September 26, 2023

Submitted electronically via http://www.regulations.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 Notice of Proposed Rulemaking (NOPR) 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 63 generation and transmission (G&T) cooperatives and 832 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.

Overview

NRECA opposes the NOPR as drafted because it will impose a one-size-fits-all option for electric storage water heaters in the most commonly used sizes that will force heat pump water heater (HPWH) installation even in space-constrained homes, which will be prohibitively expensive. Couple this with the higher upfront cost of the HPWH and we expect the NOPR to result in disproportionate harm low- to moderate income (LMI) consumers. NRECA urges DOE to retain electric resistance water heater options for installations where HPWH installation imposes a time-consuming, costly burden to consumers and will ultimately outweigh any energy cost savings. LMI consumers who can least afford them should not be forced to bear extra costs due to DOE's proposed standard. We urge DOE to craft a standard that *encourages* the shift to electric water heaters rather than backsliding to fossil fuel ones as could happen under the current proposal, particularly for consumers accustomed to using common 40-

and 50-gallon water heaters. The availability of contractors in rural areas that will be needed to support HPWH installations at the scale contemplated in the NOPR also remains a significant concern.

In addition, we want to urge DOE's continued retention in this NOPR of the existing efficiency standard in the "grid-enabled" water heater category (> 75-gallon units). These larger, grid-enabled water heaters remain an important load control tool to our members and must be maintained by DOE to give cooperatives as much demand-side management flexibility as possible amidst a changing grid with increasing intermittent renewables, distributed generation, and electrification.

We appreciate the opportunity to provide NRECA's perspective to DOE on this NOPR and urge DOE to make changes to this proposal to avoid the worst outcomes. The pace contemplated by DOE to move almost the entire electric storage water heater market to using heat pump technology in the proposed standard is simply too fast to avoid unintended consequences. Therefore, we urge DOE to make significant changes to the NOPR before finalizing this standard. We are ready with proposed solutions that will lead to more HPWH adoption but at a more reasonable pace that will not leave LMI consumers holding the bag.

Electric cooperatives support investing in energy efficiency and offer programs to support their consumer-members.

Electric cooperatives have a long history of investing in energy efficiency and are committed to finding ways to help their consumer-members save energy, lower their bills, and ultimately improve their lives.

- One of the avenues they utilize is through the U.S. Department of Agriculture's Rural Energy Savings Program (RESP). This program provides loans to electric cooperatives that can then use the funds to make affordable loans to consumers to help them implement cost-effective energy efficiency measures. RESP helps reduce energy bills for consumers in rural communities, reduce obstacles to investing in energy efficiency projects or activities, and support economic development in rural America. This program is a critical tool that helps ensure LMI consumers can invest in energy efficiency measures, which they might not otherwise be able to afford, and save on their energy bills by reducing their energy usage in the process.
- More than 100 electric cooperatives across the U.S. utilize on-bill financing (OBF) programs to support their consumer-members who may wish to purchase energy efficiency upgrades but are unable to pay upfront for these project costs. An OBF program allows the co-op to lend money, sometimes financed through the Rural Utilities Service (RUS) Energy Efficiency and Conservation Loan Program, to pay for efficiency upgrades and then recoup the loan through their monthly electric bills. Most OBF programs focus on home weatherization or heat pumps, but some include rooftop solar. Such programs enable consumers who are least able to afford the energy burden that comes with inefficient housing stock to make improvements that will lower their energy bills or be a part of renewable energy solutions. They make it possible for more people who face high energy usage and electric bills but who would traditionally face obstacles to participation due to lack of money or credit to invest in efficiency upgrades or renewable energy systems. Some OBF programs work around traditional financing barriers for low-income consumers, such as low credit scores, by instead using utility bill payment history for qualification.

We heard from and conducted in-depth interviews with cooperatives across the country, encompassing at least 18 different states and representing all geographic regions of the U.S. Many electric cooperatives offer incentives for HPWH along with several other energy efficiency technologies. The vast majority of electric cooperatives we consulted say their consumer-members are not installing HPWH even with the rebates they offer, and by and large they are seeing somewhere between one and five incentives for HPWH utilized annually. Central Electric Cooperative in Oregon is a notable exception in that it has seen adoption of HPWH increase steadily over time across its members, owing in large part to a generous incentive program funded through energy efficiency fees it has collected as part of a program managed by Bonneville Power Administration (Elzinga 2023). The cooperative provides $1,000 in rebates for the HPWH and pays toward the consumer-members' installation costs. This example is illustrative of the level of financial support and commitment that it will take to support widespread adoption of HPWH.

Electric cooperative consumer-members will be disproportionately impacted by DOE's proposed standard. Affordability in water heating is critical to these consumers.

We want to be clear in our support for the continued adoption of HPWH across the country as an energy-efficient technology that can capably provide millions of Americans with their hot water needs and look forward to continued innovation with this technology. But we want to be equally clear that if this NOPR is finalized as currently written it will cause undue harm to many LMI consumers nationwide.

The main problems are two-fold. First, many will not be able to afford the higher upfront cost of HPWH. DOE's analysis projects significant HPWH cost reductions due to aggressive market transformation over the next five years, before the standard will take effect. We are concerned that DOE's projections are overly optimistic, as our members report seeing price *increases* over the last few years. LMI consumers will be disproportionately impacted if HPWH costs do not decline as quickly as DOE predicts, unless robust and straightforward financial support is in place by the time the standard becomes effective. Second, and likely more difficult to solve, impractical installations in space-constrained homes, including but not limited to manufactured housing which is especially common in rural areas, mean custom, time-intensive solutions with significantly higher costs than straightforward installations for these same LMI consumers. Even if first-cost affordability of HPWH improves – and we hope that it will – those cost improvements will not improve the installation cost challenges facing existing space-constrained homes.

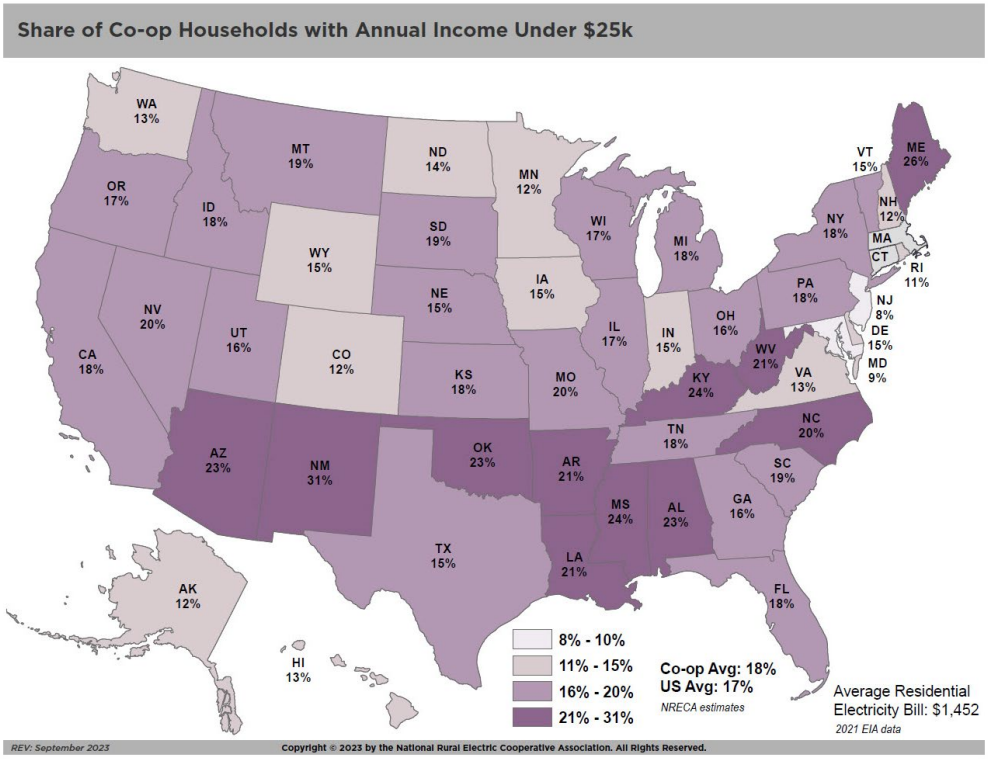
This NOPR seeks to apply a one-size-fits-all solution for the most common water heater sizes that Americans utilize, but we fear such a mandate will backfire with the most dire ramifications for those consumers least able to afford them. We heard repeatedly from our members that this proposed standard will take options off the table for their consumer-members, and that just won't work for everyone.

This issue is of particular importance to NRECA because electric cooperatives serve 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 rest of the industry averages 32 customers and $79,000 in annual revenue per mile.

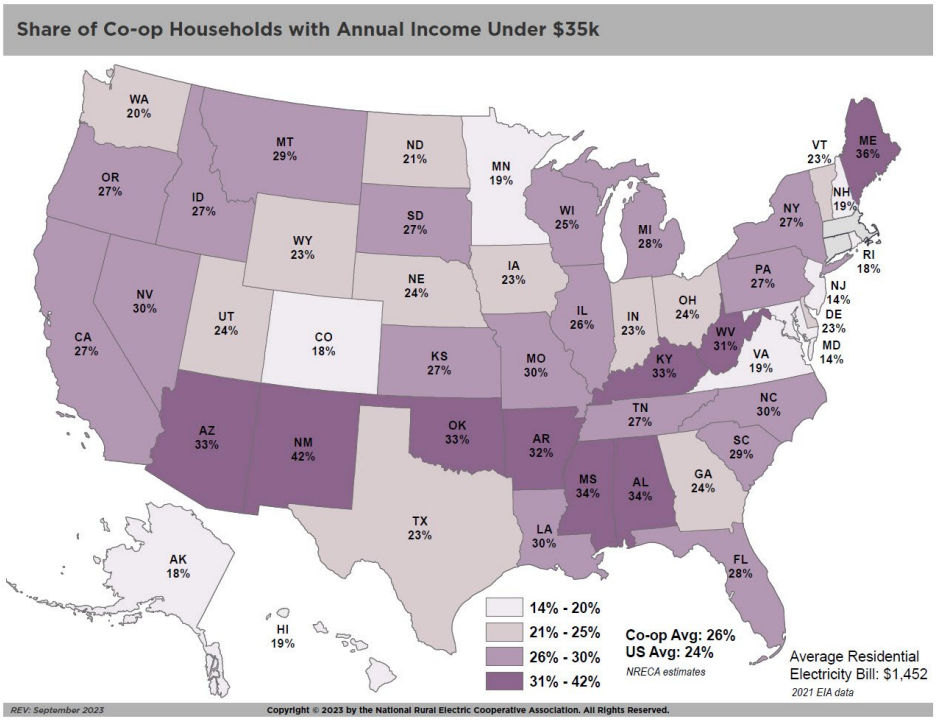
Electric cooperatives are consumer-owned so any new costs imposed on the co-ops are ultimately passed on to their consumer-members. Oftentimes these are LMI consumers, who can least afford cost increases. Electric cooperatives make every effort to look for ways to keep costs down for their consumers and to serve their members with reliable power at an affordable rate to avoid adding burden to their consumer-members, many of whom are already stretched thin on a limited income to pay for their living expenses. By their very nature, electric cooperatives find innovative ways to provide low-cost solutions for their consumer-members and have lean, agile processes for decision-making.

DOE should consider LMI, rather than below-poverty level, consumers in its subgroup analysis to better understand the financial burden of its proposal on disadvantaged communities.

DOE's analysis in the NOPR considers low-income households at and below the poverty level,[1] but we would urge DOE to take a broader look and to account for consumers near but above this threshold (DOE 2023b, Table 11.2.2). As the following maps depict, according to NRECA analysis these households make up a significant share of those served by America's electric cooperatives nationwide and are especially prevalent in many states.



[1] Poverty level is a function of number of occupants in a home. Poverty levels for 2-, 4-, and 6-member households are about $15,000, $24,000, and $33,000 annual income, respectively (DOE 2023b, Table 11.2.2).



Consider a four-person household earning $35,000 per year and the need to install a HPWH. The cost could easily reach $3,500 including installation costs. That would represent 10% of this household's annual income. This is simply too high a burden for consumers,[2] and as a voice for the 42 million Americans that electric cooperatives serve, we urge DOE to reconsider.

Water heating is not a luxury or something that Americans can reasonably decline to replace when their current water heater breaks. Rather it is essential to Americans' way of life and impacts their everyday activities from washing dishes and clothing to their own personal health and hygiene.

DOE should improve its analysis to better estimate impacts to consumers who cannot bear extra financial burden. DOE estimates that low-income consumers at and below the poverty level would realize greater life-cycle cost (LCC) savings than the average U.S. consumer, and a low percentage (10%) would bear net cost (DOE 2023b, Table 11.3.4). NRECA is concerned, however, that this subgroup is too narrowly defined to include low-income homeowners, who are the most likely consumers to be burdened by the cost and effort to replace electric resistance water heaters (ERWH) with HPWH. DOE estimates that about 40% of the low-income subgroup own their homes, and therefore are responsible for replacing their water heaters. However, as noted above, a large portion of NRECA member-served consumers fall either below or just above the poverty line but would still struggle with a water heater replacement that costs 10% or more of their annual income.

[2] According to the American Council for an Energy-Efficient Economy (ACEEE), "Low-income households (those with incomes below 200% of the federal poverty level) spend three times more of their income on energy costs than non-low-income households." See: https://www.aceee.org/press-release/2020/09/report-low-income-households-communities-color-face-high-energy-burden

In addition, consider that electric cooperatives serve a high proportion of manufactured homes and older (often small) housing stock. For many of our members, manufactured housing comprises 25 percent or more of the co-op's residential housing stock.[3] Manufactured housing provides a traditionally more affordable housing option and thus opens the gateway to home ownership for many LMI consumers. These same homes present challenges for HPWH adoption due to space constraints. NRECA's members are very concerned that requiring HPWH for all electric storage water heaters larger than 35 gallons will cause complicated and invasive installations with higher installation and materials costs than estimated in DOE's analysis. DOE should improve its analysis by 1) using LMI instead of poverty-level in the subgroup and 2) assigning proportionally higher occurrences of expensive installations to this subgroup.

HPWH installations in constrained spaces are especially challenging, and will likely require customized solutions, adding to the time and cost.

Manufactured and small homes have limited space for water heaters, which are often placed in water heater closets with very little space around the sides and top of the tank, and in short spaces under stairs, in attics, or in low-clearance basements or crawlspaces. Manufacturers have developed ERWH that fit in these constrained spaces, including short tanks with wide diameters (lowboys), tall tanks with narrow diameters, and tanks for manufactured home water heater closets. HPWH are larger than ERWH of the same tank size and may not fit in the designated space. In addition, due to their small size, these homes experience greater impact from both noise and cold air exhaust than larger homes that have more space to isolate the noise of the water heater and more air volume to buffer cold air exhaust. Constrained spaces may not have enough room for mitigation measures such as supply and exhaust air ducting or noise dampening equipment. Couple this with the reality that manufactured homes oftentimes are equipped with inefficient heating systems and poor insulation, leading to disproportionately high energy bills. Consumers will not welcome any increase in their electricity bills resulting from their heating system needing to work harder because of the HPWH drawing on the warm air as its heat source.

La Plata Electric Association (LPEA), located in Southwest Colorado, explored the feasibility of installing HPWH in constrained spaces (LPEA 2023). They installed HPWH in 20 owner-occupied manufactured homes.[4] LPEA successfully installed all units with some creative solutions including removing water heater closet doors and utilizing extra space outside the closet, and routing exhaust ducts through adjacent rooms (Figure 1). Three homes required return trips to address noise complaints which were mitigated by adding insulation and relocating the exhaust duct at one site, and by scheduling water operation for times when the space was not occupied at the remaining two sites (Kenney 2023). LPEA estimated an average installation time of about 5-7 hours and noted that the installations were customized for each home. Installations were especially challenging for the plumbers, who installed exhaust ducts, a task outside their training and experience. In many cases, the contractor likely would have decided the installation was impossible without LPEA staff guidance and problem solving. LPEA concluded that a majority of manufactured homes are not good candidates for HPWH due to space constraints and complex installations. Difficulties are cost prohibitive in many instances. These

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

[4] Two homes originally chosen for the study were removed after a site inspection determined that sufficient space for the HPWH was not available. These homes were replaced with two alternate homes.

scenarios are better retrofitted through options other than the current offering of HPWH (LPEA 2023).

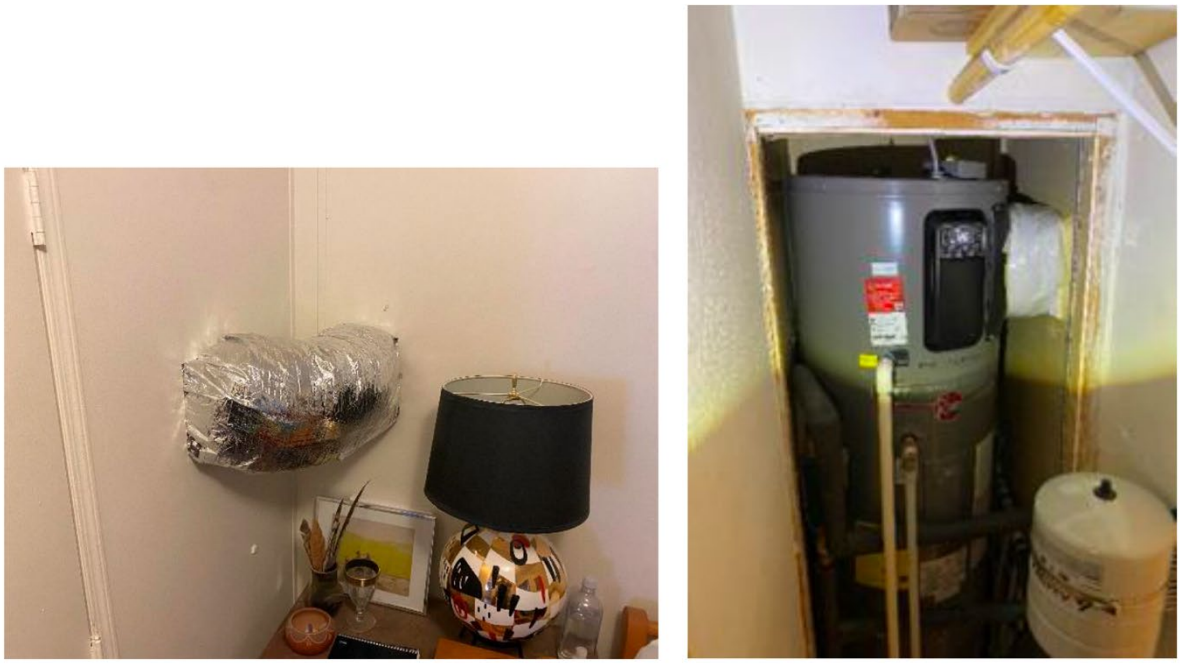


Figure 1: Two examples of space-constrained HPWH installations in manufactured homes. Left: exhaust air duct running from water heater closet, through bedroom, to the outside. Right: door removed from water heater closet with expansion tank located outside of closet. Source: LPEA (2023).

Based on their experience, electric cooperatives are concerned that available HPWH models do not fit in tight spaces.[5] DOE addresses this issue to some extent in the NOPR by creating a "small electric storage water heaters" product category with effective storage volume of 20 to 35 gallons and first-hour ratings less than 51 gallons (DOE 2023a, Section IV.A.1.d.). Although this product class covers some lowboy products, it does not include tank sizes and form factors that electric cooperatives typically observe in space constrained spaces. Small and manufactured homes in NRECA member territories typically use 40- to 50- gallon lowboys, tall tanks, or tanks specifically designed for manufactured home closets. These installations would require heat pump technology under DOE's proposed rule.

NRECA appreciates that DOE considered solutions for installing HPWH in constrained spaces, including moving the water heater, reducing tank size, or using a louvered door or ducting to manage the water heater's air supply and exhaust. However, as LPEA's pilot shows, although HPWH can be installed in some constrained spaces, they are likely not the best option when they cause high installation costs, noise and cold air impacts, and custom, potentially unsightly, installations to simply make the HPWH fit a space that was never designed to accommodate it (Figure 1). There often is no other available space in a small home to relocate the water heater, and reducing tank size can cause negative user experience. Space constrained installations require more options than the HPWH models available

[5] For example, see the "Hybrid Water Heater Installation Guidelines to Provide Optimal Efficiency" for the Rheem Professional Prestige ProTerra Hybrid Electric Heat Pump with LeakGuard Hybrid Electric Water Heater: https://s3.amazonaws.com/WebPartners/ProductDocuments/44399EA7-D027-49B0-AD09-7AC40D39C8ED.pdf

on the market today, and until cost effective heat pump solutions exist, consumers should have the flexibility to choose a water heater that benefits them from a cost and installation perspective.

Although straightforward HPWH installations may cost about $100 more than ERWH installations (HPWH require condensate drains), space-constrained installations impose additional labor and materials costs. In their HPWH pilot in manufactured homes, LPEA found that the average plumber and electrician labor and materials cost was about $2,500 and estimated installations averaged 5-7 hours in length (Kenney 2023). No electric panel upgrades were required, which would have added significant additional expense. Roanoke Electric Cooperative in North Carolina estimates even higher HPWH installation costs of $7,000-$10,000, which includes the price of the water heater as well as weatherization and health and safety measures that they determine are necessary for effective HPWH operation (Davison 2023).

Costs for complex installations are significantly higher than DOE estimates of about $700-$800 for HPWH that would meet the proposed standard (DOE 2023b, Table 8.2.7). Based on DOE's analysis, the average 20- to 55-gallon electric storage water heaters saves the consumer $1,900 over the life of the product at the proposed standard level (DOE 2023b, Table 8.5.7). Therefore, installation costs that exceed about $2,600 on average create cost rather than savings over the life of the product. Because LMI consumers disproportionately face complex installations, they are likely to disproportionately bear costs rather than savings as a result of the proposed rule. We received multiple examples from electric cooperatives illustrating that installation costs are far higher than DOE's estimates. In new construction settings, East Kentucky Power Cooperative was informed by two affordable housing builders in their area that installation of a HPWH would total about $2700 (Littrell 2023). North Carolina's Electric Cooperatives informed us that installed costs for HPWHs this year range from $2,100 to $2,500 including the cost of the tank, installation and removal of the old tank (Youth 2023).

DOE's subgroup analysis estimates that low-income consumers would realize greater life-cycle cost (LCC) savings than the average U.S. consumer, and a lower percentage of low-income consumers would bear net cost than average consumers (DOE 2023b, Table 11.3.4). For 20- to 55-gallon electric storage water heaters (excluding small electric storage water heaters), DOE estimates low-income consumers would save $220 more than the average consumer over the life of the product and 10% of low-income consumers would bear net cost compared to 25% of average consumers (DOE 2023b, Table 11.3.1). For low-income consumers to realize greater LCC savings they would experience lower installed costs or higher operational savings than average. As discussed above, we expect that because low-income consumers tend to live in smaller homes, including manufactured homes, they will on average experience higher than average installation costs. Thus, any LCC savings would be the result of greater operational savings (i.e., higher water use due to higher per-home occupancy rates for low-income consumers compared to average), that will be only be realized after many years of use.

Consumer purchasing decisions are driven by initial cost rather than by operation cost or lifetime savings (e.g. NEEA 2023). Faced with high HPWH equipment and installation costs, electric cooperatives expect that consumers may choose instantaneous electric or fossil fuel storage water heaters instead. Either outcome yields negative impacts. Instantaneous electric water heaters have high power draw (15 kW or more), can add significantly to co-op peak demand charges, and generally cannot be controlled via demand response as hot water would not be available during demand response (DR)

events. Natural gas, propane, and oil water heaters have higher emissions than electric storage water heaters and counter the Biden administration's policy goals for decarbonization.

DOE should avoid unintended consequences that will adversely impact the grid (as well as the administration's policy objectives).

A large percentage of co-op consumers have no access to natural gas service and have no affordable 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. These consumers that could not afford heat pump water heaters or their housing stock does not allow for their installation may be forced to choose electric tankless (or instantaneous) water heaters. These units may provide good comfort to consumers but have negative impacts to utilities by potentially creating spikes in demand of 20 kW instantaneously. Adding to a cooperative's peak demand can significantly raise their costs and add to the electric rates of all their consumer-members who must bear the cost. It is not clear that DOE's analysis accounts for switching from electric storage to instantaneous electric. At least one cooperative told us that most new housing stock in their territory is being equipped with electric tankless units.

For those consumers with access to gas service, many electric cooperatives saw it likely that their members would switch to gas sourced water heaters that would be more affordable and/or feasible for installation in their homes if HPWH are their only electric option. This would run counter to the Biden administration's policy goals for decarbonization.

Contractor availability will be a significant challenge should this standard take effect, particularly in rural areas.

Electric cooperatives have significant concerns about the availability of contractors, both plumbers and electricians, in their service territories to support the nearly exclusive installation of HPWH that would result once DOE's proposed standard takes effect. DOE must consider that some installations will require both a plumber and electrician. There is already a shortage today of these skilled workers. On top of that, electricians in particular will become even more in demand with the multiple electrification initiatives underway for the next several years at both the federal and state levels.

Rural areas will be disproportionately disadvantaged as they have difficulty securing enough plumbers and electricians in many of their areas today. East Kentucky Power Cooperative has experienced issues finding qualified service technicians to service HPWHs. They informed us that an affordable housing organization in their area installing HPWHs had an issue with a HPWH at a home in rural Clay County, Kentucky. The affordable housing association had difficulties finding anyone to service the product. The solution they came up with was to hire a trained technician out of Knoxville, Tennessee (about 2 hours away) who they had to pay drive time and the cost of the service to repair the unit (Littrell 2023). Palmetto Electric Cooperative serves a three-county area in lower South Carolina. While Beaufort County is very populated and has no problem finding qualified contractors, the other two – Jasper and Hampton Counties – are very rural and it is already very difficult to get qualified contractors to travel to these areas (Neville 2023). In Hawaii, Kauai Island Utility Cooperative has seen and heard of the lack of available licensed contractors to install water heaters and heat pumps on the island, and within their

Trade Ally program, saying "The constant complaint of those wanting to install solar water heaters or heat pumps is that they cannot find a contractor that will do the work for them on our island" (Sato 2023).

Electric cooperatives will support training and workforce development where they can, but on their own they do not hold all the keys to workforce development challenges in their areas. DOE, or other federal agencies, will need to put significant financial resources toward training and workforce development – both recruitment and retention – activities. At least one cooperative told us how they see an uptick in HPWH installations in their area immediately following a training they would host for plumbers in their area. DOE must also consider that not all plumbers/electricians are being employed by larger companies that may have the resources to do regular trainings on new technologies; rather, some outfits consist of only one person today. These sole proprietors may not have the resources to take time from jobs to do trainings and thus DOE should consider how to appropriately compensate people for investing in training.

DOE must maintain the grid-enabled category as contained in the NOPR (which is consistent with the existing standard) as an essential grid management tool for electric cooperatives.

Electric cooperatives 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 can 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 (>75 gallon) through the Energy Efficiency Improvement Act of 2015 that importantly recognized the value of electric resistance water heaters to demand response programs.

It is critical that DOE keeps the grid-enabled category as currently stipulated in the NOPR in the final standard, especially as the electric grid needs to use water heaters as energy storage devices more than ever amidst an evolving grid with increased intermittent renewable generation.[6] We heard repeatedly from electric cooperatives that they are actively using these units for load control – some like Great River Energy in Minnesota on an almost daily basis – and they continue to purchase and add new units to their load control programs. The cost savings enabled through cooperative demand response programs with their enrolled consumer-members' water heaters are particularly important to keeping rates down for low-income consumers. We oppose any attempt to change the grid-enabled category and urge DOE to keep the grid-enabled category unchanged from the current standard, as it is currently in the NOPR, in the final standard.

[6] According to DOE: "Because grid-enabled water heaters are statutorily defined as having electric resistance technology (see 42 U.S.C 6295(e)(6)(A)(ii)), heat pump technology is not applicable as a technology option for these water heaters and DOE has tentatively determined that the only technologically feasible means to further improve these products would be to use thicker insulation. However, increased insulation offers diminishing returns for improved UEF, and DOE has tentatively determined that the insulation levels used in some models on the market are the highest that are technologically feasible at this time, and that further increases would not significantly improve UEF. Thus, DOE has not analyzed amended UEF standards for grid-enabled water heaters." See: https://www.regulations.gov/document/EERE-2017-BT-STD-0019-0063

Electric cooperatives will be impacted by necessary changes in water heater demand response programs due to this new standard.

Significant costs to many distribution cooperatives are driven by electric demand charges they face, which must ultimately be passed on to consumer-members. While the cost of renewable energy generation continues to decline, the cost of capacity is greatly increasing due the variability of intermittent renewables. Thus, addressing capacity and keeping peak demand down is critical to cooperatives in managing their costs. Some cooperatives mitigate demand peaks by running DR programs on ERWH (both grid-enabled water heaters and 50-gallon ERWH units). But few of those cooperatives interviewed include or plan to include HPWH due to incompatible load control strategies or reduced benefits.

Incompatible load control strategies. Most electric cooperatives interviewed use load control switches to manage water heater demand. These switches allow co-ops to cut power to water heaters during load control events. Co-ops have found that this strategy is generally incompatible with HPWH, which take a long time to reboot and return to operation after a sudden, unplanned cut in power. HPWH can be controlled with more nuanced strategies, such as CTA-2045, AHRI 1430, or the manufacturer's API, but electric cooperatives are concerned about the time, expense, and security of implementing a new control strategy, particularly for a product that would yield a reduced per-unit demand reduction than the current products.

Reduced benefit. HPWH may be beneficial to grid peaks because they draw lower demand than ERWH. However, cooperatives are concerned that HPWH may not yield enough savings for their DR programs to be cost effective. Studies have shown that HPWH DR potential can be significantly lower than ERWH DR potential. A Florida study measured per-unit DR potential for ERWH from about 0.2 kW in the summer to 0.45 kW in the winter, and for HPWH from 0.15 kW in the summer and 0.35 in the winter (Gurlaskie 2017). A Pacific Northwest study estimated DR potential ranging from 0.4 to 0.5 kW for ERWH and 0.1 to 0.2 kW for HPWH (BPA 2018). In Minnesota, GRE measures about 0.6 kW demand reduction for their interruptible ERWH program (Haase 2023). Demand reduction potential per 1,000 water heaters is summarized in Table 1. Note that in both studies cited, HPWH are not running electric resistance elements during demand peaks.

Depending on climate conditions, controlling HPWH may make financial sense once they are broadly adopted, especially in cold climates where HPWH may be using electric resistance elements during demand peaks. Alternatively, co-ops may find that simply scheduling HPWH to operate during off-peak hours removes enough load from peaks that a directly controlled DR program would not pay off.

Overall, we believe DOE's NOPR will result in less new water heaters being enrolled in these programs in the future given they are not designed for and will require additional investment to include HPWH. Cooperatives will have to invest in new systems to control HPWH if they decide they need to, and other end uses if DR on HPWH no longer makes financial sense. One distribution cooperative in North Carolina informed us how the rate structure from their power supplier incentivizes DR and energy efficiency across the board, so losing that DR capability hurts the cooperative even if HPWH have lower energy demand.

Table 1: DR potential in MW per 1000 waters under load control measured in Florida and the Pacific Northwest.

	Demand Reduction Potential per 1000 Water Heaters Under Load Control (MW)		
Water Heater Type	Florida (Duke Energy)	PNW (BPA)	MN (GRE)
ERWH	0.2 (summer) - 0.45 (winter)	0.4 – 0.5	0.6
HPWH	0.15 (summer) - 0.35 (winter)	0.1 - 0.2	n/a

We remain concerned about the effectiveness of heat pump water heaters in cold climates and the impacts to residents in these regions.

Most cooperatives did not express concern about HPWH effectiveness in their climate, with the exception of a handful that serve members in cold climates. GRE in Minnesota and a distribution cooperative in Colorado both noted that heat pumps may not adequately address hot water needs in their climates (Haase 2023). In cold climates, and particularly during extreme cold events like polar vortexes, HPWH in garages or other unconditioned spaces would operate electric resistive heating elements for a large portion of the day, resulting in high energy use and reducing LCC savings. This limits customer adoption of HPWH in cold regions (Haase 2023). Water heater regulations, like other equipment whose performance depends on climate conditions, may need to adopt different efficiency levels for different climates (Haase 2023).

Other cooperatives such as Agralite Electric Cooperative in Minnesota and Iowa Lakes Electric Cooperative in Iowa expressed concerns related to the energy the HPWH removes from the home if installed in the conditioned space (Messner 2023, Vlasman 2023). Because the HPWH draws its energy from the air in the home, the space heating system must resupply heat taken up by the HPWH. To put these concerns into perspective, consider a home that uses 50 gallons of water a day. Heating 50 gallons of water from 60 ºF to 130 ºF would remove about 16 kBtu of energy from the home's air in one day. If the heat pump runs for 8 hours a day, it increases heating load of the space heating load by 2 kBtu/hr for the 8 hours of operation. For most homes, which may have 3 ton (36 kBtu/hr) or larger heating systems, this impact is small compared to the heating load of the home. However, for smaller homes, with smaller heating systems, a larger percentage of the available space heating potential will be needed to resupply heat used by the HPWH. This may result in occupant discomfort if the heating system cannot address the load of the home plus the HPWH, and, depending on how efficiently the home is heated, may add significant home heating cost.

We are ready with workable solutions that DOE should incorporate into the final standard.

In summary, NRECA members are concerned that LMI consumers will disproportionately experience challenging installations and high initial costs. Although they may realize LCC savings, consumers faced with high installation costs upfront may opt for other options that negatively impact the electric grid or run counter to the administration's policy goals for decarbonization. NRECA members see the

need for a wider range of water heater options for space-constrained installations so that consumers can choose the electric storage option that yields the biggest benefit for their situation.

DOE should incorporate changes to the NOPR that would result in more HPWH adoption but that would address these real-world constraints in a meaningful way. Some options include:

- **Delay implementation of the proposed electric storage standard for 40-gallon model sizes.** Allow more time for the manufacturers to innovate and design a HPWH with this tank size that can fit in many small or manufactured home settings, and thereby eliminate the costliest installation challenges.
- **Maintain electric resistance options for storage tank sizes up to 50 gallons for space-constrained installations.** There are multiple ways to design such an allowance, and we would welcome the opportunity to provide constructive feedback to DOE. One option could entail using a standard ERWH with a smart control and mixing valve in space-constrained spaces until further innovation by manufacturers.
- **Apply the standard to new construction only:** A new home can be designed to accommodate a HPWH, eliminating complex installations, and noise and cold air impacts. The initial cost can be incorporated into the home mortgage, easing financial strain on the consumer. Such a change still sends an important demand signal to manufacturers and gives them certainty for their future investment in product line offerings.

If DOE does finalize this proposal, the federal government must ensure that cost-effective options exist for all LMI consumers by the time the standard becomes effective. This effort should include:

1. **Product development for drop-in replacement unitary HPWH and split HPWH.** Ideally, HPWH would use the same form factor and provide the same amount of hot water as existing ERWH to make replacement as straightforward and cost-effective as possible. A likely solution is the split system, in which the heat pump assembly can be placed outdoors and storage tanks can be produced in typical ERWH tank sizes. Currently, however, split systems have very small market penetration, are more than as twice expensive as, and are more complex to install than unitary HPWH.
2. **Pilot testing of new products** to gain installation experience and measure field performance.
3. **Implementing and expanding contractor training to address the severe shortage of available plumbers and electricians who have training on and experience with HPWH.** NRECA can support its members by facilitating training opportunities to help ensure rural areas have adequate contractors available.
4. **Developing and funding financial structures that reduce the initial cost burden for LMI consumers.** Potential strategies to reduce upfront cost include point-of-sale rebates, midstream incentives, and utility on-bill financing. Strategies should be invisible to the LMI consumer, so that their up-front cost is no greater than for the baseline product, and additional work to claim rebates or incentives is not necessary. The rebates provided through the Inflation Reduction Act will not be sufficient (they are set to expire in 2032, just three years after the standard takes effect) and may not be available to all homeowners if states should reject them, as Florida has

already done. Manufacturer financing programs require high credit scores likely out of reach of LMI consumers.

Thank you for considering our comments. Please contact me at 703-907-5732 if you have any questions about the information provided and we welcome further conversation with DOE about how to make this proposal workable for America's electric cooperatives and the consumer-members they serve.

Sincerely,

Stephanie Crawford

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