

December 9, 2020



Abigail Daken  
U.S. Environmental Protection Agency  
William Jefferson Clinton Building  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460

**RE: ENERGY STAR® Draft 1 Version 4.0 Specification for Water Heaters**

Dear Ms. Daken:

Thank you for allowing the Northwest Energy Efficiency Alliance (NEEA) the opportunity to comment on Draft 1 Version 4.0 of the ENERGY STAR® Residential Water Heater Specification released October 28, 2020.

NEEA is a non-profit organization working to encourage the development and adoption of energy-efficient products and services. The Northwest's utilities, public benefits administrators, state governments, public interest groups, and efficiency industry representatives support NEEA. This unique partnership has helped make the Northwest region a national leader in energy efficiency. NEEA has a strong interest in promoting all aspects of energy efficiency and ancillary services that will promote energy efficiency, grid efficiencies, and energy reliability.

NEEA is currently working with efficiency organizations and manufacturers in collaborative partnerships to improve the efficiency of the water heating market. Efficiency matters, regardless of fuel type. We encourage EPA to consider the following general comments, related to our specification, for inclusion in the ENERGY STAR® Residential Water Heater Specification Version 4.0.

NEEA supports the increased UEF requirement for electric water heaters and for decreasing the First Hour Rating for electric water heaters to  $\geq 45$  gallons, per Table 1: Criteria for Certified Electric Water Heaters from EPA's Draft 1 Version 4.0 of the ENERGY STAR® Residential Water Heater Specification.

With regard to changes for the current draft, NEEA recommends that EPA set the UEF to 3.3 for all tank sizes for 240 Volt products; require a  $\geq 10$ -year warranty on the sealed system; require the reporting of heat pump water heater efficiency for at least one of two additional ambient temperatures (50 °F and 95 °F); require an open-standard communications port for the optional grid-connected criterion CTA-2045; and upgrade the communications protocol of the optional grid-connected criterion from CTA-2045-A to CTA-2045-B.

For future specification revisions, NEEA recommends that EPA consider all available gas water heating technologies and their impacts on savings potential and consumer payback when considering sunseting these product categories; integrate criteria for gas storage water heaters with a UEF  $> 1$ ; and explore setting a "Most Efficient" level for both gas and electric water heaters with higher UEF products.

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The following pages detail NEEA's reasoning behind the above comments.

### 3) A. Certification Criteria: Product Performance Requirements for Electric Water Heaters

- **NEEA recommends EPA establish new electric water heater product categories for both “120 Volt” heat pumps and split or remote systems.**

A “120 Volt” model would be designed to operate with a maximum input of 120 Volts and a maximum current rating of 15 amperes shared circuit.

A split-system or remote-system model would be designed for the evaporator to be located separately from the storage tank and would be functional in outdoor locations in all climates.

Both of these products are new or emerging on the market, similar to the case for the now-standard heat pump water heater designs when EPA first published a specification to include them. Recognizing these categories would encourage further development of these products. These product designs are ready to retrofit lower-efficiency water heater types in situations where other heat pump water heater designs would have more challenging installations and potentially higher costs. Encouraging the advancement of this category would increase the cost competitiveness of higher-efficiency technologies in areas of the market otherwise difficult to serve.

NEEA recommends that ENERGY STAR® consult with the key manufacturers to determine the initial minimum UEF for the 120 Volt systems. We would encourage EPA to monitor the market and, when this category's performance increases as have other heat pump water heater technologies, to raise its ENERGY STAR® specifications accordingly.

For the split systems, NEEA recommends that the initial UEF be 2.5 to encourage more participants in the market and for ENERGY STAR® to monitor their performance.

ENERGY STAR® could address improvements and performance advancements with incremental revisions (“incremental” changes). Ultimately these products would have to be cost effective for the consumer in markets such as California that have higher-UEF products with competing fuel types.

### Criteria for Certified Electric Water Heaters—Uniform Energy Factor

- **NEEA supports the increased UEF requirement for electric water heaters.**

As EPA has noted, the performance of water heaters on the market has increased significantly. A higher standard will allow utility partners to capture greater energy savings.

- **NEEA recommends EPA set the UEF to 3.3 for all tank sizes for 240 Volt products.**

The proposed Draft 1 Version 4.0 standards would have a lower requirement for larger (> 55 gal) tanks; however, larger tanks have an advantage in the DOE UEF test. Reversing the requirements from inherent performance capabilities would send the wrong signal to the market. Additionally, employing a single value for all tank sizes reduces complexity. NEEA supports raising all tank sizes to a UEF of 3.3, with exceptions listed for the 120 Volt and split-system categories described elsewhere.

NEEA has researched and uncovered information that indicates that lower-performing products of > 55 gallons have either been discontinued, become unavailable, or have such a small market share that it makes little sense to have large tanks with a different UEF lower than 3.3. NEEA recommends that we simplify the message and that water heaters all have the same UEF of 3.3 or higher.

An additional benefit for increasing the UEF is that utilities would be able to claim more savings due to the ENERGY STAR® label; they would thus point more to the ENERGY STAR® list, and in turn more utilities would run programs to support HPWHs.

### **Criteria for Certified Electric Water Heaters—First-Hour Rating**

- **NEEA fully supports decreasing the First Hour Rating for electric water heaters to ≥ 45 gallons.**

This change allows for greater market flexibility. Decreasing the FHR requirement by 5 gallons allows more products to enter the market. Further, many households' hot water needs can be met with a 45-gallon FHR; they should be allowed the opportunity to purchase an ENERGY STAR®-labeled water heater.

### **Criteria for Certified Electric Water Heaters—Warranty**

- **NEEA recommends EPA require a ≥ 10-year warranty on the sealed system.**

This requirement would further differentiate heat pump water heaters from electric resistance water heaters. It signals to consumers that the lower initial purchase cost of an electric resistance water heater may be undermined by a shorter lifespan.

Manufacturers are confident in the longevity of heat pump water heaters and demonstrate this with longer warranties for them. Ten years is already standard in the Pacific Northwest; for those referencing the Advanced Water Heating Specification, NEEA's market intelligence indicates that more than 95% of all units shipped, sold, and installed in the Pacific Northwest have 10-year warranties. With NEEA leading the nation in regional sales, having ENERGY STAR® adopt this same criterion would create an easier lift for manufacturers.

NEEA believes that market adoption will increase with the perceived reduction of risk provided by a 10-year warranty. Warranties provide peace of mind and security for both the installer and consumer. In an October 2020 consumer survey<sup>1</sup> among homeowners in 13 utility territories in the US and Canada, each of whom had installed a new water heater within the past two years, 79% cited Warranty as an extremely/very important feature in their water heater choice.

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<sup>1</sup> "North American Residential Consumer Water Heater Market Characterization" Bi-national study conducted by 13 utilities, 1,889 total respondents with more than 300 in the NEEA region.

## Criteria for Certified Electric Water Heaters—Reporting Requirements at Multiple Ambient Temperatures

- **NEEA recommends EPA require the reporting of heat pump water heater efficiency for at least one of two additional ambient temperatures: 50 °F and/or 95 °F.**

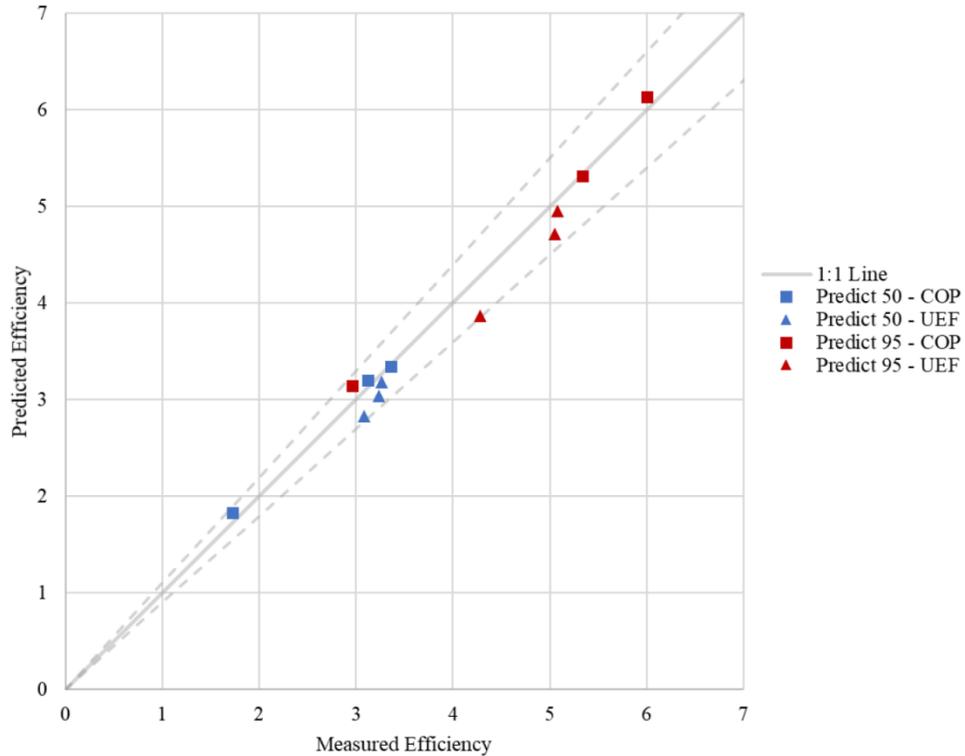
While heat pump water heater efficiency is high under all circumstances, it varies with ambient air conditions. Because heat pump water heaters are sometimes installed in unconditioned spaces (attics, garages, basements, etc.), they can experience a wide range of temperature conditions. Just as the lower compressor cut-off temperature is critical in understanding energy consumption, so is performance in different ambient conditions.

As stated by EPA in its specification, raising UEF requirements *will allow EPA and utility partners to fully account for the energy savings these models achieve*. That goal can be furthered by reporting heat pump water heater performance in different ambient conditions. Utility partners in warmer climates, especially the Carolinas, Georgia, Florida, Alabama, and Mississippi, have high concentrations of electric resistance water heaters in locations that are ideal for heat pump water heater installations; with knowledge of efficiency at these warmer conditions, these utilities would be able to set even higher incentives for their efficiency programs.

We recommend this addition as a reporting requirement only, rather than as a performance requirement. All heaters are tested and report performance at 67.5 °F under the DOE method; NEEA adds an additional requirement to test at 50 °F in the Advanced Water Heater Specification. Several states have approached NEEA to provide performance levels for 95 °F. Previous NEEA lab testing work has shown a nearly linear relationship between energy efficiency (in terms of either UEF or coefficient of performance (COP)) and ambient air and water temperatures.

Figure 1 shows electric HPWHs are significantly more efficient when operating at an ambient air temperature of 95 °F and an inlet water temperature of 70 °F (labeled “Predict 95”) than when operating at an ambient air temperature of 50 °F and an inlet water temperature of 50 °F (labeled “Predict 50”). Figure 1 also illustrates that the measured efficiencies of electric HPWHs are within a 10% error band of predicted energy efficiencies when calculated assuming a linear relationship between air/water temperatures and performance. These results suggest that it is possible to predict the energy efficiency of electric HPWHs across the full range of likely operating conditions based on measured energy efficiency at only two different sets of ambient air and inlet water temperatures.

Last, nearly all products currently having the ENERGY STAR® label are also listed on NEEA’s Advanced Water Heating Specification Qualified Products List, which relies on their tested performance at 50 °F. Therefore, adding a reporting requirement for one of two additional temperatures would not constitute significantly more incremental measurement work than current practice dictates.



**Figure 1. Measured versus predicted efficiency of electric HPWHs.**  
 Source: Larson Energy Research prepared on behalf of NEEA and the CA IOUs.

**4) D. Connected Product Criteria—Optional: Demand Response (DR)**

**4) D. a. Demand Response Communications Protocols**

- **NEEA recommends an open-standard communications port requirement for the optional grid-connected criterion: CTA-2045.**

EPA recognizes the value of an open standard for the communications *protocol*. Preserving that value also necessitates an open standard for the physical communications *port*. “Future-proofing” both the communications ports and protocols against changes in proprietary standards ensures continuity of connectivity; it allows utility partners access to this important grid asset for the full life of the water heater.

We recommend the CTA-2045 communications port for this purpose. Inclusion of this hardware would have minimal impact on heat pump water heater cost, as it consists of only the physical plug, which will cost less than \$1 in hard costs at volume.

The requirement should not preclude a manufacturer from including their own communications ports or pathways.

- **NEEA recommends upgrading the communications protocol of the optional grid-connected criterion from CTA-2045-A to CTA-2045-B.**

CTA-2045-B was recently released and offers approved updates to CTA-2045-A which, in particular, align better with evolving industry practices such as California's Building Energy Efficiency Standards, Draft Joint Appendix 13 on Water Heater Demand Management, or JA13. Key features are the ability to do advanced load-up, status and real-time pricing of energy for variable time of use pricing. Given that AHRI's current work on 1430 will include language from CTA-2045-B and JA13, having alignment would ease the path for manufacturers. NEEA, the Open ADR Alliance, and the Consumer Technology Association (CTA), supported by key large utilities, are developing and providing to smart grid device makers, universal communication module makers, and key labs the test harness, test software, test method, and a path to certification to support CTA-2045-B. Industry should be sufficiently prepared for this new generation of this ANSI/CTA standard.

## **7) Future Specification Revisions**

**7) C. Future Specification Revisions: EPA is monitoring the savings potential and consumer payback offered by ENERGY STAR® gas storage and gas instantaneous water heaters. If more significant energy savings at a lower initial investment do not materialize, EPA will consider sunsetting those product categories.**

- **NEEA recommends EPA consider all available gas water heating technologies and their impacts on savings potential and consumer payback when considering sunsetting these product categories.**

In the past several years, products have emerged for both gas storage and gas tankless equipment that can meet the ENERGY STAR® savings criteria while offering lower initial investment. Currently available ENERGY STAR® gas storage tanks with non-powered dampers and gas tankless equipment capable of operating on 1/2" gas supply lines can avoid significant retrofit installation costs (AO Smith 2020, GTI 2019).<sup>2,3</sup> Achieving the efficiency level for gas storage without the need for an electrical outlet will save on installation costs, as will the ability to install a tankless water heater without a costly gas supply line upgrade. Both technologies, therefore, suggest favorable outcomes for savings potential and consumer payback, thus justifying continuation of product categories for gas water heaters.

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<sup>2</sup> <https://www.aosmithatlowes.com/products/water-heaters/gas-water-heaters/g12-ut5040nvr/>

<sup>3</sup> <https://neea.org/resources/lab-testing-of-tankless-water-heater-systems>

## 7) Future Specification Revisions (Other)

- **NEEA recommends that EPA integrate criteria for gas storage water heaters with a UEF > 1 in future specification revisions.**

Based on NEEA's own collaborative work with industry, utility partners, and energy efficiency organizations, we believe that products meeting this requirement will be available on the market in two to three years and will further address EPA's concerns regarding savings and consumer payback.

Technologies are already under development with compelling cost effectiveness propositions over traditional, baseline gas scenarios (Brio and GTI 2019).<sup>4</sup> For instance, gas heat pump water heaters are not only capable of greater energy savings than older gas technologies; they can be fed by the same gas pipes already installed for those older technologies. Products are expected to increase in efficiency as the technology matures over time, with UEFs increasing to 1.2 and beyond. The upfront savings of using existing infrastructure combined with improved energy efficiency allow this technology to overcome consumer payback barriers.

NEEA includes such criteria in our Advanced Water Heater Specification (Gas) to help prime the market (NEEA 2019).<sup>5</sup> By recognizing this technology, EPA can further encourage manufacturers to accelerate new gas technologies and significant energy savings. As EPA did in 2007 with electric water heating, NEEA recommends an early start to integration of this emerging technology.

- **NEEA encourages EPA to explore setting a “Most Efficient” level for gas and electric water heaters in the future.**

Water heating technology and efficiency continues to improve; having a “Most Efficient” distinction aligns with EPA's goal of “recognizing products that deliver cutting edge energy efficiency along with the latest in technological innovation.”

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<sup>4</sup> [https://www.gti.energy/wp-content/uploads/2020/09/Gas-Heat-Pump-Roadmap-Industry-White-Paper\\_Nov2019.pdf](https://www.gti.energy/wp-content/uploads/2020/09/Gas-Heat-Pump-Roadmap-Industry-White-Paper_Nov2019.pdf)

<sup>5</sup> <https://neea.org/img/documents/Natural-Gas-Advanced-Water-Heating-Specification.pdf>

## Summary

Thank you again for the opportunity to submit comments on this draft specification. To recap, NEEA submits the following feedback for the draft under review:

- Support for the increased UEF requirement for electric water heaters.
- Recommendation that EPA set the UEF to 3.3 for all tank sizes for 240 Volt products.
- Recommendation that EPA establish a new electric water heater product category that includes both “120 Volt” heat pumps and split or remote systems.
- Full support for decreasing the First Hour Rating for electric water heaters to  $\geq 45$  gallons.
- Recommendation that EPA require a  $\geq 10$ -year warranty on the sealed system.
- Recommendation that EPA require the reporting of heat pump water heater efficiency for at least one of two additional ambient temperatures: 50 °F and/or 95 °F.
- Recommendation to require an open-standard communications port for the optional grid-connected criterion: CTA-2045.
- Recommendation to upgrade the communications protocol of the optional grid-connected criterion from CTA-2045-A to CTA-2045-B.

NEEA also submits the following considerations for future specification revisions:

- Recommendation that EPA consider all available gas water heating technologies and their impacts on savings potential and consumer payback when considering sunsetting these product categories.
- Recommendation that EPA integrate criteria for gas storage water heaters with a UEF  $> 1$  in future specification revisions.
- Encouragement for EPA to explore setting a “Most Efficient” level for gas and electric water heaters in the future.

Please contact Geoff Wickes at NEEA (contact information below) with questions about our comments and suggestions.

Sincerely,



### **Geoff Wickes**

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