April 29, 2013

Ms. Brenda Edwards  
US Department of Energy  
Buildings Technologies Program  
Mail Stop EE-2J  
1000 Independence Ave, SW  
Washington, DC 20585-0121

Re: Energy Conservation Program: Notice of Proposed Rulemaking  
for Energy Conservation Standards for Residential Water Heaters,  

Dear Ms. Edwards:

The undersigned parties (“Petitioners”) appreciate the opportunity to submit comments on the Department of Energy’s (“DOE” or “Department”) Notice of Proposed Rulemaking (“NOPR”) for Energy Conservation Standards for Residential Water Heaters.¹

**NRECA:** The National Rural Electric Cooperative Association (“NRECA”) is the national service organization dedicated to representing the national interests of cooperative electric utilities and the consumers they serve. NRECA is the national service organization for more than 900 not-for-profit rural electric utilities that provide electric energy to over 42 million people in 47 states or 12 percent of electric customers. Kilowatt-hour sales by rural electric cooperatives account for approximately 11 percent of all electric energy sold in the United States. NRECA members generate approximately 50 percent of the electric energy they sell and purchase the remaining 50 percent from non-NRECA members. The vast majority of NRECA members are not-for-profit, consumer-owned cooperatives. NRECA’s members also include approximately 67 generation and transmission (“G&T”) cooperatives, which generate and transmit power to 668 of the 838 distribution cooperatives. The G&Ts are owned by the distribution cooperatives they serve. Remaining distribution cooperatives receive power directly from other generation sources within the electric utility sector. Both distribution and G&T

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cooperatives were formed to provide reliable electric service to their owner-members at the lowest reasonable cost.

**APPA:** The American Public Power Association ("APPA") is the national service organization representing the interests of the more than 2,000, not-for-profit municipal and other state and local community-owned electric utilities that collectively provide electricity to approximately 47 million Americans. These utilities, or "public power" systems, are among the most diverse of the electric utility sectors, representing utilities in small, medium and large communities in 49 states (all but Hawaii). Seventy percent of public power systems are located in cities with populations of 10,000 or less. APPA was created in 1940 as a non-profit, non-partisan organization. Its purpose is to advance the public policy interests of its members and their consumers, and to provide member services to ensure adequate, reliable electricity at a reasonable price with the proper protection of the environment.

**Edison Electric Institute:** The Edison Electric Institute ("EEI") is the association of U.S. shareholder-owned electric companies. EEI’s members serve 95 percent of the ultimate customers in the shareholder-owned segment of the industry, and represent approximately 70 percent of the U.S. electric power industry. EEI also has more than 65 international electric companies as affiliate members, and more than 170 industry suppliers and related organizations as associate members.

**PJM Interconnection:** PJM Interconnection ("PJM"), founded in 1927, ensures the reliability of the high-voltage electric power system serving 60 million people in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM coordinates and directs the operation of the region’s transmission grid, which includes 62,000 miles of transmission lines; administers a competitive wholesale electricity market; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion.

**Steffes Corporation:** Steffes Corporation, located in Dickinson, North Dakota, is a manufacturer of Grid-interactive Electric Thermal Storage ("GETS") products and “Smart” control systems for space and water heaters. For the past 25 years, Steffes has been working with Power Companies helping them implement successful load and energy management
programs, today more commonly referred to as Demand Response programs. These products have proven to provide very effective and affordable distributed energy storage and are tools electric utilities use to serve the critical needs of the electric grid, while providing low-cost space and water heating for consumers. In recent years, primary emphasis has been on using these GETS products to integrate growing amounts of renewable energy onto the grid and for providing grid balancing services.

Executive Summary

As DOE correctly recognized in the NOPR, Demand Response (“DR”) and electric thermal storage (“ETS”) programs (together, “ETS programs”) that use electric storage water heaters (“ESWHs”) with tanks having a storage capacity greater than fifty-five gallons (“large-volume ESWHs”) offer tremendous value to consumers and the electric grid.

The Petitioners are grateful that DOE recognized in the NOPR that action must be taken to mitigate the impacts of the April 2010 final water heater rule on utility ETS programs to help preserve the benefits of ETS programs. While we applaud DOE’s efforts to solve this issue, the waiver process described in the NOPR will not solve the problem as the annual duration of the waivers and the conditions the NOPR imposes on those waivers makes the NOPR simply unworkable. If DOE does not make significant changes to the NOPR, the utility industry may lose the ability to use large ESWHs for load management programs critical for reducing utility and consumer costs, integrating an increasing amount of renewable energy, and providing essential grid balancing services efficiently and with fewer emissions.

The Petitioners recommend that DOE avoid the practical challenges presented by the proposed waiver and instead adopt a separate appliance category for grid-enabled large-volume ESWHs. To the extent that DOE does not believe such a separate category can be created consistent with its legal authority, DOE should adopt a simple waiver for grid-enabled large-volume ESWHs. That waiver should be valid for at least five years – from 2015 to 2020 – and thereafter should be subject to modification or elimination with three years notice. Only a simple, long-term waiver can give the electric utility industry the certainty it needs to continue to invest in DR and ETS and the manufacturing community the certainty it needs to continue to produce the water heaters needed for those successful programs. Petitioners further support the Department’s use of EIA
information, as reported by the industry and described in the NOPR, to monitor the success of the program during the waiver period. Specific proposals as to the contents of the waiver to be included in the Final Rule are set forth below.

For decades, Congress, the Administration, and DOE have consistently expressed their support for ETS programs. The separate appliance category or simple waiver for which Petitioners are applying would demonstrate the Department’s continued commitment to those principles.

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1) **DOE Should Adopt a Separate Classification for Grid-Enabled Large-Volume ESWHs.**

In the NOPR, the Department concluded that ETS programs utilizing large-volume electric resistance water heaters provide significant value to consumers, utilities, and the nation.\(^2\) Moreover, the NOPR concluded that action by the Department is required to\(^3\) mitigate the adverse impacts that the April 2010 final rule efficiency standards would have on those DR programs.\(^4\)

Grid-enabled large-volume ESWHs, which are capable of being used in a DR program “have a capacity or other performance-related feature which other products within such type (or class) do not have and such feature justifies a . . . lower standard from that which applies (or will apply) to other products within such type (or class).”\(^5\) For that reason, the Secretary of Energy (“Secretary”) should establish grid-enabled large-volume ESWHs as a separate class from other large-volume ESWHs with a lower required efficiency factor than those imposed in the 2010 standard. As detailed below, large volume ESWH’s that are “grid-enabled” perform dual functions unlike traditional large volume ESWH’s without such capability. Specifically, as noted herein, the “grid-enabled” feature allows the water heater to perform as an energy storage device which can provide added efficiencies to both the customer and the grid as a whole—efficiencies which cannot be captured by large volume ESWH’s without this capability. As a result, the grid enabling feature, both in terms of hardware and packaging of the product differentiates this product from the large volume ESWH’s which were the subject of the prior rule. Failure to do so would “lessen the utility or performance of these products,”\(^6\) by preventing the manufacture of a class of the products capable of providing demand response services.

a) **DOE Has the Authority to Adopt a Separate Classification.**

Precedent exists for the DOE to create separate product classes in instances such as this one. For example, the Department recently created an energy efficiency standard for “built in” residential refrigerators that was separate from its standard for top-freezer, bottom-freezer, and side-by-side

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\(^2\) *Id.* at 12,974.
\(^3\) *Id.* at 12,970.
\(^4\) *Id.* at 12,972.
residential refrigerators. The mere fact that both the “built in” residential refrigerators performed the same function (i.e. refrigeration) as stand-alone refrigerators did not preclude the Department from finding that a new classification was in order. By the same token, DOE established a separate product class for tabletop waters heaters, with no change to standards because this class of heaters could not be made any larger.

Grid-enabled water heaters are clearly distinguishable from the water heaters currently identified as a covered product. Specifically, the grid-enabled water heater is a dual function product that provides (i) uninterrupted hot water to consumers, and (ii) provides storage for large quantities of energy during times when there is an excess of currently unused, available renewable energy. Such a product utilizes and integrates renewable energy to support grid optimization strategies by utilities and consumers. Both grid interactive water heaters and today’s electric resistance water heaters provide hot water to consumers. However, the additional features of grid interactivity allow it to provide additional efficiencies to both electric consumers in their homes and the grid, which justifies grid interactive water heaters being treated as an entirely separate classification. As discussed in greater detail below, Petitioners believe that grid-enabled large-capacity electric water heaters can be packaged and advertised for sale for use in demand response programs and believe that they could be shipped with integrated controls, interfaces, or altered wiring schemes that make them especially functional for use in demand response programs and clearly distinguishable from the electric resistance water heater manufactured today.

The large-capacity grid-enabled water heater is also particularly distinguishable from the large-capacity water heaters that will be produced solely for water-heating purposes after 2015. As the preamble of the April 2010 standard concedes, that standard will effectively require a heat-pump water heater. In 2010, DOE declined to establish separate classifications for electric resistance and heat-pump water heaters. But that analysis was focused solely on the utility of the two products for heating water. The parties at that time did not raise the issue of utility in demand response programs as a basis for establishing separate categories, nor had the grid interactive technology advanced at the regional transmission organization (RTO) level at that time for utilizing ESWH’s for the provision of ancillary services at the grid level. By contrast, the

\[7 \text{ Id.}\]
Petitioners in this case and as discussed in much greater detail below, have established that large-capacity grid-enabled electric water heaters “have a capacity or other performance-related feature” that heat-pump water heaters lack: the ability to be used effectively in demand response programs.

The physical differences in the product and the different functions those differences enable are certainly analogous to the differences that have justified different classifications for refrigerators, such as the inclusion of a defrost cycle, an in-door ice dispenser, or the ability to build the refrigerator into a cabinet. The hundreds of dollars that consumers can potentially gain in incentives and lower electric bills by participating in the demand response programs provide them good reason to want a different product than that which will be available to them under the April 2010 standard.

Moreover, establishment of a separate category for large-capacity electric resistance water heaters would not be prohibited by the anti-backsliding provisions of the Act, which applies to amended standards. This is not a request for an “amended” standard for a product. Rather, we are requesting a new classification with its own standard. Such a request was plainly anticipated by Subsection 6295(q), which grants the Secretary clear authority to establish a level of energy use or efficiency that is “higher or lower” than that which “applies (or will apply) to other products within such type (or class).” Thus, the Secretary can establish a lower level of efficiency or higher level of energy use for products whether or not there is an existing standard that now applies to other similar products or a future standard that will apply in the future to similar products. A more restrictive reading of Subsection 6295(q) that prohibits a new classification in this case would read the words “higher or lower” and the words “applies (or will apply)” out of the statute in violation of standard cannons of statutory interpretation. Even GE concedes that “[a]dmittedly, what is being proposed does not directly violate this provision because it does not, on its face, propose to amend a standard.”

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b) The Issue of a Separate Classification was Fairly Raised in the Request for Information and NOPR.

In the NOPR, the Department reserved to itself a final decision on whether to proceed with creating a new classification of water heaters in lieu of or as a complement to the waiver process. The Department invited (and received) legal argument on the issue through its Request for Information (‘‘RFI’’) and noted that its conclusion in the NOPR to not proceed on this route was merely ‘‘tentative.’’

As the facts surrounding the attributes of large volume residential water heaters do not differ whether the Department chooses the ‘‘new classification’’ or ‘‘waiver’’ route, the public has had more than fair notice of the potential for the Department to invoke Section 6295(q) and create a new classification in this docket. This is all that is required consistent with due process. Notice is sufficient when the final outcome of a rule is a ‘‘logical outgrowth’’ of the proposed rule, or when parties have submitted comments on an issue, even if a specific issue was not raised in the initial notice. These requirements have been met, as the public was made aware both through the RFI and the ‘‘tentative’’ nature of the Department’s conclusion in the NOPR, and as adoption of the proposed new classification is a logical and foreseeable outcome of this proceeding.

2) In the Alternative, DOE Should Adopt a Simple Waiver for Grid-Enabled Large-Volume Electric Resistance Water Heaters That Promotes DR Programs.

If DOE concludes that it lacks the legal authority to adopt a separate classification for grid-enabled large-capacity electric resistance water heaters, it should adopt a simple waiver for such water heaters that makes it easy for manufacturers to produce the water heaters required for DR programs, makes it easy for consumers to acquire them, and makes it easy for utilities to operate and expand their programs. Now that DOE has agreed with Petitioners and others who commented on the RFI that the DR programs provide significant value to consumers – in the

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9 NOPR, 78 Fed. Reg. at 12980 (‘‘DOE has tentatively concluded that it will not propose to establish a separate product class for ‘‘grid-interactive’’ water heaters. . . ’’).

range of tens of millions of dollars per year\textsuperscript{11} – it would be irrational to adopt a waiver program that discourages manufacturers from producing the necessary water heaters, consumers from buying them, or utilities from building their programs.

\textbf{a) The Waiver Should Be for a Long-Enough Period to Provide Necessary Certainty.}

For that reason, we recommend that DOE provide manufacturers a waiver from the 2010 efficiency standards for those large-capacity electric resistance water heaters that are capable of being used in a DR program. The waiver should cover at least the first five years, from 2015 until 2020. The waiver should be evergreen after that, continuing until DOE concludes that the waiver is no longer serving its purpose and should be modified or eliminated. Such modification or elimination should not take effect until three years after the determination. As indicated below, Petitioners support the use of EIA reporting as a tool for the Department to monitor the penetration of grid interactive water heaters and their use in utility demand response programs.

The longer term of the waiver, the evergreen provisions, and the three-year notice provision are required to provide manufacturers, utilities, and consumers a level of certainty. Manufacturers need to have certainty that they will be permitted to produce their product to justify the business decision to continue to invest in their product lines and their production facilities, hire and train employees, and line up sources for raw materials.

Utilities need certainty that they will be permitted to continue to operate and expand their DR programs to justify the business decision to continue to invest in promoting their DR program to their consumers, continuing to invest in their communications and control devices, continue to train and hire employees to operate their program, and perhaps most importantly, continue to rely on DR programs as a resource rather than investing in other long-lived assets such as generation, transmission, or distribution facilities for which the DR program can substitute. Consumers need certainty that the water heaters they purchase will continue to be supported by the manufacturers.

A minimum three year period of certainty is also critical in certain organized markets, such as PJM. Demand response programs, including those utilizing control of water heaters, may be bid

\textsuperscript{11} \textit{Id.} at 12976 (“After considering the information presented by stakeholders regarding the benefits of ETS programs to consumers, utilities, and the Nation, DOE is persuaded by the information submitted by the utility companies. . . .”).
into the PJM capacity markets. To qualify, the bidder must be able to assure PJM that the resource will be available three years out from the auction year. Without this forward certainty, a demand response provider is unable to qualify a demand response program as a capacity resource in PJM’s capacity market. Without such three year forward commitment, the benefits of a demand response program utilizing ESWH’s will not be fully realized as PJM will be forced to procure generation, including fossil-based generation, since it cannot count on the ESWH demand response program being there three years forward to respond as a capacity resource during emergency conditions. Other RTOs have similar forward capacity markets while utilities subject to state regulation often have even longer timeframes to demonstrate their capacity portfolio to their state regulators.

Congress demonstrated its understanding of the need for significant notice in 42 U.S.C. § 6295(m)(4)(A)(ii), which requires five years of notice before amended standards can apply to water heaters, 2 years longer than the transition period required for many other covered products.12


The waiver should not be subject to artificial limitations or restrictions, such as a limit on the number of water heaters that can qualify, the distribution chains through which they can be distributed, or the control devices that can be used to operate them. Such limitations serve only to discourage the manufacturers and the utilities from the investments, competition, and creativity required to stimulate investments in and improvements in smart grid and DR. Manufacturers are at a key decision point—do they adjust their assembly lines and put investment dollars into manufacture of a “grid interactive” ESWH or not. The terms set forth in the final rule will have a significant impact on that judgment and the commercial viability of such an investment. For these reasons, the waiver should be designed in a manner that promotes innovation and investment, or at the very least, does not interfere with it.

If DOE concludes that the products that qualify for the waiver must be physically differentiable from most existing water heaters on the market today to qualify as “grid-enabled,” there are a

number of different options: control devices; interfaces; and modified wiring schematics that provide utilities easier access to control the water heaters. As discussed below, however, none of them are universally useful to utilities. Any controllers, interfaces, or other technologies integrated with the water heaters must be bypassable to leave utilities the ability to use the controllers or interfaces that are consistent with their systems. Given the heavy emphasis today on ensuring “interoperability,” it would be highly contradictory for DOE to require water heaters to be manufactured in a manner that made them non-interoperable with utility DR systems.

We understand that DOE is concerned about leakage – water heaters produced pursuant to the waiver used simply to provide hot water. We consider it unlikely that there will be much leakage. However, if necessary, we could support the imposition of simple post hoc reporting requirements on the industry, so that DOE can monitor how many water heaters are produced pursuant to the waiver and how many water heaters are being integrated into utility DR programs. Adequate reporting through the use of the EIA forms as proposed by the industry and referenced in the NOPR should give DOE a sense of the number of water heaters in the market that may not be purchased for use in DR programs. If that number is too high, then DOE could take action in 2017 or 2018 to modify or terminate the waiver program effective 2020 or 2021. That would limit the degree to which the waiver could lead to extensive leakage, without denying manufacturers, utilities, or consumers the degree of certainty required to support the utility DR programs.

c) DOE Has Clear Authority to Issue a Waiver.

Although Petitioners continue to believe that a separate classification is a better vehicle to achieve the intended result, use of a simplified and targeted waiver process is consistent with the Secretary’s ability to craft its enforcement program to meet the overall goals of the enabling statute. The Secretary has clearly established policies of promoting ETS, demand response, smart grid, and renewable resources, all of which could be undermined by an aggressive enforcement of the April 2010 standard against grid-enabled large-capacity electric resistance water heaters. In that situation, *SEC v. Chenery*[^13] and its progeny give the Secretary the discretionary authority to craft a waiver to permit him to promote the goals of the Department, the Administration, and

Congress. Similar to principles of prosecutorial discretion, the decision whether to enforce a particular regulatory requirement is generally left to the agency’s discretion and is not reviewable, especially where it involves agency expertise.\textsuperscript{14}

3) **Consistent Federal Policy Makes Clear the Need for a Separate Classification or Simple Waiver.**

As early as 1978, in the Public Utility Regulatory Policies Act ("PURPA"), Congress established as Federal Policy that “[e]ach electric utility shall offer to its electric consumers such load management techniques as the State regulatory authority (or the nonregulated electric utility) has determined will – (A) be practicable and cost effective . . . (B) be reliable, and (C) provide useful energy or capacity management advantages to the electric utility.”\textsuperscript{15}

Congress reaffirmed that policy in 2005, in the Energy Policy Act of 2005.\textsuperscript{16} In Section 1252(d), Congress directed the Secretary to work with states, utilities, other energy providers and advanced metering and communications experts to identify and address barriers to the adoption of DR programs and directed the Secretary to provide Congress with a report that identifies and quantifies the national benefits of DR and makes a recommendation on achieving specific levels of such benefit.\textsuperscript{17} Congress further announced that “[i]t is the policy of the United States to encourage States to coordinate, on a regional basis, State energy policies to provide reliable and affordable demand response services to the public” and directed the Secretary to provide technical assistance to the states in that effort.\textsuperscript{18} Congress went on to announce that “[i]t is the policy of the United States that time-based pricing and other forms of DR . . . shall be encouraged, the deployment of such technology and devices that enable electricity customers to participate in such pricing and DR systems shall be facilitated, and unnecessary barriers to DR participation in energy, capacity, and ancillary service markets shall be eliminated. It is further the policy of the United States that the benefits of such DR that accrue to those not deploying

\textsuperscript{17} Id. at § 1252(d)(codified at 42 U.S.C. § 2642(d)).
\textsuperscript{18} Id. at § 1252(e)(a) (codified at 16 U.S.C. § 2642).
such technology and devices, but who are part of the same regional electricity entity, shall be
recognized.”19

In response to Section 1252, DOE submitted to Congress a report titled Benefits of Demand
Response in Electricity Markets and Recommendations for Achieving Them.20 In that report, the
Secretary enumerated many of the benefits of DR, including participant financial benefits,
market-wide financial benefits, reliability benefits, and market performance benefits. The
Secretary then recommended that DOE encourage DR nationwide through approaches that
included improving incentive-based DR, strengthening DR analysis and valuation, integrating
DR into resource planning, adopting enabling technologies, and enhancing Federal DR actions.21
That report expressly noted that traditional load management programs, including direct load
control of residential water heaters, have “an established track record of providing cost-effective
DR [and] should be maintained or expanded.”22

Congress expressed its support for DR yet again in the Energy Independence and Security Act of
2007.23 In Section 1301, Congress stated:

[i]t is the policy of the United States to support the modernization of the Nation’s
electricity transmission and distribution system to maintain a reliable and secure
electricity infrastructure that can meet future demand growth and to achieve each
of the following, which together characterize a Smart Grid: . . . (4) Development
and incorporation of DR, demand-side resources, and energy-efficiency resources
. . . (6) Integration of “smart” appliances and consumer devices . . . (7)
Deployment and integration of advanced electricity storage and peak-shaving
technologies. . . [and] (10) Identification and lowering of unreasonable or
unnecessary barriers to adoption of smart grid technologies, practices, and
services.24

19 Id. § 1252(f).
20 See U.S. Dep’t of Energy, Benefits of Demand Response in Electricity Markets and Recommendations for
21 Id. at vii-viii.
22 Id. at 55.
24 Id. at § 1301 (codified at 42 U.S.C. § 17381 (2006)).
In Section 529 of EISA, Congress went beyond announcing the policy of the United States and directed the Federal Energy Regulatory Commission (“FERC”) to conduct a national assessment of DR potential; to develop a National Action Plan on Demand Response (“Action Plan”) to promote DR within the States and with consumers; and then with the Secretary, to submit to Congress a proposal to implement the Action Plan.25 Both FERC and the Secretary responded to Congress with an Action Plan and Implementation Proposal.26 In the Implementation Proposal, DOE explained the significant support it has provided to DR in recent years. This included support to DR through grants under the American Recovery and Reinvestment Act;27 facilitation of conversations about DR between state commissioners and others through the New England DR Initiative, the Mid-Atlantic Distributed Resources Initiative, the Midwest DR Initiative, and the Pacific Northwest DR Initiative; through education and information sessions for regulators and state officials through grants to the National Association of Regulatory Utility Commissioners (“NARUC”), the National Conference of State Legislatures, the National Governors Association, the National Association of State Energy Officials, and the Western Governors’ Association; and funding for technical assistance on DR and smart grid issues to approximately individual 30 states.28 The Implementation Plan also expresses DOE’s intention to continue to provide assistance on DR, through direct technical assistance to state commissions, funding for technical papers on DR programs and technologies, and many other avenues.29

In response to Congress and its own understanding of the value of DR, FERC has also made a significant commitment to promoting DR. As noted in the Implementation Proposal, FERC has sponsored the thrice-yearly FERC-NARUC DR Collaborative and Smart Response Collaborative.30 FERC has also issued several significant orders requiring DR to be incorporated

25 Id. § 529.
28 Implementation Proposal at 5 - 6.
29 Id. at 6 - 7.
30 Id. at 6.
into its jurisdictional wholesale markets and establishing the rates for which DR should be paid in those markets.  

The White House has also weighed in on this issue. In 2011, the National Science and Technology Council of the Executive Office of the President issued *A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future* (“Policy Framework”). In that Policy Framework, the Administration stated that “Federal, state, and local officials should strive to reduce the generation costs associated with providing power to consumers or wholesale providers during periods of peak demand and encourage participation in demand management programs.” The Policy Framework explains that:

Demand response has the potential to reduce costs for all ratepayers – not just the participants in a particular demand response program. Notably, tapping demand response resources to reduce the hours that expensive peaking plants operate promises to reduce generation costs to serve peak load. In some circumstances, demand response programs also allow utilities to defer construction of additional electricity generation, transmission, or delivery resources. Savings from these activities can be provided back to ratepayers. Recognizing its tremendous potential to reduce costs and increase reliability, FERC Chairman Jon Wellinghoff has called DR the “killer app” for smart grid technology.  

The Policy Framework specifically promotes traditional direct load control in addition to cutting edge technologies and calls out cooperatives in particular for having “significant penetrations of DR initiatives and load control programs aimed at reducing their exposure to price volatility during peak times.”

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33 *Id.* at 31 (footnotes and citations omitted).
34 *Id.* at 32.
35 *Id.* at 18.
In light of this history, Congress’ policy directives, the Secretary’s own acknowledgement of the importance of DR including direct load control of water heaters, and the Department’s recent statements in the 2012 RFI, we can only assume that had DOE staff and the Secretary understood the full, practical implications of the 2010 standard for DR at the time it was drafted, that standard would have looked different. Unfortunately, DOE staff and the Secretary did not have that information it garnered from the RFI at the time it drafted the 2010 standard.

Had DOE had that information, we presume DOE would have adopted a different efficiency factor for large capacity water heaters or would have established a different classification pursuant to 42 U.S.C. § 6295(o)(2)(A) for large capacity electric water heaters capable of being used in DR programs. Given DOE’s long history of support for DR programs and the clear direction from Congress, DOE would not have knowingly adopted an efficiency standard that undermined DR programs, states and utilities established in response to PURPA, EPAct, and EISA to bring consumers and the grid the extensive benefits that the Secretary described in his 2006 Benefits Report to Congress and acknowledged in the NOPR.

4) Because Utility ETS Programs Using ESWHs Provide Enormous Value, the Secretary Should Use His Discretionary Authority to Establish a Separate Category for Grid-Enabled ESWHs or to Provide Manufacturers of Those Water Heaters a Simple and Workable Waiver.

DOE explains in its NOPR that of the 127 comments it received in response to its Request for Information, 120 recommended that DOE take action to protect utility ETS programs from potential harm caused by the April 2010 standard, while only two opposed such action. The commenters offered substantial evidence of the large benefits that utility ETS programs offer to consumers and the grid, including: peak load reductions of approximately 145 MW; an annual cost savings to utilities of approximately $60 million; cost savings to consumers through discounted energy rates and financial incentives; consumer education; energy conservation; reductions in the need for new infrastructure investments; improved reliability; improved utilization of the generation and transmission system; and increased ability to integrate renewable resources into the system.

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36 NOPR, 78 Fed. Reg. at 12,972, 12,973.
On the basis of that evidence, DOE was quite justified in concluding “that the evidence presented indicates that these programs provide a number of valuable benefits to consumers, utilities and the Nation.”37 In fact, however, the specific peak load reductions and cost savings to utilities and consumers from utility ETS programs far exceed the figures cited by the NOPR.

a) Utility ETS Programs Using Electric Water Heaters Have Reached a High Penetration Level and Are Growing.

According to the 2012 FERC report Assessment of Demand Response and Advanced Metering, potential peak reduction associated with residential customers grew by thirteen percent, from 7,189 MWs in 2010 to 8,134 MWs in 2012. Of this, 6,940 MWs are attributable to direct load control programs. Approximately 5.8 million customers were enrolled in direct load control programs across the nation, including every North American Electric Reliability Corporation (“NERC”) region. The report also found that the potential DR resource contribution from all U.S. DR programs is estimated to be nearly 72,000 MW, or about 9.2 percent of U.S. peak demand.38 A data set of DR survey results accompanying the FERC report further indicates that electric resistance water heater programs are an integral part of the national DR strategy. Water heater programs were identified in thirty-five of fifty states and were conducted by investor-owned utilities, cooperatively owned utilities, and municipally owned utilities.39 As the FERC report did not specifically quantify the concentration of water heater programs within the category of “direct load control” programs, the electric utilities have undertaken their own surveys to supplement the FERC report findings on the overwhelming penetration of direct load control programs throughout the country.

To provide more detailed information while still ensuring a national sample, NRECA issued a DR survey in early 2012 to its members. The NRECA survey revealed that thirty percent of respondents currently offer their customers a water heater direct load control program as part of their overall direct load control program. Another ten percent are actively considering implementing a water heater program. Furthermore, cooperatives with direct load control programs are experiencing, on average, a four percent annual participation growth rate in large-

37 Id. at 12,976.
volume electric water heaters used in their programs, indicating that such water heaters are expected to continue to be a significant part of their ongoing direct load control programs. The survey also provided water heater load control capacity amounts from 109 cooperative survey respondents. The estimated peak load reduction capability from water heaters for those utility systems is more than 500 MWs during both summer and winter months.\(^{40}\) For many systems, large-volume water heaters comprise a significant portion of the controlled units.

An APPA survey of its membership across 49 states discovered that 44.5% of respondents currently offer their customers a water heater direct load control program as part of their overall direct load control program. Based on this survey, it was also found that the average water heater load control program had a summer reduction of 4.9% of load while in winter the average reduction was 4.4% of load.

EEI reviewed member company websites and found that at least 14 investor-owned utility companies operating in at least twelve states operate DR programs for residential electric resistance water heaters. It is likely that with the increase in households with “smart meters” over the next several years as a result of the “smart grid,” the number of utilities that offer such programs for “smart” water heaters will increase.\(^{41}\)

\section*{b) Utility ETS Programs Using Water Heaters Offer Significant Economic Benefits to Consumers.}

While these surveys do not permit an exact quantification of the peak megawatt (“MW”) of water heater load that utilities can control, it is clear that the number is at least five times the 145 MWs cited by DOE, and that the consumer savings probably exceed the $60 million in annual savings estimated by DOE by at least the same multiplier.\(^{42}\) That suggests that current utility load control systems are saving consumers over $300 million per year today, and will save consumers considerably more in the future as those programs grow. Over the 30 years over which DOE has

\begin{footnotes}
\item[40] That 500 MW of water heaters, controlled by electric cooperatives alone, permits cooperatives to avoid building at least two gas peaking plants.
\item[41] Congress embraced development of the Smart Grid as part of national policy in EISA at § 1301.
\item[42] Sixty-seven survey respondents were able to provide figures on the savings that they obtain from their water-heater control programs. Those 67 systems averaged $484,196 in annual savings. If that average holds out for the 233 systems that said they had water heater control programs, that would represent $113 million in annual savings for just the cooperative segment of the industry, which represents only 12% of the industry as a whole.
\end{footnotes}
evaluated the value of its efficiency standards, these programs would save consumers between $745 million at the low end ($60 million/year for 30 years discounted at 7%) and $3.723 billion ($300 million/year for 30 years discounted at 7%). These numbers don’t reflect the 4% annual growth that the programs are experiencing, or the additional utilities that are looking to develop water heater load control programs. As conservative as they are, those numbers compare favorably or vastly exceed the $1.07 billion in net present value of consumer benefits that DOE calculated for adopting a TSL 5 standard in the April 2010 standard.\(^{43}\)

As detailed in PJM’s Supplemental Comments, PJM has been utilizing grid interactive water heaters as fast responding resources that can be utilized to ensure that the grid maintains regulation services within the reliability limits established by the NERC and the FERC. A large-capacity electric resistance water heater such as those that PJM has tested and verified with the Steffes Corporation can provide 2.5 kilowatts of fast-response Regulation. Given this capability, each water heater represents $967.76 of savings per year to the PJM Regulation Market and to the ratepayers who ultimately pay for this service.\(^{44}\)

The direct and indirect economic benefits to consumers from the use of grid-interactive large-volume ESWHs can be segmented into at least three distinct areas. All three rely on consumers’ ready access to affordable large-capacity electric-resistance water heaters that can simultaneously meet their needs for hot water and utilities’ operational requirements.


Electric water heater direct load control programs aimed at peak shaving provide significant benefits to individual consumers as well as the greater community dependent on reliable, low-cost supply of electricity.

\(^{43}\) Final Rule, 75 Fed. Reg. at 20197.
\(^{44}\) ($387,104/MW)(1 MW/1,000 kW)(2.5 kW of Regulation / water heater) = $967.76 per water heater (savings).
ii) Utility ETS Programs Using Electric Water Heaters Enable Increased Integration of Wind Generation.

Grid-interactive electric water heaters are available to serve as energy storage devices providing a market for consumption of wind generation in off-peak hours, which can then be made available to customers upon demand in the form of stored hot water during on-peak hours. In these programs, utilities provide incentives to customers to install water heaters with a grid-interactive device that provides the communication and control to ensure that they heat water only during off-peak periods. Since low-cost wind energy generation is typically available at night (sometimes in excess and at negative prices), this strategy is ideal for lowering the overall energy costs of a utility, thereby applying downward pressure on electric rates for the consumer. Moreover, this strategy can assure customers who “buy green” electricity that they are taking affirmative steps to shift their consumption to enable the use and development of such renewable resources.

It also significantly reduces the number, duration, and extent of curtailment periods when the output of wind generators must be reduced to preserve reliability on the system during high-wind/low-load periods. The numbers of such hours have been increasing significantly in the United States as wind-penetration levels increase. In 2012, wind farms in the Midwest Independent System Operator’s balancing area were curtailed for a combined total of over 5,400 hours. In 2010 in Texas, 16% of the wind generation was curtailed because of insufficient load and/or congestion. The expansion of ETS programs offers a constructive response.

With the advent of hourly energy markets and the accessibility to real-time market price information in nearly every region of the United States, advanced storage strategies based on wholesale Locational Marginal Price (“LMP”) have been implemented. When utilities control the water heater so that it is allowed to charge only when the LMP is low, the water heater will operate at a lower cost than if the unit is operated without regard to the time of day or price signals. Through grid-interaction, a decision can be made by the utility to charge the unit if the price falls below certain levels and prohibit the charging of the unit if the price exceeds certain levels. A large-volume ERWH with integrated controls effectively enables this strategy. With sufficient storage capacity and fast enough heating capability, the charge level can be determined
such that it avoids the problem of running out of hot water as a result of the control strategy and does not inconvenience the consumer.

For example, Electric Power Research Institute (“EPRI”) recently compared wholesale energy cost savings and ancillary services revenue of a large-volume ERWH controlled based on LMP, controlled for the ancillary service “Regulation”, versus an uncontrolled unit. Lab results in the table below indicate significant cost savings from advanced water heater control strategies over non-controlled devices.45 EPRI found that operating a large-volume water heater based on wholesale price information yielded a 21.5% energy cost savings when compared to the same uncontrolled water heater. When a water heater was controlled based on price information and to provide frequency regulation services, the water heater cost fifty-five percent less to operate than the uncontrolled unit. Moreover, as noted in section 7 below, the heat pump water heater is simply not able to provide this same level of responsiveness to meet consumer hot water needs.

<table>
<thead>
<tr>
<th>Type of Water Heater</th>
<th>Energy Cost ($/Year)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Uncontrolled</td>
</tr>
<tr>
<td>Regular Water Heater (Uncontrolled)*</td>
<td>$111.40</td>
</tr>
<tr>
<td>Smart Electric Water Heater</td>
<td>$78.50 (21.50% reduction)</td>
</tr>
</tbody>
</table>

*The cost of operation of regular water heater varies with the different strategies due to which days were used in calculations and which sources of wholesale pricing data were used (MISO/PJM). Please refer to EPRI report No. 1021965, referenced above, for specific calculations.

As increasing amounts of intermittent renewable energy generation have come online (primarily wind and solar), the need for renewable storage becomes more and more prominent. According to the American Wind Energy Association, the U.S. wind energy industry had its strongest year ever in 2012, installing a record 13,124 MWs. A record-breaking 8,380 MWs were installed during the fourth quarter alone. During 2012, utility-scale turbines were installed in 26 states and

Puerto Rico. There are now 60,007 MWs across 39 states plus Puerto Rico. According to the Solar Energy Industry Alliance, photovoltaic (“PV”) installations grew seventy-six percent over 2011, to total 3,313 MWs in 2012, with an estimated market value of $11.5 billion. Each market segment (residential, non-residential, and utility) showed growth over 2011, while the overall markets in most states expanded as well. Installed prices for PV systems fell twenty-seven percent during 2012 and at least thirteen percent in each market segment. Nearly 83,000 homes installed solar PV, and cumulative PV installations in the United States surpassed 300,000.

By necessity, the electric utility industry is experimenting with MW-scale battery and flywheel technologies that promise performance and flexibility, while carrying the added burdens of cost and complexity. The nation needs an “all of the above” storage technology development strategy and ETS is the “low hanging fruit.” Operating as a “thermal battery,” it is the only cost-effective, widely deployable distributed storage option currently available. In addition, providing excess, low-cost or no-cost renewable energy to an electric water heater as part of an ETS strategy can significantly reduce the carbon footprint of the appliance.


A third control strategy being piloted in select areas around the country involves the utilization of large-volume electric resistance storage water heaters as a tool for regulating frequency and otherwise ensuring the reliability of the grid through cycling of the water heater in response to short-term grid signals. This effective use of water heaters is being demonstrated in PJM and in other markets. The quick response features of being able to cycle certain appliances such as electric water heaters without adversely impacting the customer’s hot water needs is being seen as increasingly critical to cost-effectively maintaining grid reliability while at the same time

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48 Although still in the pilot stage, the use of grid controlled water heaters to provide ancillary services is cumulative to the existing benefits that already exist and are being realized through the programs deployed around the nation. As a result, this emerging technology is presented as illustrative of market and technology developments that could be deployed near term. On the other hand, if manufacture of the large tank water heater is outlawed, then the promise of this emerging resource to provide grid-critical ancillary services such as regulation service will be lost.
accommodating renewable integration and reducing dependence on fossil fuels. It is widely accepted that the need for short-term balancing resources (second-by-second or minute-by-minute) increases with wind energy penetration levels.\(^4^9\) New technologies (flywheels and advanced batteries) and new control strategies for common technologies (water heaters, pumps, motors) have proven capable, and in some cases superior, in providing this fast-response balancing service when compared to most traditional generation. The FERC recently recognized the value of these fast-response devices in its Order 755, which mandates ISOs and RTOs to implement a “pay-for-performance” mechanism in their frequency regulation markets. In Order 755, FERC stated: “the use of faster-ramping resources for frequency regulation has the potential to improve operational and economic efficiency and, in turn, lower costs to consumers in the organized markets.”\(^5^0\) This FERC mandate creates a new market opportunity for fast-response, highly controllable loads such as electric resistance water heaters.

Two of the nation’s largest electric grid operators, PJM and Bonneville Power Administration (“BPA”), are actively involved in testing the ability of grid-interactive water heaters to provide frequency regulation and controllable ramping ability during periods of excess renewable energy generation, respectively.\(^5^1\) In the case of PJM, nearly two years of operational experience using water heaters located in their office buildings to “charge” during periods of low-cost wholesale power while simultaneously providing frequency regulation in response to a four-second control signal has yielded extremely positive results. The water heaters have been able to choose to heat water during the hours of lowest wholesale prices based on the day-ahead schedule. As a result, they are able to respond as fast and as accurately, if not more so, than many other advanced storage technologies coming to market today, all while providing continuous hot water to the customer with no interruption.


As part of a series of smart grid demonstration pilots, BPA and five partner utilities across the Pacific Northwest have deployed hundreds of grid-interactive water heaters in residences (some new, some retrofitted with controls) to test the aggregated bulk energy storage and balancing capabilities of large-volume devices. Today, BPA faces difficult wind integration scenarios in which they need resources to store energy quickly in response to wind energy ramping events, or face having to curtail wind generators or take other emergency operating procedures. Wind generation in BPA has been installed at a rapid pace and the balancing authority can now foresee a future where the current installed wind capacity of 4,750 MW increases to a level close to its peak load, making flexible operating conditions and resources that much more important. These pilots are running for two years and were started in September 2010. The data, results, benefits, and next steps that result from these pilots will continue to inform the industry of the value proposition of these advanced grid-interactive features of large-volume water heaters.


The consistent statements in support of DR made by Congress, DOE, FERC, and the White House, all point to the need for the Department to promptly remedy the phase out of all large volume electric thermal water heaters by April 15, 2015. Moreover, given the fact that manufacturers and vendors, as well as utilities, need sufficient lead time to plan their future products and services, timely action is needed now to ensure that the phase out does not become “self-fulfilling prophesy” merely by the passage of time.

Unfortunately, as written, the proposed waiver process set forth in the NOPR would frustrate the intended goal and effectively codify the existing uncertainty as to the future viability of grid interactive water heaters. The short tenure of the proposed waiver and the significant limitations proposed to be placed on that waiver would do nothing to protect utility ETS programs using electric water heaters from the harmful impacts of the 2010 efficiency standard and work against

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52 At a bare minimum, 109 rural electric cooperatives in 22 states across the country will be immediately impacted by these standards. In addition, approximately 40 public power utilities and an additional number of investor owned utilities will be directly impacted.
development, manufacture and deployment of a grid interactive water heater product that also meets customer hot water needs.53

a) Limiting the Length of a Waiver to One Year Denies Utilities and Manufacturers the Certainty They Need to Continue to Invest in This Product and its Associated Demand Response Programs. It Also Renders Demand Response Programs Using Such Water Heaters Ineligible to Participate as a Resource to Meet RTO Capacity Needs.

The NOPR would permit utilities and/or manufacturers to request waivers from the 2010 efficiency standard for one year at a time. The proposed process would require the applicant or applicants to send a letter each review period (annually) to the Assistant Secretary of Energy (“Assistant Secretary”) and await a decision following an undefined review process. It is not clear how long it would take to obtain a waiver or how far in advance of each new year a waiver would be granted. At least one participant in the public hearing on the NOPR on March 15, 2013 (“Public Hearing”) argued that waiver applications should be subject to notice and comment.54 That suggests that each waiver decision could be subject to a contested proceeding or even litigation each and every year.

The one-year waiver proposed in the NOPR simply does not give utilities, manufacturers or vendors the certainty they need to maintain their ETS programs. Development and implementation of ETS programs is a complex, multi-year process that requires cooperation among many stakeholders, including staff, contractors, regulators and/or board of directors, and utility consumer-members. It also requires a substantial investment in time, technology, communications infrastructure, staff, and advertising to maintain a program. Utility demand response programs are designed as long term substitutes for the installation of generation to meet customer demand during peak periods. By its very nature the utility planning process is focused in the long term since the decision to build generation (or forego building generation and instead

53 In addition, the rule would effectively limit consumer choices to existing electric heat pumps. Such products are not themselves today grid interactive nor are they capable of being cycled so as to be consistent with grid operator needs. Rather, the Department would be inadvertently condemning those consumers interested in participating in utility demand response programs to have to utilize a single product, inferior for this purpose, and available in a market dominated by one manufacturer.

rely on demand response programs) is a decision that cannot be effectuated or reversed overnight. Planning processes both in RTOs and in individual utilities utilize a ten and fifteen year planning process to determine future resource needs. Moreover, RTOs such as PJM utilize demand response programs as key resources which they rely upon to meet the RTO’s reliability needs in a three year forward timeframe. The demand response provider looking to shape a program using electric water heaters would be precluded from submitting this program for consideration by PJM because the provider could not guarantee its existence in the future period, three years from the submission of his bid. And, because it would not qualify as an eligible capacity resource in PJM’s market due to this uncertainty, PJM will be forced to procure more fossil-based generation than it would have had this certainty existed. Thus, the Department’s year by year waiver period frustrates one of the Department’s and Congress’ stated goals---namely encouraging demand response resources to substitute for fossil-based capacity when otherwise cost effective.

If utilities (be they RTOs, investor-owned entities, or cooperatives) do not know year-to-year whether the water heaters they need for their programs will continue to be available, they cannot justify a continued investment in the programs and, by default, will need to invest in alternatives including construction of costly new generation. Witness after witness at the Public Hearing consistently made this point. In short, a year by year waiver process runs afoul of the long term planning horizon that is required in the utility industry and, by definition, makes reliance on a water heater demand response program that could terminate in any given year an unreasonable strategy for a utility or RTO to rely upon to meet their reliability requirements.

The one-year waiver proposed in the NOPR also fails to give manufacturers the certainty they need to continue to maintain and operate their facilities for the production of large capacity electric resistance water heaters. At the Public Hearing, Harvey Sachs, the representative for the American Council for an Energy Efficient Economy agreed with this point, stating:

“There is absolutely no way I can think of that I can bribe a manufacturer to gear up to manufacture a product for one year. I’ve dealt with a lot of utility regulators

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55 Id. at 44, 47, 50, 61, 82, 119.
Mr. Sachs had an excellent point. If a manufacturer does not know until shortly before a new year whether it will be permitted to produce a product in that year, it would be effectively impossible for that manufacturer to invest in the raw materials, employees, maintenance, and other resources required to be ready when the year starts. That is particularly true when, by waiting to see if it will be able to produce product “x” in the following year, the manufacturer may well make it impossible to produce alternative product “y” that next year should its waiver not come through in a timely manner.

b) The Proposed One Year Renewal Process Will Pose A Significant Burden to the Department.

The annual renewal process will impose significant uncertainty and a significant administrative burden on both waiver applicants and DOE. It could well create a “paper chase” for both manufacturers and DOE Staff who will have to begin the process of preparing and processing new waiver requests in a given year before the ink is dry on the prior waiver request. Individual waiver requests could be challenged both before the Department and in court only adding to the year by year uncertainty as to the future viability of the product. Such an intensive form-based process on an annual basis has little offsetting gain and many of the adverse consequences outlined above. It is also inconsistent with the requirements of the Paperwork Reduction Act’s provisions requiring Federal Agencies to:

“minimize the paperwork burden for individuals, small businesses, educational and nonprofit institutions, Federal contractors, State, local and tribal governments, and other persons resulting from the collection of information by or for the Federal Government”

AND

“With respect to general information resources management, each agency shall-
(1) manage information resources to –

56 Id. at 146-47 (emphasis added).
57 44 U.S.C. §3501(1).
(A) reduce information collection burdens on the public;
(B) increase program efficiency and effectiveness;”

We understand that DOE proposed the one-year waiver to provide utilities greater flexibility: to make it easier for them since they cannot easily predict the number of water heaters they will add to their programs far into the future. Such flexibility, however, is important, only under a construct where the DOE somehow tries to limit manufacturers to only producing the number of water heaters each year that each utility will need, and if those water heaters have to be customized to meet the individualized requirements of each utility. As noted below, such a requirement runs afoul on state prohibitions on utilities selling appliances and places the utility in the middle of the chain between the manufacturer, the vendor and the customer. No other product has such limitations. Moreover, such a requirement would effectively rewrite the utility/customer relationship and insert a monopoly distribution utility in the middle of a competitive choice of vendors that consumers otherwise enjoy today. In essence, the NOPR’s model is simply not consistent with the role of utilities and the laws that govern them in many states and as a result, is an unworkable limitation on the waiver itself. And, without such a requirement, any justification for the one-year term of the waiver disappears.

c)  DOE Should Eliminate Its Proposed Restrictions on Waivers Because They Do Not Reflect Realistic Market Conditions.

The NOPR would require waiver applicants to identify, among other things, the particular manufacturer, brand, model(s), rated storage volume, and energy factor for which a waiver is requested; identify the number of units per utility program on an annual basis for each of the basic models for which a waiver is requested; and identify and describe the control device that will be installed on each unit. These conditions do not reflect realistic market conditions and could not practicably be satisfied by any applicants.

58 44 U.S.C. §3506(b).
i) Most Utilities Do Not Decide Which Water Heater from Which Manufacturer Customers May Use.

The NOPR appears to assume that there is a coordinated distribution network where manufacturers can work with utilities to determine how many units, which models, and which control devices will be needed to meet the needs of each individual utility program. There is no available process or easily developed process to comply with the proposal.

Utilities and manufacturers do not generally control the distribution chain of water heaters from point of manufacture to point of use, and it is impractical to expect that such distribution channels could be developed for this program. Generally, manufacturers produce water heaters which are then distributed through the same vendors as other appliances, such as dishwashers and clothes washers. Customers typically purchase the water heaters they wish to buy from the store or plumber they trust, from the manufacturer they prefer, and have the water heater installed in their home by the individual they choose. The utility will then traditionally come in and install a control device on the water heater, on the electrical circuit serving the water heater, on the breaker serving the water heater, or even on the utility meter. Some utilities do distribute or install water heaters, but the number of those utilities is limited. Many utilities are actually prohibited by law or regulation from directly purchasing these water heaters and selling them to customers. Others have chosen not to participate in the sale and installation of water heaters to avoid competing with local plumbing and HVAC contractors or becoming exposed to potential liability. Others have determined that their consumers would prefer not to purchase water heaters from the utilities and that it would significantly undermine their water heater programs if they were to be the exclusive distributor of eligible water heaters.

If the Department concludes that a waiver process is necessary, it must recognize these realities and not require utilities, working with manufacturers, to decide which model water heaters from which manufacturer customers may use. The Department should not turn existing relationships on their head or inject utilities into the well-established consumer-vendor relationship where it presently exists. Rather, the waiver process must allow consumers to acquire the water heater they wish from the distributor they choose. A more restrictive waiver that requires the utility to directly intervene in the distribution process will immediately disqualify hundreds of utilities that
are prohibited by law or market realities from applying for the waivers, make the overall
distribution process for water heaters far less competitive than it is today – and ultimately
impinge on the ability to maintain and expand their ETS programs. In essence, the Department
would be transforming what Congress intended as a “point of manufacture” regulatory program
into a far more intrusive regulatory program reaching into utility operations, vendors and even
consumer homes to ensure that the product is used exactly as the manufacture intended. This
would be vast overreach, ultimately unenforceable and far beyond Congress’ intent.

ii) There is No Single Type of Load Control or Grid-Interactive Devices on the
Market Today. The Department Should Allow for the Development of New
Technologies Rather Than Forcing the Specification of a Particular Interactive
Device.

As discussed above, the NOPR requires that the load control device on each water heater must be
specified at the time of the waiver application. There is no single “cookie cutter” process in place
that would allow every water heater to be manufactured with the exact load control device that
will be needed in the field. For example, cooperatives use a wide variety of load control devices
in their programs, and even a single system may use multiple control devices depending on the
communications resources available throughout the territory. Many of those load control devices
are not even connected to the water heater. Testimony at the Public Hearing indicated that some
utilities connect their device to the studs or wall of the house. Others connect outside of the
home. Some disconnect the water heater circuit directly, others disconnect a meter or a circuit
with more than one household device attached to allow a greater level of DR.59

If the water heaters that receive a waiver must be physically differentiated from most currently
available electric resistance water heaters to demonstrate that they are “grid-enabled,” there are
several options that the manufacturers could implement at a reasonable price. They could install
a load control-enabling device on the water heater, such as a ZigBee chip, that some load control
programs could utilize to turn off the water heater. They could install a simple interface that
would allow some load control devices to simply interconnect with the water heater. Or, they

59 Id. at 38, 105, 101, 120, 128, 210.
could separate out the water heater’s low-voltage circuit and make it readily accessible to a utility or electrician to allow the simple connection of a load control device.

DOE must recognize, however, that there is no universal controller or interface today. Utilities use dozens of different technologies to control water heaters, many of which do not directly connect with the water heater. Many of these differences are unavoidable because of differences in the communications infrastructure available to utilities in different areas of the country and because of differences in the legacy communications infrastructure, software, and other equipment each utility has in place. Moreover, there is no universal interface for water heaters or other appliances. Congress assigned to the National Institute of Standards and Technology (“NIST”) the task of developing consensus based standards that would help promote deployment of smart grid technology. That work is underway. While the standards for such an interface are being developed by NIST’s Smart Grid Interoperability Panel and being studied by EPRI, there is no single consensus standard or set of standards today. Under the best case scenarios, it will be years before such a consensus could be reached. The Department should not step into a process which Congress assigned to NIST and not the Department to undertake.

Petitioners are not proposing that utilities would “tamper” with the manufacturer-installed devices or interfaces. Nor are Petitioners proposing that utilities would use the grid-enabled large capacity electric resistance water heaters in an “off-label” manner. In most cases, utilities whose demand response infrastructure could not take advantage of the manufacturers’ built in load-control devices or interfaces would simply be disconnecting power to the water heater somewhere else on the household circuit serving the water heater – exactly as they are today. And, while they may not initially use the manufacturers’ specific bolt-on devices, they would be using the water heaters for exactly the purpose for which they were being designed, manufactured, and marketed: for demand response programs. This is also a temporary situation. As the manufacturers, through competition or through the standards development process, develop a better mousetrap, a better control device or interface than what the utilities are using today, the utilities will begin to migrate to that product. In any event, the revised reporting to EIA will allow the Department to monitor whether there is, in fact, during the pendency of the waiver, the development of such programs that closely approximate the manufacturer’s production.
iii) Specific Conditions on the Shipment of Grid-Enabled Units Would Run Afool of the Department’s Legal Authority.

Congress clearly established the appliance efficiency standard program as a “point of manufacture” regulatory program. Congress intended for the Department to regulate the energy efficiency of certain manufactured products such as water heaters. There is simply no basis in law or logic for Congress’ “point of manufacture” regulatory program to be transformed (in the context of this NOPR) into the regulation of utilities or consumers in their actual deployment and use of the product. For example, in the built-in refrigerator rule, DOE required that refrigerators qualifying for the new category meet certain design characteristics, 60 but nothing in the rule required manufacturers, appliance retailers, or home owners to actually install the product in the manner for which it was designed. Cabinet installers and home improvement companies were not required to jointly apply for permission to manufacturer a fixed number of units, issue tickets to customers before the customers could be permitted to purchase the product, or enable the refrigerators to operate properly only once they were installed in the manner in which they were designed. That was true even though DOE was worried about the “considerably higher energy consumption of these built-in products.”61 That was true even though the only difference in capacity or performance-related feature was aesthetic – the refrigerator could hide in the cabinetry. The built-in refrigerator does not offer consumers, utilities, and the Nation the myriad benefits offered by grid-enabled water heaters.

To reinterpret the statute to regulate the use of a product as opposed to the manufacturing of the product would transform today’s regulatory program into a highly intrusive reach into the residences of each consumer and a vast potential overreach of DOE authority under the Energy Policy Act of 1992. The Department should resist such attempts at overreach and count on specifications around the manufacture of appliances (along with reporting by utilities to allow the DOE to monitor the success of its Rule) as the means to police the effectiveness of its rule. Any other solution will fall far beyond the Department’s authority and embroil it in a level of regulation that cannot be effectively managed let alone be compliant with applicable law.

60 76 Fed. Reg. at 57537 (requiring the product to be “designed to be encased on the sides and rear by cabinetry, securely fastened to adjacent cabinetry, walls or floor and have sides that are not fully finished and not designed to be visible after installation.”).
61 Id. at 57538.
iv) DOE Should Not Impose a Limitation on the Number of Units Provided Waivers.

The NOPR describes a waiver process that sets a limit on the number of large-volume ESWHs that can be manufactured. That limitation is impractical and contrary to the public interest. As noted above, utilities cannot control how many units of which model their customers will install each year or stretch of years.

Moreover, it may be that the market shares of the manufacturers – and thus the number of water heaters each should produce – could change dramatically from year to year because one manufacturer may build a better mousetrap than another, enter into a better local distribution arrangement with the local plumbers or big box stores, or find a way to lower its prices compared to its competitors. If each manufacturer were limited to a predetermined number of units for each utility, the incentives for such improvements would largely evaporate. If a utility must be obligated to a certain number of units from a specific manufacturer for one or more years to qualify for a waiver, the utility and its customers will no longer be able to benefit from price or quality competition between manufacturers, raising the cost of DR programs for everyone.

If, as history suggests, DOE supports the rapid expansion of DR programs, it should not impose artificial limits on the growth in manufacture of the technologies needed by those programs. It should not impose limits on the competition that leads to innovation, better products, and lower prices. It should adopt a simple waiver that permits the existing competition between manufacturers to continue, as each manufacturer determines for itself how many of which products to produce for the market from year to year. And it should use the information provided by utilities on the growth in penetration of these programs and a reasonable time period for review (i.e. five years) as the best means to review whether the grid interactive water heater is meeting the goals set forth by the Congress.

6) There are Far Simpler Approaches to Limit “Leakage” That Support DR than Those Proposed in the NOPR or at the Public Meeting.

Many of the concerns with the NOPR expressed at the March public meeting are with provisions that appear to have been added to minimize leakage – the use of water heaters produced pursuant
to a waiver outside of a DR program. These include the restrictions on the numbers of water heaters, the requirement that utilities and manufacturers reach agreement on the models of units and the control devices to be installed, and the one-year limit on the waiver. There were also several impractical suggestions raised at the Public Meeting that appear to arise from the same concern.\textsuperscript{62}

First, we believe the risk of leakage has been overstated. In contemplating the potential for program leakage, DOE is overlooking the fact that the main driver for the purchase of large-volume residential ESWHs in many communities is the utility programs themselves along with the incentives they provide. As explained at the Public Hearing, a typical large-volume ESWH unit must be bought at a premium of several hundred dollars over a smaller electric resistance unit. Most consumers who do not have huge families will not pay that premium without the program incentives (rebates, free maintenance, and future rate savings) provided through participation in a utility load control program.\textsuperscript{63} Therefore, leakage is already controlled naturally, and is unlikely to be significant compared to the benefits provided through ETS programs. The economics themselves drive consumers to sign up for these programs---absent the program incentives in the form of rebates and utility bills reductions, the premium paid for a large-volume water heater is, in most cases, not justified.

Second, an overemphasis on leakage would reflect an excessively narrow view of DOE’s mission. Not all kWhs are created equal. As Congress, DOE, and the White House have all recognized, it is far better for water heaters to consume kWhs in the middle of the night (when wind turbines are producing more power than required by load) than for them to consume power at peak (when the grid relies on the most expensive and least efficient resources). It would be counterproductive for DOE to focus so heavily on the theoretical possibility of leakage (even when not supported by the underlying consumer economics) – that it winds up imposing such heavy restrictions on grid-enable water heaters as to kill or even narrow the availability of utility ETS programs. That would lead to more kWhs consumed during peak hours, more investment in peaking generation, more operation of inefficient power plants, more carbon and criteria pollutants, and more cost to consumers. At the same time, it would lead to fewer kWhs

\textsuperscript{62} Id. at 206-07, 213-14.
\textsuperscript{63} Id. at 109.
consumed at night and more curtailment of wind generation. In short, the significant and tangible energy storage opportunity that large volume water heaters can provide will be lost in the name of guarding against a highly speculative and counter-economic potential for some minimal degree of “leakage.”

Third, the focus on leakage assumes that the consumers who install a “leakage” water heater – one produced pursuant to the waiver but not used for DR – would have installed a large capacity heat pump water heater if DOE had not granted the waivers. That is highly unlikely. Customers currently have three major options for storage water heaters: a small capacity electric resistance water heater that costs in the range of $400, a large capacity electric resistance water heater that costs in the range of $700, and a large capacity heat pump water heater that costs over $2,000. Several witnesses at the Public Hearing testified that if customers were not given an incentive to purchase the $700 water heater by their utility’s DR program, they would buy the $400 water heater, not the $2,000 water heater. They have personal experience with that because some of them are also operating incentive programs to encourage customers who are not interested in the DR program to buy heat pump water heaters. In the experience of those who testified, only a small percentage of customers who are unable to buy the large capacity electric resistance water heater because of the absence of waivers or the aggressiveness of the conditions of those waivers are likely to spend $2,000 on the large capacity heat pump water heater. If they need more water, customers have the inexpensive but inefficient option of hooking two $400 water heaters together, because that is still half the cost of the heat pump water heater.

Finally, DOE can avoid excessive leakage by requiring manufacturers to report to DOE the number of large-volume ESWHs they produce every year so that they can compare the production numbers to the information from an EIA form on which utilities would report the number of water heaters they added to their DR programs. As the water heater manufacturer Vaughn testified at a Public Hearing, this would not be a significant burden on manufacturers.

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64 Id. at 757-56, 109.
65 Id. at 62, 188.
66 Id. at 67.
And EEI, NRECA, and APPA support use of the EIA forms. Adopting this approach would alleviate many of the problems associated with the waiver process proposed in the NOPR.

This would reflect a more aggressive enforcement scheme than that DOE adopted when it created a new category for built-in refrigerators. There, it merely stated that “[s]hould DOE receive reports that manufacturers are misapplying this definition or otherwise abusing it, DOE will avail itself of all other options at its disposal to correct that situation and may re-examine this definition to assess whether additional modifications are required. In this case, we’re offering to provide DOE with the information DOE needs to evaluate whether the new category is somehow being misapplied. We’re merely asking for notice before any necessary remedies are applied to minimize disruption to the Petitioners’ demand response programs.


In the NOPR, DOE concluded “that products that are currently available on the market that meet the April 2010 standard levels may not be practical to fulfill the needs of utility ETS programs.” Petitioners agree that the HPWHs are not a practical solution for ETS programs.

In their RFI comments and again at the Public Hearing, General Electric (“GE”) contended that their heat pump water heaters can perform the same function as resistance heaters for load control programs. However, it became clear during the Public Hearing that heat pump water heaters are not a suitable replacement for large capacity electric resistance water heaters in DR programs.

First, in response to questions from the other attendees, GE noted that their products are hybrid water heaters and can only perform DR functions in element-only mode, which is the same technology as traditional water heaters. In this mode, the unit is either as efficient as or less efficient than traditional electric resistance water heaters. In GE’s testimony, they state that they do not have data on the efficiency of their heat pump unit in this mode; however, it is apparent

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67 Id. at 241.
69 Transcript at 190-91.
70 Id. at 191.
that the hybrid water heater operated in element-only mode could not meet the efficiency factor required by the 2010 standard. In element-only mode, the heat pump water heater effectively becomes an extremely expensive electric resistance product, not cost-effective enough to warrant utility investment in these programs and to achieve consumer savings on their energy bills.

Second, as GE conceded in the Public Hearing, they do not currently permit utilities to control the element-only mode of their heat pump water heaters even if it were desirable. Additionally, a potential warranty issue with the manufacturer may result should the utility interrupt the heat pump during load control if load control were available. If the utility is not permitted to control the heat-pump water heater, that product is simply incapable of being used in a utility DR program. It is an entirely different class of product.

Third, as a number of witnesses explained and as GE conceded in the Public Hearing, consumers have complained about the cost of heat pump water heaters, about the noise they make, about the heat that they draw from elsewhere in the house, and about the amount of room they require both physically and for drawing heat. The co-op witnesses explained that even if they could physically control the heat pump water heaters in their DR programs, they could not get enough consumers to install them to maintain their DR programs as a practical matter. Utilities need a product to be available to their consumers that is not only physically capable of meeting their needs but that is also attractive to customers. GE had two responses to this concern at the Public Hearing. First, they made the bald assertion that utilities’ buying power would force manufacturers to produce an affordable, quiet, small, controllable heat pump water heater by 2015. That assurance provides utilities little comfort that the products needed – which are dramatically different from what GE sells today – will really be ready the year after next. Their second response was an ad hominem attack, charging that cooperatives are denying rural consumers the “advantage of progress,” i.e., their products. Finally, GE’s heat pump water heaters – operating in heat pump mode - are subject to certain technological limitations related to the compressor that make it difficult for them to provide key future grid-interactive features,

71 Id. at 190-93.
72 Id. at 38, 43, 62, 127, 136, 188, 196.
73 Id. at 31, 125, 196.
74 Id. at 192-93.
75 Id. at 239.
such as fast-response frequency regulation and quick ramping capabilities in response to wind generation events.

a) Elevated Temperature Water Storage.

Hybrid heat pump/resistance water heaters as designed (and in distribution in the United States) leverage both heat pump and resistive heating elements concurrently. Hybrid heat pump water heaters gain their high Energy Factor ratings by operating nearly entirely as heat pump water heaters, with minimal or no supplemental electric resistance heating at the rating conditions. This high efficiency operation mode limits the maximum heat pump generated storage temperature to approximately 130°F. If the accompanying electric resistance elements were used to store water at higher temperatures for the sake of energy storage and renewable integration, the effect is to decrease the use of the heat pump, thereby lowering aggregate efficiency. Though technology may develop to allow heat pumps to operate as grid interactive resources, they presently cannot effectively support the needs of utility energy storage programs.

i) Compressor Cycling.

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.

ii) Space, Noise, and Cold Climate Issues.

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 cubic feet. One would assume that a larger unit such as an eighty-five gallon unit must have an even larger space requirement to operating efficiently. Many homes, especially older housing stock, do not allow for such a large space to house a water heater. 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.

The April 16 filing by Delaware County, New York Electric Cooperative makes all of these points quite succinctly. The co-op explained:

Delaware County Electric Cooperative currently has a pilot program in place funded by NYSERDA and implemented in conjunction with EPRI to place 40 heat pump hot water heaters. To date 24 units have been placed and are in the study by EPRI. One customer has a unit in a cellar that typically is in the 40 degree range and the study has found that this unit heats very little from the heat pump cycle. We have many other customers that were eliminated from the program, because they didn’t have a place for the units (mobile home in closets), while others had no area other that the immediate home for the unit, thus sacrificing heated air at $4.00 per gallon for oil to feed the heat pump hot water heater. Heat pump hot water heaters are very good in the right conditions, but in more than 50% of the instances, would not be suitable for the residence. After our pilot program is over, we plan to offer heat pump hot water heaters to our customer/members and will carefully scrutinize the suitable conditions for their location.76

This paragraph makes clear that cooperatives are not anti-HPWH, that the HPWH is purely an experimental or “pilot” product at this time, and that it has proven simply unsuitable, even for the basic purpose of providing hot water, for 50% of the homes served by this rural New York cooperative. Even if the HPWH were capable of being controlled for demand response purposes, requiring utilities to depend on it for that purpose would cut down by half the number of homes in which they could operate demand-response programs.

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b) No Additional Analysis Is Required Before Issuing a Waiver.

During the Public Hearing, the National Resource Defense Council and EarthJustice requested that DOE conduct more quantitative analysis of the energy, economic, and environmental impacts that would result from a waiver under a range of foreseeable circumstances and at a reasonable variety of utility conditions. A great deal of quantitative analysis has been performed and the results are clear. In response to the RFI on the impact of its amended energy conservation standards for residential electric water heaters on utility DR and energy storage programs, NRECA, PJM, APPA, EEI, and the Steffes Corporation (“Steffes”) submitted extensive data into the record. Through those comments, DOE has determined that there are significant benefits of ETS programs provided by large-volume ESWHs as they stated in the NOPR. Additionally, with Demand Response programs now accounting for 72,000 MW of capability across the U.S., or 9% of U.S. peak demand, countless studies have used this wealth of deployment and operating data to outline the many benefits of DR. One such study by the National Resources Defense Council concludes, “Accelerating deployment of low-cost demand response and end-use energy efficiency provides the capability to meet growing electricity service needs without creating a significant need for new capacity through 2020, saving the industry billions of dollars in new construction costs, ensuring affordable energy for American households and decreasing carbon dioxide emission levels.” Finally, as discussed above, it is stated federal policy to promote DR, electric storage, and renewable grid integration. Requesting additional analysis will only serve to delay the waiver process, which will increase program uncertainty and have a negative impact on ETS programs across the country.

Nothing in Section 6295(o)(2)(A) granting the Secretary authority to establish separate classifications for certain products or in Section 7194(a) granting the Secretary authority to grant waivers requires the Secretary to conduct an extensive econometric analysis evaluating all of the costs and benefits of the alternatives available to him. The Secretary requires only an articulable

77 Id. at 89-94, 150-152
and plausible reason – a reasonable basis – to believe that his choice provides consumers and the nation net benefits. To demand more of the Secretary now is only to pursue paralysis by analysis, and to undermine the clear policy goals established by Congress, the White House, and the Department to promote the expansion of DR programs.

8) The Proposed Waiver Would Have a Substantial Impact on a Large Number of Small Entities.

As noted above, at least 233 electric cooperatives have water heater load control programs that would be affected adversely by the proposed waiver’s short duration and significant conditions. Nearly all electric cooperatives are below the 4 million MWh/annual sales threshold in the Small Business Administration’s definition of a small electric utility. In addition, as noted in their individual comments, some of the manufacturers who are also seeking a separate classification or simple waiver for large-capacity grid-enabled electric resistance water heaters are also small businesses under the separate definition for a small manufacturer. Petitioners ask the DOE to take those impacts into account in this rulemaking.

Conclusion

For the foregoing reasons, Petitioners respectfully request that DOE grant the industry the relief requested.

Sincerely,

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