May 16, 2022

Submitted electronically via ConsumerWaterHeaters2017STD0019@ee.doe.gov

Re: **Energy Conservation Program: Energy Conservation Standards for Consumer Water Heaters (EERE-2017-BT-STD-0019)**

To Ms. Julia Hegarty:

The National Rural Electric Cooperative Association (NRECA) respectfully submits the following comments to the U.S. Department of Energy (DOE) in response to its request for comment on the preliminary technical support document on Energy Conservation Standards for Consumer Water Heaters ((EERE-2017-BT-STD-0019).

NRECA is the national trade association representing nearly 900 local electric cooperatives and other rural electric utilities. America's electric cooperatives are owned by the people that they serve and comprise a unique sector of the electric industry. From growing regions to remote farming communities, electric cooperatives power 1 in 8 Americans and serve as engines of economic development for 42 million Americans across 56 percent of the nation's landscape.

Electric cooperatives operate at cost and without a profit incentive. NRECA's member cooperatives include 62 generation and transmission (G&T) cooperatives and 831 distribution cooperatives. The G&Ts generate and transmit power to distribution cooperatives that provide it to the end of line co-op consumer-members. Collectively, cooperative G&Ts generate and transmit power to nearly 80 percent of the distribution cooperatives in the nation. The remaining distribution cooperatives receive power directly from other generation sources within the electric utility sector. Both distribution and G&T cooperatives share an obligation to serve their members by providing safe, reliable, and affordable electric service.

We appreciate the opportunity to provide NRECA's perspective to DOE on the preliminary technical support document to inform possible changes to the energy conservation standards for consumer water heaters. We urge DOE to update the analysis in the document ahead of releasing a new proposed standard on consumer water heaters for the following reasons.

Water heaters are important demand response tools for electric cooperatives, who have a vital stake in the outcome of DOE's review of energy conservation standards.

DOE should actively engage with electric cooperatives before advancing any proposal that would limit or change access to these important grid management tools (electric resistance water heaters), to ensure no unintended consequences arise to consumers and the grid. NRECA member systems use electric resistance water heaters for load flexibility, grid stabilization, demand response, keeping consumer rates down, and more.

- Over 250 electric cooperatives in 35 states conduct demand response programs using electric resistance water heaters that are able to lower system peaks, store wind and hydro energy during the night, enhance grid efficiency, and importantly save consumers money.
- NRECA was integral to the creation of the "grid-enabled" water heater class through the Energy Efficiency Improvement Act of 2015 that importantly recognized the value of electric resistance water heaters to demand response programs.
- It is essential that any new energy conservation standard for consumer water heaters does not limit the use of electric water heaters for these programs, especially as the electric grid needs to use water heaters as energy storage devices more than ever.

DOE should amend the analysis in its preliminary technical support document to account for the need for a broad range of options for consumers. DOE should avoid an outcome with a one-size-fits-all approach.

Affordability is critical. Electric cooperatives serve many low- and moderate-income (LMI) communities, including 92% (364 of 395) of the persistent poverty counties in the United States. Cooperatives also serve an average of eight customers per mile of line and collect annual revenue of approximately $19,000 per mile; the other utility sectors average 32 customers and $79,000 in annual revenue per mile. Electric cooperatives are consumer-owned so any new costs imposed on the co-op are ultimately passed on to their consumer-members. Oftentimes these are LMI consumers, who can least afford cost increases. The cost savings enabled through co-op demand response programs with their enrolled consumer-members' water heaters are particularly important to keeping rates down for these low-income consumers.

Heat pump water heaters do not provide the same functionality as electric resistance water heaters. Heat pump water heaters do not currently provide the same functionality as electric resistance water heaters in demand response programs, do not perform as well in certain regions of the country, and have no equivalent available alternative for consumers without access to natural gas in their homes. Overall, heat pump water heaters today cannot effectively support the needs of utility energy storage programs.

- **Demand Response Capabilities**: Heat pump water heater systems, like HVAC systems, are more efficient when run for extended "on" cycles. Practically speaking, compressors and other moving parts of a heat pump water heater are designed with duty cycles consistent with longer run cycles. Attempting to "short cycle" the heat pump water heater circuit to take advantage of variable renewable energy production that often comes in shorter-term duration "events" would result in, at a minimum, dramatic reduction of life for these components and practically would result in loss of reliability due to short cycling of compressors. This precludes the heat pump water heater from being an option for utility peak-shaving, renewable integration and energy storage, and grid balancing programs, in which the water heater is controlled to stop or start operating at different times of the day and sometimes for multiple on/off cycles per day or per hour.
- **Spacing:** Heat pump water heaters utilize ambient heat from the area where they are installed. These units are required to maintain a specific minimum area around the heat pump water heater to function per manufacturer design specifications. As an example, a fifty-gallon heat pump

water heater must typically have a minimum space requirement of approximately 700 square feet or a 9'x9'x8' room. Many homes, especially older housing stock or manufactured homes, do not allow for such a large space to house a water heater, and others would require home retrofits. For many of our members, manufactured housing comprises 25 percent or more of the co-op's residential housing stock.[1] Heat pump water heaters are simply not practical in many of these cases. Many homes simply use a closet or small area in a basement to stage a water heater that do not have the large space the water heater needs to make its thermal transfer effectively. There is also a significant noise issue associated with the heat pump water heaters if the system is located within the living area.

  - DOE's analysis should account for the fact that not all homes have this amount of space available, and this could limit the availability and installation of all-electric options. Field studies from NREL, Fortis BC, and SMUD[2] provide a range of actual costs for installing heat pump water heaters when replacing electric resistance water heaters in spaced constrained areas such as closets where walls, ceilings, and doors must be removed and replaced due to the physical operating requirements of heat pump water heaters—or when adding ductwork in space constrained areas.
  - DOE should update its cost analysis to take these factors into account, and we believe will find that additional categories of electric water heater remain competitive options and should be included as cost-effective options for consumers.

- **Fuel Source:** A large percentage of co-op consumers have no access to natural gas service and have no other alternative option for a product that performs equivalent to electric resistance water heating, and therefore eliminating electric resistance water heating as an option in the market would pose a serious problem for many of the consumer-members served by cooperatives.
- **Effectiveness in Different Climates:** Electric hybrid heat pump water heaters pull ambient heat from the surrounding air and as such, in colder climates, the benefits of using wasted heat are significantly less. Energy savings and costs should be considered region by region, and not averaged nationally, as the impact to individual consumers may vary significantly.

DOE should update its analysis to more accurately represent the costs of retrofits required as part of replacing electric resistance water heaters with heat pump water heaters.

DOE's economic analysis in the preliminary technical support document includes some costs associated with replacing electric resistance water heaters, but omits other costs associated with the installation of heat pump water heaters in closets where walls, ceilings, and doors must be removed and replaced due to the physical operating requirements of heat pump water heaters or adding ductwork in space constrained areas.

[1] For more information, see: https://www.cooperative.com/programs-services/bts/Documents/TechSurveillance/Surveillance-Manufactured-Housing-Efficiency-July-2019.pdf

[2] For more information, see: https://www.nrel.gov/docs/fy16osti/64904.pdf
https://energy350.com/wp-content/uploads/2018/11/CO2-Integrated-Heat-Pump-Water-Heater-Performance-Report-FINAL.pdf
https://www.smud.org/-/media/Documents/Corporate/About-Us/Reports-and-Documents/2018/HPWH-Field-Testing-Report-1-6-2016.ashx

Specifically, in Chapter 8 and Appendix 8C of the technical support document, DOE does not include a cost estimate for replacing electric resistance water heaters in closets where walls, ceilings, and doors are removed and/or replaced along with the installation of new ductwork due to the technical requirements of heat pump water heaters. As a result, DOE's current analysis underestimates installation and labor costs which, if updated, additional categories of electric water heater remain competitive options and should be included as cost-effective options for consumers. DOE should update its analysis to reflect these factors as it moves forward, and with real world information on the costs of such installations. For example:

- A 2016 report from NREL, *Field Performance of Heat Pump Water Heaters in the Northeast*,[3] shows the actual cost to install a heat pump water heater in the Northeast. Table 12 from the report shows the incremental cost to install an 80-gallon or 50-60 gallon heat pump water heater versus an electric resistance water heater ranged from $1,510 to $2,710, respectively.
- A 2018 report from Fortis BC, *CO2 & Integrated Heat Pump Water Heater Performance Report*,[4] found that the incremental installation costs for a heat pump water heater (a Rheem non-ducted unit) in five locations ranged from $1,360 to $1,856 (Canadian) as shown in Table 11 from the report.
- A 2016 report from the Sacramento Municipal Utility District (SMUD), *Sacramento Municipal Utility District Heat Pump Water Heater Field Testing Report*[5] found that the installation cost for heat pump water heaters averaged $1,265 for 38 contractor installations.

Summary

Electric resistance water heaters are important tools to electric cooperatives in their demand response programs which are becomingly increasingly important as the grid takes on more variable renewable generation. It is critical that DOE amend its analysis as outlined above to more accurately reflect some of the real costs and benefits associated with heat pump water heater installations, in different climates and in different housing types. Electric cooperatives are increasingly using heat pump water heaters, particularly in newly constructed homes; however, there are still many useful applications for electric resistance water heaters, including energy savings across the grid, load control and cost savings for the consumer. Right now, we are concerned that the analysis as structured overstates energy savings and thus benefits of heat pump water heaters as compared to electric resistance water heaters, which could result in electric resistance water heaters no longer being available. Such an outcome would impair if not end electric cooperatives' demand response programs. DOE should also take into account the energy impacts that may occur if consumers switch to non-electric water heaters.

[3] See: https://www.nrel.gov/docs/fy16osti/64904.pdf
[4] See: https://energy350.com/wp-content/uploads/2018/11/CO2-Integrated-Heat-Pump-Water-Heater-Performance-Report-FINAL.pdf
[5] See: https://www.smud.org/-/media/Documents/Corporate/About-Us/Reports-and-Documents/2018/HPWH-Field-Testing-Report-1-6-2016.ashx

Thank you for considering our comments. Please contact me at 703-907-5732 if you have any questions regarding these comments.

Sincerely,

Stephanie Crawford

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