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Heat Pump Water Heater Benefit/Cost Model Review

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RE: Heat Pump Water Heater Benefit/Cost Model Review

Ecotope has been contracted by the Northwest Energy Efficiency Alliance (NEEA) to review the current Heat Pump Water Heater (HPWH) Benefit/Cost Model. Specific review tasks for the research team were:

Task 1: Review of the methodology used to estimate a specific manufacturer's annual unit shipments to the region and considerations for using this estimation method moving forward.

Task 2: Provide an assessment of NEEA's naturally occurring market baseline logic (developed originally in 2014), given knowledge of how the market has developed. This includes the application of the original baseline logic to advanced tiers of efficiency as well as the new construction market.

This memorandum is organized according to each of the above topics. Heat pump water heater efficiency tiers are defined in NEEA's Advanced Water Heating Specification[1].

Task 1: Estimation of manufacturer annual shipments to the PNW region

Total annual wholesale and retail shipments to the Pacific Northwest (PNW) region have been supplied by manufacturers since 2018. This information provides NEEA with the full market of HPWH products used to assess NEEA's market transformation effort. In the most recent year (2020), these data have not been available from a specific manufacturer, referred to in this memo as manufacturer kappa. NEEA analyst staff have prepared an estimation method to re-construct those market segments based on distributor reporting (to provide a wholesale estimate) and data provided from Energy Trust of Oregon (Energy Trust) and Puget Sound midstream incentive programs (to estimate regional annual retail sales).

Wholesale estimation approach

In addition to manufacturer-provided data, NEEA receives annual distributor reporting on HPWH sales. Historically, while there is some variability by year and by manufacturer, there is

[1] https://neea.org/img/documents/Advanced-Water-Heating-Specification.pdf

overall good agreement between manufacturer shipments and distributor-provided totals. On average, comparing total reports through 2020, distributor data reflects 95% of manufacturer wholesale shipments, with the lowest annual fraction being 83%. The NEEA estimation method for manufacturer kappa's 2020 wholesale market share uses reported distributor data for 2020 inflated by the distributor-reported fraction of manufacturer-provided wholesale shipments in 2019 (the last available year for manufacturer kappa's reported data).

Retail estimate approach

To understand annual retail sales and re-construct that market share for manufacturer kappa's information in 2020, NEEA worked with Energy Trust. Based on Energy Trust-provided incentive program data, NEEA calculated a total sales per year for metropolitan and non-metropolitan retail stores. Retail store locations in Oregon and Washington were geo-coded and classified as metropolitan or non-metropolitan using US Census urban areas definitions. Average annual retail sales were converted to monthly sales and multiplied by the number of metropolitan or non-metropolitan stores, respectively. In addition to Energy Trust incentive program data, a Puget Sound incentive program opened in 2020. In this case, monthly sales are reported directly to NEEA from participating retail stores. To incorporate that information, average sales from reporting stores were tallied monthly, and the number of Puget Sound stores reporting each month removed from the metropolitan store total to prevent double-counting with the Energy Trust-provided data. Summing the estimated monthly retail store sales provided an estimate of Oregon and Washington annual 2020 retail sales.

The table and figure below summarize the estimated regional shipments, with 2020 totals using the proposed estimation methods for manufacturer kappa as outlined above:

Table 1. Estimated total PNW HPWH shipments with percent retail

	Wholesale	Retail	Total	% Retail
2018	9,429	2,264	**11,693**	19.4%
2019	12,327	2,890	**15,217**	19.0%
2020	12,455	4,987	**17,442**	28.6%

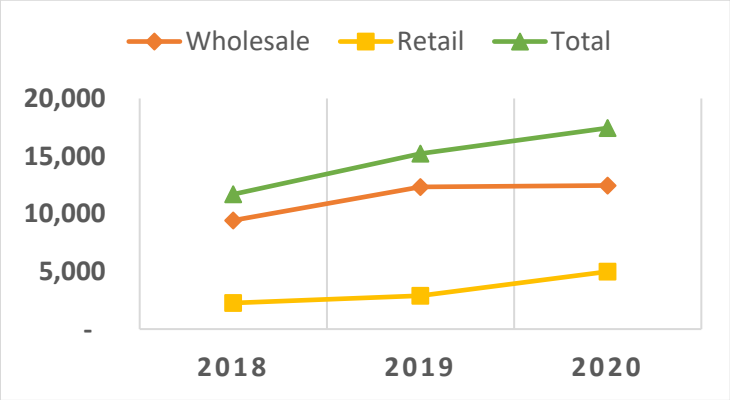

Figure 1. Estimated total PNW HPWH shipments

Estimation considerations

Distributor/Wholesale Estimates

As noted above, distributor-reported information has historically demonstrated a close relationship to the wholesale shipment information provided by manufacturers. There are two topics to consider in using distributor reports to reconstruct regional wholesale estimates moving forward:

1) Currently, NEEA has been able to confirm alignment between distributor- and manufacturer-provided data, demonstrating coverage of the regional distribution channels. Large distributors are relatively stable and stock products from multiple manufacturers, so it is likely that future coverage of distributor channels will continue to provide substantial coverage of regional manufacturer shipments. Nevertheless, given the long-term purposes of this estimation method, the review team recommends that the NEEA analysis team refresh their distributor survey every five to ten years to ensure that their distribution-channel reporting is as robust as possible.

2) At this time, NEEA has a short comparative window with which to assess manufacturer- and distributor-provided data; in most cases, the three most recent years. For manufacturer kappa, there are only two years, with the most recent year representing 83% of manufacturer-provided estimates. As this is the lowest annual fraction, using this most recent year to inflate 2020 (and future) distributor data, may slightly inflate the estimate of PNW shipments by manufacturer kappa. Other brands show distributor data averaging 90-100+%[2] of manufacturer-provided data. While relying on the 83% relationship may

[2] Distributor annual reporting can be slightly higher than manufacturer shipments when products are sold after the year of shipment.

slightly overestimate the wholesale segment for this specific manufacturer, inflation of the overall regional wholesale estimate would be small.

In the absence of better data, NEEA should use the proposed estimation method; however, see the Recommendations section below.

Retail Estimates

NEEA is leveraging incentive program reporting to calculate annual retail sales for manufacturer kappa where self-reported retail shipments to the region are unavailable.

- **IDAHO/MONTANA**

The proposed approach does not attempt to estimate the retail market segment for Idaho or Montana. In the most recently published Market Progress Evaluation Report[3], by-state market share estimates suggest that those states are each less than 1% of the regional total market share. Given the low overall volume of HPWH installations in those states and reduced drivers (e.g., less-stringent energy codes) for increased adoption, excluding retail estimates from these states is not expected to have a meaningful effect on the overall regional market share estimation. However, if there is increased market share in these states in the future, NEEA should develop a similar or alternative estimation method if possible.

- **WASHINGTON/OREGON**

The outlined approach relies on information from Energy Trust and Puget Sound incentive programs. For the first half of 2020, only Energy Trust incentive program data were available until a Puget Sound program opened. This assumes similar retail sales patterns in the two states. By-state retail/distributor fractions for 2018[3]-2019[4] suggest that retail shipments were higher in Oregon (31-37%) than Washington (8-14%). Using only Oregon incentive program information may slightly overestimate the regional retail proportion; however, incentive program information from Washington state has been added to the calculations. The Puget Sound program appears to have had a very strong launch based on comparisons to monthly sales estimates from Energy Trust's metropolitan stores. Within four months, monthly Puget Sound sales (per store) exceeded Energy Trust metropolitan monthly sales averages for manufacturer kappa. Having a strong local incentive program in Washington may increase the retail market share in this state in future years; and using information from both incentive programs reduces the potential risk of relying solely on data from Oregon.

[3] NMR Group. 2019. Northwest Heat Pump Water Heater Initiative Market Progress Evaluation Report #5. Report # E19-394. Prepared for Northwest Energy Efficiency Alliance.

[4] NMR Group. 2021. Northwest Heat Pump Water Heater Initiative Market Progress Evaluation Report #6. Prepared for Northwest Energy Efficiency Alliance.

- **OVERALL INCREASE IN RETAIL ESTIMATE – MARKET SENTIMENT**

The review team noted a substantial increase in the retail portion of the market share in 2020 (Table 1). Given that this increase coincides with a new methodology for estimating that segment of regional shipments, the review team discussed this topic further with NEEA analysts, and this section summarizes some supporting evidence for the methodology and the 2020 retail estimate.

Internally to NEEA, the Products Program noted a shift towards increased retail sales for manufacturer kappa and regional retail shipments estimated through that program roughly agree with the Benefit/Cost model team's analysis using incentive program information. The newly opened Puget Sound incentive program also could have resulted in increased 2020 retail sales. Both factors contribute to a market sentiment that increased retail sales were likely to have occurred in 2020. Additionally, the NEEA analysis team explored 2020 Energy Trustincentive data for other retail chains where both incentive program and manufacturer-reported data were available, and there was good agreement between the incentive program estimation method and the manufacturer-provided retail shipment numbers.

The review team suggested another possibility for cross-checking the methodology – to use historical 2018-2019 Energy Trust data to validate the estimation method against previous years' retail shipments specifically for manufacturer kappa. The NEEA analyst team has requested this information from Energy Trust for review and assuming earlier years also show good agreement, there will be significant support for using this method for 2020 and future estimations.

Recommendations

- Using a static distributor proportion of actual manufacturer wholesale shipments could be problematic if the relationship changes in the future. To ensure robust monitoring of the distributor market share, NEEA could consider refreshing their distributor participants survey intermittently over time, perhaps every two to four years.

- Since the 2019 distributor data share for this specific manufacturer is at the low end of the range (83%), compared to other manufacturers or annual averages across manufacturers, NEEA could rely on an average 2019 proportion across manufacturers (90%) to apply as an inflator. Applying the 90% figure to 2020 distributor reporting would reduce the estimated total wholesale PNW shipments for manufacturer kappa by 5%, but the overall 2020 market estimate by ~3.5%. NEEA should assess the sensitivity impacts of using an average 2019 distributor share (rather than the manufacturer-specific share) to the overall model for 2020 and future years.

- The review team recommends NEEA examine historical Energy Trust data (which has been requested) to determine alignment between the retail estimation method and manufacturer kappa-provided retail shipments for the period when both datasets overlap. Additionally, moving forward, NEEA should continue to cross-reference estimated retail numbers across manufacturers to ensure the retail estimation methodology continues to be supported.

- NEEA may also consider requesting manufacturer kappa review NEEA's annual wholesale and retail estimates for confirmation of annual estimates.

Task 2: Review of market baseline logic

NEEA analyst staff provided the research team with a memo summarizing the development of NEEA's market baseline logic and requested review of the assumptions surrounding subsequent adjustments to the baseline logic, particularly for the treatment of the new construction market, and advanced efficiency equipment. NEEA's market evaluation process relies on the development of a naturally-occurring baseline – essentially, a quantification of the rate of natural adoption over the measure lifetime without NEEA's market transformation influence. With that baseline in mind, NEEA's Net Market Effects savings are calculated as any savings not counted by the baseline or through local programs run by utilities. Figure 2 (excerpted from a NEEA memo[5]) summarizes the approach.

Figure 2. Use of the baseline in calculating net market effects

In preparation for developing a residential HPWH measure, a baseline forecast of HPWH sales through 2042 (created through a panel of experts via a structured technique known as a Delphi panel) was provided to NEEA[6]. NEEA initiated the HPWH market transformation initiative in 2014, along with data collection from various sources aimed at providing reliable market progress indicators over the measure lifetime. Early adjustments were needed within the first few years of market evaluation to account for differences in the initial adoption rate (with the estimated baseline exceeding NEEA's total sales, and fewer large tank sales than anticipated by the baseline market forecast).

More recently, NEEA has added specific measures to the model to account for HPWH installs in new construction separately from existing construction and to add higher efficiency equipment to the savings model. These topics are explored in more detail in the following sections.

[5] NEEA. 2014. Heat Pump Water Heater Baseline memo.

[6] Evergreen Economics. Dec. 6, 2013. NEEA Heat Pump Water Heater Baseline Research. Prepared for the Northwest Energy Efficiency Alliance.

New construction installs

Originally, the baseline estimate was for total HPWH sales parsed by tank size (≤ 55 / > 55-gal) and efficiency tiers (Tier 1 / 2). In 2017, NEEA added specific measures to their model to separately account for new construction and existing replacements – applying the same baseline proportionally to the market size estimated for the new construction installs. This was driven in part by the introduction of a HPWH measure in state energy code (particularly Washington state) in 2012. And by the 2015 Washington code cycle, the required additional energy credits list (Table 406.2) only offered efficient water heating system credits in electric homes for heat pump water heating equipment (with an EF ≥ 2.0) or solar water heating supplementing a standard water heater. Oregon's Resident Specialty Code (2017) also has a high efficiency water heater upgrade which includes a Tier 1 HPWH measure.

In NEEA's savings accounting methodology, savings from each code cycle are accounted for separately from the HPWH savings – where all the incremental savings of each code cycle is accrued for ten years in the New Homes Benefit/Cost model. In the HPWH Benefit/Cost model, efforts are made to 1) de-rate the savings for new homes built to code in Washington and Oregon (where HPWHs are included as a possible pathway to meet state energy code requirements), and 2) remove any savings attributed to above-code homes. These savings methodologies have been reviewed in previous years by this review team. The topic for this year's review focused instead on whether the HPWH options pathways would have developed in regional state energy codes without NEEA's intervention.

Although it's not possible to address the topic with complete certainty, the review team believes NEEA's codes and standards team was instrumental in getting the HPWH measure introduced in the Washington and Oregon code development processes. Without this intervention, the new construction market segment would have had equivalent adoption drivers as replacements in existing homes. NEEA's most recent market progress evaluation report quantifies the increased adoption in new construction over the past several years (and recent code cycles)[7], while the existing homes market share has remained fairly stable.

Although other parties may eventually have moved the energy efficiency codes to include a HPWH measure, NEEA took early action to evolve the residential code for efficient water heating systems. Another contributing factor to having successful energy code measure development was the market development work that NEEA's HPWH program had already done as a part of their market transformation efforts. As a result, the market contained products that would operate efficiently in the region's climate zones and distribution channels ready to serve the new construction market segment. This foundation allowed HPWH equipment efficiency measures to be successfully integrated into energy code compliance pathways in the PNW.

[7] Northwest Heat Pump Water Heater Market Progress Evaluation Report #6. 2022. Report #E22-435. Prepared for Northwest Energy Efficiency Alliance by NMR Group, Inc,

Although the federal standard for larger (> 55-gal) tanks currently require HPWH-level efficiencies, the majority of residential electric storage water heaters (87%) are under that threshold[8] and prescriptive codes (based on federal equipment standards) can only require electric resistance water heaters tanks. Eventually, as HPWHs become the federal standard for all electric storage water heaters, NEEA may consider eliminating the new construction savings methodology at the appropriate Tier level. For example, if federal equipment efficiency standards move to require Tier 2 HPWHs, Tier 3 installations would still provide incremental savings.

Advanced Efficiency Tiers

In 2018, Tier 3 and Tier 4 savings were added to NEEA's Benefit/Cost HPWH model. Each efficiency tier's savings is incremental to the tier below it, with Tier 2 savings being the incremental energy savings above Tier 1, and Tier 3 savings being incremental to savings above Tier 2, etc. Because the baseline was originally limited to Tier 1 / 2, the model is structured so that incremental Tier 3 / 4 savings (less any local programs effects) are attributed to NEEA's net market effects. This structure essentially ascribes the development of higher efficiency equipment (and the associated savings) to NEEA's manufacturer engagement and broader efforts to drive the market towards HPWH adoption (while ensuring equipment could adequately serve residential water heating needs in PNW climates). NEEA requested review of this topic to explore whether manufacturers would have produced higher tier equipment as soon as they did without NEEA's market intervention, and if Tier 3 / 4 equipment savings should be discounted (now or in the future).

To address whether manufacturers would have progressed to Tier 3 (and above) equipment without NEEA's influence, it is helpful to understand other market drivers for efficiency improvements. In the United States, these are mainly the federal energy conservation standards for consumer water heaters,[9] which are commonly the basis for prescriptive building codes and were last updated for electric storage water heaters in 2015 (to an EF of 0.96 for tanks ≤ 55-gallon tanks and > 55-gal tanks requiring HPWH technology). And the ENERGY STAR® program which certifies products that are more energy efficient than standard appliances.

In light of the ENERGY STAR® program's initial specification for residential water heaters which started with Version 1[10] (effective January 2009) and listed equipment efficiency requirements of EF ≥ 2.0 (regardless of tank size), NEEA's Advanced Water Heating Specification (AWHS) and qualified products list (QPL) process was intended to focus on performance and comfort issues not yet addressed by the ENERGY STAR® (ES) program for

[8] Residential Building Stock Assessment II: Single-Family Homes Report 2016-2017. Revised 04/2019. Prepared for Northwest Energy Efficiency Alliance

[9] https://www.federalregister.gov/documents/2020/05/21/2020-10564/energy-conservation-program-energy-conservation-standards-for-consumer-water-heaters

[10] https://www.energystar.gov/sites/default/files/specs//private/WaterHeater_ProgramRequirements.pdf

HPWH operations in cold climates. From the onset (in 2010-2011) NEEA's AWHS used a tiered structure (starting with Tier 1 through Tier 3 equipment[11]) to promote product development and improvement by manufacturers. ES's criteria effectively became a Tier 1 product in NEEA's initial AWHS QPL, and the roadmap for improved equipment efficiency laid out through advanced tiers.

The following milestones are useful to understand the development of NEEA's AWHS in the context of the national ENERGY STAR program:

- NEEA AWHS 4.0, effective November 2011, lists criteria for three efficiency tiers. The corresponding QPL includes Tier 1 and Tier 2 products, indicating the AWHS was laying a clear pathway for future product improvement.
- ES Version 3.0[12] became effective April 16, 2015 and added the distinction that qualified electric water heaters > 55 gallons had increased efficiency requirements of EF ≥ 2.2, still a Tier 1 product.
- In January 2015, several months prior to ES Version 3.0, NEEA added the first Tier 3 products to their QPL. This product had been in development by GE for several years with the goal of reaching Tier 3.
- Between 2015 and present, dozens of products have been added to the AWHS QPL at the Tier 3 and Tier 4 level as the manufacturers have been competing to all be visible in this field.
- The most recent ES Version 4.0[13] became effective January 5, 2022 and outlines increased UEF (≥ 3.3) requirements for integrated HPWHs (regardless of tank size). See Table 2.

[11] Per NEEA's AWHS 4.0, effective November 7, 2011.

[12] https://www.energystar.gov/sites/default/files/specs/ENERGY%20STAR%20Water%20Heaters%20Version%203%200%20Program%20Requirements.pdf

[13] https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Version%204.0%20Water%20Heaters%20Final%20Specification%20and%20Partner%20Commitments_0.pdf

Table 2. Criteria for Certified Electric Water Heaters

Criteria		ENERGY STAR Requirements
Uniform Energy Factor	Integrated HPWH	UEF ≥ 3.30
	Integrated HPWH, 120 Volt / 15 Amp Circuit	UEF ≥ 2.20
	Split-system HPWH	UEF ≥ 2.20
First-Hour Rating		FHR ≥ 45 gallons per hour
Warranty		Warranty ≥ 6 years on sealed system
Safety		UL 174 and UL 1995 or UL 60335-2-40
Lower Compressor Cut-Off Temperature (Reporting Requirement Only)		Report ambient temperature below which the compressor cuts off and electric resistance only operation begins

Just based on efficiency requirements, the newest ES certification requirements would align with NEEA's AWHS Tier 2/3 equipment. (NEEA's Tiers also require additional product features to ensure high efficiency operations in PNW region climates).

Even though national energy efficiency programs like ES are evolving, national federal standards currently set the bar at Tier 1 equipment (for large >55-gallon tanks only). It is useful to note that very few Tier 1 products are on the QPL, most are Tier 3 or higher. This, coupled with the chronology above, suggests that residential HPWH product development (including efficiency and feature improvements) was accelerated almost exclusively by NEEA's AWHS process and supports NEEA's current methodology of savings attribution. Looking forward, the review team suggests periodic review of federal equipment standards to understand when those equipment criteria require higher tier products and/or heat pump technology for all electric storage water heaters, and at that time, a savings discounting approach could be considered at the appropriate tier. DOE has a legal obligation to review appliance standards every six years to determine either a proposed update or a negative determination (i.e., no change). The most recent deadline for residential water heaters was March 2016, but that was missed. An appliance standard rule making is currently underway for consumer water heaters and is likely to be adopted late in 2022 or in 2023. The earliest effective date is likely to be 2026 and more likely be 2028. In any event, NEEA should track this and expect to revise the baseline as early as 2026.

Other Baseline Considerations

The initial baseline forecast was constructed a few years after federal efficiency standards outlined increased efficiencies for large electric storage water heaters. Set to become effective in 2015, this standard required heat pump water heaters for >55-gallon tanks and shaped the Delphi panel's forecast for large tank HPWHs. As mentioned in the introduction to this section of the memo, the initial years of NEEA's initiative found the large tank market segment was well

below the baseline forecast, and adjustments were made to use the small tank baseline market share percentage and apply it to the estimated large tank market size.

Early investigations into this phenomenon (fewer large HPWH installations than anticipated) suggested existing >55-gallon electric resistance water heater (ERWH) stock, small tank substitutions, and potential fuel-switching and/or tankless installations[14] were all potential factors in lowered large HPWH installations. It was anticipated that the stock of large ERWH would be depleted relatively quickly; however, depressed large tank HPWH installations have continued.

There are several other factors that have kept some level of large ERWH products available beyond 2015. Shortly after the National Appliance Energy Conservation Act (NEACA III) was issued in 2010, a waiver process[15] was established to allow limited production of ERWH products specifically to support utility "grid-enabled", electric thermal storage programs when the updated NAECA standards became effective in 2015. The exemptions were intended to be for limited production, closely linked to serve utility program needs, and quantified by the Department of Energy (DOE). The review team understands that no data on the number of units in this program has yet been released to date, so it is difficult to quantify the impact to the PNW HPWH market. However, it is a pathway for large ERWH equipment availability and installations post-2015.

Additionally, DOE has issued several (non-)enforcement policy statements, the first in December 2016, less than a year after the updated efficiency standard became effective. Over the years, the policy has been extended, and the most recent policy statement[16] (published in 2019), extends DOE's enforcement discretion to December 31, 2021. Essentially the policy suspends any potential civil penalties for the distribution of or failure to properly certify certain water heaters not in compliance with applicable energy conservations standards. Meaning, electric storage water heaters that do not meet current federal efficiency standards have been on the market after the federal efficiency requirements should have precluded further production of this equipment. While typical federal enforcement should be resumed as of December 31, 2021, there is likely to

[14] Evergreen Economics. Feb. 22, 2016. HPWH Large Gallon Mini Study Findings Memorandum. Prepared for the Northwest Energy Efficiency Alliance.

[15] https://www1.eere.energy.gov/buildings/appliance_standards/pdfs/water_heater_nopr.pdf

[16] https://www.energy.gov/sites/default/files/2019/07/f64/Enforcement%20Policy-ConsumerWH_Def_102019.pdf

be some existing stock that continues to be available until depleted. The review team found several large tank products listed on manufacturer websites while preparing this memo[17,18].

Although the exact market impact of exemption programs and (non-)enforcement policies on large tank HPWH installations is unknown, what is clear is the potential for continued availability of large-tank ERWH products since the most recent federal equipment efficiency standards took effect in 2015. Fundamentally, homeowners could choose to install a large tank HPWH, but HPWH products were not the only option (despite the federal standard) and the large tank baseline product has effectively continued to be an ERWH. As such, NEEA has a strong case to consider revising the baseline to include all savings above an ERWH (of any size) in their regional savings estimates. Based on DOE's most recent enforcement policy memo, any baseline revision should sunset in 2021. Nevertheless, many of the market workarounds that were evident in 2015-2016 are likely to continue to some extent. Beginning in 2022, NEEA could resume using the small tank market share percentage as the large tank baseline.

Conclusion

The ACE model review team focused on two main research topics as requested by NEEA's HPWH Benefit/Cost Model analysts.

1) The proposed regional shipment estimation methodology for wholesale and retail markets for manufacturer kappa appears sound. Several recommendations are offered for the NEEA analyst team consideration:

    a. Continued monitoring of the distributor pathways and refreshing distributor survey data intermittently over time.

    b. Rather than the 2019 distributor data share for this specific manufacturer, use a 2019 average proportion across manufacturers. This methodology change should only be considered if it offers more conservative savings estimates beyond the allowable ~5% sensitivity impacts to the model.

    c. Continued cross-referencing of estimated retail numbers across manufacturers to ensure the retail estimation methodology continues to be supported into the future. And, if possible, to use historical (pre-2020) Energy Trust data to confirm

[17] This product is listed as discontinued, but the installation manuals include instructions for light commercial products manufactured after April 2015. https://www.htproducts.com/everlast-light-com-documents-dis.html

[18] https://www.hotwater.com/water-heaters/residential/electric/proline/standard/proline-electric-tank-water-heater-pgr-80/

previous years' estimates for manufacturer kappa as a further check on the methodology to be applied towards 2020 retail estimates.

d. Request manufacturer kappa review NEEA's annual wholesale and retail estimates for confirmation.

2) In review of the most recent measures added to NEEA's baseline logic (new construction savings and advanced efficiency tiers), the review team agrees with the current savings accounting approach. NEEA's role in code and product development supports savings attribution into NEEA's net market effects calculations. The review team recommends that NEEA HPWH Benefit/Cost model team monitor federal equipment efficiency requirements and consider savings discount methodologies (at the appropriate tier) at the point when HPWH equipment is federally required for all electric storage water heaters.

   Beyond the recent measures introduced to the HPWH Benefit/Cost model, the review team believes there is a strong case for revising the baseline to account for large-tank ERWH product availability beyond 2015, when the most recent federal equipment efficiency requirements became effective. Essentially > 55-gallon ERWH should have become obsolete after any stockpile (produced before the standard) was depleted. Instead, exemption programs and non-enforcement policies (extending back to 2016) established a channel for continued access to large tank ERWH. Per the most recent policy issuance by DOE, non-enforcement policies are ended as of December 31, 2021. It is likely that the many workarounds observed in 2015-2016 will continue to some extent and the review team recommends applying the baseline adjustment (i.e., use the small tank baseline market share percentage and apply it to the estimated large tank market size) starting in 2022.