintenance requirements, change in electricity bill, and temperature in the room where the HPWH was installed. A possible explanation for these trends could be higher customer expectations as the HPWH technology becomes more mainstream.

Satisfaction with HPWH by Year Purchased	2016-2017 (n=108)	2018-2019 (n=166)	2020-2021 (n=116)	
Hot Water Supply	80%	87%	89%	
Sales Process	71%	69%	81%	
Value of HPWH	87%	84%	78%	
Maintenance Requirements	77%	71%	66%	
Change in Electricity Bill	77%	72%	66%	
Temperature near HPWH	63%	55%	51%	

FIGURE 64: SATISFACTION WITH HPWH BY YEAR PURCHASED

61. SATISFACTION1. Since [IF S_HPWH = 1 "purchasing"; S_HPWH = 2 "moving into the home with"] the heat pump water heater, how satisfied have you been with the following items on a 5-point scale, where 1 means "very dissatisfied" and 5 means "very satisfied." How about …?

⁶⁹ All differences between 2016-2017 and 2020-2021 for aspects listed in Figure 64 are statistically significant at the 90% confidence level.



Nine out of ten HPWH purchasers said the HPWH met their expectations (Figure 65). Among the 6% who said the HPWH fell short of their expectations, the most common complaints were not saving as much on electricity bills as expected (12 respondents) and that the HPWH did not provide enough hot water (seven respondents).

FIGURE 65: HPWH MET EXPECTATIONS



Would Recommend a HPWH. Figure 66 shows that most HPWH purchasers (88%) have or would recommend a HPWH to a friend, colleague, or family member (MPI 4b).⁷⁰

FIGURE 66: WOULD RECOMMEND HPWH





68. Have you, or would you, recommend a heat pump water heater to a friend, colleague, or family member?

⁷⁰ Figure does not sum to 100% due to rounding.



Impact on heating bills. Overall, nearly four-fifths (78%) of HPWH purchasers heated with electricity, 12% heated with gas or propane, and 8% heated with other fuels.⁷¹ Nearly one-quarter (24%) of HPWH purchasers had noticed a change in their home heating costs since installing their HPWH, only 8% of whom said their heating bill had increased since installing the HPWH.

ATTITUDES ABOUT TECHNOLOGY AND THE ENVIRONMENT

Adopting new technology. The evaluation team gauged HPWH purchasers' and the homeowner survey respondents' tendency to accept new technology by reading a series of five statements and asking respondents to pick the one that best described them. As Figure 67 shows, HPWH purchasers tend to be early adopters of new technology in general, and more so than the respondents to the homeowner survey. Higher proportions of HPWH purchasers than respondents to the homeowner survey said they were the first among their friends to purchase new technology (18%) or purchased new technology sooner than most of their friends (35%), compared to homeowners with electric storage water heaters (12% and 23%, respectively).

⁷¹ Others include wood, fuel oil, or no heating fuel. Two percent of respondents did not know their heating fuel.



FIGURE 67: NEW TECHNOLOGY ADOPTION WITH COMPARISON TO ALL HOMEOWNERS



* Statistically different at the 90% confidence level



Thirteen percent of respondents in the 2021 homeowner survey self-reported that they own a HPWH. Figure 68 compares HPWH purchasers' tendency to accept new technology to the 2021 homeowner survey respondents who did not claim to own a HPWH. After removing the homeowner survey respondents who said they own a HPWH, the percent who said they were the first among their friends to purchase new technology declined from 12% to 7%, further underscoring the tendency of HPWH purchasers to be early adopters of new technology in general.

FIGURE 68: NEW TECHNOLOGY ADOPTION WITH COMPARISON TO HOMEOWNERS WHO DO NOT OWN HPWH



69. Which of the following statements best describes you? * Statistically different at the 90% confidence level



Attitudes about making major purchases and the environment. Figure 69 compares HPWH purchasers' attitudes about making major purchases and the environment to those of homeowners with electric water heaters. Almost all HPWH purchasers said they do research when making big purchases (97%), compare prices online (95%), and will spend money upfront to save money in the long term (95%). HPWH purchasers were more likely than homeowners with electric water heaters to agree with all of these statements, with the exception of seeking out expert recommendations for big purchases. Most notably, HPWH purchasers were more likely to 76%), prioritize energy efficiency when choosing mechanical systems for the home (87% compared to 74%), and consider sustainability when making purchase decisions (81% compared to 70%).

FIGURE 69: PURCHASE PROCESS AND ENVIRONMENTAL CONSIDERATIONS BY POPULATION



70. Please assess how much you agree or disagree with the following statements. * Statistically different at the 90% confidence level

Figure 70 compares HPWH purchasers' attitudes about making major purchases and the environment to the 2021 homeowner survey respondents who did not claim to own a HPWH. After removing the homeowner survey respondents who said they own a HPWH, the percent who said they consider sustainability declined from 70% to 67%.



FIGURE 70: PURCHASE PROCESS AND ENVIRONMENTAL CONSIDERATIONS BY HOMEOWNERS WHO DO NOT OWN HPWH



70. Please assess how much you agree or disagree with the following statements. * Statistically different at the 90% confidence level



DEMOGRAPHIC CHARACTERISTICS

2021 Survey Respondents

This section presents demographic characteristics of the HPWH purchaser survey respondents. Most respondents were white (85%), non-Hispanic (90%), and homeowners (99%). Over one-half (63%) of respondents had a college degree (Table 30).

TABLE 30: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Characteristic	Total	Urban	Rural
n	419	363	56
White	85%	84%*	96%*
Non-Hispanic	90%	91%	89%
Own Home	99%	99%*	100%*
College Graduate	63%	64%	54%

* Statistically different at the 90% confidence level

Over one-half (56%) of respondents lived in households of only one or two (Table 31). The average household size among respondents was 2.7.

TABLE 31: HOUSEHOLD SIZE

Household Size	Total	Urban	Rural
n	409	355	54
1 to 2	56%	55%	57%
3 to 4	35%	36%	33%
5 or more	7%	7%	7%
Don't know/Rather not say	2%	2%	2%
Average	2.7	2.7	2.7



Over one-half (55%) of respondents' 2020 household income was more than \$80,000 (Table 32). Only 5% of households earned less than \$40,000 per year. Respondents residing in urban areas were more likely to have household incomes less than \$40,000 per year (6%) than those residing in rural areas (2%).

TABLE 32: HOUSEHOLD INCOME

Household Income	Total	Urban	Rural
n	419	363	56
Less than \$40,000	5%	6%*	2%*
\$40,001 to \$80,000	20%	19%	29%
\$80,001 to \$120,000	28%	28%	25%
Over \$120,000	27%	27%	27%
Don't know/Rather not say	20%	20%	18%

* Statistically different at the 90% confidence level

The majority of respondents (94%), including all respondents residing in rural areas (100%), lived in single-family, detached homes (Table 33).

TABLE 33: TYPE OF HOME

Type of Home	Total	Urban	Rural
n	419	363	56
Single-family detached	94%	93%*	100%*
Manufactured/mobile home	4%	5%*	_*
Townhouse/rowhouse	1%	1%*	_*
Apartment in building with 2 to 4 units	<1%	<1%	-
Apartment in building with 5 or more units	<1%	<1%	-

* Statistically different at the 90% confidence level



Over one-half (59%) of respondents' homes were built during or after 1980 (Table 34). Around one-quarter (27%) were built between 2000 and 2021. Urban respondents were more likely to reside in homes built before 1960 (16%) than rural respondents (4%).

Year Home Built	Total	Urban	Rural
Ν	419	363	56
2010 to present	10%	9%	16%
2000 - 2009	17%	17%	16%
1990 - 1999	16%	16%	16%
1980 - 1989	16%	14%*	27%*
1970 - 1979	16%	16%	14%
1960 - 1969	10%	10%	7%
Prior to 1960	14%	16%*	4%*
Don't know/Rather not say	2%	3%	0%

TABLE 34: YEAR HOME BUILT

* Statistically different at the 90% confidence level



DETAILED RESULTS

This section contains full results for all purchaser survey questions. All results are unweighted.

TABLE 35: DETAILED PURCHASER SURVEY RESULTS

Survey Question	Deenemee Ontiene	Т	otal	OR		WA		ID		МТ		Urban		Rural	
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n		n	
7 (n=419) Have you purchased a heat pump water	Yes, purchased a heat pump water heater	412	98%	110	99%	299	98%	2	100%	1	100%	359	99%	53	95%
into a home with a heat pump water heater already installed, in the past five years?	Yes, moved into a home with a heat pump water heater already installed	7	2%	1	1%	6	2%	0	0%	0	0%	4	1%	3	5%
8 (n=419) Is the heat pump	Yes	415	99%	111	100%	301	99%	2	100%	1	100%	359	99%	56	100%
water heater still installed?	No	4	1%	0	0%	4	1%	0	0%	0	0%	4	1%	0	0%
9 (n=4) Why did you uninstall it?	I was dissatisfied with the heat pump water heater	4	100%	0	0%	4	100%	0	0%	0	0%	4	100%	0	0%
10 (n=4) What type of	Storage	2	50%	0	0%	2	50%	0	0%	0	0%	2	50%	2	50%
water heater did	On-demand / tankless	1	25%	0	0%	1	25%	0	0%	0	0%	1	25%	1	25%



Sumary Question	Beenenee Ontione	Тс	Total		OR		WA		ID	MT		Urban		Rural	
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
you install to replace the heat	I'm not sure	1	25%	0	0%	1	25%	0	0%	0	0%	1	25%	1	25%
	2011	1	0%	0	0%	1	0%	0	0%	0	0%	1	0%	0	0%
	2012	1	0%	1	1%	0	0%	0	0%	0	0%	1	0%	0	0%
	2013	3	1%	2	2%	1	0%	0	0%	0	0%	3	1%	0	0%
11 (n=419)	2014	6	1%	5	5%	1	0%	0	0%	0	0%	6	2%	0	0%
In which year did	2015	6	1%	3	3%	3	1%	0	0%	0	0%	5	1%	1	2%
you "purchase"	2016	32	8%	5	5%	26	26%	1	1%	0	0%	25	7%	7	13%
"move into the home with" the	2017	76	18%	7	7%	68	68%	1	1%	0	0%	71	20%	5	9%
heat pump water	2018	82	20%	29	26%	53	17%	0	0%	0	0%	78	21%	4	7%
heater?	2019	84	20%	34	31%	49	16%	0	0%	1	100%	66	18%	18	32%
	2020	107	26%	18	16%	89	29%	0	0%	0	0%	90	25%	17	30%
	2021	9	2%	3	3%	6	2%	0	0%	0	0%	8	2%	1	2%
	I'm not sure	12	3%	4	4%	8	3%	0	0%	0	0%	9	2%	3	5%
12 (n=195) Have you	Yes	20	10%	1	50%	19	10%	0	0%	-	-	14	8%	6	23%
purchased more than one heat	No	174	89%	1	50%	172	90%	1	100%	-	-	154	91%	20	77%
pump water heater?	I'm not sure	1	1%	0	0%	1	0%	0	0%	-	-	1	1%	0	0%
13 (n=21)	One	19	90%	1	100%	18	90%	-	-	-	-	14	93%	5	83%

Survey Question	Response Options -	Тс	otal	C)R	WA			ID		МТ		Urban		Rural	
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n		n		
How many heat pump water heaters are currently installed at your primary residence (where you live most of the year)?	Two or more	2	10%	0	0%	2	10%	-	-	-	-	1	7%	1	17%	
	My primary residence	409	98%	108	97%	299	98%	2	100%	0	0%	355	98%	54	96%	
15 (n=419)	My vacation home	4	1%	1	1%	3	1%	0	0%	0	0%	3	1%	1	2%	
Where was the heat pump water heater installed?	A property I rent to others	5	1%	2	2%	3	1%	0	0%	0	0%	5	1%	0	0%	
	I'm not sure	1	0%	0	0%	0	0%	0	0%	1	100%	0	0%	1	2%	
16 and 17 Combined (n=412) Did you receive a	Yes	378	92%	104	95%	272	91%	1	50%	1	100%	334	93%	44	83%	
rebate or discount from your utility when you	Νο	12	3%	2	2%	9	3%	1	50%	0	0%	8	2%	4	8%	
purchased the heat pump water heater?	I'm not sure	22	5%	4	4%	18	6%	0	0%	0	0%	17	5%	5	9%	
18 (n=378)	\$250 or less	9	2%	3	3%	6	2%	0	0%	0	0%	8	2%	1	2%	

	Deserves Ontions	Тс	otal	C	DR	V	VA		ID		МТ	Url	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Please enter the amount of the	\$251 to \$500	97	26%	12	12%	84	31%	1	100%	0	0%	76	23%	21	48%
rebate or discount you received for	\$501 to \$750	89	24%	21	20%	68	25%	0	0%	0	0%	80	24%	9	20%
the heat pump water heater	\$751 to \$1,000	51	13%	11	11%	40	15%	0	0%	0	0%	47	14%	4	9%
	More than \$1,000	5	1%	4	4%	1	0%	0	0%	0	0%	5	1%	0	0%
	Unit was provided for free by my utility	26	7%	21	20%	4	1%	0	0%	1	100%	25	7%	1	2%
	I'm not sure	101	27%	32	31%	69	25%	0	0%	0	0%	93	28%	8	18%
19 (n=412) Did you receive a	Yes	33	8%	23	21%	10	3%	0	0%	0	0%	29	8%	4	8%
state tax credit for	No	287	70%	56	51%	228	76%	2	100%	1	100%	246	69%	41	77%
the purchase of	I'm not sure	90	22%	30	27%	60	20%	0	0%	0	0%	82	23%	8	15%
water heater?	I'd rather not answer	2	0%	1	1%	1	0%	0	0%	0	0%	2	1%	0	0%
20 (n=412)	Yes	65	16%	14	13%	51	17%	0	0%	0	0%	54	15%	11	21%
federal tax credit	No	242	59%	60	55%	181	61%	0	0%	1	100%	214	60%	28	53%
for the purchase	I'm not sure	103	25%	35	32%	66	22%	2	100%	0	0%	89	25%	14	26%
of your heat pump water heater?	I'd rather not answer	2	0%	1	1%	1	0%	0	0%	0	0%	2	1%	0	0%
22 (n=419) Was the heat pump water	Existing home	394	94%	105	95%	286	94%	2	100%	1	100%	345	95%	49	88%

Survey Question	Boononoo Ontiono	Total		OR		WA		ID		МТ		Urban		Rural	
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n		n	
heater installed in an existing home or was it part of a new home construction?	New home construction	25	6%	6	5%	19	6%	0	0%	0	0%	18	5%	7	13%
	Unfinished basement or crawl space	40	10%	1	1%	38	12%	0	0%	1	100%	33	9%	7	13%
23 and 24	Finished basement	57	14%	8	7%	48	16%	1	50%	0	0%	49	13%	8	14%
Combined (n=419)	Garage	221	53%	66	59%	154	50%	1	50%	0	0%	193	53%	28	50%
Where is the heat pump water	Closet or utility room (not in a basement)	82	20%	28	25%	54	18%	0	0%	0	0%	71	20%	11	20%
heater located?	Other	18	4%	8	7%	10	3%	0	0%	0	0%	16	4%	2	4%
	I'm not sure	1	0%	0	0%	1	0%	0	0%	0	0%	1	0%	0	0%
25 and 26 Combined (n=419)	Yes - heated	123	29%	35	32%	87	29%	1	50%	0	0%	106	29%	17	30%
water heater located in a part	No - unheated	293	70%	76	68%	215	70%	1	50%	1	100%	255	70%	38	68%
of your home that is heated?	I'm not sure	3	1%	0	0%	3	1%	0	0%	0	0%	2	1%	1	2%
27 (n=419)	Yes - insulated	320	76%	88	79%	229	75%	2	100%	1	100%	274	75%	46	82%

0	Deserves Outlines	Т	otal	C	DR	۷	VA		ID		МТ	Urk	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Is the heat pump water heater located in a part	No - not insulated	93	22%	22	20%	71	23%	0	0%	0	0%	84	23%	9	16%
is insulated?	I'm not sure	6	1%	1	1%	5	2%	0	0%	0	0%	5	1%	1	2%
28 (n=419) Are you responsible for paying the electric	Yes	416	99%	110	99%	303	99%	2	100%	1	100%	360	99%	56	100%
bill at the property with the heat pump water heater?	No	3	1%	1	1%	2	1%	0	0%	0	0%	3	1%	0	0%
	l previously owned one	25	6%	6	5%	19	6%	0	0%	0	0%	18	5%	7	13%
	From a friend or acquaintance	55	13%	15	14%	39	13%	0	0%	1	100%	47	13%	8	14%
30 (n=419) Where or how have you heard	Utility print advertising or bill insert	85	20%	40	36%	45	15%	0	0%	0	0%	78	21%	7	13%
about heat pump water heaters?	Utility website	111	26%	38	34%	73	24%	0	0%	0	0%	100	28%	11	20%
	Smart Water Heat website	13	3%	2	2%	11	4%	0	0%	0	0%	12	3%	1	2%
	Hot Water Solutions website	5	1%	1	1%	4	1%	0	0%	0	0%	5	1%	0	0%



Survey Question Res	Boononce Ontione	T	otal	(OR	V	VA		ID		МТ	Ur	ban	R	Rural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Retail store display	56	13%	9	8%	47	15%	0	0%	0	0%	48	13%	8	14%
	Retail store salesperson	17	4%	6	5%	11	4%	0	0%	0	0%	16	4%	1	2%
	Printed newspaper ad	5	1%	3	3%	2	1%	0	0%	0	0%	5	1%	0	0%
	Print newspaper story	7	2%	1	1%	6	2%	0	0%	0	0%	7	2%	0	0%
	Online news story	24	6%	5	5%	18	6%	1	50%	0	0%	21	6%	3	5%
	Television ad	3	1%	2	2%	1	0%	0	0%	0	0%	3	1%	0	0%
	Social media, such as Facebook, Instagram, or YouTube	6	1%	1	1%	5	2%	0	0%	0	0%	5	1%	1	2%
	Contractor or installer	36	9%	4	4%	32	10%	0	0%	0	0%	32	9%	4	7%
	While researching on the internet	135	32%	17	15%	118	39%	0	0%	0	0%	111	31%	24	43%
	Internet advertising	12	3%	3	3%	9	3%	0	0%	0	0%	10	3%	2	4%
	Utility newsletter	91	22%	44	40%	47	15%	0	0%	0	0%	86	24%	5	9%
	Other	16	4%	1	1%	15	5%	0	0%	0	0%	10	3%	6	11%
	Work/profession	11	3%	1	1%	10	3%	0	0%	0	0%	8	2%	3	5%
	I'm not sure	11	3%	0	0%	10	3%	1	50%	0	0%	9	2%	2	4%
31a (n=419) Please assess	Strongly disagree	16	4%	3	3%	13	4%	0	0%	0	0%	15	4%	1	2%
how much you	Somewhat disagree	12	3%	5	5%	7	2%	0	0%	0	0%	11	3%	1	2%

	Despense Options	Т	otal	(OR	۷	VA		ID		MT	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
agree or disagree with the following	Neither agree nor disagree	41	10%	12	11%	29	10%	0	0%	0	0%	36	10%	5	9%
Heat pump water	Somewhat agree	138	33%	40	36%	98	32%	0	0%	0	0%	122	34%	16	29%
heaters are very efficient.	Strongly agree	212	51%	51	46%	158	52%	2	100%	1	100%	179	49%	33	59%
31b (n=419) Please assess	Strongly disagree	17	4%	1	1%	16	5%	0	0%	0	0%	16	4%	1	2%
how much you agree or disagree	Somewhat disagree	9	2%	2	2%	7	2%	0	0%	0	0%	9	2%	0	0%
vith the following statements N Heat pump water c neaters are c	Neither agree nor disagree	62	15%	24	22%	36	12%	1	50%	1	100%	56	15%	6	11%
heaters are eligible for tax	Somewhat agree	120	29%	21	19%	99	32%	0	0%	0	0%	103	28%	17	30%
discounts from utility companies.	Strongly agree	211	50%	63	57%	147	48%	1	50%	0	0%	179	49%	32	57%
31c (n=419)	Strongly disagree	16	4%	3	3%	13	4%	0	0%	0	0%	15	4%	1	2%
Please assess how much you	Somewhat disagree	8	2%	1	1%	7	2%	0	0%	0	0%	7	2%	1	2%
agree or disagree with the following statements	Neither agree nor disagree	167	40%	54	49%	111	36%	2	100%	0	0%	148	41%	19	34%
Heat pump water	Somewhat agree	93	22%	15	14%	78	26%	0	0%	0	0%	82	23%	11	20%
heaters can be	Strongly agree	135	32%	38	34%	96	31%	0	0%	1	100%	111	31%	24	43%

Survey Question	Beenenee Ontione	То	otal	(OR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
controlled from a smart phone.															
31d (n=419) Please assess	Strongly disagree	225	54%	62	56%	161	53%	1	50%	1	100%	195	54%	30	54%
how much you	Somewhat disagree	97	23%	23	21%	73	24%	1	50%	0	0%	84	23%	13	23%
with the following statements	Neither agree nor disagree	68	16%	18	16%	50	16%	0	0%	0	0%	58	16%	10	18%
Heat pump water heaters are	Somewhat agree	20	5%	5	5%	15	5%	0	0%	0	0%	17	5%	3	5%
unreliable.	Strongly agree	9	2%	3	3%	6	2%	0	0%	0	0%	9	2%	0	0%
31e (n=419) Please assess	Strongly disagree	21	5%	6	5%	15	5%	0	0%	0	0%	20	6%	1	2%
how much you agree or disagree	Somewhat disagree	30	7%	6	5%	24	8%	0	0%	0	0%	28	8%	2	4%
with the following statements Heat pump water	Neither agree nor disagree	309	74%	82	74%	224	73%	2	100%	1	100%	261	72%	48	86%
heaters are	Somewhat agree	38	9%	11	10%	27	9%	0	0%	0	0%	34	9%	4	7%
service or repair.	Strongly agree	21	5%	6	5%	15	5%	0	0%	0	0%	20	6%	1	2%
31f (n=419) Please assess	Strongly disagree	13	3%	1	1%	12	4%	0	0%	0	0%	13	4%	0	0%
how much you agree or disagree	Somewhat disagree	14	3%	3	3%	11	4%	0	0%	0	0%	14	4%	0	0%
with the following statements	Neither agree nor disagree	42	10%	13	12%	29	10%	0	0%	0	0%	37	10%	5	9%

Summer Outpution	Despense Ontions	Т	otal	(OR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Heat pump water heaters result in lower electric bills	Somewhat agree	160	38%	47	42%	113	37%	0	0%	0	0%	142	39%	18	32%
than a typical water heater.	Strongly agree	190	45%	47	42%	140	46%	2	100%	1	100%	157	43%	33	59%
31g (n=419) Please assess	Strongly disagree	12	3%	1	1%	11	4%	0	0%	0	0%	10	3%	2	4%
how much you agree or disagree	Somewhat disagree	16	4%	3	3%	13	4%	0	0%	0	0%	16	4%	0	0%
with the following statements Heat pump water	Neither agree nor disagree	52	12%	16	14%	36	12%	0	0%	0	0%	50	14%	2	4%
heaters offer better value than typical electric	Somewhat agree	142	34%	34	31%	107	35%	1	50%	0	0%	123	34%	19	34%
water heaters.	Strongly agree	197	47%	57	51%	138	45%	1	50%	1	100%	164	45%	33	59%
31h (n=419)	Strongly disagree	104	25%	32	29%	72	24%	0	0%	0	0%	94	26%	10	18%
how much you	Somewhat disagree	95	23%	19	17%	74	24%	1	50%	1	100%	82	23%	13	23%
agree or disagree with the following	Neither agree nor disagree	62	15%	14	13%	48	16%	0	0%	0	0%	52	14%	10	18%
statements Heat pump water	Somewhat agree	127	30%	38	34%	88	29%	1	50%	0	0%	107	29%	20	36%
heaters are noisy.	Strongly agree	31	7%	8	7%	23	8%	0	0%	0	0%	28	8%	3	5%
31i (n=419)	Strongly disagree	92	22%	31	28%	60	20%	1	50%	0	0%	80	22%	12	21%



0	Deserves Ontions	Т	otal	(DR	V	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Please assess how much you	Somewhat disagree	88	21%	21	19%	67	22%	0	0%	0	0%	74	20%	14	25%
agree or disagree with the following statements	Neither agree nor disagree	105	25%	30	27%	73	24%	1	50%	1	100%	90	25%	15	27%
Heat pump water heaters are	Somewhat agree	91	22%	21	19%	70	23%	0	0%	0	0%	78	21%	13	23%
expensive to install.	Strongly agree	43	10%	8	7%	35	11%	0	0%	0	0%	41	11%	2	4%
31j (n=419) Please assess	Strongly disagree	201	48%	55	50%	144	47%	1	50%	1	100%	174	48%	27	48%
how much you agree or disagree	Somewhat disagree	91	22%	21	19%	70	23%	0	0%	0	0%	74	20%	17	30%
with the following statements	Neither agree nor disagree	60	14%	18	16%	41	13%	1	50%	0	0%	55	15%	5	9%
Heat pump water heaters do not	Somewhat agree	52	12%	15	14%	37	12%	0	0%	0	0%	46	13%	6	11%
hot water.	Strongly agree	15	4%	2	2%	13	4%	0	0%	0	0%	14	4%	1	2%
32 (n=412) What type of	Storage	386	94%	103	94%	280	94%	2	100%	1	100%	337	94%	49	92%
water heater did	On-demand	5	1%	1	1%	4	1%	0	0%	0	0%	4	1%	1	2%
you nave perore you purchased the heat pump	Indirect storage tank attached to boiler	7	2%	3	3%	4	1%	0	0%	0	0%	7	2%	0	0%
water heater?	I'm not sure	14	3%	3	3%	11	4%	0	0%	0	0%	11	3%	3	6%

0	Deensee Ontions	Тс	otal	(OR	V	/A		ID		MT	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Electricity	333	84%	94	88%	236	82%	2	100%	1	100%	290	83%	43	86%
33 (n=398) What fuel did that	Natural gas or propane	32	8%	3	3%	29	10%	0	0%	0	0%	31	9%	1	2%
water heater use?	Fuel Oil	2	1%	0	0%	2	1%	0	0%	0	0%	2	1%	0	0%
	I'm not sure	31	8%	10	9%	21	7%	0	0%	0	0%	25	7%	6	12%
34 (n=393) What was the size	Less than 55 gallons	198	50%	57	54%	140	49%	0	0%	1	100%	175	51%	23	47%
heater you replaced with the	55 gallons or more	175	45%	46	43%	127	45%	2	100%	0	0%	151	44%	24	49%
replaced with the heat pump water heater?	I'm not sure	20	5%	3	3%	17	6%	0	0%	0	0%	18	5%	2	4%
35 (n=419) How many	Less than 55 gallons	247	59%	86	77%	159	52%	2	100%	0	0%	215	59%	32	57%
gallons is your	55 gallons or more	161	38%	24	22%	136	45%	0	0%	1	100%	139	38%	22	39%
current water heater?	I'm not sure	11	3%	1	1%	10	3%	0	0%	0	0%	9	2%	2	4%
36 (n=412) Why did you	My water heater was completely broken and did not provide any hot water	31	8%	3	3%	28	9%	0	0%	0	0%	30	8%	1	2%
Why did you a purchase a new water heater? N w	My water heater worked poorly and/or needed repair	37	9%	10	9%	26	9%	1	50%	0	0%	28	8%	9	17%

	Desnames Ontions	Т	otal	(OR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	My water heater was old and/or close to failing	143	35%	27	25%	114	38%	1	50%	1	100%	123	34%	20	38%
	I wanted to install a more energy-efficient water heater	167	41%	57	52%	110	37%	0	0%	0	0%	151	42%	16	30%
	To serve an addition to my home	2	0%	0	0%	2	1%	0	0%	0	0%	0	0%	2	4%
	New construction	9	2%	4	4%	5	2%	0	0%	0	0%	4	1%	5	9%
	Incentive/Free	9	2%	8	7%	1	0%	0	0%	0	0%	9	3%	0	0%
	Needed more capacity	2	0%	0	0%	2	1%	0	0%	0	0%	2	1%	0	0%
	Remodel	2	0%	1	1%	1	0%	0	0%	0	0%	2	1%	0	0%
	Required by code	2	0%	0	0%	2	1%	0	0%	0	0%	2	1%	0	0%
	Other	4	1%	0	0%	4	1%	0	0%	0	0%	4	1%	0	0%
	I'm not sure	4	1%	0	0%	4	1%	0	0%	0	0%	4	1%	0	0%
37 (n=412) Besides heat	Standard electric storage water heaters	158	30%	31	28%	126	42%	0	0%	1	100%	135	38%	23	43%
heaters, what other water	Tankless water heaters	194	37%	43	39%	149	50%	2	100%	0	0%	167	47%	27	51%

Survey Question Response Options	Deserves Outlines	Т	otal	(DR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
heating options did you consider?	Natural gas storage water heaters	19	4%	4	4%	15	5%	0	0%	0	0%	19	5%	0	0%
	Propane storage water heaters	14	3%	2	2%	12	4%	0	0%	0	0%	8	2%	6	11%
	Solar water heating	23	4%	7	6%	16	5%	0	0%	0	0%	21	6%	2	4%
	l did not consider other types of water heaters	112	21%	42	38%	70	23%	0	0%	0	0%	101	28%	11	21%
	I'm not sure	6	1%	3	3%	3	1%	0	0%	0	0%	5	1%	1	2%
	Other options were not available	10	3%	2	3%	8	4%	0	0%	0	0%	9	4%	1	2%
38 (n=294) Why did you	Other options were more expensive to purchase	61	21%	19	29%	42	19%	0	0%	0	0%	56	22%	5	12%
decide to install a heat pump water heater instead of the other water	Other options were more expensive to operate	62	21%	13	20%	49	22%	0	0%	0	0%	53	21%	9	22%
heating options you considered?	Other options were less efficient	127	43%	18	28%	108	48%	1	50%	0	0%	108	43%	19	46%
	Other options required unacceptable renovation	36	12%	4	6%	32	14%	0	0%	0	0%	30	12%	6	15%

0	Deenenee Ontione	Т	otal	(OR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Heat pump water heaters were recommended by my contractor	19	6%	5	8%	14	6%	0	0%	0	0%	18	7%	1	2%
	Heat pump water heaters were recommended by someone else	36	12%	12	18%	23	10%	0	0%	1	100%	31	12%	5	12%
	Rebate	29	10%	9	14%	19	8%	1	50%	0	0%	28	11%	1	2%
г (с	Other options had drawbacks (e.g., not enough hot water)	9	3%	0	0%	9	4%	0	0%	0	0%	6	2%	3	7%
	Other	15	5%	4	6%	11	5%	0	0%	0	0%	13	5%	2	5%
	I'm not sure	7	2%	2	3%	5	2%	0	0%	0	0%	6	2%	1	2%
39 (n=412) Where did you	Retail store (e.g., Home Depot, Lowe's, ACE Hardware, including online)	218	53%	32	29%	186	62%	0	0%	0	0%	181	50%	37	70%
purchase your	Contractor or installer	50	12%	8	7%	41	14%	1	50%	0	0%	45	13%	5	9%
purchase your (heat pump water heater?	Plumbing supply house	21	5%	9	8%	11	4%	0	0%	1	100%	17	5%	4	8%
heater?	Utility marketplace (e.g., Enervee)	45	11%	20	18%	25	8%	0	0%	0	0%	41	11%	4	8%

0		Т	otal	(OR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Online / Internet / Website (e.g., Amazon.com)	5	1%	0	0%	5	2%	0	0%	0	0%	5	1%	0	0%
	Directly from my utility (this may include units that were provided at no cost)	68	17%	39	35%	28	9%	1	50%	0	0%	66	18%	2	4%
	I'm not sure	5	1%	2	2%	3	1%	0	0%	0	0%	4	1%	1	2%
40a (n=412) On a scale from 1 to 5, where 1 is	1 - Not at all important	18	4%	4	4%	13	4%	1	50%	0	0%	15	4%	3	6%
"not at all important" and 5 is "extremely	2	8	2%	2	2%	6	2%	0	0%	0	0%	8	2%	0	0%
important," please rate how important each of	3	46	11%	13	12%	33	11%	0	0%	0	0%	42	12%	4	8%
the following factors was in your decision to	4	125	30%	38	35%	85	28%	1	50%	1	100%	113	31%	12	23%
purchase a heat pump water heater The	5 - Extremely important	209	51%	52	47%	157	53%	0	0%	0	0%	175	49%	34	64%
ENERGY STAR	I'm not sure	6	2%	1	1%	5	2%	0	0%	0	0%	6	2%	0	0%

Survey Question	Beenenee Ontione -	Тс	otal		OR	V	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options –	n	%	n	%	n	%	n	%	n	%	n		n	
40b (n=388) On a scale from 1 to 5, where 1 is "not at all	1 - Not at all important	4	13%	0	0%	4	15%	-	-	-	-	4	14%	0	0%
important" and 5 is "extremely important," please rate how	3	3	10%	0	0%	3	11%	-	-	-	-	3	11%	0	0%
important each of the following factors was in	4	9	29%	0	0%	9	33%	-	-	-	-	8	29%	1	33%
your decision to purchase a heat pump water heater Your	5 - Extremely important	14	45%	4	100%	10	37%	-	-	-	-	12	43%	2	67%
contractor or installer's recommendation	I'm not sure	1	3%	0	0%	1	4%	-	-	-	-	1	4%	0	0%
40c (n=412) On a scale from 1 to 5, where 1 is "not at all	1 - Not at all important	5	1%	0	0%	5	2%	0	0%	0	0%	4	1%	1	2%
important" and 5 is "extremely important," please	2	2	0%	0	0%	2	1%	0	0%	0	0%	2	1%	0	0%
rate how important each of	3	16	4%	4	4%	12	4%	0	0%	0	0%	16	4%	0	0%

	Deserves Ontions	Тс	otal	(DR	V	/A		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
the following factors was in your decision to	4	82	20%	23	21%	59	20%	0	0%	0	0%	74	21%	8	15%
purchase a heat pump water heater	5 - Extremely important	301	73%	82	75%	216	72%	2	100%	1	100%	257	72%	44	83%
Reducing your energy bills	I'm not sure	6	1%	1	1%	5	2%	0	0%	0	0%	6	2%	0	0%
40d (n=181) On a scale from 1 to 5, where 1 is	1 - Not at all important	2	1%	0	0%	2	2%	-	-	0	0%	2	1%	0	0%
"not at all important" and 5 is "extremely	2	3	2%	1	2%	2	2%	-	-	0	0%	3	2%	0	0%
important," please rate how important each of	3	11	6%	1	2%	10	9%	-	-	0	0%	10	6%	1	7%
the following factors was in your decision to	4	38	21%	12	18%	26	23%	-	-	0	0%	34	20%	4	29%
purchase a heat pump water heater The	5 - Extremely important	124	69%	51	77%	72	63%	-	-	1	100%	115	69%	9	64%
rebate or discount you received	I'm not sure	3	2%	1	2%	2	2%	-	-	0	0%	3	2%	0	0%

0	Reenence Antiene	Total		OR		WA			ID	МТ		Urban		Rural	
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
40e (n=65) On a scale from 1 to 5, where 1 is	1 - Not at all important	1	2%	0	0%	1	2%	-	-	-	-	1	2%	0	0%
"not at all important" and 5 is "extremely	2	6	9%	0	0%	6	12%	-	-	-	-	5	9%	1	9%
important," please rate how important each of	3	8	12%	0	0%	8	16%	-	-	-	-	6	11%	2	18%
the following factors was in your decision to	4	17	26%	4	29%	13	25%	-	-	-	-	15	28%	2	18%
purchase a heat pump water heater The	5 - Extremely important	32	49%	9	64%	23	45%	-	-	-	-	26	48%	6	55%
federal tax credit you received	I'm not sure	1	2%	1	7%	0	0%	-	-	-	-	1	2%	0	0%
40f (n=14) On a scale from 1 to 5, where 1 is	2	1	7%	0	0%	1	8%	-	-	-	-	1	8%	0	0%
important" and 5 is "extremely important," please	3	4	29%	0	0%	4	33%	-	-	-	-	4	31%	0	0%
rate how important each of	4	6	43%	1	50%	5	42%	-	-	-	-	5	38%	1	100%

Survey Question	Poononco Ontione	Total		OR		W	Α		ID	МТ		Urban		Rural	
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n		n	
the following factors was in your decision to purchase a heat	5 - Extremely important	2	14%	1	50%	1	8%	-	-	-	-	2	15%	0	0%
heater The information on the Hot Water Solutions website	I'm not sure	1	7%	0	0%	1	8%	-	-	-	-	1	8%	0	0%
40g (n=412) On a scale from 1 to 5, where 1 is	1 - Not at all important	9	2%	2	2%	7	2%	0	0%	0	0%	8	2%	1	2%
important" and 5 is "extremely	2	9	2%	1	1%	8	3%	0	0%	0	0%	6	2%	3	6%
rate how important each of the following	3	28	7%	8	7%	20	7%	0	0%	0	0%	26	7%	2	4%
factors was in your decision to purchase a heat	4	105	26%	25	23%	80	27%	0	0%	0	0%	89	25%	16	30%
pump water heater The availability of a	5 - Extremely important	256	62%	73	66%	181	61%	1	50%	1	100%	226	63%	30	57%

Survey Question	Poononco Ontione	Total		OR		WA			ID	MT		Urban		Rural	
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
utility rebate for heat pump water heaters	I'm not sure	5	1%	1	1%	3	1%	1	50%	0	0%	4	1%	1	2%
40h (n=412) On a scale from 1 to 5, where 1 is "not at all	1 - Not at all important	26	6%	8	7%	16	5%	2	100%	0	0%	21	6%	5	9%
important" and 5 is "extremely important." please	2	27	7%	5	5%	22	7%	0	0%	0	0%	24	7%	3	6%
rate how important each of the following	3	61	15%	16	15%	45	15%	0	0%	0	0%	54	15%	7	13%
factors was in your decision to	4	102	25%	27	25%	74	25%	0	0%	1	100%	90	25%	12	23%
purchase a heat pump water heater Reducing your	5 - Extremely important	188	46%	53	48%	135	45%	0	0%	0	0%	162	45%	26	49%
environmental footprint	I'm not sure	8	2%	1	1%	7	2%	0	0%	0	0%	8	2%	0	0%
40i (n=33) On a scale from 1 to 5, where 1 is "not at all	2	3	9%	1	4%	2	20%	-	-	-	-	3	10%	0	0%

	Boononco Ontiono	Total		(OR	١	VA		ID	МТ		Urban		Rural	
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
important" and 5 is "extremely important," please rate how important each of the following factors was in your decision to purchase a heat pump water heater The state tax credit you received	3	4	12%	2	9%	2	20%	-	-	-	-	2	7%	2	50%
	4	7	21%	6	26%	1	10%	-	-	-	-	7	24%	0	0%
	5 - Extremely important	19	58%	14	61%	5	50%	-	-	-	-	17	59%	2	50%
41a (n=26)	Labels are meaningless	8	31%	3	50%	5	26%	0	0%	-	-	7	30%	1	33%
Why was this factor unimportant	l rely on efficiency data rather than	3	12%	0	0%	3	16%	0	0	-	-	3	13%	0	0%
to your decision to purchase a heat	Other factors were more important	2	8%	1	17%	1	5%	0	0	-	-	2	9%	0	0%
pump water heater? - ENERGY STAR label	l don't trust the ENERGY STAR label	2	8%	0	0%	2	11%	0	0	-	-	2	9%	0	0%
	Other	5	19%	0	0%	5	26%	0	0	-	-	4	17%	1	33%
	I'm not sure	6	23%	2	33%	3	16%	1	100	-	-	5	22%	1	33%
41b (n=4) Why was this factor unimportant	We hired an independent installer after the purchase	1	20%	-	-	1	25%	-	-	-	-	1	25%	-	-

	Posponso Optiono	Total		OR		١	VA		D	МТ		Urban		Rural	
Survey Question	Response Options -	n	%	n	%	n	%	n	%	n	%	n		n	
to your decision to purchase a heat pump water heater? - Your contractor or	I am installing	1	20%	-	-	1	25%	-	-	-	-	1	25%	-	-
	No input, I wanted it installed	1	20%	-	-	1	25%	-	-	-	-	1	25%	-	-
installer's recommendation	I'm not sure	1	20%	-	-	1	25%	-	-	-	-	1	25%	-	-
41c (n=7) Why was this factor unimportant to your decision to purchase a heat pump water heater? - Reducing energy hills	Other factors were more important	3	43%	-	-	3	43%	-	-	-	-	3	50%	0	0%
	Other	4	57%	-	-	4	57%	-	-	-	-	3	50%	1	100%
41d (n=5) Why was this factor unimportant to your decision to purchase a heat pump water heater? - The rebate or discount you received	The savings were calculated to exceed the discount within 11 months	1	20%	0	0%	1	25%	-	-	-	-	1	20%	-	-
	Rebate or not this was the correct choice	1	20%	0	0%	1	25%	-	-	-	-	1	20%	-	-
	No need to explain	1	20%	1	100%	0	0%	-	-	-	-	1	20%	-	-
	Nice to have but not a decision factor	1	20%	0	0%	1	25%	-	-	-	-	1	20%	-	-

0	Baananaa Ontiona	Total		OR		١	VA		ID	МТ		Urban		Rural	
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	I'm not sure	1	20%	0	0%	1	25%	-	-	-	-	1	20%	-	-
41e (n=7) Why was this	Didn't know about it until tax time	3	43%	-	-	3	43%	-	-	-	-	3	50%	0	0%
factor unimportant to your decision to	Didn't need it	2	29%	-	-	2	29%	-	-	-	-	1	17%	1	100%
purchase a heat pump water	Other factors were more important	1	14%	-	-	1	14%	-	-	-	-	1	17%	0	0%
heater? - The federal tax credit you received	Small amount	1	14%	-	-	1	14%	-	-	-	-	1	17%	0	0%
41f (n=1) Why was this factor unimportant to your decision to purchase a heat pump water heater? - The information on the Hot Water Solutions website	Didn't know about the website	1	100%	-	-	1	100%	-	-	-	-	1	100%	-	-
41g (n=18) Why was this factor unimportant	Other factors were more important	10	56%	0	0%	10	67%	-	-	-	-	8	57%	2	50%
to your decision to purchase a heat	Not aware of/did not receive rebate	5	28%	1	33%	4	27%	-	-	-	-	3	21%	2	50%
heater? - The	It was free	2	11%	2	67%	0	0%	-	-	-	-	2	14%	0	0%
Survey Question	Baananaa Ontiona	Тс	otal	(OR	۷	VA		ID	N	TN	Ur	ban	R	ural
--	--	----	------	---	------	----	-----	---	-----	---	----	----	-----	---	------
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
availability of a utility rebate	Other	1	6%	0	0%	1	7%	-	-	-	-	1	7%	0	0%
41h (n=53)	Not important to me	17	32%	4	31%	12	32%	1	50%	-	-	16	36%	1	13%
factor unimportant to your decision to	Other factors were more important	13	25%	2	15%	11	29%	0	0%	-	-	11	24%	2	25%
purchase a heat pump water beater?	Water heater has no/very small impact	12	23%	3	23%	9	24%	0	0%	-	-	8	18%	4	50%
Reducing your environmental	Other	5	9%	2	15%	3	8%	0	0%	-	-	5	11%	0	0%
footprint	I'm not sure	6	11%	2	15%	3	8%	1	50%	-	-	5	11%	1	13%
41i (n=3) Why was this factor unimportant	Didn't need it	1	20%	0	0%	1	50%	-	-	-	-	1	33%	-	-
to your decision to purchase a heat	No need to explain	1	20%	1	100%	0	0%	-	-	-	-	1	33%	-	-
heater? - The state tax credit you received	None	1	20%	0	0%	1	50%	-	-	-	-	1	33%	-	-
42 (n=46) Were there any other factors that	Ease of installation/ability to self-install	13	28%	3	7%	10	22%	-	-	-	-	12	26%	1	2%
were important in	Capacity	10	22%	2	4%	8	17%	-	-	-	-	8	17%	2	4%
your decision to	Fits in space	7	15%	0	0%	7	15%	-	-	-	-	5	11%	2	4%

Survey Question	Paananaa Ontiana	T	otal	(OR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
install a heat pump water	Heat/humidity reduction benefits	5	11%	0	0%	5	11%	-	-	-	-	4	9%	1	2%
heater?	Wi-fi	3	7%	0	0%	3	7%	-	-	-	-	3	7%	0	0%
	Local energy credits	3	7%	0	0%	3	7%	-	-	-	-	2	4%	1	2%
	Switch from gas to electric	2	4%	0	0%	2	4%	-	-	-	-	2	4%	0	0%
	Other	7	15%	1	2%	6	13%	-	-	-	-	7	15%	0	0%
43 and 44 Combined (n=419) Did you install the new water heater yourself, did you hire an installer to do it, or did the general contractor building your home manage the installation?	Self-install Professional install I'm not sure	223 186 10	53% 44% 2%	58 52 1	52% 47% 1%	164 132 9	54% 43% 3%	1 1 0	50% 50% 0%	0 1	0% 100% 0%	193 163 7	53% 45% 2%	30 23 3	54% 41% 5%
45 (n=163) How did you find the person or company that installed your new water heater?	Smart Water Heat website / Hot Water Solutions website / contractor finder Angie's List	2	1% 2%	0	0%	2	2% 3%	0	0%	0	0%	2 3	1% 2%	0	0%

Survey Question	Boononoo Ontiono	T	otal	(OR	V	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Personal recommendation	30	18%	6	14%	23	20%	0	0%	1	100%	28	20%	2	10%
	Retailer recommendation	1	1%	0	0%	1	1%	0	0%	0	0%	1	1%	0	0%
	Retailer home services (e.g., Home Depot or Lowe's Home Services department)	12	7%	1	2%	11	9%	0	0%	0	0%	9	6%	3	15%
M re F	Manufacturer recommendation	2	1%	0	0%	2	2%	0	0%	0	0%	2	1%	0	0%
	Previous relationship with contractor	64	39%	16	36%	47	40%	1	100%	0	0%	55	38%	9	45%
	Utility contractor list	34	21%	20	45%	14	12%	0	0%	0	0%	30	21%	4	20%
	Nextdoor	1	1%	1	2%	0	0%	0	0%	0	0%	1	1%	0	0%
	Phonebook / internet search	6	4%	0	0%	6	5%	0	0%	0	0%	5	3%	1	5%
	Other	3	2%	0	0%	3	3%	0	0%	0	0%	3	2%	0	0%
	I'm not sure	5	3%	0	0%	5	4%	0	0%	0	0%	4	3%	1	5%
47 (n=163) Did the	Yes	90	55%	30	68%	59	50%	0	0%	1	100%	78	55%	12	60%
installer/contracto	No	66	40%	12	27%	54	46%	0	0%	0	0%	59	41%	7	35%

Sum and Outpution	Despense Options	Тс	otal	(OR	۷	VA		ID		МТ	Url	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n		n	
r tell you which water heater settings to use?	I'm not sure	7	4%	2	5%	4	3%	1	100%	0	0%	6	4%	1	5%
	Heat pump only (most efficient)	35	39%	17	59%	17	29%	-	-	1	100%	32	42%	3	25%
48 (n=89) Which water heater setting did your contractor encourage you to use?	Hybrid or mixed operation (primarily operates in heat pump mode but uses electric resistance as backup) Electric resistance only (least efficient)	49 1	55% 1% 4%	10 0 2	34% 0% 7%	39 1 2	66% 2% 3%	-	-	0	0%	41 1 3	53% 1%	8 0	67% 0% 8%
		050	000/	70	770/	474	0,0	0	400%	4	4000/	047	050/	-	700/
	Half a day of less	253	66%	79	11%	171	62%	2	100%	1	100%	217	65%	30	12%
49 (n=383)	One day	97	25%	20	20%	77	28%	0	0%	0	0%	86	26%	11	22%
About how long	Two days	19	5%	1	1%	18	6%	0	0%	0	0%	16	5%	3	6%
did it take to	Three days	7	2%	1	1%	6	2%	0	0%	0	0%	7	2%	0	0%
pump water	Four days	1	0%	1	1%	0	0%	0	0%	0	0%	1	0%	0	0%
heater?	Five or more days	2	1%	0	0%	2	1%	0	0%	0	0%	2	1%	0	0%
	I'm not sure	4	1%	0	0%	4	1%	0	0%	0	0%	4	1%	0	0%

	Despense Outions	Тс	otal	(DR	V	/A		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
50 (n=388) Did "your contractor / installer" "you"	Yes	90	23%	17	17%	72	26%	0	0%	1	100%	73	22%	17	33%
encounter any challenges with	No	279	72%	81	79%	196	70%	2	100%	0	0%	245	73%	34	67%
the heat pump water heater installation?	I'm not sure	19	5%	5	5%	14	5%	0	0%	0	0%	19	6%	0	0%
	Pipe configuration	47	52%	8	47%	39	54%	-	-	0	0%	41	56%	6	35%
51 (n=90)	No nearby drain for condensate	43	48%	6	35%	37	51%	-	-	0	0%	35	48%	8	47%
What challenges did "your	New wiring/electrical work required	15	17%	0	0%	15	21%	-	-	0	0%	14	19%	1	6%
contractor / installer" "you" encounter?	Inadequate make-up air/airflow	9	10%	1	6%	7	10%	-	-	1	100%	8	11%	1	6%
	Heat pump water heater too large to fit where old water heater was located	16	18%	2	12%	13	18%	-	-	1	100%	13	18%	3	18%

Survey Question	Poononco Ontiono	T	otal	(OR	V	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Complications related to floorplan and noise (noise from heat pump water heater would be a nuisance in desired installation location)	5	6%	0	0%	5	7%	-	-	0	0%	4	5%	1	6%
	Complications related to floorplan and cold air (cold air generated by heat pump water heater would be a nuisance in desired installation location)	11	12%	1	6%	10	14%	-	-	0	0%	6	8%	5	29%
	Other	6	7%	2	12%	4	6%	-	-	0	0%	6	8%	0	0%
	Contractor/installer inexperience	2	2%	0	0%	2	3%	-	-	0	0%	2	3%	0	0%
	Faulty unit	2	2%	1	6%	1	1%	-	-	0	0%	2	3%	0	0%
	Had to install ducting	3	3%	0	0%	3	4%	-	-	0	0%	1	1%	2	12%
	HPWH was heavy	3	3%	0	0%	3	4%	-	-	0	0%	3	4%	0	0%
	Removal of old unit	2	2%	0	0%	2	3%	-	-	0	0%	0	0%	2	12%
	I'm not sure	3	3%	3	18%	0	0%	-	-	0	0%	3	4%	0	0%
53 (n=419)	Yes	41	10%	9	8%	31	10%	1	50%	0	0%	37	10%	4	7%

0	Deserves Outions	Т	otal	(DR	V	/A		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Since "purchasing" "moving into the home with" the heat pump water heater, have you contacted a professional to service or repair the heat pump	No I'm not sure	374 4	89%	101	91% 1%	271 3	89%	1	50% 0%	1	0%	322 4	89% 1%	52 0	93% 0%
the heat pump															
54 (n=41) How many times	1	14	34%	2	22%	12	39%	0	0%	-	-	12	32%	2	50%
professional service and/or	2	2	5%	0	0%	1	3%	1	100%	-	-	1	3%	1	25%
repair the heat pump water heater? - Number	3	1	2%	0	0%	1	3%	0	0%	-	-	1	3%	0	0%
of service-only visits	0	24	59%	7	78%	17	55%	0	0%	-	-	23	62%	1	25%
55 (n=41) How many times have you had a	1	12	29%	2	22%	10	32%	0	0%	-	-	9	24%	3	75%
professional service and/or	2	1	2%	1	11%	0	0%	0	0%	-	-	2	3%	0	0%

	Deserves Ontions	Т	otal	(OR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n		n	
repair the heat pump water heater? - Number	3	3	7%	0	0%	3	10%	0	0%	-	-	3	8%	0	0%
visits	0	25	61%	6	67%	18	58%	1	100%	-	-	24	65%	1	25%
56 (n=41) How many times have you had a	1	7	17%	3	33%	4	13%	0	0	-	-	6	16%	1	25%
service and/or repair the heat	3	1	2%	0	0%	1	3%	0	0	-	-	1	3%	0	0%
repair the heat pump water heater? - Number ₍ of visits with	0	33	80%	6	67%	26	84%	1	100	-	-	30	81%	3	75%
	No issues, just conducting periodic or annual tune-up	8	24%	0	0%	7	26%	1	100%	-	-	7	23%	1	25%
57 (n=34) What issues	Not enough hot water	8	24%	1	17%	7	26%	0	0%	-	-	7	23%	1	25%
What issues triggered the service or repair	Hot water slow to arrive at faucet	1	3%	0	0%	1	4%	0	0%	-	-	1	3%	0	0%
visits for the heat pump water heater?	Noise / humming / vibration	4	12%	0	0%	4	15%	0	0%	-	-	4	13%	0	0%
	Water leak	1	3%	0	0%	1	4%	0	0%	-	-	1	3%	0	0%
	Control board failed	6	18%	3	50%	3	11%	0	0%	-	-	5	17%	1	25%

Survey Question	Boononoo Ontiono	T	otal		OR	١	VA		ID		МТ	Uı	ban	F	Rural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Error code	5	15%	0	0%	5	19%	0	0%	-	-	4	13%	1	25%
	HPWH stopped working	3	9%	1	17%	2	7%	0	0%	-	-	3	10%	0	0%
	Sensor broke	2	6%	0	0%	2	7%	0	0%	-	-	2	7%	0	0%
	Compressor overheated	1	3%	0	0%	1	4%	0	0%	-	-	1	3%	0	0%
	Replaced pressure valve	1	3%	1	17%	0	0%	0	0%	-	-	1	3%	0	0%
57a (n=34) Did you have a warranty that	Yes, warranty covered the cost of the entire repair or service.	17	50%	4	67%	13	48%	0	0%	-	-	16	53%	1	25%
warranty that covered the repair or service for the heat pump water heater?	Yes, warranty only partially covered the cost of the repair or service.	2	6%	0	0%	2	7%	0	0%	-	-	2	7%	0	0%
	No	11	32%	2	33%	8	30%	1	100%	-	-	8	27%	3	75%
	I'm not sure	4	12%	0	0%	4	15%	0	0%	-	-	4	13%	0	0%
58 (n=17)	Less than \$100	1	6%	0	0%	1	7%	0	0%	-	-	1	7%	0	0%
Roughly, how much did the	Between \$100 and \$200	4	24%	1	50%	3	21%	0	0%	-	-	3	21%	1	33%
service visit(s)	More than \$200	3	18%	1	50%	2	14%	0	0%	-	-	3	21%	0	0%
cost you, in total?	I'm not sure	9	53%	0	0%	8	57%	1	100%	-	-	7	50%	2	67%
59 (n=17)	Less than \$100	4	24%	0	0%	4	29%	0	0%	-	-	3	21%	1	33%

	Deserves Ontions	Тс	otal	(OR	۷	A		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Roughly, how much did the	Between \$100 and \$200	2	12%	1	50%	1	7%	0	0%	-	-	2	14%	0	0%
repairs cost you, in total?	More than \$200 I'm not sure	3 8	18% 47%	1 0	50% 0%	2 7	14% 50%	0 1	0% 100%	-	-	3 6	21% 43%	0 2	0% 67%
60 (n=34) Was it challenging to find a	Yes	9	27%	1	17%	8	30%	0	0%	-	-	7	23%	2	50%
technician who knew how to	No	23	68%	5	83%	17	63%	1	100%	-	-	21	70%	2	50%
the heat pump water heater?	I'm not sure	2	6%	0	0%	2	7%	0	0%	-	-	2	7%	0	0%
61a (n=419) Since	Very dissatisfied	15	4%	2	2%	13	4%	0	0%	0	0%	13	4%	2	4%
"purchasing" "moving into the home with" the	Somewhat dissatisfied	55	13%	20	18%	34	11%	1	50%	0	0%	49	13%	6	11%
heat pump water heater, how	Neither satisfied nor dissatisfied	105	25%	31	28%	73	24%	1	50%	0	0%	92	25%	13	23%
been with the	Somewhat satisfied	98	23%	18	16%	80	26%	0	0%	0	0%	87	24%	11	20%
The sound level	Very satisfied	145	35%	40	36%	104	34%	0	0%	1	100%	122	34%	23	41%
water heater	I'm not sure	1	0%	0	0%	1	0%	0	0%	0	0%	0	0%	1	2%
61b (n=419)	Very dissatisfied	5	1%	0	0%	5	2%	0	0%	0	0%	5	1%	0	0%

0		Т	otal	(OR	V	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Since "purchasing"	Somewhat dissatisfied	23	6%	5	5%	18	6%	0	0%	0	0%	22	6%	1	2%
"moving into the home with" the heat pump water	Neither satisfied nor dissatisfied	30	7%	11	10%	19	6%	0	0%	0	0%	29	8%	1	2%
heater, how satisfied have you	Somewhat satisfied	100	24%	27	24%	72	24%	1	50%	0	0%	86	24%	14	25%
following items? - Your hot water	Very satisfied	259	62%	67	60%	190	62%	1	50%	1	100%	219	60%	40	71%
supply	I'm not sure	2	1%	1	1%	1	0%	0	0%	0	0%	2	1%	0	0%
61c (n=419) Since	Very dissatisfied	12	3%	3	3%	9	3%	0	0%	0	0%	10	3%	2	4%
"purchasing" "moving into the home with" the	Somewhat dissatisfied	38	9%	12	11%	26	9%	0	0%	0	0%	33	9%	5	9%
heat pump water heater, how satisfied have vou	Neither satisfied nor dissatisfied	127	30%	31	28%	94	31%	2	100%	0	0%	112	31%	15	27%
been with the following items? -	Somewhat satisfied	86	21%	21	19%	64	21%	0	0%	1	100%	71	20%	15	27%
in the room where the heat pump	Very satisfied	145	35%	41	37%	104	34%	0	0%	0	0%	126	35%	19	34%
water heater is installed	I'm not sure	11	3%	3	3%	8	3%	0	0%	0	0%	11	3%	0	0%

	Deenenee Ontione	Тс	otal	(DR	۷	VA		ID		MT	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
61d (n=419) Since	Very dissatisfied	5	1%	0	0%	5	2%	0	0%	0	0%	5	1%	0	0%
"purchasing" "moving into the	Somewhat dissatisfied	10	2%	3	3%	7	2%	0	0%	0	0%	10	3%	0	0%
home with" the heat pump water heater, how	Neither satisfied nor dissatisfied	87	21%	22	20%	65	21%	0	0%	0	0%	77	21%	10	18%
satisfied have you been with the following items? -	Somewhat satisfied	86	21%	17	15%	68	22%	1	50%	0	0%	73	20%	13	23%
The sales process for buying a heat	Very satisfied	223	53%	68	61%	154	50%	1	50%	0	0%	192	53%	31	55%
heater	I'm not sure	8	2%	1	1%	6	2%	0	0%	1	100%	6	2%	2	4%
61e (n=416) Since	Very dissatisfied	7	2%	0	0%	7	2%	0	0%	0	0%	7	2%	0	0%
"purchasing" "moving into the home with" the	Somewhat dissatisfied	13	3%	5	5%	8	3%	0	0%	0	0%	11	3%	2	4%
heat pump water heater, how satisfied have you	Neither satisfied nor dissatisfied	75	18%	22	20%	53	17%	0	0%	0	0%	69	19%	6	11%
been with the following items? -	Somewhat satisfied	114	27%	32	29%	81	27%	1	50%	0	0%	96	27%	18	32%

	Deserves Ontions	Тс	otal	(DR	V	A		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
The change in your electricity bill after installing the	Very satisfied	186	45%	44	40%	140	46%	1	50%	1	100%	158	44%	28	50%
heat pump water heater	I'm not sure	21	5%	7	6%	14	5%	0	0%	0	0%	19	5%	2	4%
61f (n=419) Since	Very dissatisfied	3	1%	1	1%	2	1%	0	0%	0	0%	3	1%	0	0%
"purchasing" "moving into the	Somewhat dissatisfied	12	3%	3	3%	9	3%	0	0%	0	0%	9	2%	3	5%
heat pump water heater, how	Neither satisfied nor dissatisfied	90	22%	22	20%	67	22%	1	50%	0	0%	82	23%	8	14%
satisfied have you been with the following items? -	Somewhat satisfied	69	17%	16	14%	52	17%	0	0%	1	100%	58	16%	11	20%
The maintenance requirements of	Very satisfied	226	54%	66	59%	159	52%	1	50%	0	0%	195	54%	31	55%
the heat pump water heater	I'm not sure	19	5%	3	3%	16	5%	0	0%	0	0%	16	4%	3	5%
61g (n=416) Since	Very dissatisfied	6	1%	0	0%	6	2%	0	0%	0	0%	5	1%	1	2%
"purchasing" "moving into the	Somewhat dissatisfied	8	2%	2	2%	6	2%	0	0%	0	0%	7	2%	1	2%
home with" the heat pump water	Neither satisfied nor dissatisfied	52	13%	18	16%	34	11%	0	0%	0	0%	45	13%	7	13%

	Deserves Ontions	Т	otal	(DR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
heater, how satisfied have you been with the	Somewhat satisfied	95	23%	18	16%	76	25%	1	50%	0	0%	85	24%	10	18%
following items? - The value of the	Very satisfied	250	60%	71	65%	177	58%	1	50%	1	100%	214	59%	36	64%
heat pump water heater	I'm not sure	5	1%	1	1%	4	1%	0	0%	0	0%	4	1%	1	2%
61h (n=419) Since	Very dissatisfied	9	2%	0	0%	9	3%	0	0%	0	0%	8	2%	1	2%
"purchasing" "moving into the	Somewhat dissatisfied	11	3%	2	2%	9	3%	0	0%	0	0%	9	2%	2	4%
home with" the heat pump water heater, how	Neither satisfied nor dissatisfied	21	5%	6	5%	15	5%	0	0%	0	0%	19	5%	2	4%
satisfied have you been with the	Somewhat satisfied	99	24%	26	23%	72	24%	1	50%	0	0%	90	25%	9	16%
following items? - The heat pump water heater	Very satisfied	276	66%	77	69%	197	65%	1	50%	1	100%	234	64%	42	75%
overall	I'm not sure	3	1%	0	0%	3	1%	0	0%	0	0%	3	1%	0	0%
62a (n=70) Why are you dissatisfied with the sound level of the heat pump water heater?	It is loud/noisy	70	100%	22	100%	47	100%	1	100%	-	-	62	100%	8	100%

Summer Oursetien	Despense Options	Т	otal		OR	١	NA		ID	1	TN	Url	ban	F	Rural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
62b (n=28) Why are you	Not enough hot water	25	89%	5	100%	20	87%	-	-	-	-	24	89 %	1	100%
your hot water supply?	I'm not sure	3	11%	0	0%	3	13%	-	-	-	-	3	11 %	0	0%
62c (n=50)															
Why are you dissatisfied with	Made the space cold	42	84%	11	73%	31	89%	-	-	-	-	35	81%	7	100%
the temperature of the room where	Good in summer, bad in winter	7	14%	3	20%	4	11%	-	-	-	-	7	16%	0	0%
the heat pump water heater is installed?	I'm not sure	1	2%	1	7%	0	0%	-	-	-	-	1	2%	0	0%
62d (n=16)	Sales rep did not provide sufficient/correct information	4	27%	0	0%	4	33%	-	-	-	-	4	27%	-	-
Why are you dissatisfied with	General purchase challenges	4	27%	3	100%	1	8%	-	-	-	-	4	27%	-	-
for buying a heat pump water	Hard to find qualified installer	4	27%	0	0%	4	33%	-	-	-	-	4	27%	-	-
heater?	Prefer instant rebate	1	7%	0	0%	1	8%	-	-	-	-	1	7%	-	-
	I'm not sure	2	13%	0	0%	2	17%	-	-	-	-	2	13%	-	-
62e (n=20)	Little/no reduction in bill	16	80%	4	80%	12	80%	-	-	-	-	14	78%	2	100%

Surray Quanting	Despense Ontions	Т	otal	(OR	١	NA		ID		MT	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Why are you dissatisfied with the change in your electricity bill?	Bill increased	4	20%	1	20%	3	20%	-	-	-	-	4	22%	0	0%
	Does not work properly	2	13%	1	25%	1	9%	-	-	-	-	2	17%	0	0%
62f (n=15)	Needed maintenance	4	27%	1	25%	3	27%	-	-	-	-	3	25%	1	33%
dissatisfied with	Needed repair	1	7%	0	0%	1	9%	-	-	-	-	1	8%	0	0%
the maintenance requirements of the heat pump	Needed to be replaced	1	7%	0	0%	1	9%	-	-	-	-	1	8%	0	0%
water heater?	Needed to install drain	1	7%	1	25%	0	0%	-	-	-	-	1	8%	0	0%
	I'm not sure	6	40%	1	25%	5	45%	-	-	-	-	4	33%	2	67%
62g (n=14)	Too expensive	7	50%	0	0%	7	58%	-	-	-	-	6	50%	1	50%
Why are you dissatisfied with	Not enough bill savings	4	29%	1	50%	3	25%	-	-	-	-	4	33%	0	0%
the value of the heat pump water	Does not work properly	1	7%	0	0%	1	8%	-	-	-	-	1	8%	0	0%
neater?	I'm not sure	2	14%	1	50%	1	8%	-	-	-	-	1	8%	1	50%
62h (n=20) Why are you	Not enough bill savings	6	26%	2	100%	4	22%	-	-	-	-	4	24%	2	67%
dissatisfied with	Not enough hot water	4	17%	0	0%	4	22%	-	-	-	-	4	24%	0	0%

	Deenemen Ontione	Тс	otal	(DR	V	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
the heat pump water heater	Does not work properly	3	13%	0	0%	3	17%	-	-	-	-	3	18%	0	0%
overall?	Unhappy with it overall	2	9%	0	0%	2	11%	-	-	-	-	2	12%	0	0%
	Expensive to operate	1	4%	0	0%	1	6%	-	-	-	-	1	6%	0	0%
	Expensive to purchase	1	4%	0	0%	1	6%	-	-	-	-	1	6%	0	0%
	It is loud/noisy	1	4%	0	0%	1	6%	-	-	-	-	1	6%	0	0%
	Made space cold	1	4%	0	0%	1	6%	-	-	-	-	1	6%	0	0%
	Needed maintenance	1	4%	0	0%	1	6%	-	-	-	-	0	0%	1	33%
	Too big	1	4%	0	0%	1	6%	-	-	-	-	1	6%	0	0%
	I'm not sure	2	9%	0	0%	2	11%					2	12%	0	0%
	Electricity	328	78%	90	81%	235	77%	2	100%	1	100%	280	77%	48	86%
64 (n=419)	Natural gas or Propane	49	12%	6	5%	43	14%	0	0%	0	0%	48	13%	1	2%
what fuel do you	Fuel Oil	6	1%	0	0%	6	2%	0	0%	0	0%	6	2%	0	0%
primarily use to	Wood	26	6%	13	12%	13	4%	0	0%	0	0%	23	6%	3	5%
fieat your nome?	None	1	0%	0	0%	1	0%	0	0%	0	0%	0	0%	1	2%
	I'm not sure	9	2%	2	2%	7	2%	0	0%	0	0%	6	2%	3	5%
64 (n=409) Since installing the heat pump	Yes	100	24%	34	31%	65	22%	1	50%	0	0%	86	24%	14	26%



	Deenenee Ontiene	Тс	otal	C	DR	۷	/A		ID		МТ	Url	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
water heater, have you noticed any changes in	No	235	57%	53	49%	180	60%	1	50%	1	100%	209	59%	26	49%
how much it costs to heat your home?	I'm not sure	74	18%	21	19%	53	18%	0	0%	0	0%	61	17%	13	25%
	Increased a lot	2	2%	1	3%	1	2%	0	0%	-	-	2	2%	0	0%
65 (n=100)	Increased a little	6	6%	2	6%	4	6%	0	0%	-	-	6	7%	0	0%
Since installing the heat pump	Stayed about the same	9	9%	2	6%	7	11%	0	0%	-	-	8	9%	1	7%
have your heating	Decreased a little	47	47%	21	62%	26	40%	0	0%	-	-	41	48%	6	43%
bills changed?	Decreased a lot	32	32%	7	21%	24	37%	1	100%	-	-	25	29%	7	50%
	I'm not sure	4	4%	1	3%	3	5%	0	0%	-	-	4	5%	0	0%
66 (n=419) Overall, has the	Yes	378	90%	102	92%	273	90%	2	100%	1	100%	325	90%	53	95%
heat pump water	No	26	6%	7	6%	19	6%	0	0%	0	0%	24	7%	2	4%
heater met your expectations?	I'm not sure	15	4%	2	2%	13	4%	0	0%	0	0%	14	4%	1	2%
67 (n=26)	Not enough bill savings	12	46%	5	71%	7	37%	-	-	-	-	11	46%	1	50%
Where did the	Not enough hot water	7	27%	0	0%	7	37%	-	-	-	-	7	29%	0	0%
neat pump water heater fall short of your	Does not work properly	3	12%	1	14%	2	11%	-	-	-	-	3	13%	0	0%
, expectations?	It is loud/noisy	3	12%	1	14%	2	11%	-	-	-	-	3	13%	0	0%
	Made space cold	3	12%	0	0%	3	16%	-	-	-	-	3	13%	0	0%

0	December Outline	Т	otal	(OR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Incompatible with hot water recirculation system Needed repair	2	8%	0	0%	2	11% 5%	-	-	-	-	1	4% 4%	1	50%
		1	40/	0	070	4	570	_	_	_	_	, 0	- 70 - 00/	4	50%
	Required air duct kit	1	4%	0	0%	1	5%	-	-	-	-	0	0%	1	50%
	Required maintenance	1	4%	0	0%	1	5%	-	-	-	-	1	4%	0	0%
	Too complicated to fix myself	1	4%	0	0%	1	5%	-	-	-	-	1	4%	0	0%
68 (n=419) Have you, or	Yes, I have	261	62%	64	58%	194	64%	2	100%	1	100%	218	60%	43	77%
Have you, or would you, recommend a heat pump water heater to a friend, colleague, or	Yes, I would	110	26%	34	31%	76	25%	0	0%	0	0%	101	28%	9	16%
	No	21	5%	6	5%	15	5%	0	0%	0	0%	19	5%	2	4%
family member?	I'm not sure	27	6%	7	6%	20	7%	0	0%	0	0%	25	7%	2	4%
69 (n=419) Which of the	I am the first among my friends to purchase new technology	74	18%	17	15%	57	19%	0	0%	0	0%	61	17%	13	23%
statements best describes you?	l purchase new technology sooner than most of my friends	148	35%	37	33%	109	36%	1	50%	1	100%	129	36%	19	34%

Sumary Question	Beenenee Ontione	Тс	otal	(OR	۷	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	I am typically in the middle of the group when purchasing new technology	133	32%	33	30%	100	33%	0	0%	0	0%	117	32%	16	29%
	I purchase new technology after most of my friends have purchased it Lam one of the last	28	7%	11	10%	17	6%	0	0%	0	0%	26	7%	2	4%
	people to purchase new technology	14	3%	7	6%	7	2%	0	0%	0	0%	12	3%	2	4%
	I'm not sure	22	5%	6	5%	15	5%	1	50%	0	0%	18	5%	4	7%
70a (n=419) Please assess	Strongly disagree	1	0%	0	0%	1	0%	0	0%	0	0%	0	0%	1	2%
how much you	Somewhat disagree	2	1%	0	0%	2	1%	0	0%	0	0%	0	0%	2	4%
agree or disagree with the following statements: - I do	Neither agree nor disagree	8	2%	3	3%	5	2%	0	0%	0	0%	5	1%	3	5%
research before	Somewhat agree	86	21%	27	24%	58	19%	1	50%	0	0%	79	22%	7	13%
purchases.	Strongly agree	322	77%	81	73%	239	78%	1	50%	1	100%	279	77%	43	77%
70b (n=419) Please assess	Strongly disagree	4	1%	0	0%	4	1%	0	0%	0	0%	3	1%	1	2%
how much you agree or disagree	Somewhat disagree	16	4%	3	3%	13	4%	0	0%	0	0%	16	4%	0	0%
with the following statements: - I	Neither agree nor disagree	67	16%	17	15%	50	16%	0	0%	0	0%	59	16%	8	14%

Survey Question	Baananaa Ontiana	То	otal	(OR	V	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
seek out expert recommendations	Somewhat agree	185	44%	42	38%	141	46%	1	50%	1	100%	158	44%	27	48%
for big purchases.	Strongly agree	147	35%	49	44%	97	32%	1	50%	0	0%	127	35%	20	36%
70c (n=419)	Strongly disagree	8	2%	2	2%	6	2%	0	0%	0	0%	7	2%	1	2%
Please assess how much you	Somewhat disagree	17	4%	7	6%	9	3%	1	50%	0	0%	16	4%	1	2%
agree or disagree with the following statements: - I am	Neither agree nor disagree	61	15%	15	14%	45	15%	1	50%	0	0%	47	13%	14	25%
concerned about environmental	Somewhat agree	154	37%	40	36%	113	37%	0	0%	1	100%	136	37%	18	32%
135063.	Strongly agree	179	43%	47	42%	132	43%	0	0%	0	0%	157	43%	22	39%
70d (n=419) Please assess	Strongly disagree	11	3%	3	3%	8	3%	0	0%	0	0%	10	3%	1	2%
how much you agree or disagree	Somewhat disagree	14	3%	5	5%	9	3%	0	0%	0	0%	13	4%	1	2%
with the following statements: -	Neither agree nor disagree	72	17%	17	15%	53	17%	2	100%	0	0%	57	16%	15	27%
Actions taken by individuals like me	Somewhat agree	168	40%	46	41%	122	40%	0	0%	0	0%	151	42%	17	30%
have an impact on the environment.	Strongly agree	154	37%	40	36%	113	37%	0	0%	1	100%	132	36%	22	39%

Sum and Outputien	Passana Ontiona	Тс	otal	(OR	V	A		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
70e (n=419)	Strongly disagree	5	1%	2	2%	3	1%	0	0%	0	0%	4	1%	1	2%
how much you	Somewhat disagree	6	1%	3	3%	3	1%	0	0%	0	0%	5	1%	1	2%
with the following statements: - I	Neither agree nor disagree	10	2%	4	4%	5	2%	1	50%	0	0%	6	2%	4	7%
compare prices online for big	Somewhat agree	95	23%	25	23%	70	23%	0	0%	0	0%	84	23%	11	20%
purchases.	Strongly agree	303	72%	77	69%	224	73%	1	50%	1	100%	264	73%	39	70%
70f (n=419) Please assess	Strongly disagree	1	0%	0	0%	1	0%	0	0%	0	0%	0	0%	1	2%
how much you agree or disagree	Neither agree nor disagree	22	5%	7	6%	15	5%	0	0%	0	0%	19	5%	3	5%
with the following statements: - I will	Somewhat agree	143	34%	36	32%	105	34%	1	50%	1	100%	126	35%	17	30%
spend money upfront to save money in the long term.	Strongly agree	253	60%	68	61%	184	60%	1	50%	0	0%	218	60%	35	63%
70g (n=419) Please assess	Strongly disagree	9	2%	1	1%	8	3%	0	0%	0	0%	8	2%	1	2%
how much you agree or disagree	Somewhat disagree	17	4%	6	5%	11	4%	0	0%	0	0%	15	4%	2	4%
with the following statements: - I	Neither agree nor disagree	54	13%	11	10%	42	14%	1	50%	0	0%	46	13%	8	14%

Survey Question	Beenenee Ontione	Тс	otal	C	DR	۷	A		ID		МТ	Url	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
consider sustainability when making	Somewhat agree	175	42%	46	41%	127	42%	1	50%	1	100%	152	42%	23	41%
which products to purchase.	Strongly agree	164	39%	47	42%	117	38%	0	0%	0	0%	142	39%	22	39%
70h (n=419) Please assess how much you	Strongly disagree	4	1%	1	1%	3	1%	0	0%	0	0%	3	1%	1	2%
agree or disagree with the following statements: - Energy efficiency	Somewhat disagree	10	2%	5	5%	5	2%	0	0%	0	0%	10	3%	0	0%
is my primary consideration when choosing	Neither agree nor disagree	39	9%	12	11%	26	9%	1	50%	0	0%	34	9%	5	9%
systems for my home, like a furnace, air	Somewhat agree	168	40%	43	39%	124	41%	1	50%	0	0%	146	40%	22	39%
conditioner, or water heater.	Strongly agree	198	47%	50	45%	147	48%	0	0%	1	100%	170	47%	28	50%
71 (n=419)	2010 to present	41	10%	10	9%	31	10%	0	0%	0	0%	32	9%	9	16%
Approximately	2000 - 2009	70	17%	20	18%	49	16%	1	50%	0	0%	61	17%	9	16%
what year was	1990 - 1999	66	16%	18	16%	48	16%	0	0%	0	0%	57	16%	9	16%
your home built?	1980 - 1989	66	16%	6	5%	58	19%	1	50%	1	100%	51	14%	15	27%



0	Deers and Ontions	Т	otal	(DR	۷	VA		ID		МТ	Ur	ban	R	Rural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	1970 - 1979	66	16%	22	20%	44	14%	0	0%	0	0%	58	16%	8	14%
	1960 - 1969	40	10%	15	14%	25	8%	0	0%	0	0%	36	10%	4	7%
	Prior to 1960	60	14%	16	14%	44	14%	0	0%	0	0%	58	16%	2	4%
	I'm not sure	10	2%	4	4%	6	2%	0	0%	0	0%	10	3%	0	0%
	A free-standing, single-family home	395	94%	99	89%	293	96%	2	100%	1	100%	339	93%	56	100%
72 (n=419) What type of home "do you live in" "is the heat pump water heater installed	A townhouse or rowhouse	5	1%	0	0%	5	2%	0	0%	0	0%	5	1%	0	0%
	Apartment or condominium in a building with 2 to 4 units	1	0%	0	0%	1	0%	0	0%	0	0%	1	0%	0	0%
in?"	Manufactured or mobile home	17	4%	12	11%	5	2%	0	0%	0	0%	17	5%	0	0%
	Apartment or condominium in a building with 5 or more units	1	0%	0	0%	1	0%	0	0%	0	0%	1	0%	0	0%
73 (n=409)	Own	405	99%	107	98%	296	99%	2	100%	-	-	351	99%	54	100%
rent your home?	Rent	2	1%	1	1%	1	0%	0	0%	-	-	2	1%	0	0%



	Deenenee Ontiene	Т	otal	(OR	V	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	I'd rather not say	2	1%	1	1%	1	0%	0	0%	-	-	2	1%	0	0%
	1	37	9%	8	7%	29	10%	0	0%	-	-	34	10%	3	6%
74 (n=409) How many people live in your household, including yourself?	2	190	47%	52	48%	137	46%	1	50%	-	-	162	46%	28	52%
	3	78	19%	23	21%	55	18%	0	0%	-	-	69	19%	9	17%
	4	67	16%	18	17%	49	16%	0	0%	-	-	58	16%	9	17%
	5	18	4%	3	3%	15	5%	0	0%	-	-	15	4%	3	6%
	6	6	2%	0	0%	6	2%	0	0%	-	-	6	2%	0	0%
	7	2	1%	1	1%	1	0%	0	0%	-	-	2	1%	0	0%
	8	2	1%	0	0%	2	1%	0	0%	-	-	1	0%	1	2%
	9 or more	1	0%	1	1%	0	0%	0	0%	-	-	1	0%	0	0%
	I'd rather not say	8	2%	3	3%	4	1%	1	50%	-	-	7	2%	1	2%
	Some high school	3	1%	2	2%	1	0%	0	0%	0	0%	3	1%	0	0%
75 (n=419)	High school graduate or GED	25	6%	10	9%	15	5%	0	0%	0	0%	20	6%	5	9%
Which of the	Trade or technical	35	8%	7	6%	28	9%	0	0%	0	0%	28	8%	7	13%
categories	Some college	79	19%	28	25%	51	17%	0	0%	0	0%	68	19%	11	20%
describes the	College graduate	120	29%	26	23%	92	30%	1	50%	1	100%	107	29%	13	23%
highest level of education you have completed?	Some graduate school	22	5%	3	3%	19	6%	0	0%	0	0%	18	5%	4	7%
	Graduate degree	120	29%	31	28%	89	29%	0	0%	0	0%	107	29%	13	23%
	I'd rather not say	15	4%	4	4%	10	3%	1	50%	0	0%	12	3%	3	5%
76 (n=419)	Yes	6	1%	2	2%	4	1%	0	0%	0	0%	4	1%	2	4%



Survey Question	Beenenee Ontione	Тс	otal	C	DR	V	VA		ID		МТ	Ur	ban	R	ural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Do you consider	No	379	91%	102	92%	275	90%	1	50%	1	100%	329	91%	50	89%
or Latino?	I'd rather not say	34	8%	7	6%	26	9%	1	50%	0	0%	30	8%	4	7%
77 (n=419) How would you	White	358	83%	95	86%	260	85%	2	100%	1	100%	304	84%	54	96%
	Black or African	2	0%	0	0%	2	1%	0	0%	0	0%	2	1%	0	0%
	American Indian or Alaska Native	8	2%	4	4%	4	1%	0	0%	0	0%	8	2%	0	0%
Please select all	Asian	9	2%	0	0%	9	3%	0	0%	0	0%	8	2%	1	2%
that apply.	Native Hawaiian or Pacific Islander	2	0%	0	0%	2	1%	0	0%	0	0%	1	0%	1	2%
	I'd rather not say	50	12%	14	13%	36	12%	0	0%	0	0%	48	13%	2	4%
78 (n=419)	Less than \$40,000	22	5%	11	10%	11	4%	0	0%	0	0%	21	6%	1	2%
Which of the following categories best	Between \$40,001 and \$60,000	33	8%	7	6%	26	9%	0	0%	0	0%	26	7%	7	13%
describes your approximate annual household income from all sources in 2020, before taxes?	Between \$60,001 and \$80,000	52	12%	13	12%	39	13%	0	0%	0	0%	43	12%	9	16%
	Between \$80,001 and \$120,000	116	28%	34	31%	81	27%	0	0%	1	100%	102	28%	14	25%
	Between \$120,001 and \$250,000	92	22%	21	19%	70	23%	1	50%	0	0%	80	22%	12	21%



	Roonanaa Ontiana	Т	otal	(OR	V	VA		ID		МТ	Ur	ban	R	Rural
Survey Question	Response Options	n	%	n	%	n	%	n	%	n	%	n	%	n	%
	Over \$250,000	21	5%	3	3%	18	6%	0	0%	0	0%	18	5%	3	5%
	I'm not sure	3	1%	1	1%	2	1%	0	0%	0	0%	3	1%	0	0%
	I'd rather not say	80	19%	21	19%	58	19%	1	50%	0	0%	70	19%	10	18%
81 (n=372) What brand is	Rheem	248	67%	85	81%	161	61%	1	50%	1	100%	215	67%	33	62%
	General Electric	52	14%	13	12%	38	14%	1	50%	0	0%	44	14%	8	15%
	AO Smith	44	12%	2	2%	42	16%	0	0%	0	0%	37	12%	7	13%
	Ruud	12	3%	0	0%	12	5%	0	0%	0	0%	10	3%	2	4%
	Reliance	5	1%	3	3%	2	1%	0	0%	0	0%	5	2%	0	0%
	Bradford White	4	1%	1	1%	3	1%	0	0%	0	0%	3	1%	1	2%
your heat pump	Stiebel Eltron	2	1%	0	0%	2	1%	0	0%	0	0%	1	0%	1	2%
water heater?	AirTap	1	0%	1	1%	0	0%	0	0%	0	0%	1	0%	0	0%
	Electrolux	1	0%	0	0%	1	0%	0	0%	0	0%	1	0%	0	0%
	Kenmore	1	0%	0	0%	1	0%	0	0%	0	0%	1	0%	0	0%
	Sanden	1	0%	0	0%	1	0%	0	0%	0	0%	1	0%	0	0%
	State	1	0%	0	0%	1	0%	0	0%	0	0%	0	0%	1	2%
82 (n=47) Those are all the questions that we have. Thank you	Very happy with HPWH	25	53%	8	67%	17	49%	-	-	-	-	19	51%	6	60%
	Disappointed with HPWH	8	17%	1	8%	7	20%	-	-	-	-	6	16%	2	20%

Sumary Question	Response Options	Т	otal	(OR	١	NA		ID		МТ	Ur	ban	F	ural
Survey Question		n	%	n	%	n	%	n	%	n	%	n	%	n	%
for your help with this survey. Do you have any comments that you'd like to share about heat pump water heaters?	Information consumers should know before buying HPWH	5	11%	1	8%	4	11%	-	-	-	-	4	11%	1	10%
	Cooling/dehumidificati on effect is a benefit	3	6%	0	0%	3	9%	-	-	-	-	3	8%	0	0%
	Ducting/installation kit should be included	3	6%	2	17%	1	3%	-	-	-	-	3	8%	0	0%
	Local installers lack knowledge/experience with HPWH	3	6%	0	0%	3	9%	-	-	-	-	2	5%	1	10%

Appendix G Additional MPI Measurements

FEDERAL TEST PROCEDURE

NEEA's HPWH initiative formed a Department of Energy (DOE) Task Force to prepare for the DOE rule-making process for water heaters in 2020. Securing a DOE standard will ensure the Alliance's future energy savings from the initiative.

The goals of NEEA's DOE Task Force are to coalesce advocates on a negotiated rulemaking process with a bottom-line position equal to or greater than NEEAs position.⁷² This will likely be an iterative process in which NEEA shares its research with efficiency advocates and aligns first on process, then on goals. The DOE Task Force is preparing for the DOE rulemaking process by creating a life-cycle cost analysis, manufacturer impact analysis, and savings scenarios to determine NEEA's position and determine how this position could be effectively argued to the DOE. NEEA is also engaging with major manufacturers and energy efficiency advocates to pursue a private negotiated deal.

In pursuit of these goals, NEEA submitted public comments on June 24, 2020, that contained the following recommendations:

- Allow optional reporting of efficiency ratings at additional ambient temperatures in the CCMS database.
- Require testing and reporting of heat pump lower compressor temperature cut-off temperature in the CCMS database.
- Allow optional reporting of Demand Response Capability in the CCMS database.
- Clarify the boundary between residential and commercial heat pump water heaters for testing purposes.
- Investigate the test procedure's treatment of niche products.
- Review the list of responses NEEA has provided in issues raised by DOE concerning ASHRAE Standard 118.2 test procedures based upon NEEA's experience in testing.

DOE is currently considering the comments submitted in 2020 in response to their Request for Information (RFI) on the proposed rule published in the Federal Register on April 16, 2020.⁷³

Northwest Energy Efficiency Alliance 206

⁷² NEEA's position is to achieve a standard that includes 40 gallon (nominal) storage tanks and above, with a UEF of 3.1 or greater in order to limit those with net-cost based on the lifecycle cost-effectiveness model, and has an effective date no later than 2028 in order to meet the savings targets and forecast of the alliance ⁷³ https://www.regulations.gov/document/EERE-2019-BT-TP-0032-0009



The next DOE Notice of Proposed Rulemaking (NPRM) was expected in August 2021;⁷⁴ however, it was not yet available at the time this report was finalized (October 2021).

NEEA participated in the previous federal rule-making process from 2013 to 2014. A representative from NEEA attended the public meeting on December 6, 2013. In response to NEEA's comments (submitted January 21, 2014) and participation in the rulemaking process, the Department of Energy ultimately included most of NEEA's recommendations in the final rulemaking.⁷⁵

DOE adopted the following provisions that were supported by NEEA:

- Reduced the set-point temperature of the first hour rating temperature to 125 degrees.
- Specified a relative humidity requirement of 50 percent ± 1 percent for HPWH testing.
- Replaced the 24-hour preconditioning period, which imposed a high test burden, with a requirement that the test procedure have at least a one-hour period in which all heat sources to the water in the tank do not energize.
- Adopted language classifying commercial water heaters used in residential applications as "residential-duty" instead of "light commercial."
- Adopted some of NEEA's suggested capacity criteria for defining non-residential water heaters.
- Adopted modification of the draw pattern which would replace the existing test procedure applied during the 24-hour simulated test use with one of four patterns that is more representative of the demand put on water heaters with different delivery capacities.

DOE did not adopt the following recommendations:

- NEEA recommended that annual energy consumption should not be estimated based on the test procedure. DOE agreed with NEEA that the actual annual energy consumption of water heaters can vary widely based on variations in field conditions but believes that this estimate base on the test procedure can provide consumers with valuable information for comparing two water heaters under a standard set of conditions.
- NEEA recommended keeping the energy factor (EF) nomenclature, reasoning that the changes to the test procedure are not significant enough to warrant a new descriptor.

⁷⁴ https://www.regulations.gov/docket/EERE-2019-BT-TP-0032/unified-agenda

⁷⁵ Energy Conservation Program for Consumer Products and Certain Commercial and Industrial Equipment: Test Procedures for Residential and Commercial Water Heaters. 79 Fed. Reg. 40542 (July 21, 2014) (to be codified at 10 CFR Parts 429, 430, and 431).



DOE adopted the nomenclature change of uniform energy factor (UEF) to clarify that the existing and new ratings are determined under different test conditions.

REVIEW OF QUALIFIED PRODUCTS LIST

The team reviewed the HPWH Qualified Products list and confirmed that all three major manufacturers continue to offer AWHS-qualified products (MPI 7a) and that all three major manufacturers offer AWHS-qualified products in 40–80-gallon tank sizes (MPI 7b).

CEE HPWH SURVEY

The team used Consortium for Energy Efficiency data to measure MPI 5a, "The number of utilities that offer incentives or other support, as appropriate, for AWHS-qualified products does not decrease." For the previous MPER (#5), NMR reviewed CEE reports from 2015,⁷⁶ 2016,⁷⁷ and 2017,⁷⁸ identifying 64 programs active in at least one of these years. For MPER #6, NMR included results from 2018⁷⁹ and 2019,⁸⁰ identifying 75 programs active in at least one of those years (13 of which were located in the Northwest). The following table shows the count of HPWH programs active from 2015 to 2019, based on the CEE reports (Table 36).

TABLE 36: COUNT OF UTILITY PROGRAMS INCENTIVIZING HPWHS (FROM CEE REPORTS)

CEE Report Year	# of Active HPWH Programs	Active Programs in the NW	Reviewed for
2015	54	7	MPER #5
2016	62	8	MPER #5
2017	66	10	MPER #5
2018	70	13	MPER #6
2019	72	13	MPER #6

⁷⁶ https://library.cee1.org/content/cee-2015-heat-pump-water-heater-program-overview/

⁷⁷ https://library.cee1.org/content/cee-2016-heat-pump-water-heater-program-overview

⁷⁸ https://library.cee1.org/content/cee-2017-heat-pump-water-heater-program-overview-1/

⁷⁹ https://library.cee1.org/content/2018-cee-residential-water-heating-program-summary/

⁸⁰ https://library.cee1.org/content/2019-residential-water-heating-initiative-impact-overview/



In MPER #5, NMR found that ten of these programs (each active for the entire review period, from 2015 through 2017) offered incentives or support for AWHS water heaters. For this MPER, NMR found 12 programs that support AWHS HPWHs. Based on this, NMR confirmed that there has been no decrease in the number of programs nationwide that offer incentives or other support for AWHS-qualified products. In fact, the number seems to be increasing.

Appendix H MPI Measurements Included in MPER #6

ADDITIONAL MPI MEASUREMENTS

The team measured one or more indicators for each of the eight outcomes slated for measurement in MPER #6, for a total of 13 MPIs. Table 37 shows the outcomes, MPIs, and current values. Detailed descriptions of each MPI can be found in the sections of the report noted for each MPI in the "Location" column.

TABLE 37: MPER #6 MPI TRACKING

Outcomes and Related MPIs	Metric	MPER Data Source	Location of Detailed Results	Measurement 1	Measurement 2 (if applicable)	Measurement 3 (if applicable)							
	I. Installers increasingly recommend/sell/install HPWHs.												
1 d. Installers' recommendations of HPWHs in emergency and/or non-emergency scenarios increase year-over-year	Rate of installer recommendations of HPWHs in emergency scenarios	Mystery shopping	Appendix D	Percent of installers who mention HPWHs before mystery shopper asks: 2 out of 16 (13%)	Percent of installers who recommend HPWHs: 2 out of 16 (13%)	Percent of installers who provide a generally positive view of HPWHs (even if they don't recommend them): 10 out of 16 (63%)							
1 e. Share of sales for emergency replacement increases each year	Rate of emergency replacement sales of HPWHs, whether or not AWHS-qualified	Purchaser survey Retailer web- scraping	Appendix F Appendix C	Purchaser survey Q36. Percent who purchased a new water heater because water heater was completely broken and did not provide any hot water: 8%	Retailer web- scraping. Percent of in-stock electric water heater listings that are HPWH: 8%								
1 f. Increase in referral traffic from HWS site to oriented installer sites	Rate of referrals through HWS site visits	HWS web traffic review	Appendix A	HWS site visitors clicking through to installer sites (referrals): 2019: 4.0 referrals per 10 HWS site visits; 2020: 3.8 referrals per 10 HWS site visits									



Outcomes and Related MPIs	Metric	MPER Data Source	Location of Detailed Results	Measurement 1	Measurement 2 (if applicable)	Measurement 3 (if applicable)						
			П.	Retailers increasingly sell HPWHs.								
2. Year-over-year sales of AWHS qualified products increase through the retail channel	Retail sales of HPWHs, whether or not AWHS- qualified	Market sizing update Retailer web- scraping	Appendix B Appendix C	Market sizing update. Percent of residential HPWHs sold in the Northwest through retailers in 2019: 19%	Retailer web- scraping. Percent of available electric model listings that are HPWH: 4% (excluding electric point-of-use models). Percent of unique electric water heater model listings that are HPWH: 4% (excluding electric point-of-use models)							
III. Distributors increasingly stock and sell HPWHs.												
3 a. Year-over-year sales of AWHS qualified products increase	Distributor sales of HPWHs, whether or not AWHS-qualified	Market sizing update	Appendix B	Percent of residential HPWHs sold in the Northwest through distributors in 2019: 81%	Market share of HPWH installations 2019: 10.2%; 2020: 11.6%							
IV. Purchasers are satisfied with AWHS-qualified products.												
4 a. At least 90% of purchasers are satisfied with qualified products	Percent of purchasers satisfied with HPWH	Purchaser survey Homeowner survey	Appendix F Appendix E	Purchaser survey Q61. Percent satisfied with the HPWH overall: 89%	Homeowner survey Q18. Percent satisfied with the HPWH overall: 79%							
4 b. Percent of purchasers who would recommend HPWHs does not decline year- over-year	Percent of purchasers who would recommend HPWH	Purchaser survey Homeowner survey	Appendix F Appendix E	Purchaser Survey Q68. Percent who have or would recommend HPWH to a friend, colleague, or family member: 88%	Homeowner Survey Q19. Percent who have or would recommend HPWH to a friend, colleague, or family member: 98%							
	V. Regional and out	side NEEA territe	ory utilities co	ntinue to support quality installations of HPWHs through inc	entives and financing.							
5 a. The number of utilities that offer incentives or other support, as appropriate, for AWHS qualified products does not decrease	Number of utilities with HPWH programs that support AHWS-qualified water heaters	CEE HPWH Program Survey	Appendix G	Number of utilities with HPWH programs: 2015: 54; 2016: 62; 2017: 66; 2018: 70; 2019: 72	Number of utilities with HPWH programs that support AWHS- qualified water heaters: 2018-2019: 12							
5 b. Number of utility incented units increases year-over- year	Number of utility incentives in NW	NW utilities, via NEEA	Appendix B	NEEA utility funders. Percent of HPWH units incented in 2019: 59%; 2020: 49%								



Outcomes and Related MPIs	Metric	MPER Data Source	Location of Detailed Results	Measurement 1	Measurement 2 (if applicable)	Measurement 3 (if applicable)
		VI	. All three maj	or manufacturers offer AWHS-qualified products.		
7 a. All three major manufacturers offer AWHS-qualified	Number of major manufacturers offering AWHS-qualified products	Qualified Products List (QPL)	Appendix G	100%		
7 b. All three major manufacturers offer AWHS-qualified products in 40–80- gallon tank sizes.	Number of major manufacturers offering AWHS-qualified products in 40-80 gallon tank sizes	Qualified Products List (QPL)	Appendix G	100%		
			IX	. Consumers are aware of HPWHs.*		
9. Year-over-year increase in awareness and adoption of HPWHs among consumers in single- family homes	Percent of homeowners who are aware of HPWHs	Homeowner survey	Appendix E	Homeowner Survey Q15 and Q16. Percent of homeowners who had heard of "heat pump water heaters" or "hybrid water heaters": 57%		
		X. Federa	l test procedu	re incorporates recommendations by energy advocates.		
Federal test procedure incorporates recommendations by energy advocates.	Changes to adopted test procedures, including those proposed by NEEA	NEEA staff interviews	Appendix G	DOE is currently considering the comments NEEA submitted in 2020 in response to their Request for Information (RFI) on the proposed rule published in the Federal Register on April 16, 2020.		

* MPI added in 2020 to reflect increasing programmatic need to raise consumer awareness to drive installers' willingness to recommend.

Appendix I Survey Instruments

HOMEOWNER SURVEY GUIDE

Intro

Welcome to NMR Group's water heater study. Your responses will provide valuable information about water heaters in the Northwest, and they will be kept completely confidential. This survey will take about 10 minutes. If you have any questions or need help with completing the survey, please reach out to XX@nmrgroupinc.com.

Screener

- 1. S_State. What state do you live in? (Please answer for your primary residence.)
 - 1. Oregon
 - 2. Washington
 - 3. Idaho
 - 4. Montana
 - 5. Another state [SKIP TO C1]
- 2. S_ZIP. [IF S_County = DON'T KNOW] What is your zip code?
- 3. S_OwnRent. Do you own or rent your home?
 - 1. Own
 - 2. Rent [SKIP TO C1]
 - 98. I'm not sure [SKIP TO C1]
- S_Decisions. Are you involved in making decisions about major purchases for your home?
 Yes
 - 2. No [SKIP TO C1]
- 5. S_HomeType. What type of home do you live in? [INCLUDE PHOTO EXAMPLES]
 - 1. A free-standing, single-family home
 - 2. A townhouse or rowhouse. These share at least one side with another building, but have no other units above or below. There are no shared hallways, stairs, or basements.
 - 3. Mobile home [SKIP TO C1]
 - 4. Apartment or condominium in a building with 2 to 4 units.
 - 5. Apartment or condominium in a building with 5 or more units. [SKIP TO C1]
 - 98. I'm not sure [SKIP TO C1]
- 6. S_WHOwn. Does your home have its own water heater?


- 1. Yes
- 2. No [SKIP TO C1]

98. I'm not sure [SKIP TO C1]

- 7. S_WHType. What type of water heater do you have? [SHOW EXAMPLE PHOTOS AND POPUP DEFINITIONS FOR EACH]
 - 1. Storage ["A storage water heater is typically located on the floor, and is typically a large cylinder shape."]
 - 2. On Demand / tankless ["An on-demand water heater is a smaller metal box typically mounted on a wall."] [SKIP TO C1]
 - 3. Indirect storage tank attached to boiler ["Indirect water heaters use the heat from your boiler to warm the water stored in the tank; they are usually connected to a boiler with pumps and pipes."] [SKIP TO C1]
 - 98. I'm not sure [SKIP TO C1]
- 8. S_WHFuel. What fuel does your water heater use? [ADD POPUP DEFINITIONS FOR EACH]
 - 1. Electricity ["Electric water heaters only use electricity to heat water."] [SKIP FUEL HELP SECTION]
 - 2. Natural Gas or Propane [SKIP TO C1] ["Natural gas comes to your home via underground pipes. Propane is delivered to your home and stored in a tank."]
 - 3. Fuel oil [SKIP TO C1] ["Fuel oil is delivered to your home and stored in a tank."]
 - 4. Another fuel type [SKIP TO C1]
 - 98. I'm not sure
- 9. S_WHFuelHelp1. [IF S_WHFuel = 98] If you're not sure what fuel your water heater uses, we can walk you through it. Go to your water heater and look for a yellow "ENERGY GUIDE" label. It might say "KWH" for electric, "therms" for natural gas, "BTU" for propane, or "fuel oil" for oil systems. [SHOW PICTURE OF ENERGY GUIDE] Based on what you see, what fuel does your water heater use?
 - 1. Electricity ("KWH") [SKIP to next section]
 - 2. Natural gas ("therms") or Propane ("BTU") [SKIP TO C1]
 - 3. Oil [SKIP TO C1]
 - 4. I don't see a label
 - 98. I'm not sure
- 10. S_WHFuelHelp2. [IF S_WHFuelHelp1 = 4 or 98] Look for the manufacturer's label on the water heater that shows the brand, model number, and serial number. These usually specify the fuel. Electric water heaters usually indicate a "wattage" rating. [SHOW EXAMPLES]
 - 1. Electricity [SKIP to next section]



- 2. Natural Gas or Propane [SKIP TO C1]
- 3. Oil [SKIP TO C1]
- 4. I don't see a label
- 98. I'm not sure
- 11. S_WHFuelHelp3. [IF S_DHWfuelHelp2 = 5 OR 98)] Does your water heater have an exhaust vent pipe at the top? It would be more than 2 inches wide, and could be made out of metal or white PVC. It would either be connected to a chimney or it would exhaust to the outside of your home. [SHOW EXAMPLE PHOTO]
 - 1. Yes [SKIP TO C1]
 - 2. No
 - 98. I'm not sure
- 12. S_WHFuelHelp4. [IF S_DHWfuelHelp3 = 2 OR 99] Your system sounds like it may be electric, since it doesn't have a vent pipe. Can you find an electrical plug or wiring connected to the tank? It might be coming out of the top of the tank, or out of the side. [SHOW EXAMPLE PHOTO]
 - 1. Yes
 - 2. No [SKIP TO C1]
 - 98. I'm not sure [SKIP TO C1]
- 13. S_WHFuelHelp5. [IF S_DHWfuelHelp4 = 98] If you can, please take a photo of your entire water heater.
 - 1. [UPLOAD MESSAGE] [SKIP TO C4]
 - 2. I'm not able to do that [SKIP TO C1]
- 14. WH_Age. Approximately how old is your water heater? If you are able to access your water heater, the manufacturer's label that shows the brand, model number, and serial number usually provides the date of manufacture. [SHOW EXAMPLE PHOTO]
 - 1. Less than 1 year old
 - 2. 1 to 5 years old
 - 3. 6 to 10 years old
 - 4. More than 10 years old
 - 98. I'm not sure



Awareness, Interest, and Perceptions

15. A1. Before today, had you heard the terms "heat pump water heater" or "hybrid water heater"?

- 1. Yes
- 2. No
- 98. I'm not sure

[DISPLAY TEXT] Heat pump water heaters, or electric hybrid water heaters, use an electric heat pump to transfer heat from outside of the unit to the water in the tank rather than generating heat directly. You may have also seen them advertised as "electric hybrid water heaters" or "electric hybrid heat pump water heaters". They work like a refrigerator, but in reverse. This is *not* the same as a tankless water heater; heat pump water heaters have a cylinder-shaped tank like a standard water heater. Tankless water heaters are a smaller metal box mounted on a wall without a large storage tank.

16. A2. [IF A1 = 2, 98] Based on that description, have you heard of "heat pump water heaters" or "hybrid water heaters"?

- 1. Yes
- 2. No
- 98. I'm not sure

[DISPLAY TEXT] For the rest of this survey, we will use the term "heat pump water heater" to refer to this type of water heater.

- 17. A4. [IF A1 = 1 OR A2 = 1] Where or how have you heard about heat pump water heaters? [ROTATE OPTIONS 3 THROUGH 18]
 - 1. I currently own one
 - 2. I previously owned one
 - 3. From a friend or acquaintance
 - 4. Utility print advertising or bill insert
 - 5. Utility website
 - 6. "Smart Water Heat" website
 - 7. "Hot Water Solutions" website
 - 8. Retail store display
 - 9. Retail store salesperson
 - 10. Printed newspaper ad
 - 11. Print newspaper story
 - 12. Online news story
 - 13. Television ad



- 14. Social media, such as Facebook, Instagram, or YouTube
- 15. From contractor/installer
- 16. While researching on the Internet
- 17. Internet advertising
- 18. Utility newsletter
- 97. Other, please specify: [REQUIRE OPEN END RESPONSE]
- 98. I'm not sure
- 18. A6. [IF A4 = 1] Please rate your satisfaction with the following aspects of your heat pump water heater. [INCLUDE N/A OPTION]
 - Very dissatisfied
 - Somewhat dissatisfied
 - Neither satisfied nor dissatisfied
 - Somewhat satisfied
 - Very satisfied
 - a. The sound level of the heat pump water heater
 - b. The change in your electricity bill since installing the heat pump water heater
 - c. Your hot water supply
 - d. The maintenance requirements of the heat pump water heater
 - e. The heat pump water heater overall
- 19. A7. [IF A4 = 1] Have you, or would you, recommend a heat pump water heater to a friend, colleague, or family member?
 - 1. Yes, I have
 - 2. Yes, I would
 - 3. No
 - 97. Other, please specify: [REQUIRE OPEN END RESPONSE]
 - 98. I'm not sure
- 20. A8. [IF A4 = 1] For an additional incentive, we will be conducting another survey with people who own heat pump water heaters. If you are also interested in participating in that survey, please provide your email address below. Email:
- 21. A9. [IF A1 = 1 OR A2 = 1] Please assess how much you agree or disagree with the following statements. [RANDOMIZE; COLOR ONLY FOR REVIEWERS' BENEFIT FOR POSITIVE AND NEGATIVE STATEMENTS]
 - Strongly disagree
 - Somewhat disagree



- Neither agree nor disagree
- Somewhat agree
- Strongly agree
- a. Heat pump water heaters are very efficient.
- b. Heat pump water heaters result in lower electric bills than a typical electric water heater.
- c. Heat pump water heaters are eligible for tax credits and/or discounts from utility companies.
- d. Heat pump water heaters offer better value than typical electric water heaters.
- e. Heat pump water heaters can be controlled from a smart phone.
- f. Heat pump water heaters are noisy.
- g. Heat pump water heaters are unreliable.
- h. Heat pump water heaters are expensive to install.
- i. Heat pump water heaters are expensive to service or repair.
- j. Heat pump water heaters do not produce enough hot water.
- 22. A10. When making a decision about purchasing mechanical equipment for your home, such as a furnace or water heater, what are your typical sources of information regarding which product to purchase? [ROTATE RESPONSES 1 THROUGH 16; ALLOW MULTIPLE RESPONSES]
 - 1. Friends or acquaintances
 - 2. Utility print advertising or bill inserts
 - 3. Utility website
 - 4. Retail store general
 - 5. Retail store displays
 - 6. Retail store salespeople
 - 7. Newspaper ads
 - 8. Print newspaper stories
 - 9. Online news stories
 - 10. Television ads
 - 11. Social media, such as Facebook, Instagram or YouTube
 - 12. From a contractor or installer
 - 13. Internet research or Internet reviews
 - 14. Internet advertising
 - 15. Specific internet website, please specify: [REQUIRE OPEN END RESPONSE]
 - 16. Utility newsletter
 - 97. Other, please specify: [REQUIRE OPEN END RESPONSE]
 - 98. I'm not sure
- 23. A11. Have you purchased a new water heater in the past three years?
 - 1. Yes



No
98. I'm not sure

- 24. A12. [IF A11 = 1] Why did you purchase a new water heater? [ROTATE RESPONSES 1 THROUGH 6]
 - 1. My water heater was completely broken and did not provide any hot water
 - 2. My water heater worked poorly and/or needed repair
 - 3. My water heater was old and/or close to failing
 - 4. I wanted to install a more energy-efficient water heater
 - 5. To serve an addition to my home
 - 6. I wanted a water heater with a specific feature: (please specify the feature)
 - 97. Other; please specify: [REQUIRE OPEN END RESPONSE]
 - 98. I'm not sure
- 25. A13. [IF (A1 = 1 OR A2 = 1) AND A11 = 1] Did your installer or contractor recommend a heat pump water heater to you?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
- 26. A15. What would cause you to purchase a new water heater (of any type)? [MULTIPLE RESPONSE]
 - 1. If it fails, breaks, or leaks
 - 2. If it has some issues but needs repairs to work well
 - 3. To save energy, even if it still works
 - 4. To lower utility bills, even if it still works
 - 5. If I was already renovating my home
 - 97. Other; please specify: [REQUIRE OPEN END RESPONSE]
 - 98. I'm not sure
- 27. A16. [IF A4 ≠ 1] [IF A11A11 = 1 "Did you consider"] [IF A11 ≠ 1 "Have you ever considered"] installing a heat pump water heater?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
- 28. A17. [IF A4 ≠ 1 AND (A1 = 1 OR A2 = 1) AND A16 = 2] What is the primary reason you [IF A11 = 1 "did not"] [IF A11 ≠ 1 "would not"] consider installing an electric hybrid heat pump water heater? [ROTATE RESPONSES 1 THROUGH 8]



- 1. Existing equipment works fine
- 2. Prefer a different kind
- 3. May/plan to in the future
- 4. Cost of installation
- 5. Cost of maintenance or repairs
- 6. Not familiar enough with them
- 7. Concerns about their performance
- 8. Does not fit in my space
- 9. [SHOW IF A11 = 1] The installer/contractor did not mention them
- 10. [SHOW IF A11 = 1] The installer/contractor recommended against them
- 11. Other, please specify
- 98. I'm not sure

29. A19. [IF A1 = 1 OR A2 = 1] Have you heard of any brands that make heat pump water heaters?

- 1. Yes
- 2. No
- 98. I'm not sure
- 30. A20. [IF A1 = 1 OR A2 = 1] Which of the following heat pump water heater brands have you heard of, if any? [RANDOMIZE OPTIONS 1 THROUGH 20]
 - 1. General Electric ("GE")
 - 2. A.O. Smith
 - 3. American
 - 4. Kenmore
 - 5. Reliance
 - 6. State
 - 7. Stiebel Eltron
 - 8. U.S. Craftmaster
 - 9. Whirlpool
 - 10. AirGenerate
 - 11. Electrolux
 - 12. Rheem
 - 13. Bradford White
 - 14. Sanden
 - 15. Hubbell
 - 16. Jetglas
 - 17. Lochinvar
 - 18. Ruud
 - 19. Richmond
 - 20. Vaughn



97. Other; please specify: [REQUIRE OPEN ENDED TEXT RESPONSE] 98. I'm not sure

HWS Awareness

31. HWS_Aware. Before today, had you heard of the "Hot Water Solutions" program?

- 1. Yes
- 2. No
- 98. I'm not sure
- 32. HWS_First. [IF HWS_Aware = 1] How did you first hear of the "Hot Water Solutions" program? [RANDOMIZE]
 - 1. Hot Water Solutions website [LINK TO WEBSITE]
 - 2. Friend or acquaintance
 - 3. Utility print advertising or bill insert
 - 4. Utility website
 - 5. Retail store display
 - 6. Retail store salesperson
 - 7. Print newspaper ad
 - 8. Print newspaper story
 - 9. Online news story
 - 10. Television ad
 - 11. Social media, such as Facebook, Instagram or YouTube
 - 12. From a contractor or installer
 - 13. Internet research
 - 14. Internet advertising
 - 15. Other [PLEASE SPECIFY:]
 - 98. I'm not sure

Household Characteristics and Demographics

- 33. D1. Which of the following statements best describes you?
 - 1. I am the first among my friends to purchase new technology
 - 2. I purchase new technology sooner than most of my friends
 - 3. I am typically in the middle of the group when purchasing new technology
 - 4. I purchase new technology after most of my friends have purchased it
 - 5. I am one of the last people to purchase new technology
 - 98. I'm not sure



- 34. D2. Please assess how much you agree or disagree with the following statements: [ROTATE ORDER]
 - Strongly disagree
 - Somewhat disagree
 - Neither agree nor disagree
 - Somewhat agree
 - Strongly agree
 - a. I do research before making big purchases.
 - b. I compare prices online for big purchases.
 - c. I seek out expert recommendations for big purchases.
 - d. I will spend money upfront to save money in the long term.
 - e. I am concerned about environmental issues.
 - f. I consider sustainability when making decisions about which products to purchase.
 - g. Actions taken by individuals like me have an impact on the environment.
 - h. Energy efficiency is my primary consideration when choosing mechanical systems for my home, like a furnace, air conditioner, or water heater.
- 35. D4. Which of the following categories includes your age?
 - 1. Under 18
 - 2. 18 to 24
 - 3. 25 to 34
 - 4. 35 to 44
 - 5. 45 to 54
 - 6. 55 to 64
 - 7. 65 and older
 - 99. I'd rather not say
- 36. D6. Which of the following categories best describes the highest level of education you have completed?
 - 1. Some high school
 - 2. High school graduate or GED
 - 3. Trade or technical school
 - 4. Some college
 - 5. College graduate
 - 6. Some graduate school
 - 7. Graduate degree
 - 97. Other, please specify: [REQUIRE OPEN END RESPONSE]
 - 98. I'm not sure
 - 99. I'd rather not say



- 37. D7. Which of the following categories best describes your approximate annual household income from all sources in 2020, before taxes?
 - 1. Less than \$40,000
 - 2. Between \$40,001 and \$60,000
 - 3. Between \$60,001 and \$80,000
 - 4. Between \$80,001 and \$120,000
 - 5. Between \$120,001 and \$250,000
 - 6. Over \$250,000
 - 98. I'm not sure
 - 99. I'd rather not say

38. D8. Do you consider yourself Hispanic or Latino?

- 1. Yes
- 2. No
- 98. I'd rather not say
- 39. D9. How would you describe yourself? Please select all that apply. [MULTIPLE RESPONSES
 - 1. White
 - 2. Black or African American
 - 3. American Indian or Alaska Native
 - 4. Asian
 - 5. Native Hawaiian or Other Pacific Islander
 - 97. Other; please specify: [REQUIRE OPEN END RESPONSE]
 - 98. I'd rather not say

40. D10. How would you describe yourself?

- 1. Male
- 2. Female
- 3. Prefer to self-identify (please specify):
- 4. I'd rather not say
- 41. D11. What language is primarily spoken in your home? [SKIP TO C3]
 - 1. English
 - 2. Spanish
 - 3. French
 - 4. Arabic
 - 5. Portuguese
 - 6. Mandarin
 - 7. Cantonese
 - 8. Russian



- 9. Ukrainian
- 10. Tagalog
- 11. Korean
- 12. Vietnamese
- 13. Japanese
- 14. Marshallese
- 15. Punjabi
- 97. Other; please specify: [REQUIRE OPEN END RESPONSE]
- 99. I'd rather not say

Closing

42. C1. Unfortunately, you do not qualify for this survey. Thank you very much for your time.

43. C2. [IF A4 = 1] We are inviting electric hybrid heat pump water heater owners to take a survey about your experience. If eligible, you will be compensated up to \$20 for participating. For more information, please enter your email address.

[REQUIRE EMAIL ADDRESS]

- 99. I am not interested
- 44. C3. Those are all the questions that we have. Thank you for your help with this survey. Do you have any comments that you'd like to share about heat pump water heaters?
 - 1. Yes [REQUIRE OPEN END RESPONSE]
 - 2. No
- 45. C4. Thank you for providing this photo. Depending on the type of water heater you have, we will follow up with you to continue the survey.



PURCHASER SURVEY GUIDE

Intro

Welcome to NMR Group's heat pump water heater study. Your responses will provide valuable information about heat pump water heaters in the Northwest, and they will be kept completely confidential. This survey will take about 15 - 20 minutes. If you are eligible and complete the survey, we will send you a \$25 gift card to thank you for your time. If you have any questions or need help with completing the survey, please contact Christine Smaglia at NEEAsurvey@nmrgroupinc.com or (617) 544-2008.

Whenever you see text with a box around it, like the one below, you can click on it for more information. ["CLICK ME" EXAMPLE POP-UP BOX]

Screener

[BASE: ALL]

- 1. When it comes to equipment purchases and home repairs, are you one of the decision-makers in your household?
 - 1. Yes
 - 2. No [TERMINATE; ASK TO FORWARD SURVEY TO DECISION-MAKER]
 - 98. I'm not sure [TERMINATE]

- 2. S_STATE. What state do you live in? (Please answer for your primary residence.) [DROPDOWN MENU]
 - 1. Oregon
 - 2. Washington
 - 3. Idaho
 - 4. Montana
 - 5. Another state [TERMINATE]
- COUNTY. Please select your county. [DROPDOWN MENU. ANSWER CHOICES REFLECT S_STATE RESPONSE AND INCLUDE "I'm not sure"]
- 4. [ASK IF COUNTY = I'M NOT SURE] S_ZIP. What is your zip code?
- 5. S_AWARE. Before today, had you heard the term "heat pump water heater" or "hybrid water heater"? Note that these are *not* the same as a tankless water heater.
 - 1. Yes



No
98. I'm not sure

[DISPLAY TEXT] [IF S_AWARE = 1 "As you may already be aware, heat"; IF S_AWARE = 2 or 98 "Heat"] pump water heaters, also known as electric hybrid water heaters, use an electric heat pump to transfer heat from the air outside of the unit to the water in the tank. They work like a refrigerator, but in reverse. They are *not* the same as a tankless water heater. A heat pump water heater has a cylinder-shaped water storage tank, like a standard water heater. A tankless water heater has a smaller metal box mounted on a wall, with no storage tank.

- 6. [IF S_AWARE = 2, 98] Based on that description, have you heard of "heat pump water heaters" or "hybrid water heaters"?
 - 1. Yes
 - 2. No [TERMINATE]
 - 98. I'm not sure [TERMINATE]

[DISPLAY TEXT] For the rest of this survey, we will use the term "heat pump water heater" to refer to this type of water heater.

- 7. S_HPWH. Have you purchased a heat pump water heater, or moved into a home with a heat pump water heater already installed, in the past five years?
 - 1. Yes, purchased a heat pump water heater
 - 2. Yes, moved into a home with a heat pump water heater already installed
 - 3. No [TERMINATE]
 - 98. I'm not sure [TERMINATE]
- 8. S_INSTALL. Is the heat pump water heater still installed?
 - 1. Yes
 - 2. No
 - 98. I'm not sure [TERMINATE]
- 9. S_UNINSTALL. [IF S_INSTALL=2] Why did you uninstall the heat pump water heater?
 - 1. The heat pump water heater was completely broken and did not provide any hot water
 - 2. The heat pump water heater worked poorly and/or needed repair
 - 3. I renovated my home
 - 4. I wanted a water heater with a specific feature (Please specify the feature:) [REQUIRE TEXT ENTRY]



- I was dissatisfied with the heat pump water heater (Please explain:) [REQUIRE TEXT ENTRY]
- 6. Other; please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure
- 10. [IF S_INSTALL = 2] What type of water heater did you install to replace the heat pump water heater? As a reminder, whenever you see text with a box around it, like those in the answer choices below, you can click on it for more information. [SHOW EXAMPLE PHOTOS AND POP-UP DEFINITIONS FOR EACH]
 - 1. Storage ["A storage water heater is typically located on the floor, and is typically a large cylinder shape."]
 - 2. On Demand / tankless ["An on-demand water heater is a smaller metal box typically mounted on a wall."]
 - 3. Indirect storage tank attached to boiler ["Indirect water heaters use the heat from your boiler to warm the water stored in the tank; they are usually connected to a boiler with pumps and pipes."]
 - 98. I'm not sure

[IF S_INSTALL= 2, DISPLAY TEXT] For the remainder of the survey, please think about the heat pump water heater that was previously installed.

- 11. In which year did you [IF S_HPWH = 1 "purchase"; IF S_HPWH = 2 "move into the home with"] the heat pump water heater? [DROPDOWN 2010 or earlier, 2011 2021, AND "I'M NOT SURE" OPTIONS]
- 12. HPWH_NUM. [ASK IF MULTIPLE_HPWH] Have you purchased more than one heat pump water heater?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
- 13. HPWH_NUM2. [IF HPWH_NUM = 1 OR 98] How many heat pump water heaters are currently installed at your *primary residence* (where you live most of the year)?
 - 1. One
 - 2. Two or more
 - 3. None, my heat pump water heater(s) are installed in my vacation home
 - 4. None, my heat pump water heater(s) are installed in property I rent to others
 - 5. Other; please specify: [REQUIRE TEXT ENTRY]



6. I'm not sure [TERMINATE]

[DISPLAY TEXT] During the survey, [IF HPWH_NUM2 = 1 "please think about the heat pump water heater installed in your primary residence."] [IF HPWH_NUM2 = 2 "please think about the heat pump water heaters installed in your primary residence."]

- 14. [IF HPWH_NUM2 = 2] Could you describe why your primary residence has more than one heat pump water heater? [REQUIRE OPEN END TEXT ENTRY AND INCLUDE OPTION TO REFUSE]
- 15. [IF **MULTIPLE_HPWH** = NO OR HPWH_NUM = 2] HPWH_HOME. Where was the heat pump water heater installed?
 - 1. My primary residence
 - 2. My vacation home
 - 3. A property I rent to others
 - 4. Other; please specify: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure [TERMINATE]

[BASE: HPWH WAS PURCHASED AND PROGRAM DATA IS NOT AVAILABLE]

- 16. S_INCENTIVE1. [IF S_HPWH = 1 AND INCENTIVE AMOUNT IS NOT AVAILABLE] Did you receive a rebate or discount from your utility when you purchased the heat pump water heater? (Please only think about discounts from your utility; we will ask separately about tax credits.)
 - 1. Yes
 - 2. No
 - 98. I'm not sure

[BASE: HPWH WAS PURCHASED AND PROGRAM DATA IS AVAILABLE]

- 17. S_INCENTIVE2. [IF S_HPWH = 1 AND INCENTIVE AMOUNT AVAILABLE] Our records indicate that you received a rebate or discount of [INCENTIVE] for the heat pump water heater. Is that correct?
 - 1. Yes
 - 2. No the amount is not correct
 - 3. No I did not receive a rebate
 - 98. I'm not sure
- 18. [IF S_INCENTIVE1 = 1 OR S_INCENTIVE2 = 2] Please enter the amount of the rebate or discount you received for the heat pump water heater. [ALLOW TEXT ENTRY WITH AN OPTION FOR DON'T KNOW]
 - 1. Amount: \$ [REQUIRE NUMERIC TEXT ENTRY]



- 2. Unit was provided for free by my utility
- 3. Other, please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure

[BASE: HPWH WAS PURCHASED]

19. S_TAX1 [IF S_HPWH = 1] Did you receive a *state* tax credit for the purchase of your heat pump water heater?

- 1. Yes
- 2. No
- 98. I'm not sure
- 99. I'd rather not answer
- 20. S_TAX2 [IF S_HPWH = 1] Did you receive a *federal* tax credit for the purchase of your heat pump water heater?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
 - 99. I'd rather not answer
- 22. PROJECT_TYPE2. Was the heat pump water heater installed in an existing home or was it part of a new home construction?
 - 3. Existing home
 - 4. New home construction
 - 99. I'm not sure
- 23. INSTALL_CONFIRM. [IF INSTALL_LOC IS AVAILABLE] Our records indicate that your heat pump water heater is installed in [INSTALL_LOC]. Is that correct?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
- 24. [IF INSTALL_LOC IS NOT AVAILABLE OR INSTALL_CONFIRM = 2] Where is the heat pump water heater located? Is it in a...
 - 1. Unfinished basement or crawl space
 - 2. Finished basement
 - 3. Garage
 - 4. Closet or utility room (not in a basement)
 - 5. Kitchen



98. Other, please specify: [REQUIRE TEXT ENTRY]98. I'm not sure

- 25a. [IF **CONDITIONED** = YES] Our records indicate that your heat pump water heater is located in a part your home that is heated. By "heated", we mean a space that is served by a heating system and generally stays close to the temperature set by your thermostat. Is this correct?
 - 1. Yes heated
 - 2. No unheated
 - 3. Other, please specify: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure

25b. [IF **CONDITIONED** = NO] Our records indicate that your heat pump water heater is located in a part your home that is *not heated.* By "heated", we mean a space that is served by a heating system and generally stays close to the temperature set by your thermostat. Is this correct?

- 1. Yes unheated
- 2. No heated
- 3. Other, please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure

26. [IF **CONDITIONED** IS NOT AVAILABLE] Is the heat pump water heater located in a part of your home that is heated? By "heated", we mean a space that is served by a heating system and generally stays close to the temperature set by your thermostat.

- 1. Yes heated
- 2. No unheated
- 3. Other, please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure

- 27. Is the heat pump water heater located in a part of your home that is insulated? By "insulated", we mean a room that has insulation in the exterior walls, floors, or ceilings, so that it is reasonably warm in the winter, though maybe not as warm as the rest of your home. These spaces may or may not be directly heated. Common examples include garages or basements with insulated walls
 - 1. Yes insulated



- 2. No not insulated
- 3. Other, please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure

[BASE: ALL]

28. RESPONSIBLE_BILL. Are you responsible for paying the electric bill at the property with the heat pump water heater?

- 6. Yes
- 7. No
- 99. I'm not sure

29. IF UTILITY NOT AVAILABLE] Who is your electric utility provider? [REQUIRE TEXT ENTRY]

Sources of Awareness

[BASE: ALL]

30. SOURCE_AWARE. Where or how have you heard about heat pump water heaters? [MULTIPLE RESPONSES; ROTATE OPTIONS 3 THROUGH 17]

- 1. I previously owned one
- 2. From a friend or acquaintance
- 3. Utility print advertising or bill insert
- 4. Utility website
- 5. "Smart Water Heat" website
- 6. "Hot Water Solutions" website
- 7. Retail store display
- 8. Retail store salesperson
- 9. Printed newspaper ad
- 10. Print newspaper story
- 11. Online news story
- 12. Television ad
- 13. Social media, such as Facebook, Instagram, or YouTube, please specify: [REQUIRE TEXT ENTRY]
- 14. Contractor or installer
- 15. While researching on the Internet
- 16. Internet advertising
- 17. Utility newsletter
- 97. Other, please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure



- **31.** Please assess how much you agree or disagree with the following statements. [RANDOMIZE; COLOR ONLY FOR REVIEWERS' BENEFIT FOR POSITIVE AND NEGATIVE STATEMENTS]
 - Strongly disagree
 - Somewhat disagree
 - Neither agree nor disagree
 - Somewhat agree
 - Strongly agree
 - a. Heat pump water heaters are very efficient.
 - b. Heat pump water heaters result in lower electric bills than a typical electric water heater.
 - c. Heat pump water heaters are eligible for tax credits and/or discounts from utility companies.
 - d. Heat pump water heaters offer better value than typical electric water heaters.
 - e. Heat pump water heaters can be controlled from a smart phone.
 - f. Heat pump water heaters are noisy.
 - g. Heat pump water heaters are unreliable.
 - h. Heat pump water heaters are expensive to install.
 - i. Heat pump water heaters are expensive to service or repair.
 - j. Heat pump water heaters do not produce enough hot water.

Purchase Decision / Importance of Incentives

- **32**. PREVIOUS_WH. [IF S_HPWH = 1] What type of water heater did you have before you purchased the heat pump water heater? [SHOW EXAMPLE PHOTOS AND POPUP DEFINITIONS FOR EACH]
 - 1. Storage ["A storage water heater is typically shaped like a large cylinder and located on the floor."]
 - 2. On Demand / tankless ["An on-demand water heater is a smaller metal box typically mounted on a wall."]
 - 3. Indirect storage tank attached to boiler ["Indirect water heaters use the heat from your boiler to warm the water stored in a tank. They are usually connected to a boiler with pumps and pipes."]
 - 98. I'm not sure
- 33. [IF S_HPWH = 1 AND PREVIOUS_WH = 1, 2, OR 3] You indicated that you installed a heat pump water heater to replace a [IF PREVIOUS_WH = 1 "storage"; IF PREVIOUS_WH = 2 "on-demand/tankless"; IF PREVIOUS_WH = 3 "indirect storage tank"] water heater. What fuel did that water heater use? [ADD POP-UP DEFINITIONS FOR EACH]
 - 1. Electricity ["Electric water heaters only use electricity to heat water."]



- 2. Natural Gas or Propane ["Natural gas comes to your home via underground pipes. Propane is delivered to your home and stored in a tank."]
- 3. Fuel oil ["Fuel oil is delivered to your home and stored in a tank."]
- 4. Another fuel type; please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure

34. [IF PREVIOUS_WH = 1 OR 3] What was the size of the water heater you replaced with the heat pump water heater?

- 1. Less than 55 gallons
- 2. 55 gallons or more
- 98. I'm not sure

35. [IF TANK_VOLUME IS NOT AVAILABLE] How many gallons is your [IF S_HPWH = 1

"current water heater tank"] [IF S_HPWH = 2 "heat pump water heater"]?

- 1. Less than 55 gallons
- 2. 55 gallons or more
- 98. I'm not sure

[BASE: PURCHASED A HEAT PUMP WATER HEATER]

- **36**. [IF S_HPWH = 1] Why did you purchase a new water heater? [ROTATE RESPONSES 1 THROUGH 6]
 - 1. My water heater was completely broken and did not provide any hot water
 - 2. My water heater worked poorly and/or needed repair
 - 3. My water heater was old and/or close to failing
 - 4. I wanted to install a more energy-efficient water heater
 - 5. To serve an addition to my home
 - 6. I wanted a water heater with a specific feature: (please specify the feature)
 - 7. Other, please specify: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure

[BASE: PURCHASED A HEAT PUMP WATER HEATER]

37. WH_OPTIONS. [IF S_HPWH = 1] Besides heat pump water heaters, what other water heating options did you consider? Did you consider...[ALLOW MULTIPLE RESPONSES]

- 1. Standard electric storage water heaters
- 2. Tankless water heaters
- 3. Natural gas storage water heaters, which would require natural gas service
- 4. Propane storage water heaters
- 5. Solar water heating
- 6. I did not consider other types of water heaters



99. I'm not sure

- 38. [IF WH_OPTIONS = 1 THROUGH 5] Why did you decide to install a heat pump water heater instead of the other water heating options you considered? Please select all that apply. [ALLOW MULTIPLE RESPONSES]
 - 1. Other options were not available
 - 2. Other options were more expensive to purchase
 - 3. Other options were more expensive to operate
 - 4. Other options were less efficient
 - 5. Other options required unacceptable renovation
 - 6. Heat pump water heaters were recommended by my contractor
 - 7. Heat pump water heaters were recommended by someone else; please specify who: [REQUIRE TEXT ENTRY]
 - 8. Other, please specify: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure

39. [IF S_HPWH = 1] Where did you purchase your heat pump water heater?

- 1. Retail store (e.g., Home Depot, Lowe's, ACE Hardware, including online)
- 2. Contractor or installer
- 3. Plumbing supply house
- 4. Utility marketplace (e.g., Enervee)
- 5. Online / Internet / Website (e.g., Amazon.com) (Please specify: [REQUIRE TEXT ENTRY]
- 6. Directly from my utility (this may include units that were provided at no cost)
- 7. Other, please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure

[BASE: PURCHASED A HEAT PUMP WATER HEATER]

- **40.** HPWH_FACTOR. [IF S_HPWH = 1] On a scale from 1 to 5, where 1 is "not at all important" and 5 is "extremely important," please rate how important each of the following factors was in your decision to purchase a heat pump water heater. [RESPONSE MATRIX]
 - 1. 1 Not at all important
 - 2. 2
 - 3. 3
 - 4. 4
 - 5. 5 Extremely important
 - 98. I'm not sure



Rating
RGY STAR [®] label
CE_AWARE = 5 OR 6] The information on the Hot Water Solutions website
CE_AWARE = 14] Your contractor or installer's recommendation
ability of a utility rebate for heat pump water heaters
your energy bills
your environmental footprint
1 OR 2] The rebate/incentive you received
(1 = 1] The state tax credit you received
(2 = 1] The federal tax credit you received
CE_AWARE = 14] Your contractor or installer's recommendation ability of a utility rebate for heat pump water heaters your energy bills your environmental footprint 1 OR 2] The rebate/incentive you received (1 = 1] The state tax credit you received (2 = 1] The federal tax credit you received

41. [FOR EACH HPWH_FACTOR WITH RATING < 3] Why was this factor unimportant to your decision to purchase a heat pump water heater?

[DISPLAY IF RATING < 3] Factor	OPEN END RESPONSE
The ENERGY STAR label	
The information on the Hot Water Solutions website	
Your contractor's/installer's recommendation	
The availability of a utility rebate for heat pump water heaters	
Reducing your energy bills	
Reducing your environmental footprint	
The rebate/incentive you received	
The state tax credit you received	
The federal tax credit you received	

[BASE: PURCHASED A HEAT PUMP WATER HEATER]

42. [IF S_HPWH = 1] Were there any other factors that were important in your decision to install

- a heat pump water heater?
 - 1. Yes, please specify: [REQUIRE TEXT ENTRY]
 - 2. No
 - 98. I'm not sure

Installation

[DISPLAY TEXT] Now I would like to ask a few questions about the installation itself.

43. [PROJECT_TYPE2 = 1 AND S_HPWH = 1] HIRE_INSTALLER1. Did you install the new water

heater yourself, or did you hire an installer to do it?

- 1. Installed it myself
- 2. Hired an installer
- 3. Other, please specify: [REQUIRE TEXT ENTRY]



98. I'm not sure

- 44. [PROJECT_TYPE2 = 2 AND S_HPWH = 1] HIRE INSTALLER2. Did you install the new water heater yourself, did you hire an installer to do it separately from your home construction, or did the general contractor building your home manage the installation?
 - 1. Installed it myself
 - 2. Hired an installer separate from home construction
 - 3. General contractor managed installation
 - 4. Other, please specify: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure

[BASE: HIRED AN INSTALLER OR HIRED AN INSTALLER SEPARATE FROM HOME CONSTRUCTION]

45. [IF HIRE_INSTALLER1 = 2 OR HIRE INSTALLER2 = 2] How did you find the person or company that installed your new water heater?

- 1. Smart Water Heat website / Hot Water Solutions website / contractor finder
- 2. Angie's List
- 3. Craigslist
- 4. Personal recommendation
- 5. Retailer recommendation
- 6. Retailer home services (e.g., Home Depot or Lowe's Home Services department)
- 7. Manufacturer recommendation
- 8. Previous relationship with contractor
- 9. Utility contractor list
- 10. Yelp
- 11. Nextdoor
- 12. Thumbtack
- 13. TaskRabbit
- 14. Other, please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure

[BASE: HIRED AN INSTALLER OR HIRED AN INSTALLER SEPARATE FROM HOME BUILD]

46. SETTINGS1 [IF HIRE_INSTALLER1 = 2 OR HIRE INSTALLER2 = 2] Heat pump water heaters can be set in different modes:

- heat pump only (most efficient),
- hybrid or mixed operation (primarily operates in heat pump mode but uses electric resistance as backup), or
- electric resistance only (least efficient).



- 47. Did the installer/contractor tell you which water heater settings to use?
 - 1. Yes
 - 2. No
 - 3. Other, please specify: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure

48. [IF SETTINGS1 = 1] Which water heater setting did your contractor encourage you to use?

- 1. Heat pump only (most efficient)
- 2. Hybrid or mixed operation (primarily operates in heat pump mode but uses electric resistance as backup)
- 3. Electric resistance only (least efficient)
- 98. I'm not sure

[BASE: SELF-INSTALLED, HIRED AN INSTALLER, OR HIRED AN INSTALLER SEPARATE FROM HOME BUILD]

- **49**. [IF (HIRE_INSTALLER1 = 1 OR 2) OR (HIRE_INSTALLER2 = 1 OR 2)] About how long did it take to install the heat pump water heater?
 - 1. Half a day or less
 - 2. One day
 - 3. Two days
 - 4. Three days
 - 5. Four days
 - 6. Five or more days
 - 98. I'm not sure
- 50. INSTALL_CHALLENGES [IF (HIRE_INSTALLER1 = 1, 2) OR (HIRE INSTALLER2 = 1, 2, 3)] Did [IF HIRE_INSTALLER 1 = 2 OR (HIRE_INSTALLER2 = 2 OR 3) "your contractor / installer"] [IF HIRE_INSTALLER 1 = 1 OR HIRE_INSTALLER2 = 1 "you"] any challenges with the heat pump water heater installation?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
- 51. CHALLENGES_ENCOUNTER [IF INSTALL_CHALLENGES = 1] What challenges did [IF HIRE_INSTALLER 1 = 2 OR (HIRE_INSTALLER2 = 2 OR 3) "your contractor / installer"] [IF HIRE_INSTALLER 1 = 1 OR HIRE_INSTALLER2 = 1 "you"] encounter? Please select all that apply. [RANDOM ORDER, ALLOW MULTIPLE RESPONSES]
 - 1. Pipe configuration
 - 2. No nearby drain for condensate



- 3. New wiring/electrical work required
- 4. Inadequate make-up air/airflow
- 5. Heat pump water heater too large to fit where old water heater was located
- 6. Complications related to floorplan and noise (noise from heat pump water heater would be a nuisance in desired installation location)
- 7. Complications related to floorplan and cold air (cold air generated by heat pump water heater would be a nuisance in desired installation location)
- 8. Other, please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure

52. [IF CHALLENGES_ENCOUNTER = 1 THROUGH 8] For each challenge you encountered, how was the issue resolved? [SHOW FOR EACH RESPONSE SELECTED IN CHALLENGES ENCOUNTER]

- 1. [REQUIRE TEXT ENTRY FOR EACH SELECTED CHALLENGES_ENCOUNTER 1-8]
- 98. I'm not sure

Service and Repair

[BASE: ALL]

53. Since [IF S_HPWH = 1 "purchasing"; IF S_HPWH = 2 "moving into the home with"] the heat pump water heater, have you contacted a professional to service or repair the heat pump water heater?

A **service** is routine maintenance to keep the heat pump water heater in optimal working condition (annual tune-ups, cleaning, inspecting, etc.).

A **repair** fixes equipment that is malfunctioning or not working.

- 1. Yes
- 2. No [SKIP TO SATISFACTION MODULE]
- 98. I'm not sure [SKIP TO SATISFACTION MODULE]

[DISPLAY TEXT] How many times have you had a professional service and/or repair the heat pump water heater?

54. NUM_SERVICE1. Number of service-only visits: [DROPDOWN 0-20, I'M NOT SURE]

55. NUM_SERVICE2. Number of repair-only visits? [DROPDOWN 0-20, I'M NOT SURE]

56. NUM_SERVICE3. Number of visits with service and repair in the same visit? [DROPDOWN 0-20, I'M NOT SURE]



- 57. [IF NUM_SERVICE1, NUM_SERVICE2, OR SUMSERVICE3 >0 AND < 96] What issues triggered the service or repair visits for the heat pump water heater? Please select all that apply. [MULTIPLE RESPONSE]
 - 1. No issues, just conducting periodic or annual tune-up
 - 2. Cools down room
 - 3. Not enough hot water
 - 4. Hot water slow to arrive at faucet
 - 5. Noise/humming/vibration
 - 6. Water leak
 - 7. High cost to operate
 - 8. Other, please specify: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure
- 57. [IF NUM_SERVICE1, NUM_SERVICE2, OR SUMSERVICE3 > 0 AND > 96] Did you have a

warranty that covered the repair or service for the heat pump water heater?

- 1. Yes, warranty covered the cost of the entire repair or service.
- 2. Yes, warranty only partially covered the cost of the repair or service.
- 3. No
- 98. I'm not sure
- 58. [IF NUM_SERVICE1, NUM_SERVICE2, OR SUMSERVICE3 <>96) AND Q57 >1] Roughly, how much did the service visit(s) cost you, in total? This includes costs of labor and parts. If you had a warranty, consider only the cost you needed to pay to service the heat pump water heater. For any visits that included a service that also triggered the need for an additional repair, please only provide the service portion of those costs. We will ask about any repair costs separately.
 - 1. Cost (enter numerical value only): [REQUIRE NUMERIC TEXT ENTRY]
 - 2. I'm not sure
- **59.** [IF NUM_SERVICE1, NUM_SERVICE2, OR SUMSERVICE3 <>96) AND Q57 >1] Roughly, how much did the repairs cost **you**, in total? This includes costs of labor and parts. If you had a warranty, consider only the cost **you** needed to pay to repair the heat pump water heater. Enter zero if the warranty covered the full cost of the repair.
 - 1. Cost (enter numerical value only): [REQUIRE NUMERIC TEXT ENTRY]
 - 2. I'm not sure
- 60. [IF NUM_SERVICE1, NUM_SERVICE2, OR SUMSERVICE3 >0 AND > 96] Was it challenging to find a technician who knew how to service or repair the heat pump water heater?



- 1. Yes
- 2. No
- 98. I'm not sure

Satisfaction

[BASE: ALL]

- 61. SATISFACTION1. Since [IF S_HPWH = 1 "purchasing"; S_HPWH = 2 "moving into the home with"] the heat pump water heater, how satisfied have you been with the following items on a 5-point scale, where 1 means "very dissatisfied" and 5 means "very satisfied." How about …? [RESPONSE MATRIX]
 - 1. 1 Very dissatisfied
 - 2. 2 Somewhat dissatisfied
 - 3. 3 Neither satisfied nor dissatisfied
 - 4. 4 Somewhat satisfied
 - 5. 5 Very satisfied
 - 98. I'm not sure

Item	Rating
The sound level of the heat pump water heater	
[DISPLAY IF RESPONSIBLE_BILL = 1] The change in your electricity bill after	
installing the heat pump water heater	
Your hot water supply	
The maintenance requirements of the heat pump water heater	
The temperature in the room where the heat pump water heater is installed?	
[DISPLAY IF RESPONSIBLE_BILL = 1] The value of the heat pump water heater	
[DISPLAY IF S_HPWH = 1] The sales process for buying a heat pump water heater	
The heat pump water heater overall	

62. [FOR EACH ITEM IN SATISFACTION1 WITH RATING < 3] Why are you dissatisfied with...?



[DISPLAY IF RATING < 3] Item	OPEN END RESPONSE
The sound level of the heat pump water heater	
The change in your electricity bill after installing the heat pump	
water heater	
Your hot water supply	
The maintenance requirements of the heat pump water heater	
The temperature of the room where the heat pump water	
heater is installed	
The value of the heat pump water heater	
The sales process for buying a heat pump water heater	
The heat pump water heater overall	

[BASE: ALL]

63. PRIMARY_HEAT. What fuel do you primarily use to heat your home?

- 1. Electricity ["Either electric resistance heating or with heat pumps."]
- 2. Natural Gas or Propane ["Natural gas comes to your home via underground pipes. Propane is delivered to your home and stored in a tank."]
- 3. Fuel oil ["Fuel oil is delivered to your home and stored in a tank."]
- 4. Another fuel type; please specify: [REQUIRE TEXT ENTRY]
- 99. I'm not sure

64. [(IF PRIMARY_HEAT = 1 AND RESPONSIBLE_BILL = 1) OR PRIMARY_HEAT = 2 - 4]

HEAT_BILL_CHANGE Since installing the heat pump water heater, have you noticed any changes in how much it costs to heat your home?

- 1. Yes
- 2. No
- 98. I'm not sure
- 65. [IF HEAT_BILL_CHANGE = 1] Since installing the heat pump water heater, how have your heating bills changed? [RANDOMIZE SCALE FOR RESPONDENT FROM INCREASE TO DECREASE OR DECREASE TO INCREASE]
 - 1. Increased a lot
 - 2. Increased a little
 - 3. Stayed about the same
 - 4. Decreased a little
 - 5. Decreased a lot
 - 98. I'm not sure



66. MET_EXPECTATIONS. Overall, has the heat pump water heater met your expectations?

- 1. Yes
- 2. No
- 98. I'm not sure
- 67. [IF MET_EXPECTATIONS = 2] Where did the heat pump water heater fall short of your expectations? [REQUIRE TEXT ENTRY WITH OPTION FOR "DON'T KNOW"]

[BASE: ALL]

- 68. Have you, or would you, recommend a heat pump water heater to a friend, colleague, or family member?
 - 1. Yes, I have
 - 2. Yes, I would
 - 3. No
 - 4. Other, please specify: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure

Household Characteristics and Demographics

[DISPLAY TEXT] These final questions about you and your household are for classification

purposes only. All your answers will be kept confidential.

69. Which of the following statements best describes you?

- 1. I am the first among my friends to purchase new technology
- 2. I purchase new technology sooner than most of my friends
- 3. I am typically in the middle of the group when purchasing new technology
- 4. I purchase new technology after most of my friends have purchased it
- 5. I am one of the last people to purchase new technology
- 98. I'm not sure
- 70. Please assess how much you agree or disagree with the following statements: [ROTATE ORDER]
 - Strongly disagree
 - Somewhat disagree
 - Neither agree nor disagree
 - Somewhat agree
 - Strongly agree
 - a. I do research before making big purchases.
 - b. I compare prices online for big purchases.
 - c. I seek out expert recommendations for big purchases.



- d. I will spend money upfront to save money in the long term.
- e. I am concerned about environmental issues.
- f. I consider sustainability when making decisions about which products to purchase.
- g. Actions taken by individuals like me have an impact on the environment.
- h. Energy efficiency is my primary consideration when choosing mechanical systems for my home, like a furnace, air conditioner, or water heater.
- 71. Approximately what year was your home built?

1. YEAR: ____ [REQUIRE 4-DIGIT NUMBER > 1800 AND < 2022] 98. I'm not sure

- 72. What type of home [IF (HPWH_HOME = 1 OR 2) OR (HPWH_NUM2 = 1 OR 2) "do you live in?"; IF HPWH_HOME = 3 OR (HPWH_NUM2 = 3 or 4) "is the heat pump water heater installed in?"]
 - 1. A free-standing, single-family home
 - 2. A townhouse or rowhouse. [POP-UP: These share at least one side with another building, but have no other units above or below. There are no shared hallways, stairs, or basements.]
 - 3. Manufactured or mobile home
 - 4. Apartment or condominium in a building with 2 to 4 units.
 - 5. Apartment or condominium in a building with 5 or more units.
 - 6. Other, please specify: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure
 - 99. I'd rather not say

[BASE: PRIMARY RESIDENCE OR VACATION HOME]

73. [IF (HPWH_HOME = 1 or 2) OR (HPWH_NUM2 = 1, 2, OR 3)] Do you own or rent your home?

- 1. Own
- 2. Rent
- 3. Other, please specify: [REQUIRE TEXT ENTRY]
- 99. I'd rather not say

[BASE: PRIMARY RESIDENCE OR VACATION HOME]

74. [IF (HPWH_HOME = 1 or 2) OR (HPWH_NUM2 = 1, 2, OR 3)] How many people live in your household, including yourself?

- 1. 1
- 2. 2
- 3. 3



- 4. 4
- 5. 5
- 6. 6
- 7. 7
- 8. 8
- 9. 9 or more
- 99. I'd rather not say

75. Which of the following categories describes the highest level of education you have completed?

- 1. Some high school
- 2. High school graduate or GED
- 3. Trade or technical school
- 4. Some college
- 5. College graduate
- 6. Some graduate school
- 7. Graduate degree
- 97. Other, please specify: [REQUIRE TEXT ENTRY]
- 98. I'm not sure
- 99. I'd rather not say
- 76. Do you consider yourself Hispanic or Latino?
 - 1. Yes
 - 2. No
 - 99. I'd rather not say
- 77. How would you describe yourself? Please select all that apply. [ALLOW MULTIPLE RESPONSES]
 - 1. White
 - 2. Black or African American
 - 3. American Indian or Alaska Native
 - 4. Asian
 - 5. Native Hawaiian or Other Pacific Islander
 - 6. Other, please specify: [REQUIRE TEXT ENTRY]
 - 99. I'd rather not say



- **78**. Which of the following categories best describes your approximate annual household income from all sources in 2020, before taxes?
 - 1. Less than \$40,000
 - 2. Between \$40,001 and \$60,000
 - 3. Between \$60,001 and \$80,000
 - 4. Between \$80,001 and \$120,000
 - 5. Between \$120,001 and \$250,000
 - 6. Over \$250,000
 - 98. I'm not sure
 - 99. I'd rather not say

Model Number

- 79. HPWH_PICTURE [IF S_INSTALL=1 AND MODEL IS NOT AVAILABLE] Please go to your heat pump water heater and take a picture of the manufacturer's label that shows the brand, model number, and serial number. See example below. If you are not able to upload a photo, please proceed to the next question. [SHOW EXAMPLE PHOTO]
 - 1. I am unable to take or upload the picture
- 80. HPWH_MODEL. [IF S_INSTALL=1 AND HPWH_P ICTURE IS EMPTY] Please type the model number you see on the manufacturer's label. In the example below, you would type "XXX-XX". [USE MODEL NUMBER FROM EXAMPLE PHOTO]
 - 1. Model number: [REQUIRE TEXT ENTRY]
 - 2. I cannot locate the model number
- 81. [IF S_INSTALL=1 AND HPWH_MODEL = 2 AND BRAND IS NOT AVAILABLE] What brand is your heat pump water heater?
 - 1. Brand: [REQUIRE TEXT ENTRY]
 - 98. I'm not sure

Closing

- 82. Those are all the questions that we have. Thank you for your help with this survey. Do you have any comments that you'd like to share about heat pump water heaters?
 - 1. Yes [REQUIRE TEXT ENTRY]
 - 2. No
- **83**. GIFT_CARD In appreciation of your time, we are offering a \$25 gift card. Please enter the email address where you would like the \$25 gift card sent.



- 1. Yes, please send me a gift card. My email is: [REQUIRE EMAIL ADDRESS]
- 2. No thank you.
- 84. [DISPLAY TEXT IF GIFT_CARD = 1] Please allow up to seven (7) days for the gift card to be sent to the email address you have provided. If you have not received your gift card at that time, please contact Christine at NEEAsurvey@nmrgroupinc.com for assistance.



MEMORANDUM

To: Anu Teja, NEEA

From: Christine Smaglia, Jared Powell, Melissa Meek, Monica Nevius, NMR Group, Inc.

Date: Feb. 8, 2022

Re: NEEA Hot Water Solutions HPWH Training Add-on Installer Survey Results

Introduction to HWS Training Survey Task

Hot Water Solutions (HWS) is a market-facing initiative of the Northwest Energy Efficiency Alliance (NEEA) that promotes the adoption of heat pump water heaters (HPWHs) by providing trainings, marketing materials, and other resources to increase sales and installations of HPWHs in the Northwest.¹ The HWS HPWH trainings, administered by CLEAResult, provide an overview of HPWH technology, installation best practices, and how to engage with customers looking to replace their water heater.

After completing the data collection for NEEA's sixth HPWH Market Progress Evaluation Report (MPER), NEEA asked NMR to perform an add-on research task – a survey with water heater installers who participated in HWS' HPWH trainings. The team assessed the impact of the trainings on installers' technical knowledge, perceptions of HPWHs, and sales practices. The survey collected information on the training attended; the impact of the trainings on installer capability, sales practices, recommendation rates, sales volumes, and perception of HPWHs; training and information gaps; and the value of being listed on the HWS installer directory.² The results of this assessment are intended to inform the content of future HWS HPWH trainings and materials that could be disseminated to other sponsors of HPWH programs.

Key Findings and Recommendations



HWS' HPWH trainings increased installers' technical knowledge and changed their perception of HPWHs; as a result, they have a better understanding of how HPWHs work and are more knowledgeable about technical aspects (e.g., installation and venting).



After attending HWS trainings, installers are more confident discussing HPWHs with customers as part of their sales practices.



Installers rely on the HWS trainings for HPWH information and have rarely attended any other HPWH training.



Installers expressed high levels of satisfaction with the content of the HWS trainings.

² https://hotwatersolutionsnw.org/installation/find-an-installer



¹ https://hotwatersolutionsnw.org

Based on feedback from training attendees, the team has identified several opportunities for enhancing and improving the HWS HPWH trainings:

- Provide more detailed information on installation and venting, troubleshooting and repair, and sizing. This could be achieved by spending more time discussing these topics during the HWS trainings or by developing new trainings that focus exclusively on these technical subjects. Installers indicated they would like the trainings to include specific information on installation, ducting, and venting options, particularly for retrofits in mobile and manufactured homes. Installers also expressed interest in receiving more in-depth technical information on how to diagnose and repair the most common HPWH issues and failures.
- Increase marketing efforts. To help promote the installation of HPWHs, consider increasing advertising efforts. In particular, previous attendees suggested TV and radio advertisements. In addition, installers suggested that consumer-facing marketing efforts focus on HPWH efficiency and the rebates available for installing them.
- Offer pre-recorded online training modules. Consider offering online training tools, including self-paced, pre-recorded training modules and access to a monthly live Q&A session with a HPWH expert. Akin to the current HWS trainings, these online "on-demand" trainings should provide continuing education units (CEUs).

Methodology

Between December 2021 and January 2022, 50 participating water heater installers from 40 companies completed surveys via web or phone. NEEA provided contact information for 402 HWS training participants. After removing duplicates and contacts that did not have email addresses or phone numbers, the sample frame was reduced to 291. The survey consisted of a single battery of questions, regardless of the respondent's role in the company (e.g., company owner, water heater installer, salesperson). Given the small sample size, and because knowledge gaps can differ from employee to employee, NMR allowed multiple installers from the same company to complete the survey.

The survey specified and confirmed that respondents attended and remembered the training(s) and that they were employed at the same company or that they were employed at a new company in a similar position as their previous role. Respondents were offered a \$100 electronic gift card with the option to select a retailer of their choice, a Visa[®] gift card, or to donate the incentive to a charity of their choice.³

Email outreach began on December 14 to the 261 training attendees with an email address on file. In order to encourage responses, CLEAResult sent the initial email invitation using an email address familiar to the HWS training attendees. Phone outreach started on December 20 to the 279 training attendees who had not yet completed the survey and was quickly followed by a reminder email on December 23 (214 respondents). The NMR team sent a second reminder email on December 29 (201 respondents), followed by a third reminder email on January 4 (186

³ <u>https://www.tangocard.com/</u>



respondents).⁴ Over 2,000 phone calls were made to training attendees, averaging 7 phone calls per attendee. Phone outreach continued through January 10.

The survey included questions derived from two main sources: 1) the installer survey that was fielded as a part of NEEA's HPWH MPER #5, and 2) the code compliance training assessments that NMR has conducted in Massachusetts for many years. The following lists the topics covered in the survey:

- Training attended
- Impact of trainings on installer capability, perception of HPWHs, sales practices, recommendation rates, and sales volumes
- Training and information gaps
- Value of being listed on HWS trained installer list (lead generation)

Results

TRAINING IMPACT

Changes to HPWH-related business

Respondents changed their HPWH-related business after taking the HWS trainings. Figure 1 shows that of the 16% of installers who did not sell, stock, install, or specify HPWHs before the training, 75% made changes to their HPWH-related business after the training. Only two installers (4% of all respondents) were not moved to begin selling, stocking, installing, or specifying HPWHs after attending the trainings. Of the 84% of installers who were already selling, stocking, installing, or specifying HPWHs, 55% made changes to their business practices after completing the training.⁵

All eight respondents who were not already selling, stocking, installing, or specifying HPWHs indicated that their perception of HPWHs had changed after the training. Six of these respondents indicated that after the training they had a better understanding of HPWHs, two had a better understanding of installation, two were more confident discussing/selling HPWHs, and one noted that they are more efficient.

⁵ Figure 3 shows how the respondents' work has changed as a result of the HWS trainings.



⁴ The reminder emails were sent by Braun Research, Inc. (BRI).


Figure 1: Changes to HPWH-related Business Due to Training

(Q5. Did your company sell, install, stock, or specify heat pump water heaters before you attended the Hot Water Solutions training(s)? [Multiple choice]

Q6. Have you made any changes to your heat pump water heater-related business because of the Hot Water Solutions training(s) you attended? [Multiple choice])

Respondents expect that what they learned in the HWS training will influence future work. Figure 2 shows that over one-half (55%) of respondents have already made changes to their HPWH-related business because of the HWS training they attended. Of the 45% of respondents who have not yet made changes, most (91%) expect that what they learned in the training will

influence their work in the future. Respondents who had not made changes to their HPWH-related business tended to have completed the HWS training more recently — 12 of them completed a training in 2021 as opposed to three who completed a training in 2019 — suggesting that they may need more time to incorporate changes to their business practices.



Figure 2: Training Influence on Future Work

(Q6. Have you made any changes to your heat pump water heater-related business because of the Hot Water Solutions training(s) you attended? [Multiple choice]

Q8b. Do you expect what you learned at the Hot Water Solutions training(s) will influence your work in the future? [Multiple choice])



As a result of the HWS trainings, respondents have changed their practices to help promote the installation of HPWHs. Figure 3 shows that of respondents who had already made changes to their HPWH-related business, most had trained their employees on HPWH installation (90%), changed or improved how they explain the benefits of HPWHs to homeowners (90%), recommended more HPWHs (86%), and installed and/or sold more HPWHs (72%). Respondents also indicated that they experienced fewer installation challenges for HPWHs (59%) and received fewer service calls for HPWHs (45%), suggesting that the trainings have increased installers' technical knowledge and skills. Reducing installation challenges and decreasing the number of callbacks benefits homeowners and companies by saving time and money. To a lesser extent, respondents had changed or improved how they explain the benefits of HPWHs (14%). It is reasonable that these items were mentioned less often because not all installers are communicating with builders and stocking water heaters at all, so making changes to this effect would not be possible.



Figure 3: Changes as a Result of HWS Trainings (n=29)

(Q8a.How has your work changed as a result of the Hot Water Solutions training(s) you attended? [Multiple response with "Other" open-end])

Installer Recommendation of HPWH

Reasons for homeowners not installing HPWHs may be outside the contractors' control. Figure 4 shows that 38% of respondents said when they recommend HPWHs to homeowners, the homeowners generally take them up on the recommendation and move forward with installing one. One-fifth (20%) of respondents said when they recommend HPWHs, the homeowners generally do *not* accept the recommendation. Approximately one-third (36%) gave a response in the middle, and said that whether or not the homeowner chooses to install a HPWH depends on the particular circumstances. According to respondents, homeowners who choose not to install a HPWH do so because of high upfront costs (mentioned by 20 respondents) and the lack of space



for the installation (eight respondents). As considerations for cost and water heater location are out of a contractor's control, the results suggest that recommendations from trained installers are influential in a typical customer's purchasing decision.



Figure 4: HPWH Installation Based on Installer Recommendation (n=50)¹

¹ Respondents did not always provide reasons why homeowners decide to install or not install HPWHs when they are recommended by the installer.

² Operating costs.

³ Upfront costs, including equipment and installation.

⁴ May require additional modification or construction to allow for adequate space around the HPWH.

(Q11. When you recommend heat pump water heaters to your customers, do they generally decide to install heat pump water heaters? Why or why not? [Open-end response])

Installer Satisfaction

Respondents show high satisfaction with the HWS trainings. Figure 6 shows that at least 90% of respondents were satisfied (providing a rating of at least 4 out of 5) with the training coverage in each of the following areas: how to install HPWHs, how HPWHs work, energy savings from HPWHs, and how to size HPWHs. While satisfaction was high overall, the largest opportunity for improvement is related to sales strategies – 16% of respondents were less satisfied with the information the trainings provided on how to overcome customer concerns and lack of awareness about HPWHs. Respondents also provided feedback on the instructor (four respondents, all were



ratings of 5), the course overall (three respondents, all ratings of 5), tax credits or incentives (two respondents, all ratings of 5), and how to orient HPWHs during transportation (one respondent, rating of 2).

Figure 5: Installer Satisfaction with Training



(Q13. On a scale of 1 to 5, where 1 is "not at all satisfied" and 5 is "very satisfied," how satisfied were you with how the Hot Water Solutions trainings covered the following topics? [Scale with "Other" open-end])

Respondents value the information provided by HWS trainings. When asked to identify the most valuable parts of the trainings, installers most commonly mentioned learning more about HPWHs (60%) and learning proper installation and venting (40%).

Figure 6: Most Valuable Part of the Training (n=50)



(Q12. What would you say was the most valuable part of the Hot Water Solutions training(s) you attended? [Open-end])

Additional Trainings

HWS trainings are valuable and are often the only HPWH training that respondents have attended. Three-fourths of respondents (72%) indicated that the HWS training is the only HPWH training they have ever attended. This highlights the importance of the HWS trainings as a resource for installers. Eight respondents said they had attended other HPWH trainings for the following HPWH brands: by Rheem (five respondents), AO Smith (two respondents) and GE (one respondent).⁶ When asked to compare the other trainings with the HWS training, half of the

⁶ One respondent reported attending another training but did not specify the content or training provider.



respondents said they were similar (4 respondents), while two respondents reported that the other training was more technical and two indicated that the other training was brand-specific.

Installers are interested in on-demand HPWH trainings. Most respondents (90%) expressed interest in attending HWS on-demand trainings that would allow participants access to pre-recorded online training modules and Q&A sessions with a HPWH expert.

Installer Suggestions for HWS Training Content

In an open-ended question, installers were asked what should have been included in the HWS trainings they attended. Most respondents (60%) did not make any recommendations for improvement. Respondents who made suggestions were primarily interested in discussing installation and venting (six respondents) and troubleshooting and repair (five respondents) in greater detail.

Discuss installation and venting in greater detail and include specific examples. Respondents most frequently suggested the trainings provide more in-depth information on installation, ducting, and venting options. They suggested providing examples for retrofits, mobile homes, and manufactured homes.

Discuss troubleshooting and repair in greater detail, describe common issues, and identify possible solutions. Respondents suggested the trainings provide more in-depth information on diagnosing and repairing HPWH issues and failures. They suggested describing common issues and possible solutions.

.

Installation and venting (6)

- More in-depth/specific info about install, ducting, and venting options
- Provide examples, particularly for retrofits, mobile homes, and manufactured homes

Troubleshooting and repair (5)

- More in-depth info on diagnosing and repairing issues/failures
- Describe common issues and provide possible solutions

Installer Suggestions to Promote HPWHs

Respondents recommended additional advertising to promote HPWHs. Table 1 shows the suggestions that installers had for how NEEA and HWS can promote the installation of HPWHs. Among those who recommended additional advertising, suggestions included television or radio advertisement (12%), direct mailers (12%), efficiency-focused advertisements (8%), social media (4%), websites (4%), and fliers in supply houses (2%). Other suggestions were each mentioned by one respondent and include more post-training follow up, more focus on general contractors and architects, more retailer options, a bonus/incentive for selling HPWHs, better warranties, and curating the HPWHs selection offered.



Suggestion	Respondents
More advertising	40%
More/easier rebates	18%
More trainings	8%
Other	12%
No suggestions	24%
N/A	4%

Table 1: Suggestions to Promote the Installation of HPWHs (n=50)

(Q32. What suggestions do you have for NEEA and Hot Water Solutions that would help promote the installation of heat pump water heaters? [Open-end])

SHARING INFORMATION FROM TRAININGS

Respondents are sharing information from the HWS trainings. All respondents indicated that they have shared information from the HWS trainings. Figure 8 shows that installers have primarily shared information with employees and colleagues within their company (88%) and homeowners (80%). To a lesser extent, respondents have shared information with builders (42%), water heater professionals outside their company (28%), and building code officials (20%). Not all installers talk regularly with builders, professionals outside their company, and building code officials, so it is not surprising to see information being shared less frequently with these parties.



Figure 7: Parties With Which Installers Shared Information (n=50)

(Q15. Have you shared any information from the Hot Water Solutions training(s) with any of the following parties? [Multiple response])



Respondents most commonly shared information on how HPWHs work (17 respondents), installation (16 respondents), efficiency (12 respondents), and energy cost savings (10 respondents) (Figure 9).

Figure 8: Types of Information Shared by Installers (n=50)



(Q16. What type of information did you share? [Open-end response])

HWS WEBSITE

Respondents said it was important to have their businesses listed on the HWS Installer Directory. Figure 10 shows almost two-thirds of respondents (65%) indicated that it was important (rating of 4+ out of 5) for their businesses to be listed on the trained list of HPWH installers on the HWS Installer Directory. While most of the respondents said it was important to be on the list, only eight percent said the website generated a few leads for their business, whereas the remaining respondents said it did not generate leads (46%) or were not aware that their businesses were on the list (46%). Note that respondents may not be aware of where their leads come from and may underestimate the impact of their company's presence on the HWS Installer Directory.





(Q13. On a scale of 1 to 5 where 1 is "not at all important" and 5 is "very important" how important is having your business on the list of trained HPWH installers? [Multiple response])

Over one-quarter of respondents (28%) reported they had visited the HWS website for technical marketing or other kinds of information. Of those respondents, 11 out of 13 said they were satisfied (4+ out of 5) with the information on the website. One respondent who gave a score of 2 out of 5 said that the website was difficult to navigate.



FIRMOGRAPHICS

Figure 10 shows that the breakdown of the outreach sample and the survey completes by state were almost identical.



Figure 10: Breakdown by State

Survey respondents represented 40 companies. The main line of work for these companies is in existing homes (58%) and residential new construction (28%). The remaining respondents worked mainly in commercial or industrial facilities (10%) and both in residential new construction and existing homes (5%).

Figure 11 shows respondents represented small and large companies with workforces ranging from 1 to 585 employees (average of 37 employees). These companies installed an average of 215 residential water heaters (all water heater types) in the Northwest over the past year. Of the residential electric storage water heaters they sold in the past year, approximately 20% were HPWHs.



Figure 11: Firmographics



PRO DEAL INITIATIVE

Two respondents received a HPWH for their home through the ProDeal initiative.⁷ Both said they were satisfied with the HPWH's performance and did not encounter any challenges with their installation. One respondent said the HPWH received influenced the rate they recommended HPWHs to their customers.

⁷ Under the ProDeal initiative, NEEA provided free HPWHs to key installers for them to install in their own homes. This gave these installers experience with installing and living with HPWHs, to help build installer familiarity and confidence in the technology, which they could then pass on to their colleagues and customers.



Appendix A

A.1 SURVEY INSTRUMENT

Follow-up Web Survey for NEEA HPWH Installers

Topic Covered by Survey	Relevant Section
Company size / activity level	Firmographics and Company
	Size/Activity
How the information from the trainings or webinars is	Impact on Practices
used or will be used in the field	
If applicable, why information from the trainings or	00
webinars is not used in the field	49
Training content	Training Content
How and with whom information is shared	Sharing Information
Other trainings or webinars attended	Additional Trainings
Use of the Hot Water Solutions website	Hot Water Solutions Website
Other suggestions for NEEA	Closing

NEEA has provided NMR with the sample frame for this installer survey. The sample frame included approximately 400 records for installers who participated in Hot Water Solutions trainings. After deduplicating, the sample frame is approximately 300 individuals, as many people attended multiple trainings and showed up multiple times in the larger list.

A1. Introduction

The sponsor of the Hot Water Solutions trainings, the Northwest Energy Efficiency Alliance (NEEA), has partnered with NMR Group to understand how the information from the classroom trainings and webinars is used in the field. Your feedback is important and will ensure that trainings address the needs of water heater installers. The survey should take about 15 minutes. [IF COMPLETING VIA WEB: You can stop the survey at any time and return to it later. Your earlier responses will be saved.] If you are qualified to complete the survey, NMR will send a \$100 digital gift to the email address you provide at the end of the survey. The digital gift card options include Visa®, a retailer of your choice, or a charitable donation. Your responses will be kept confidential; we will combine them with those of other respondents for the findings and analyses we present to NEEA.

If you have questions about the legitimacy of this study, you may contact Christine Smaglia of NMR at <u>NEEAsurvey@nmrgroupinc.com</u>. If you have any technical questions about the survey, please contact [Braun contact].



A2. Screening

1. Our records show that you attended the following training(s):

[TrainingType1] on [Date1]

[TrainingType2] on [Date2]

[TrainingType3] on [Date3]

[TrainingType4] on [Date4]

Do you recall attending any of these events?

1. Yes

- 2. No [TERMINATE]
- 98. I'm not sure [TERMINATE]

[If Q1 = 2 OR 98] We are sorry, but you do not qualify for this survey. Thank you for your time. [END SURVEY]

For the remainder of the survey, we will refer to the Hot Water Solutions trainings or webinars you attended as the "Hot Water Solutions trainings."

- 2. Are you still employed at the same company you worked for when you attended the Hot Water Solutions trainings?
 - 1. Yes
 - 2. No
 - i. [IF Q2 = NO] Are you currently employed in a similar position as your previous role?
 - 1. Yes
 - 2. No

[If Q2i = YES] Please describe your new position: [REQUIRE OPEN END RESPONSE]

[If Q2i = NO] We are sorry, but you do not qualify for this survey. Thank you for your time. [END SURVEY]

- 3. What best describes your role at the company? Please select all that apply.
 - 1. I own the company
 - 2. I install or service water heaters
 - 3. I make recommendations about what customers should install
 - 4. I manage installation technicians
 - 5. I am in a sales position
 - 6. Other, please describe: [REQUIRE OPEN-END RESPONSE]



- 4. Before today, had you heard the term "heat pump water heater" or "hybrid water heater"? Note that these are not the same as a tankless water heater.
 - 1. Yes
 - 2. No
 - 98. I'm not sure

[DISPLAY TEXT] [IF Q4 = 1 "As you may already be aware, heat"; IF Q4 = 2 or 98 "Heat"] pump water heaters, also known as electric hybrid water heaters, use an electric heat pump to transfer heat from the air outside of the unit to the water in the tank. They work like a refrigerator, but in reverse. They are *not* the same as a tankless water heater. A heat pump water heater has a cylinder-shaped water storage tank, like a standard water heater. A tankless water heater has a smaller metal box mounted on a wall, with no storage tank.

- 4b. Based on that description, have you heard of "heat pump water heaters" or "hybrid water heaters"?
 - 1. Yes
 - 2. No [TERMINATE]
 - 98. I'm not sure [TERMINATE]

[DISPLAY TEXT] For the rest of this survey, we will use the term "heat pump water heater" to refer to this type of water heater.

A3. Impact on Practices

- 5. Did your company sell, install, stock, or specify heat pump water heaters before you attended the Hot Water Solutions training(s)?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
- 6. Have you made any changes to your heat pump water heater-related business because of the Hot Water Solutions training(s) you attended?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
- 7. [IF Q6 = NO] Do you expect what you learned at the Hot Water Solutions training(s) will influence your work *in the future*?
 - 1. Yes
 - 2. No
 - 98. I'm not sure



8. [IF Q6 OR Q7 = YES]

- a. [DISPLAY IF Q6 = YES] How has your work changed as a result of the Hot Water Solutions training(s) you attended? Select all that apply. [ALLOW MULTIPLE RESPONSE]
- b. [DISPLAY IF Q7 = YES] How will your work change as a result of the Hot Water Solutions training(s) you attended? Select all that apply [ALLOW MULTIPLE RESPONSE]

Due to the training(s), my business has	Due to the training(s), my business expects to
[DISPLAY IF Q6 = YES]	[DISPLAY IF Q7 = YES]
a. Installed and/or sold more heat pump	a. Install and/or sell more heat pump water
water heaters	heaters
b. Recommended more heat pump water	 Recommend more heat pump water
heaters	heaters
c. Trained our employees on heat pump	c. Train our employees on heat pump
water heater installation	water heater installation
 Changed or improved how we explain	 Change or improve how we explain the
the benefits of heat pump water heaters	benefits of heat pump water heaters to
to homeowners	homeowners
e. Changed or improved the process of	e. Change or improve the process of
explaining the benefits of heat pump	Explaining the benefits of heat pump
water heaters to builders	water heaters to builders
f. Stocked a greater variety of heat pump	f. Stock a greater variety of heat pump
water heater brands	water heater brands
g. Stocked a greater quantity of heat pump water heater units	 g. Stock a greater quantity of heat pump water heater units
h. Experienced fewer challenges when	 Experience fewer challenges when
installing heat pump water heaters	installing heat pump water heaters
 Experienced fewer service calls for heat	i. Experience fewer service calls for heat
pump water heaters	pump water heaters
j. Other, please describe: [REQUIRE	j. Other, please describe: [REQUIRE
OPEN-END RESPONSE]	OPEN-END RESPONSE]

9. [IF Q6 AND Q7 = NO] Why has the Hot Water Solutions training <u>not</u> affected or <u>will not</u> affect your work? Please check all that apply.



- 1. The training was not relevant to my work
- 2. I already did everything recommended in the training
- 3. My customers are not inclined to install heat pump water heaters
- 4. Other, please describe: [REQUIRE OPEN-END RESPONSE]
- 10. Would you say your overall perception of heat pump water heaters has changed as a result of the Hot Water Solutions training(s) you attended?
 - 1. Yes, please describe: [REQUIRE OPEN-END RESPONSE]
 - 2. No
 - 98. I'm not sure
- 11. When you recommend heat pump water heaters to your customers, do they generally decide to install heat pump water heaters? Why or why not? [REQUIRE OPEN-END RESPONSE]

A4. Training Content

- 12. What would you say was the most valuable part of the Hot Water Solutions training(s) you attended? [REQUIRE OPEN-END RESPONSE]
- 13. On a scale of 1 to 5, where 1 is "not at all satisfied" and 5 is "very satisfied," how satisfied were you with how the Hot Water Solutions trainings covered the following topics? [NUMERIC RESPONSE, 1 TO 5 ANSWER FOR EACH]
 - 1. Not at all satisfied
 - 2. 2
 - 3. 3
 - 4.4
 - 5. Very satisfied
 - 98. I'm not sure
 - 99. N/A not relevant for training I attended
 - 1. How heat pump water heaters work
 - 2. How to install heat pump water heaters
 - 3. How to size heat pump water heaters
 - 4. Energy savings from heat pump water heaters
 - 5. How to overcome customer concerns and/or lack of awareness about heat pump water heaters
 - 6. Other, please describe: [REQUIRE OPEN-END RESPONSE]
- 14. What, if anything, should have been included in the Hot Water Solutions training(s) you attended? [OPEN-ENDED]

A5. Sharing Information

- 15. Have you shared any information from the Hot Water Solutions training(s) with any of the following parties? Please select all that apply. [MULTIPLE RESPONSE UNLESS "I HAVE NOT SHARED ANY INFORMATION" IS SELECTED]:
 - 1. Your employees and/or colleagues at your company



- 2. Water heater professionals at other companies
- 3. Builders
- 4. Building code officials
- 5. Homeowners
- 6. Other, please describe: [REQUIRE OPEN-END RESPONSE]
- 7. I have not shared any information
- 16. [IF Q15 = 1 6] What type of information did you share? [REQUIRE OPEN-END RESPONSE]

A6. Hot Water Solutions Website

- 17. After completing the Hot Water Solutions Installer Orientation, your business was added to the installer directory on the Hot Water Solutions website. On a scale of 1 to 5, where 1 is "not at all important" and 5 is "very important," how important is having your business on this list of trained HPWH installers?
 - 1. Not at all important
 - 2. 2
 - 3. 3
 - 4.4
 - 5. Very important
 - 98. I'm not sure
- 18. Has your presence on the Hot Water Solutions website generated any leads for your business?
 - 1. Yes, it has generated many leads
 - 2. Yes, it has generated **some** leads
 - 3. Yes, it has generated a few leads
 - 4. No, it has **not generated** any leads
 - 5. I wasn't aware that my business was listed on the Hot Water Solutions website
 - 98. I'm not sure
- 19. Have you visited the Hot Water Solutions website for technical, marketing, or any other kind of information?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
- 20. [IF Q19 = YES] On a scale of 1 to 5, where 1 is "not at all satisfied" and 5 is "very satisfied," how satisfied were you with the information on the Hot Water Solutions website? [NUMERIC RESPONSE, 1 TO 5]
 - 1. Not at all satisfied
 - 2. 2
 - 3. 3
 - 4.4
 - 5. Very satisfied



98. I'm not sure

21. [IF Q20 < 3] Please tell us why you were unsatisfied. [REQUIRE OPEN-END RESPONSE]

A7. Additional Trainings

22. Besides the training(s) listed below, have you attended any other trainings or webinars on heat pump water heaters?

[TrainingType1] on [Date1]

[TrainingType2] on [Date2]

[TrainingType3] on [Date3]

[TrainingType4] on [Date4]

- 1. Yes, please specify training(s): [REQUIRE OPEN-END RESPONSE]
- 2. No
- 98. I'm not sure
- 23. [IF Q22 = YES"")] Please describe how these trainings compared to the training(s) you attended that were sponsored by Hot Water Solutions.

A8. Pro Deal Installers

- 24. Did you receive a heat pump water heater for your own home for no charge through the Pro Deal initiative?
 - 1. Yes
 - 2. No
 - 98. I'm not sure
- 25. [IF Q24 = YES] Are you satisfied with the performance of the heat pump water heater you received through Pro Deal? Why or why not? [REQUIRE OPEN-END RESPONSE]
- 26. [IF Q24 = YES] Did you encounter any challenges when installing your heat pump water heater that were not addressed in the training?
 - 1. Yes, please describe: [REQUIRE OPEN-END RESPONSE]

2. No

98. I'm not sure



- 27. [IF Q24 = YES] Did receiving the heat pump water heater for your own home have any impact on how often you recommend heat pump water heaters to your customers? If yes, please describe: [OPEN END RESPONSE]
 - 1. Yes, please describe: [REQUIRE OPEN-END RESPONSE]
 - 2. No
 - 98. I'm not sure

A9. Firmographics and Company Size/Activity

- 28. Approximately how many people in total work for your company across these four states: Oregon, Washington, Idaho, and Montana? [RESTRICT TO NUMERIC RESPONSES]
- 29. How many residential water heaters (of any type) did your company install in the Northwest in the past year? Your best estimate is fine. ___ [restrict to number]
- 30. Thinking about all the residential electric storage water heaters your company installed in the past year, about what percent of the total number was **heat pump water heaters**? ____% [restrict to percentage from 0% to 100%]
- 31. Which of the following activities represents your company's main line of work?
 - a. Installing equipment in residential new construction (newly built homes that are not yet occupied)
 - b. Installing, replacing, or servicing equipment in existing homes
 - c. Installing, replacing, or servicing equipment in commercial or industrial facilities
 - d. Other, please describe [REQUIRE OPEN END RESPONSE]

A10. Closing

- 32. What suggestions do you have for NEEA and Hot Water Solutions that would help promote the installation of heat pump water heaters? [REQUIRE OPEN-END RESPONSE]
- 33. Hot Water Solutions is considering adding on-demand training, where participants could access pre-recorded training modules online and complete the training at their own pace. Participants would have access to a monthly live Q&A with a heat pump water heater expert to ask relevant questions. Participants would receive CEUs just as they would for a live training.

If Hot Water Solutions offered on-demand training, would you or your colleagues be interested in attending?

- 1. Yes
- 2. No
- 3. Other, please describe: [REQUIRE OPEN-END RESPONSE]



98. I'm not sure

- 34. Please enter the email address where you want NMR to send your \$100 digital gift card. You will receive an email with an option to choose a digital gift card to a retailer of your choice, a Visa® gift card, or donate it to a charity of your choice. (You may also check below to decline the incentive.)
 - a. Email address: [REQUIRE RESPONSE IN EMAIL FORMAT]
 - b. I do not wish to accept an incentive for this survey

[FINISH SURVEY] Thank you for your feedback!



Memorandum

May 4, 2022



TO: Anu Teja, MRE Senior Scientist

FROM: Emily Rosenbloom, Program Manager – Heat Pump Water Heater

SUBJECT: Response to Northwest Heat Pump Water Heater Market Progress Evaluation Report #6

In 2020 and 2021, NEEA contracted with NMR Group, Inc. to assess NEEA's Heat Pump Water Heater program progress towards specific market progress indicator. This memo responds to select key conclusions and recommendations documented in the report.

 The HPWH market appears to be trending upward, primarily driven by installations in new homes. Installations in existing homes have remained relatively flat for the past few years. However, preliminary data from 2020 indicates a much smaller portion of 2020 installations may have received utility incentives than in the past, a positive signal that customers may install HPWHs even without utility subsidies

Related recommendation. NEEA should continue its effort to gather full shipment data from all HPWH manufacturers. Gathering this information is critical for assessing market progress. <u>Staff Response.</u> Agreed. NEEA continues to work with all manufacturers to establish data sharing agreements. Additionally, we work with retails and distributors to fill in data gaps. Combined, we currently capture approximately 86% of the regional sales.

2. Retailers represent an important portion of the HPWH market, particularly for emergency replacements. Evidence suggests they are poised to increase their role in emergency replacement installations

Related recommendation. Call centers processing installation inquiries represent a key leverage point for the retail side of the HPWH supply chain. NEEA should continue to work with retailers and their affiliated installer partners to shift their recommendation practices toward HPWHs. This would likely entail focused partnerships with retailers to learn more about the talking points they use in different scenarios and identifying opportunities for companies' incentive structures to better support HPWHs (or at least not present a barrier to them). Understanding the barriers to recommending HPWHs to electric water heater customers and designing an intervention to overcome them are important for reaching potential HPWH purchasers in the emergency replacement market. Retailers' representatives have clearly been trained about HPWHs and have positive things to say about them, which indicates an openness to promoting the equipment.

Related recommendation. To help capture more of the DIY emergency replacement market, NEEA should encourage retailer partners to provide information and instructions in-store and online about how to install a HPWH.

<u>Staff Response</u>: Agreed. The program communicates with major retailer on a regular basis and is currently developing a plan retailers to increase instore signage with resources for Do It Yourself (DIY) customers in 2022.

3. Homeowner awareness of HPWHs has doubled since 2016

Related recommendation. NEEA should look for ways to increase HPWH awareness in rural areas, and in Montana and Idaho generally. Targeted advertisements and utility messaging are effective strategies to increase HPWH awareness. As HPWH adoption increases in these areas, word-of-mouth referrals can then help boost awareness and further adoption.

<u>Staff Response</u>: Agreed. The program has plans to rerun the "Boring But Efficient" awareness campaign in the second half of 2022 with specific goals to target a wider audience including rural populations.

Related recommendation. NEEA should work with partners to continue to encourage installers to simply make the recommendation for a HPWH, given that so many homeowners are likely to accept a recommendation. As seen in MPER #5, the likelihood of accepting the recommendation was highly correlated with previous awareness of HPWHs. Now that awareness has grown substantially, there may be more opportunities for near-term market progress.

<u>Staff Response:</u> Agreed. The program is actively sharing the increased awareness statistics and the findings that homeowners are likely to accept a HPWH recommendation as a result in both Hot Water Solutions installer newsletters and installer training materials. Persuasive messages

4. Social media and online engagement strategies have been successful at increasing awareness of Hot Water Solutions and HPWHs among the target audience. There are opportunities to further increase the target audience's engagement with the Hot Water Solutions website. **Related recommendation.** YouTube videos appear to offer an effective means of reaching the target population—be it through partner organizations or via social media—but these visitors may require customized calls to action for NEEA to fully benefit from this traffic.

Related recommendation. Consider adding a mobile phone-optimized version of the website to retain phone users. This could be as simple as a custom style sheet for small screens.

Related recommendation. NEEA should work with utilities to ensure that as many utilities as possible in the Northwest direct their customers to the HWS site to learn more about the benefits of HPWHs and to help them identify relevant installers and retailers. NEEA should also consider interviews with utility partners as part of the next MPER, to assess opportunities for additional partnerships and for moving the HPWHP market forward.

Related recommendation. Encourage utilities to include information about HWS in bill inserts, and prominently link to the HWS website in digital communications.

Related recommendation. NEEA should use search engine optimization to increase traffic to the Hot Water Solutions website by engaging potential purchasers who are searching for water heaters. **Related recommendation.** NEEA should enable the referral goals in Google Analytics to permit finer-grained analysis of click-through rates in the future. This will allow analysis of traffic from the date the goals are enabled onward.

<u>Staff Response.</u> Agreed. We recognize marketing's past success in increasing awareness and preference for HPWHs, particularly with digital marketing and engagement campaigns. We plan to rerun Boring But Efficient campaign with the goals of reaching a wider consumer audience and further driving familiarity with HPWHs. We will continue to review and update HotWaterSolutionsNW.org. This includes optimizing for mobile (given the majority of visitors use a mobile device to access the site), reviewing Google Analytics to further understand and drive site traffic, and updating available program marketing assets.