



December 19, 2024

U.S. Environmental Protection Agency (EPA)  
ENERGY STAR®  
HVAC@energystar.gov

Topic: Final Draft ENERGY STAR Test Method for Central Heat Pump Water Heater Systems

Dear Ms. Daken and Ms. Hegarty:

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), collectively referred to herein as the California Investor-Owned Utilities (CA IOUs), in response to the United States (U.S.) Environmental Protection Agency (EPA) ENERGY STAR® Final Draft Test Method for Central Heat Pump Water Heater (CHPWH) Systems.

The CA IOUs comprise some of the largest utility companies in the nation, serving over 32 million customers in the Western U.S. We are committed to helping customers reduce energy costs and consumption while striving to meet their evolving needs and expectations. Therefore, we advocate for standards that accurately reflect the climate and conditions of our respective service areas.

We respectfully submit the following comments to DOE and EPA:

**1. The CA IOUs strongly support DOE and EPA’s inclusion of our recommendations for ambient air and entering water temperature into CHPWH test conditions.**

The range of test conditions detailed by DOE and EPA in the Final Draft CHPWH Test Method will accelerate CHPWH system deployment by broadening and standardizing the performance data available to designers and installers. The CA IOUs support DOE’s rationale for aligning test points with the space-heating industry. We continue to recognize the importance of including lower temperature conditions, such as H<sub>35</sub>, H<sub>17</sub>, and H<sub>5</sub>, representing the operating temperatures at crucial design points for CHPWHs across various climates.

The CA IOUs also support the proposed entering water temperatures that correspond with the proposed ambient air test conditions, reflecting cooler water temperature when the air is cooler.

Furthermore, research funded by the CA IOUs does show that the water temperature entering the condenser differs from that of the incoming mains. The water is warmer because it partially mixes with hot water in a storage tank.<sup>1</sup>

---

<sup>1</sup> Evan Green et al., “PG&E and SCE HPWH Laboratory Testing and Software Updates for Multifamily Applications | ETCC,” ETCC (Energy Transition Coordinating Council), August 26, 2024, <https://etcc-ca.com/reports/pge-and-sce-hpwh-laboratory-testing-and-software-updates-multifamily-applications>.

**2. The CA IOUs support development of a CHPWH seasonal metric and strongly encourage DOE and EPA to engage with stakeholders and include a CHPWH seasonal metric in a future revision.**

The Final Draft CHPWH Test Method introduces defrost testing and a seasonal metric for the first time. While defrost testing and seasonal metrics are common for HVAC equipment, these concepts are relatively new to the water heating industry. Industry standards test committees have discussed defrost testing and seasonal metrics; however, no consensus-based approaches exist for CHPWH defrost testing and seasonal metric calculations. Therefore, stakeholders may find it challenging to provide substantive and informed comments on a new test method and metric within the two-week comment period.

The CA IOU comments on the ENERGY STAR Draft 1 CHPWH Test Method and Specification recommended that DOE and EPA prioritize various ambient, entering, and leaving water temperature conditions over a seasonal metric.<sup>2</sup> Most stakeholders supported testing and reporting at multiple test conditions as an initial step. While the CA IOUs support a CHPWH seasonal metric, we are concerned that implementing an unvetted metric could negatively impact the ENERGY STAR CHPWH program. Although DOE and EPA's proposed seasonal metric approach aligns with that used for air-to-air heat pumps, the seasonal load requirements for CHPWH may differ. DOE and EPA's metric approach does not currently reference specific CHPWH load or run-time data. Moreover, the CA IOUs have been unable to locate data sources to support the proposed approach.

The CA IOUs, therefore, urge DOE and EPA to continue engaging with the industry on an appropriate CHPWH seasonal metric. This engagement could be achieved by lengthening the CHPWH Version 3 Test Method development timeline and releasing additional draft test methods with realistic timeframes for stakeholder review. If DOE and EPA cannot extend the CHPWH Version 3 Test Method timeline, the CA IOUs encourage them to revisit a CHPWH seasonal metric in a later version. Should DOE and EPA finalize a CHPWH seasonal performance metric in Version 3, the CA IOUs strongly recommend requiring reporting performance at all relevant test conditions.

**3. The CA IOUs support developing a CHPWH defrost test method and recommend that DOE and EPA extend the test method timeline or include defrost in a future revision to provide stakeholders with the opportunity to validate the proposed test method.**

The CA IOUs recommended including a defrost test condition in our comments on the Draft 1 CHPWH Test Method and Specification.<sup>2</sup> We continue to support the development of a CHPWH defrost test method and believe DOE and EPA's direction is appropriate. However, we are concerned that DOE and EPA are expediting the process of such a complicated test method.

While the proposed test method is similar to that used for assessing defrost in small unitary heat pumps, DOE and EPA have yet to clarify whether they have conducted lab testing to validate the proposed

---

<sup>2</sup> Pacific Gas & Electric, Inc., San Diego Gas & Electric, Inc., and Southern California Edison, Inc., "Central Heat Pump Water Heater Systems Discussion Guide and Draft Test Procedure," *Energystar.Gov*, September 13, 2024, [https://www.energystar.gov/sites/default/files/2024-09/CA%20IOU%20Comments\\_508.pdf](https://www.energystar.gov/sites/default/files/2024-09/CA%20IOU%20Comments_508.pdf).

CHPWH test method. Additionally, stakeholders need sufficient time to evaluate the feasibility of the test method in laboratories and on their equipment.

Along with these concerns, the CA IOUs have specific comments on two aspects of the proposed defrost test method.

Firstly, line 252 of the Final Draft CHPWH Test Method specifies disabling the electric resistance (ER) elements when testing the heat pump. Disabling supplemental ER provides heat pump efficiency; however, overall equipment efficiency provides the most value to designers and installers. Those specifying or purchasing the equipment benefit from knowing if a heat pump's control system calls on ER or other supplemental heating during the test. The CA IOUs recommend that DOE remove this instruction.

Secondly, line 391 states that "for heat pumps containing defrost controls which are likely to cause defrost at intervals less than one hour, the preliminary test period starts at the termination of an automatic defrost cycle and ends at the termination of the next occurring automatic defrost cycle." The CA IOUs question whether a test lab can readily identify a unit's defrost frequency without significant additional test time. Although we currently have no suggestions for modifying this language, we encourage DOE and EPA to collaborate with stakeholders to clarify it further and to consider requiring reporting of defrost type and frequency.

The two points described above would benefit from further stakeholder review and discussion. The CA IOUs recommend that DOE and EPA extend the timeline for developing Version 3 of the CHPWH Test Method. This extension would give stakeholders additional time to validate the proposed test method. Alternatively, the CA IOUs urge DOE and EPA to require manufacturers to report the average CHPWH demand (in kW) during a defrost cycle and the average defrost cycle duration while continuing to refine a comprehensive defrost test for inclusion in the next version of the CHPWH test method.

**4. The CA IOUs recommend that DOE and EPA include test methods for determining CHPWH off-cycle energy consumption in a future version.**

The Final Draft CHPWH Test Method does not include a procedure for evaluating base pan heat and other off-cycle energy consumption. Incorporating off-cycle energy consumption would make this test method more representative and align it with other industry heat pump test procedures, such as AHRI 210/240, AHRI 1340, and AHRI 310/380. Additional time to develop this test method would enable the inclusion of these factors.

**5. The CA IOUs recommend the following technical and editorial revisions to the Final Draft CHPWH Test Method.**

The CA IOUs carefully reviewed the Final Draft CHPWH Test Method and offer the following technical and editorial revisions.

## Recommendations for Substantive Revision

The substantive change proposals under Section 4.3 WHEER Calculation are as follows:

1. **Equations 4.3-10 and 4.3-12:** The structure of the fourth equation interpolating/extrapolating between tests at 47°F and 35°F in the range  $17 \leq T_j < 42^\circ\text{F}$  is inconsistent with other similar heat pump test procedures. The ENERGY STAR Room Heat Pump Test Method, the AHRI 310/380 Draft Test Procedure Revision for PTHP, and AHRI 210/240 for Central AC/HP all interpolate/extrapolate between tests at 17°F and 35°F in the range  $17 \leq T_j < 42^\circ\text{F}$ . A simple option would be to align the fourth equation to match the aforementioned test procedures. However, our recommended option is to account for  $CD_{DF}$  at 17°F in the updated equation, providing internal consistency with the fifth equation:

$$\dot{Q}_h(T_j) = 0.91106 \cdot \dot{Q}_{H17} + \frac{[\dot{Q}_{H35} - 0.91106 \cdot \dot{Q}_{H17}] \cdot (T_j - 17)}{35 - 17}$$

2. **Equation 4.3-10:** If the previous suggestion is adopted, we recommend aligning the sixth equation with the fifth by reintroducing  $CD_{DF}$  for temperatures below 17°F. The rationale is that frost impact below 17°F should not be affected by whether the 35°F test is conducted. With the change to Item #1, the overall capacity curve should remain a continuous function with no step changes.
3. **Equation 4.3-12:** If the second suggestion is adopted, we recommend aligning the sixth equation with the seventh by reintroducing  $CD_{DF}$  below 17°F.

## Recommendations for Editorial Revision

The proposed editorial changes under Section 3 Definitions and throughout are as follows:

1. **Under “(J) Commercial Heat Pump Water Heater Unit,”** we recommend changing Types A, B, C, and D to Types 1, 2, 3, and 4 as the definitions fully align with the July 2024 ENERGY STAR Test Method to Determine Room Air Conditioner Heating Mode Performance July 2024 and the AHRI 310/380 draft for packaged terminal heat pumps.

The proposed editorial changes under 4.3 WHEER Calculation are as follows:

1. **Equations 4.3-6, 4.3-8, 4.3-10, and 4.3-12:** The first and second equations are mathematically equivalent. We recommend using the second equation and note the range as “if  $T_j \geq 68^\circ\text{F}$ .”
2. **Equations 4.3-7, 4.3-9, 4.3-11, and 4.3-13:** The first and second equations are mathematically equivalent. We recommend using the second equation and note the range as “if  $T_j \geq 68^\circ\text{F}$ .”
3. **The fourth equation under 4.3-8:**  $T_L$  in the numerator should be 35.
4. **The fourth equation under 4.3-9:**  $T_L$  in the numerator should be 35.
5. **The fifth equation under 4.3-9:** 35 in the numerator should be  $T_L$ .
6. **At lines 546-547,** the phrase “or in Equation 4.3-11, below, if the H35 test is not conducted, Btu/h” may be in error. We recommend removing the phrase and aligning with the text at lines 529-530.
7. **The sixth equation under 4.3-10:** the range should be  $T_{off} \leq T_j < 17^\circ\text{F}$ .

8. **Under 4.3-11:** A sixth equation appears to be absent. We recommend including an additional equation identical to the fifth equation that states, "if the 35 test is conducted and  $T_{off} \leq T_j < 17^\circ\text{F}$ ."

**The proposed editorial changes under Section 4.5 Other Reported Values are as follows:**

1. **Sections B)1) and B)2):** We recommend including a conversion factor to convert the COP equations from W to Btu/h in the denominator (prefer 3.412, alternatively 3.413 to be consistent with the rest of the document) to give COP in typical dimensionless units.

**Following Section 4.5:**

1. **Document formatting changes after 4.5:** No Section 4.6 exists.
2. **Section 4.7 shows ")"** after the "7," which is inconsistent with the remainder of the document. This same inconsistency also appears in Section 4.8.

The CA IOUs appreciate the opportunity to provide these comments regarding the ENERGY STAR Final Draft Test Method for CHPWH Systems. We thank DOE and EPA for their consideration and look forward to the next steps in the development of a CHPWH specification.

Sincerely,



Rob Bohn  
Manager, Codes & Standards  
Pacific Gas and Electric Company



Christopher Malotte  
Sr. Manager, Codes and Standards  
Southern California Edison



Kate Zeng  
ETP/C&S/ZNE Manager  
Customer Programs  
San Diego Gas & Electric Company