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December 9, 2020

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Office of Air and Radiation
U.S. Environmental Protection Agency
Washington, DC 20460

Catherine Rivest
Energy Efficiency and Renewable Energy
U.S. Department of Energy
Washington, DC 20585

Dear Ms. Daken and Ms. Rivest:

This letter comprises the comments of the Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric (SDG&E), and Southern California Edison (SCE) in response to the United States (U.S.) Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE) on the Draft 1 of the Version 4.0 ENERGY STAR® Specification and the Draft 2 Test Method to Validate Demand Response for Residential Water Heaters.

The signatories of this letter, collectively referred to herein as the California Investor-Owned Utilities (CA IOUs), represent some of the largest utility companies in the Western U.S., serving over 32 million customers. As energy companies, we understand the potential of appliance efficiency standards to cut costs and reduce consumption while maintaining or increasing consumer utility of products. We have a responsibility to our customers to advocate for standards that accurately reflect the climate and conditions of our respective service areas, so as to maximize these positive effects.

We appreciate this opportunity to provide the following comments on these draft documents. We commend EPA and DOE for revisiting water heater performance requirements and for developing and improving the demand response test protocol. We fully support EPA analyzing updated energy conservation specifications levels for this equipment. We strongly urge EPA and DOE to consider the following comments:

ENERGY STAR draft 1 Version 4.0 Specification for Residential Water Heaters

- 1. The CA IOUs support an increase in minimum Uniform Energy Factor (UEF) requirements for unitary electric storage water heaters (ESWHs) rated to operate at 240 volts (V). The CA IOUs recommend the creation of two new ESWH product classes with their own minimum UEF requirements.**

One of the foremost aims of the ENERGY STAR certification is to help consumers identify and purchase highly efficient products. However, only heat pump water heaters (HPWHs) are able to meet the energy efficiency requirements for ENERGY STAR ESWHs. EPA reports that in 2019

ENERGY STAR certified ESWHs had only a two percent market penetration;¹ even though, many residential water heater energy efficiency programs require the ENERGY STAR label for a water heater to be eligible for incentives.

The data package provided by EPA (see Figure 1) suggests the UEF levels EPA has proposed in Draft 1 of Version 4.0 are an attempt to recognize the increased performance levels of the well-established class of unitary ESWHs rated to operate at 240 V (hereafter referred to as U24WH), as well as to also continue to support the newer and less efficient class of split-system HPWHs. The CA IOUs agree that the observed progress in both product classes are positive developments and should be supported by ENERGY STAR.

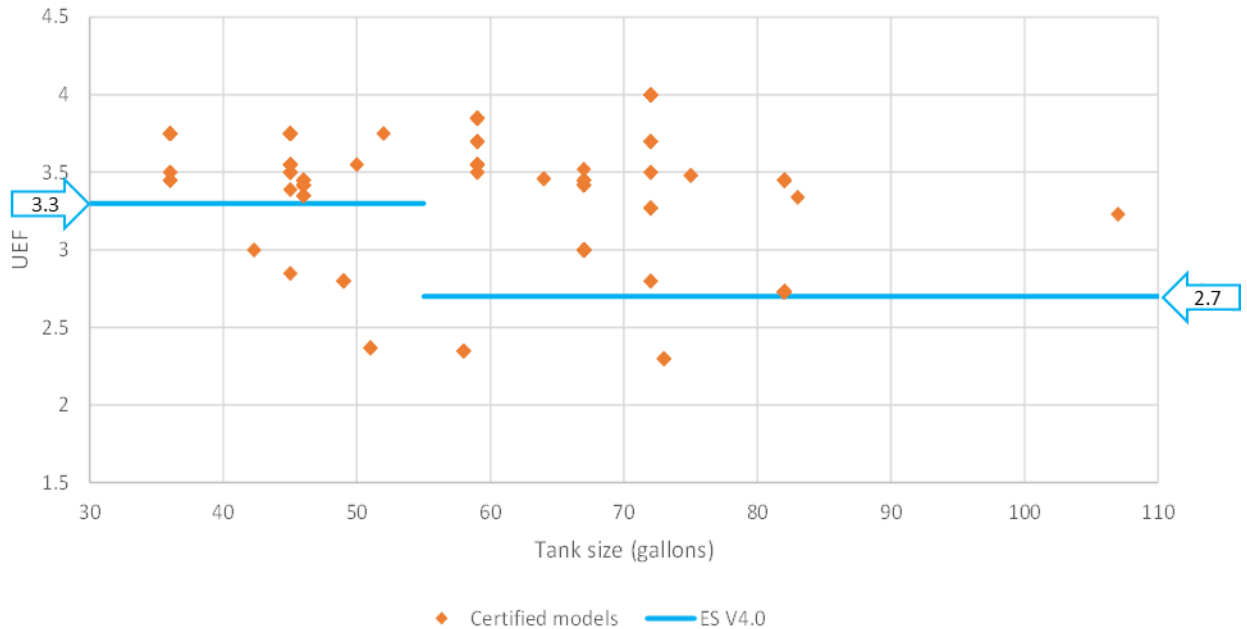


Figure 1: V4.0 Efficiency Criteria and ENERGY STAR Heat Pump Water Heaters
 Source: ENERGY STAR Draft 1, Version 4.0 data package.

Complimentary to the ENERGY STAR data package, 91 percent of U24WHs currently listed in the DOE Compliance Certification Management System (CCMS)/Air-Conditioning, Heating, and Refrigeration Institute (AHRI) databases and rated as having tanks greater than 55 gallons would still be able to qualify for ENERGY STAR under the minimum UEF of 2.7 proposed in Version 4.0. Conversely, only 13 percent of listed models with tanks rated at less than or equal to 55 gallons would still be able to qualify under the minimum UEF of 3.3 proposed for this size category. If EPA were to instead also increase the UEF requirement for the units greater than 55 gallon U24WH to 3.3, it would significantly increase the energy savings associated with the ENERGY STAR label for these products, and more than half of U24WH models currently on the ENERGY STAR Qualified Products List (QPL) would still qualify.

¹ ENERGY STAR Unit Shipment and Market Penetration Report Calendar Year 2019 Summary.

However, a new minimum UEF of 3.3 for all ESWHs would eliminate most, if not all, split-system² HPWH models from ENERGY STAR certification. California's 8.83 million housing units are spread across the state's 16 climate zones, and California residential water heaters must operate in different applications and across a wide range of ambient conditions. Split-system HPWHs can often be installed in applications that unitary HPWHs cannot. The CA IOUs believe it would be beneficial to continue to offer ENERGY STAR certification for split-system HPWHs.

The California residential storage water heater stock is 90 percent natural gas-fired, comprising one-quarter of all gas-fired residential water heaters in the U.S. California has started a massive effort to convert the natural gas-fired residential water heating stock to electricity to reduce greenhouse gas emissions from the residential sector. All-electric storage HPWHs currently available on the U.S. market are designed to operate on 240 V current, like almost all ESWHs. Because of California's high penetration of residential natural gas storage water heaters, converting to either 240 V HPWH or electric resistance water heaters usually means an expensive upgrade to add a dedicated 240 V circuit. A unitary, residential HPWH designed to operate on single-phase, 120 V electric current (U12WH) would be the drop-in replacement for natural gas storage water heaters that could significantly decrease the cost of converting residential water heating to electricity in California. The first U12WH prototype³ was exhibited in early 2020 and multiple manufacturers are expected to bring 120 V products to market soon.

ENERGY STAR certification will be an important tool guiding the application of utility and state incentives and other resources during California's water heating electrification. ENERGY STAR certification would ease access to energy efficiency program incentives for U12WH, but because these products are at an early stage of development, they cannot be expected to meet the same UEF requirements as U24WH.

The CA IOUs agree with EPA that increasing the minimum UEF for ENERGY STAR qualification will enable energy efficiency programs to claim greater energy savings⁴ by promoting certified ESWHs. However, the CA IOUs believe that EPA should modify the UEF requirements more broadly than proposed and adopt complementary new provisions to the ENERGY STAR water heaters specification. An 80-gallon water heater uses more energy than a 50-gallon one with the same UEF. ENERGY STAR should require larger water heaters to be at least as efficient as smaller ones. Requiring a higher UEF for ESWHs that are less than or equal to 55 gallons as proposed would create an incentive to install larger units. The CA IOUs recommend that EPA set a UEF requirement of at least 3.2 for all unitary ESWHs (regardless of capacity) rated to operate at 240 V (U24WH). The CA IOUs also recommend that EPA create two new product classes; one for unitary U12WH, and one for split-system electric storage HPWHs (all voltages). These two new product classes would have unique UEF requirements to be determined by EPA following a market analysis for each new product class.

Version 3.2 of the ENERGY STAR water heaters specification excludes "Add-on Heat Pump" water heaters, which are split-system HPWHs "designed for use with a storage-type water heater or a storage tank that is not specified or supplied by the manufacturer." The CA IOUs further recommend

² For the purposes of these comments a "split-system heat pump water heater" is a residential ESWH where the compressor, evaporator, and possibly also the condenser is separate from the hot water storage tank and connected to it by piping. Split-system HPWHs may be sold with a specific hot water storage tank or paired at installation with an Original Equipment Manager (OEM) tank.

³ Haier prototype at Sacramento meeting in January 2020.

⁴ "...increasing the minimum performance will allow EPA and utility partners to fully account for the energy savings these models achieve." ENERGY STAR Program Requirements Product Specification for Residential Water Heaters Eligibility Criteria Draft 1, Version 4.0, pg. 3.

that EPA remove this exclusion. The CA IOUs suggest that EPA instead define split-system HPWHs as in footnote (2) of this document and include models designed for use with OEM hot water storage tanks. The CA IOUs further recommend that EPA modify *Section 5 – Test Requirements* of Draft 1 Version 4.0 to accommodate split-system HPWHs by defining a reference hot water storage tank to be paired with the split-system HPWH model designed for use with OEM tanks.⁵

2. The CA IOUs support EPA’s proposal to change the minimum First Hour Rating (FHR) for all ESWHs to 45 gallons.

As noted by EPA, this change would align the ENERGY STAR program with the minimum FHR for the Medium Usage draw pattern in the DOE test procedure.⁶ In addition to addressing this issue with the test procedure, decreasing the minimum FHR from 67 gallons per hour in Version 3.2 to 45 gallons per hour in Version 4.0 (as proposed) should also accelerate the market entrance of split-system HPWHs and U12WH. This will give consumers more flexibility to choose ENERGY STAR rated water heaters that best suit their needs.

3. The CA IOUs recommend that EPA make compatibility with American National Standards Institute/Consumer Technology Association (ANSI/CTA) -2045 a mandatory requirement for ENERGY STAR certification for all ESWH classes.

If widely adopted, connected residential ESWHs could generate large benefits for the electricity grid due to their large potential for electricity consumption and ability to consume electricity at a different time than the consumers use hot water. EPA recognizes this potential in *Section 4 - Connected Product Criteria* for ENERGY STAR certified water heaters. The first step in realizing this potential is for connected functionality to be built into as many ESWHs as possible.

Administrative Code 194-24-180 for the state of Washington requires that ESWHs sold in the state have a modular demand response communications port (ibid. connected) that complies with ANSI/CTA-2045-A and that they carry a label indicating compliance.⁷ Oregon has implemented a similar regulation that will come into effect in 2022.⁸ Major water heater manufacturers now offer products that are CTA-2045 compliant.⁹

Furthermore, the functionality of CTA-2045 has been extended in the forthcoming protocol, CTA-2045-B, which incorporates additional advanced functionality including time-varying price, get/set Smart-Grid Device (SGD) efficiency level, and some extensions to get/set commodity subscription.¹⁰ We recommend that EPA update the connected sections of this specification and Appendix B protocol translation to reflect the updated CTA standards.

The CA IOUs believe that realizing the full value of an open standard for a water heater communications protocol requires an open standard for the physical communications port. CTA-2045 is primarily a hardware standard with an associated application layer while Open Automated Demand Response (OpenADR) is primarily an application layer (i.e., communication protocol) with many potential hardware implementations. The two approaches have significantly different levels of

⁵ Per 10 CFR Part 430, Subpart B, Appendix E.

⁶ Per Table I in 10 CFR Part 430, Subpart B, Appendix E, Section 5.4.1.

⁷ <https://apps.leg.wa.gov/wac/default.aspx?cite=194-24-180>.

⁸ <https://www.oregon.gov/energy/Get-Involved/rulemakingdocs/2020-05-20-Oregon-2020-Standards-Summary-Table-draft.pdf>.

⁹ For example: A.O. Smith, <https://www.hotwater.com/water-heaters/residential/electric/grid-enabled-residential-electric-water-heater-egt-80/>, Rheem: <https://www.prnewswire.com/news-releases/rheem-unveils-all-new-proterra-hybrid-electric-water-heater-301059649.html>.

¹⁰ https://skycentrics.com/studies/CTA-2045-B-Level-2_New_Features.xlsx.

interoperability with each other: a water heater can have a CTA-2045 port configured to receive a range of application layers including OpenADR and BACnet. We note it would be unlikely for all OpenADR certified hardware to share this compatibility in the opposite direction in responding to a CTA-2045 application layer request. This Open ADR hardware is not easily extendable to additional communication pathways (unlike CTA equipped units) and may not be factory equipped with a non-Wi-Fi pathway beneficial for hard to reach areas (e.g., FM, LoRa, or 3/4G cellular modules). Making compatibility with CTA-2045 a mandatory requirement of the ENERGY STAR water heaters specification is a way to ensure the maximum possible compatibility with current and future grid services implementations, maximizing the benefit of this technology and would not prevent water heater manufacturers from including their own preferred application layers and communication pathways.

4. The CA IOUs suggest that EPA align the functional requirements of Section 4 of Draft 1 Version 4 with recent updates to California’s Building Energy Efficiency Standards (Title 24, Part 6), Joint Appendix 13 (JA13).

Remotely controlling residential electricity end-use to reduce system peak load or provide other grid benefits is not a new idea. “Connectedness” predates the internet, and problems with maintaining communications between the utility and the residential end-use are not wholly solved by the internet. The criteria in JA13, as presented in most updated version of the California Title 24, Part 6, are intended to account for the fact that communications may be interrupted. In such a scenario, JA13 compliant water heaters will default to stored time-of-use (TOU) schedules that are loaded into the water heater when the water heater is installed. The stored TOU schedules allow the water heater to continue to provide a lower level of demand response service even when not connected to the utility. By aligning functional requirements with recent JA13 updates, ENERGY STAR would ensure that certified water heaters provide at least minimal demand response services.

5. The CA IOUs recommend the inclusion of a CTA-2045 native port as noted in comment #3. If a CTA-2045 port is not included, an OpenADR only option should be available in the test procedure.

Our review of the ENERGY STAR Test Method to Validate Demand Response for HPWH indicates some challenges with testing an OpenADR 2.0 only water heater (see Comment 11 for more information on this issue). We consider this a more critical issue in the case that CTA-2045 is not a requirement, as some connected configurations of products may not be able to fulfill the test method to validate demand response as written. Therefore, there is potential for meeting the specification and not the test procedure.

6. The CA IOUs recommend that OpenADR 2.0a remains an option for demand response communication.

The CA IOUs note that in the proposed voluntary connected criteria for ENERGY STAR certified water heaters, there is a strong emphasis on OpenADR 2.0b solutions when OpenADR is chosen as the pathway to meeting connected criteria.¹¹ We note that many active demand response programs using OpenADR reference the OpenADR 2.0a protocol.¹² The OpenADR Alliance indicates that

¹¹ See for example, ENERGY STAR Program Requirements Product Specification for Residential Water Heaters Eligibility Criteria Draft 1, Version 4.0: (Section 4)(D)(a), p. 8.

¹² For example: https://www.pge.com/tariffs/assets/pdf/advicelatter/ELEC_5931-E.pdf, p. 29 (p. A-15 in document). See <https://www.gridfabric.io/oadr-programs/> for additional program listings with ADR requirements.

Virtual End Nodes (VEN) which are certified to OpenADR 2.0b may be capable but are not required to support cross-compatibility with the 2.0a profile.¹³

The CA IOUs encourage EPA to help bridge this backward compatibility gap by reporting this compatibility information on the QPL and ensuring that Appendix B of the specification is updated to additionally reference the OpenADR 2.0a specification. We also encourage EPA to evaluate the potential benefits of requiring this cross-profile-compatibility, to minimize the risk of stranded assets. Regarding the test method to validate demand response, we recommend that OpenADR 2.0 functionality is verified via clarifications to the test procedure.

7. The CA IOUs recommend EPA prioritize price responsiveness in demand response requirements and the demand response validation test method.

A recent analysis¹⁴ of California load flexibility demonstrates an increasing readiness for dynamic/real-time pricing programs, both in the state and nationally. The CA IOUs reviewed four pilot programs in the residential sector¹⁵ demonstrating proof of concept of operation in many states,¹⁶ such as California, Illinois, and Washington, often at scale. A Pacific Northwest National Laboratory 2013 transactive energy pilot covered five states, 11 utilities, and 60,000 customers.¹⁷ This aligns with recent California activity through the California Load Management Standards 1621 and 1623, which will create a universal real-time tariff and statewide price portal based on five-minute interval data. TOU rates will go live in 2021, and hourly rates will be available to consumers by 2023.¹⁸

This increase in development and rollout of dynamic pricing methodology is due in part to the market realities of load generation; the 2015 Lawrence Berkeley National Laboratory California Demand Response Potential Study showed extreme variation in both load shape and time of the daily peak load.¹⁹ Furthermore, the inclusion of this demand response methodology will also align with California Title 24, Part 6, JA13, advanced operating modes, where advanced demand response control includes the capability to support real-time or day-ahead price signals.²⁰ Please note that edits to JA13 are still in the pre-rulemaking process and the California Energy Commission is expected to release its 45-Day Language in early 2021.

Alongside this additional emphasis in the specification, the CA IOUs also recommend that this functionality be added to the mandatory test segments of the test method to validate demand response, as this would ensure field readiness of the implementation of this demand response strategy.

8. The CA IOUs recommend that EPA either increase efficiency requirements for gas water heaters or sunset the categories.

Draft 1 of the Version 4.0 eligibility criteria notes “EPA is monitoring the savings potential and consumer payback offered by ENERGY STAR gas storage and gas instantaneous water heaters. If more significant energy savings at a lower initial investment do not materialize, EPA will consider

¹³ https://www.openadr.org/assets/openadr_sept2015_webinar.pdf, slide 10.

¹⁴ <https://www.etcc-ca.com/reports/automated-demand-response-non-residential-incentive-structure-research-project?dl=1606841433>, 2020. Note, free account needed for download.

¹⁵ *id.*, p. 21-25.

¹⁶ Complete list of states involved – California, Oklahoma, Illinois, Washington, Oregon, Idaho, and Montana.

¹⁷ <https://www.greentechmedia.com/articles/read/results-from-the-worlds-biggest-transactive-energy-test>.

¹⁸ See 20 CCR § 1623 (b) for marginal cost rates and implementation timeline.

¹⁹ <https://www.openadr.org/assets/symposium/2b.Nordman-OpenADR%202019.pdf>, slide 3 for a 2020 estimated load profile plot by month and hour of day.

²⁰ https://title24stakeholders.com/wp-content/uploads/2020/08/NR-Grid-Integration_Final-CASE-Report_Statewide-CASE-Team.pdf, see p. 115, JA13.3.3.2.

sunsetting those product categories.”²¹ The CA IOUs support EPA in reviewing the provisions of this ENERGY STAR program for gas storage and gas instantaneous water heaters. However, we believe that there is sufficient information to warrant EPA acting at this time and not simply leaving the UEF requirements for gas water heaters unmodified.

Like ESWHs, the market penetration of ENERGY STAR certified gas storage water heaters is low, at about six percent. Penetration is low even though the current ENERGY STAR UEF requirements for gas storage water heaters rated at less than or equal to 55 gallons are only 0.64 and 0.68 for the medium and high draw patterns respectively; levels that do not require the use of condensing technology. The difference between electric and gas units, however, is that the efficiency benefits of ENERGY STAR rated ESWH are significant, and this may not be the case for ENERGY STAR certified gas water heaters. Thus, there is limited reason to believe that ENERGY STAR certified gas water heaters will ever gain a much larger share of the market.

Eliminating greenhouse gas emissions from the U.S. residential sector will require converting natural gas water heating to electricity, and the conversion will be neither easy nor quick. Consumers will continue to purchase gas water heaters, and considering the lifetime of these products, ensuring these water heaters are highly efficient will lead to greenhouse gas reductions and energy savings. The CA IOUs recommend that EPA increase the UEF requirements for all new gas water heaters to at least condensing levels. This will further help highly efficient gas technology penetrate the market. The CA IOUs also recommend that EPA state its intention to further increase the UEF requirements for all gas water heaters in the next revision of the specification to greater than 1.0, levels currently only achievable by gas HPWHs. The CA IOUs recommend that if residential gas HPWHs have not been successfully commercialized before the next specification revision that ENERGY STAR sunset the gas water heater product categories at that time.

9. The CA IOUs recommend EPA include reporting requirements at different ambient conditions.

While HPWHs are more efficient than electric resistance water heaters in all circumstances,²² HPWH efficiency does vary with ambient air conditions. Because HPWHs are often installed in unconditioned spaces (attics, garages, basements, etc.), they can experience a wide range of ambient temperatures. Just as the lower compressor cut-off temperature is critical in understanding energy consumption, so is performance in different ambient conditions.

As stated by EPA in their specification, raising UEF requirements “will allow EPA and utility partners to fully account for the energy savings these models achieve.” That goal can be furthered by requiring manufacturers to report HPWH performance in different ambient conditions, specifically 50 °F and 95 °F. Thus, utility partners, in warmer climates especially, will be able to set even higher incentives for their water heater efficiency programs. The CA IOUs recommend that Draft 1 v 4.0 be amended to require reporting of UEF at these two temperatures, without associated minimum UEF performance requirements.

²¹ Section 7.B, ENERGY STAR Program Requirements Product Specification for Residential Water Heaters Eligibility Criteria Draft 1, Version 4.0.

²² <https://neea.org/resources/hpwh-lab-report-ao-smith-hptu-12-09-2015>.

Draft 2 Test Method to Validate Demand Response for Residential Water Heaters

- 10. In line with Comment 4 above, the CA IOUs recommend that EPA update the test method to include specific JA13 user interface requirements and to verify these functions as described in the manufacturer literature.**

In *Section 6.2 – User Interface*, the draft test method only requires that the manufacturer literature supplied with connected water heater products (CWHPs) or third-party control modules includes instructions for users on how to override demand response requests. In line with the recommendation that the specification be updated to align with recent updates to JA13, the CA IOUs recommend updates to the test method such that it aligns with the user interface requirements in JA13. According to JA13, the user interface should at a minimum provide the following information: control strategy that is currently active, remote or local demand management mode, selected TOU schedule if applicable, and confirmation of any settings change.²³ During testing, these features should be verified according to manufacturer instructions.

- 11. In the verification test steps, the acceptable responses align with the operating state monitoring responses in CTA-2045-A. Because other communication pathways are allowed in this specification, the CA IOUs recommend that the test method clarify the verification test steps when using open standards other than CTA-2045-A.**

The verification test steps require sending requests and queries to the CWHP to ensure that the product returns an acceptable response. The acceptable responses given in the test step tables align with the operating state monitoring codes in CTA-2045-A. The inclusion of these codes in the test method facilitates testing CTA-2045-A-compliant CWHPs or control modules, but the acceptable responses do not align with the language used in other open standards, such as OpenADR 2.0a or b. Since the specification allows for other open standards to be used to provide water heaters with the connected device capabilities, more information is needed in the test method on how to generalize these response requirements to open standards other than CTA-2045-A. The CA IOUs recommend clarifying the acceptable responses so that they would also apply to OpenADR 2.0-certified systems.

- 12. For the consumer override test, the test method currently does not require testing an expiration of the consumer override. The CA IOUs believe the test could be expanded to cover this feature without imposing excessive additional test burden.**

For the consumer override test in *Section 6.3 - Consumer Override*, to avoid an undue increase in the test time and burden, the test method currently does not require testing an expiration of the consumer override feature. The CA IOUs recommend that by default, consumer overrides should have a specified duration, after which they expire. Without this, customer products could inadvertently become permanently opted out or overridden, and customers would lose out on the benefits of purchasing a water heater with additional connected capabilities. Other specifications, such as the Northwest Energy Efficiency Alliance (NEEA) Advanced Water Heating Specification Version 7.0, include similar override expiration requirements for higher-tier products. For example, for Tiers 3.0, 4.0, and 5.0, this NEEA specification states that “should a user initiate an override to a mode less energy efficient than the default condition, such selection will expire after a 72-hour period. Upon expiration, the appliance shall then automatically return to the mode previously selected by the user unless that mode was less efficient than the default, in which case it shall return to the default.”²⁴ If

²³ JA13.3.2 (f) - <https://www.energy.ca.gov/filebrowser/download/2261>.

²⁴ NEEA Advanced Water Heating Specification Version 7.0, Section 6.1 - <https://neea.org/img/documents/Advanced-Water-Heating-Specification.pdf>.

implementation of an indefinite override without automatic expiration is desired, it should not be the default option, and when the CWHP is in an overridden state, this status should be clearly highlighted in the user interface to remind users of the status. The specification and test procedure should be updated to include and test a requirement in which the override automatically expires after a set time period by default. The user should also be able to specify a non-standard time period for expiration, if desired, and indefinite overrides should be discouraged and clearly highlighted in the user interface.

To test this feature without excessive time and test burden, the CA IOUs recommend that the consumer override verification test in Table 1 of the test method be expanded to initiate a consumer override that expires after a specified short time period (for example, 15 to 30 minutes – similar to the 30-minute wait time in Step 6 of the loss of connectivity verification test in Table 2). Then, the tester could wait for the override to expire before sending an Operational State query that should show a return to normal operation after the expiration of the override.

13. The CA IOUs recommend that the non-emergency curtailment and load up test events should include an end time, if possible. This better aligns with actual demand response events.

In the test method, there are many instances where demand response requests are sent with a “Maximum” duration, indicating that the demand response request has no defined end time. The test method notes that although a 4-hour test period was generally supported by commenters, EPA and DOE have tentatively determined that the general curtailment request should be sent with no end time. This indefinite test duration is also used to test the basic or advanced load up requests, as well as the emergency curtailment and grid emergency requests.

Although EPA and DOE note that the load shift test is intended to be representative of actual use in the field, for the non-emergency (i.e., general curtailment) and load up events, an event without a specified end time does not reflect the likely operation of actual demand response events. Barring emergency conditions, events are more likely to have a specified duration and end time. Therefore, the CA IOUs recommend revising the general curtailment and load up requests to include an end time or specified duration so that the test method and testing results better align with anticipated operation during actual demand response events.

14. The CA IOUs recommend additional clarifications to improve the usability of the test method.

In some instances, the test method could be clarified to improve its usability. Additional clarifying recommendations are listed below:

- Regarding the load up and advanced load up verification test in Table 4, the test verifies that the CWHP will load up from a depleted state. However, during actual demand response events, the load up request may initiate at a time when the water heater energy is not fully depleted. Therefore, the CA IOUs recommend clarifying that the CWHP load up function should initiate at any mean tank temperature less than the setpoint or target temperature, even if the water heater is not fully depleted.
- Regarding the added reheat period after the general curtailment period, the CA IOUs agree that this step is a useful addition to the test method. This information could be used to estimate the anticipated energy demand that will occur at the end of a demand response event as devices return to normal operation. This information is helpful for planning for potential demand response “snapback,” the sharp increase in demand immediately after the demand response event has concluded, and it could also be used to plan and sequence groups of water heater resources for demand response event dispatch.

- In line 225, the test method states that by using electrical or fuel supply measurements, the tester should verify that the CWHP began heating water after the load up or advanced load up request. In line with the other calculations listed in the test method, the CA IOUs recommend added specificity for this verification; for example, the user could verify that the power draw at a specified time step after the request is sent exceeds by a given magnitude the power draw at a specified time step before the request is sent.
- For the calculations of Current Available Energy Storage Capacity and Current Total Energy Storage Capacity, the CA IOUs recommend clarifying whether “RE_{Rated},” rated recovery efficiency, should be a whole number or if it should be in percentage terms.
- For Section 7.1.2.4, root-mean-square-difference is a useful metric to determine the accuracy of the Current Total Energy Storage Capacity response, but the test method does not include a performance threshold for the acceptable difference between the reported and calculated values. The CA IOUs recommend that DOE include additional performance guidelines based on the results of product testing.

In conclusion, we would like to reiterate our support for EPA and DOE’s action to develop and update Draft 1 of the Version 4.0 ENERGY STAR Specification and the Draft 2 Test Method to Validate Demand Response for Residential Water Heaters. We thank EPA and DOE for the opportunity to be involved in this process.

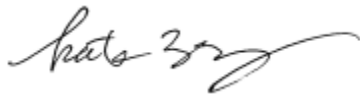
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