

April 30<sup>th</sup>, 2014  
Via Electronic Mail



Ms. Abigail Daken  
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Office of Air and Radiation  
Washington, DC 20460

**Re: Energy Star Water Heaters; Proposed v3.0 Draft 1 Product Specification**

The following comments are submitted for the record of the Agency's above-captioned proceeding regarding the **Version 3.0 Draft 1 Product Specification for Energy Star Water Heaters**. They are submitted on behalf of the Northwest Energy Efficiency Alliance (NEEA).

The Northwest Energy Efficiency Alliance is a non-profit organization working to encourage the development and adoption of energy-efficient products and services. NEEA is supported by the region's electric utilities, public benefits administrators, state governments, public interest groups and efficiency industry representatives. This unique partnership has helped make the Northwest region a national leader in energy efficiency.

*Overview*

We recognize and appreciate in this first draft of the Version 3.0 Specification for Energy Star Water Heaters EPA's attempt to provide adequate lead time for stakeholders to adapt to the 2015 changes in the minimum federal efficiency standards for residential water heaters. Unfortunately, DOE is not moving at a similar pace and as EPA clearly states, many of the proposed elements of the specification, including definitions, metrics, and perhaps even the qualifying levels themselves will have to be adjusted in the wake of DOE's publication of the Water Heater Test Procedure Final Rule. For this reason, we won't spend much time commenting on these elements of the specification, but simply acknowledge and support EPA's intent to adjust as necessary to the provisions of the Final Rule. This includes our support for expanding the scope of EPA's specification in order to include the expanded classes of products covered by the test procedure and standards (e.g. light duty commercial water heaters used in residential applications and water heaters with storage capacities between 2 and 20 gallons). NEEA, too, will have to adjust its own Northern Climate test procedures and specifications to conform to the changes decided upon by DOE in its rulemakings.

Most of the proposed specification changes are in response to the 2015 federal standards changes, which is clearly required. However, we also believe that EPA should be seriously considering specification upgrades that will promote long-term product performance and owner satisfaction, especially for heat pump water heaters. We don't see much in the way of such improvements in this draft of the specification.

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In spite of the addition of one new qualification element for electric water heaters – the reporting of the lower limit compressor cut-off temperature – we still have significant concerns with regard to the comprehensiveness and utility of EPA’s specifications for heat pump water heaters. While DOE has proposed some important improvements to the water heater test procedure, some of the most needed changes to the test procedure – appropriate ambient test conditions and test procedures for other than unitary water heating systems – have not been addressed. In addition, there are important features of heat pump water heaters that help to ensure long-term system performance and owner satisfaction with these products that have not been addressed at all.

**All of these important specifications – appropriate test conditions and required product features and characteristics – have been built into NEEA’s Northern Climate Heat Pump Test Procedures and Specifications and NEEA will continue to rely on these procedures and specifications to determine eligibility for regional efficiency and incentive programs. NEEA is also reaching out to other efficiency organizations around the country to encourage them to use the Northern Climate Specifications for their programs.**

Based on our own field work and monitoring in the realm of “connected” appliances, we also have serious concerns about the inclusion of the “Connected Product Criteria” portion of the specifications at a time when there is so little consensus about what the term “connected” *should* mean and why, much less what it *does* mean in practice. By mid-May, we will have a final report on our first field study with heat pump water heaters in a demand response and energy storage role. When it is in final form, we will submit it to EPA for your consideration in the matter of “connected” appliances.

In these comments we will focus only on these areas, *for electric water heaters only*,<sup>1</sup> with the intent of helping EPA make further progress toward a specification that will maximize the benefits of the Energy Star Water Heater label to organizations such as ours that will invest substantial resources in promoting significant improvements in residential electric water heating efficiency. At the same time, we understand the degree to which EPA is tied to DOE’s test procedures and metrics. We hope that EPA will move its specifications as far as possible toward a framework that allows efficiency organizations to actually make use of its specification.

## *Heat Pump Water Heater Specifications, Generally*

In our comments on earlier versions of EPA’s Energy Star Water Heater Specification, we explained in some detail why we strongly believe that the Pacific Northwest’s Northern Climate Heat Pump Water Heater Specification and its associated test methods can provide EPA the means to assure product performance commensurate with their ratings and maximize consumer satisfaction with their Energy Star-rated products. Our extensive experience with all of the heat pump water heaters on the market in North America suggests that many heat pump water heater products will too often fail to deliver their promised energy savings and too often fail to meet consumer expectations in other regards, as well. Part of this failure is due to a test procedure and resulting performance ratings that do not appropriately represent field conditions for a significant number of

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<sup>1</sup> At this time, NEEA is not funded for natural gas energy efficiency work, so we will not comment on the parts of the specification that pertain to natural gas water heating technologies.

installations. The other market failure is due to a lack of product features that reasonably assure the trouble-free operation of the product during its entire expected lifetime, and the inability of a homeowner to know whether or not the water heater is functioning normally. The Northern Climate Specification and testing are designed to address these issues.

The final version of the specification is available here: <https://conduitnw.org/Pages/File.aspx?rid=289>.

While we're pleased that EPA is beginning to understand the importance of the compressor lower limit cut-off temperature, we believe that the current draft of EPA's specification is insufficient to ensure the energy savings promised by product ratings and support the long-term satisfaction of homeowners with their high efficiency water heaters.

### *Product Performance Requirements*

For electric water heaters with storage capacities less than 55 gallons, EPA's proposed efficiency level of EF 2.0 (adjusted as necessary following DOE's Final Rules) is sufficiently stringent to identify heat pump water heaters that will provide significant energy savings for products in this class. We support this part of the specification.

With regard to electric water heaters with storage capacities larger than 55 gallons, we note that pretty much all of such products in the market today have EF ratings that exceed 2.2. If it is EPA's intent to award Energy Star status to *all large electric water heaters* after the new standards take effect, then this specification level is appropriate. However, if it is EPA's intent to award Energy Star status to the most efficient 25 percent of the products in the market (EPA's usual practice), then the stringency of this part of the specification will have to increase. We suggest that EPA make any adjustments to the EF requirement for large electric water heaters after DOE has published its Final Rule for the test procedure and the resulting metrics, and after DOE has done its "crosswalk" of the standards with the old metric to the standards with the new metric.

In any case, NEEA and its partners will not be able to make use of EPA's Energy Factor qualification criteria, as they will not have been derived using a test method that accurately assesses the energy performance of the products in typical applications. We will continue to use the Northern Climate Test Procedure and Specification for product qualification in Pacific Northwest residential water heater programs.

### *"Add-on" Heat Pump Water Heaters*

We believe that the term "add-on heat pump water heater" is inappropriate for describing the function of what should be referred to as a "split system heat pump water heater."

The use of the term "add-on heat pump water heater" had its genesis at a time when a handful of manufacturers made a compressor unit that was designed to be used with a storage tank they did not manufacture. Rather, the products were designed to be used with a more-or-less standard electric resistance storage water heater, of any capacity, with the electric resistance elements providing back-up for the heat pump unit. While there are still such products in the market, the concept of a split system heat pump water heater has evolved since then. NEEA is now supporting field testing, conducted by the Washington State University Extension Energy program and substantially funded by the Bonneville Power Administration, of split system CO<sub>2</sub> heat pump water

heating systems. They are performing extraordinarily well, in fact outperforming all other heat pump water heating products tested to date.

Because there is no federal test method for these products, we acknowledge the difficulty in including them in EPA's current specification. However, we strongly suggest that EPA more appropriately define these products as "split system heat pump water heaters" rather than "add-on heat pump water heaters." It is highly likely that the future test procedure for these systems will be specified for "split systems" rather than "add-on" systems, even though the test procedure would apply to both. It is just as likely that future split systems will be comprised of matched components sold by a single manufacturer as it is that the heat pump units would be sold separately for addition to any storage tank.

**We are disappointed that EPA proposes to exclude these systems from the scope of its specification, but we understand the complexity of the task and the time required to specify an appropriate test method for them. NEEA will focus its future efforts on establishing an appropriate federal test procedure for these systems, no doubt after creating a Northern Climate Test Procedure component for them in the meantime.**

### *Connected Product Criteria*

**Based on our own recent experience with "connected" heat pump water heaters in the field, and on a considerable and growing body of knowledge about the energy consumption of the "connected" function in a variety of appliances, we strongly believe that it is very premature to be including any sort of criteria for "connected" water heaters in EPA's specifications.**

In spite of EPA's best efforts to specify "open standards" in its criteria, it has failed to answer a couple of fundamental questions.

For instance, in Section 4) B. (Communications), EPA fails to communications *with whom or what*. In most of our "connected appliance" work, we have discovered that the motivations behind the provision of such capabilities are most often data collection – proprietary data collection, through a proprietary "cloud" or network. Since the requirements for this data collection can be very different than those required for management of the water heater functions by a utility (or its designated third party) or the homeowner, the communication link may be of limited utility when activated under the limitations imposed by the larger proprietary systems. We have been working with a manufacturer that claimed to offer the kind of functionality described by EPA in its proposed specification (an appropriate communication link/device, remote management of the HPWH functions (operation mode, temperature setpoint) and the ability to conduct demand response and energy storage functions. When actually called upon to exercise these functions, most of these claimed capabilities were so limited as to be largely unreliable.

Part of this unreliability stemmed from the endemic unreliability of household internet connections to the outside world. **So far, it is our opinion that household internet connectivity is so unreliable, particularly in a wireless mode, that it may never be able to meet the communication and functional reliability requirements of utility Demand Response (DR) and Energy Storage (ES) programs.**

We do see some benefit to a HPWH being able to report to the homeowner its status or any failures requiring a service technician. The level of reliability in the performance of this “connected” function is nowhere near as stringent as that required for utility DR and ES programs, and so might very well be useful enough to justify its presence in the product.

Another question EPA fails to address is *how often* a HPWH has to successfully report its status or mode or temperature setting in order to meet this requirement. If a manufacturer’s or third party’s “cloud” manages to successfully query a HPWH unit only sporadically and at a rate of a few times per day, is that sufficient to meet the requirement? We see that level of success in the field, best described as “hit or miss.”

How reliably does a “connected” HPWH have to respond to a load-shedding or energy storage request? Is an 80% successful response sufficient? Fifty percent?

How much extra energy should a “connected” HPWH use in order to provide the “connected” function? Some of the newest “connected” furnaces and air handlers we’re seeing in the field use more than 80 Watts, 24/7, in “connected standby” mode (compared to approximately 12 Watts for the earlier unconnected versions of the same product). At this rate, the annual energy use for the “connected” function (600 kWh) exceeds the annual energy use of the product in providing its primary function – that of heating and cooling the house (420 kWh). Is that something EPA wishes to promote? If EPA cannot document the incremental energy use associated with providing “connectivity” then we believe it has no business promoting this function in any way until such time as such documentation exists. NEEA is just beginning to document the energy use of this function and the early results are alarming, even if one ignores the cloud or server energy use associated with the other end of the “connected” functionality.

**In short, providing any sort of criteria or “credit” for “connected” functionality is way too premature at this time. We strongly suggest that EPA strike this section of the specification until such time as some of the important questions raised here can be answered. As always, we will share all of the data we acquire in our field research, as requested, when it’s available. As mentioned at the beginning of this document, the final report on our first field research project on HPWH DR and ES will be available before the end of May, and we will forward it to EPA for consideration in this process as soon as it is available.**

## *Summary*

**Overall, we strongly believe that for electric water heaters, the proposed EPA specification is insufficient to appropriately specify the most efficient and reliable heat pump water heaters in the market.** For that reason NEEA and its partners will continue to use the Northern Climate Specification and its associated test methods to qualify products for our residential water heating efficiency programs. The market for the most efficient electric water heaters would be best served if the Northern Climate Specification and the Energy Star Specification were optimally aligned, but in the absence of that alignment, the choice to continue with the NEEA specification that has proven itself effective in the marketplace seems obvious.

**In addition, NEEA will not be endorsing any sort of criteria or credit for “connected” functionality *in any product* until our growing concerns with the trajectory of this concept are addressed.**  
Thank you for the opportunity to provide EPA with the benefits of our rapidly growing body of knowledge and experience with these products.



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