February 28, 2020

Ms. Abigail Daken
ENERGY STAR for HVAC
U.S. Environmental Protection Agency
Office of Air and Radiation
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Subject: Draft 2 Version 6.0 ENERGY STAR® Central Air Conditioner and Heat Pump Specification

Dear Ms. Daken:

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) Draft 2 Version 6.0 ENERGY STAR Central Air Conditioner and Heat Pump (CACHP) Specification.

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 to cut costs and reduce consumption while maintaining or increasing consumer utility of the products. We have a responsibility to our customers to advocate for specifications that accurately reflect the climate and conditions of our respective service areas, so as to maximize these positive effects.

The CA IOUs appreciate this opportunity to provide comments on Draft 2 Version 6.0 of the CACHP ENERGY STAR Specification, equipment for which the ENERGY STAR Specification was last updated in 2015. We appreciate the enhanced efficiency requirements, quality installation (QI) capabilities, addition of the controls verification procedure (CVP), and connected criteria included in this draft of the CACHP Specification. In support of our positions, we strongly urge EPA to consider the following comments.

1) **The CA IOUs support much of the Draft 2 Specification, including most efficiency levels, the prescriptive staged capacity requirement, and QI capabilities. We recommend that DOE consider 17.0 seasonal energy efficiency ratio 2 (SEER2) for the moderate and hot climate. We agree with the decision to align the ENERGY STAR Version 6.0 effective date of January 1, 2023, with other regulatory changes for CACHPs.**

By establishing more stringent efficiency levels, which we appreciate, EPA will counterbalance the impact of delaying the effective date. We agree with including an energy efficiency ratio 2 (EER2) requirement in the ENERGY STAR Specification for all climate regions. However, we recommend that DOE consider a higher SEER2 requirement (currently 16.0 SEER2 for all climates) for moderate and hot climates than for cold climates. We recommend 17.0 SEER2 for "moderate and hot" climates to emphasize the greater cooling needs in those regions of the U.S. Since the DOE appliance standard levels in the southwest and southeast are higher than in the northern region, it is logical to conclude that the commensurate ENERGY STAR levels should also be higher for cooling ratings in the warmer parts of the

U.S. Furthermore, we suggest that EPA investigate the possibility of increasing the EER2 level for CACs in the moderate and hot climates since this level appears to be unchanged from the Version 5.0 Specification.

The CA IOUs understand that the two-stage or variable capacity requirement should not be particularly difficult for manufacturers to meet, given the SEER2 levels being targeted by this Specification. We are also encouraged to see this prescriptive requirement in the Specification, as it will ensure efficient part-load performance for CACHPs.

The CA IOUs applaud EPA's efforts to emphasize QI issues in its Version 6.0 Specification. QI is critical to realizing CACHP performance. However, it is also very difficult to achieve within the ENERGY STAR platform as the label is designated prior to installation. Given the challenge of ensuring QI with a label, we believe that EPA has put in place a solid framework to ensure installers who are well trained and attentive to QI will be able to properly install the systems. For the next update (i.e., Version 7.0), EPA might consider making all "Installation Capabilities" mandatory, rather than a selection from the list.

It is the CA IOUs' understanding that the translated values from SEER, EER, and HSPF to SEER2, EER2, and HSPF2, respectively, that EPA shows in its Draft 2 Specification may vary from system to system. The CA IOUs encourage EPA and DOE to conduct the necessary laboratory testing to confirm the average magnitude of CACHP systems' shift from the old to new metrics and potentially update the Version 6.0 SEER2, EER2, and HSPF2 levels accordingly if necessary.

The CA IOUs agree with EPA's decision to delay the effective date to January 1, 2023 for its ENERGY STAR Version 6.0 Specification, to align with the upcoming DOE test procedure and standards updates for CACHPs. In addition, there is an active California Air Resources Board rulemaking for residential CACHP that would ban refrigerants with a global warming potential greater than or equal to 750.[1] This regulation has a planned effective date of January 1, 2023, which further supports the decision to align all updates across the different federal and state regulatory bodies.

2) **The CA IOUs are supportive of the addition of the CVP to ENERGY STAR Version 6.0. We believe that all variable capacity CACHP equipment should have a CVP in both heating and cooling modes at all test points.**

The CA IOUs contributed heavily toward the development of the CVP in the DOE Variable Refrigerant Flow (VRF) Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) Working Group. In Fall 2018, the CA IOUs placed information on the federal docket that showed a misalignment between VRF ratings and in-field performance for a VRF system that had been tested by the CA IOUs.[2] Prior to the development of the CVP, there was no mechanism within the Air Conditioning, Heating and Refrigeration Institute (AHRI) 1230 test procedure that ensured that the fixed-speed controls settings used in the test chamber matched the performance VRF systems actually achieved at equivalent ambient temperature and building load conditions. In the interest of achieving steady-state conditions in the test chamber industry has typically overridden certain control settings while testing variable capacity equipment. Through the ASRAC negotiation, the CVP was developed as an approach that balances test burden and representativeness of field operation, by ensuring consistency in critical parameter settings between the test chamber and in-field operation. In the longer term, the CA IOUs support development of a dynamic, load-based test procedure for variable capacity equipment ratings and view the CVP as an excellent medium-term option.

[1] https://ww2.arb.ca.gov/sites/default/files/2020-01/2020-01-28%20CA%20SNAP%20Amendments%20-%20Reg%20Text-TP-KT.pdf.
[2] https://www.regulations.gov/document?D=EERE-2018-BT-STD-0003-0010.

While the CA IOUs support adapting the CVP to all variable capacity CACHPs, we have found in our own laboratory testing that additional testing is needed to ensure that the procedure has the desired impact. To accomplish this, the CA IOUs recommend laboratory testing of CACHP equipment that compares system performance under native controls with performance under the test procedure including the CVP.

We are encouraged to see the CVP added to the 5 °F test point condition. The CA IOUs find the CVP may add even more value by being included in all test points that contribute to the heat seasonal performance factor 2 (HSPF2) and SEER2 ratings. The effective date for this Specification, January 1, 2023, gives EPA and stakeholders time to further adapt the CVP to all test points.

In the CA IOUs' testing experience, the misalignment between rated and field conditions is more significant in part-load conditions than it is in full-load conditions. For heat pumps claiming to have cold weather performance, the 5 °F test point can be thought of as "full-load," while 17 °F, 35 °F, 47 °F, and 62 °F ambient dry-bulb test points move the heat pump progressively further into "part-load" conditions. The CA IOU data for variable capacity heat pumps shows that the misalignment between HSPF ratings and in-field heating performance to be less severe than the cooling SEER rating misalignment, it is still recommended that CVP be added for all heating test points.

Regarding part-load cooling performance, the CA IOUs have measure performance of variable capacity heat pumps in unoccupied homes in Stockton, CA and have observed that SEER ratings can occasionally be misaligned from field performance, similar to what was observed with VRF IEER ratings.[3,4] This further highlights the need to have a CVP in place for part-load SEER2 rating test conditions, which we highly recommend.

Given the magnitude of this change to variable capacity CACHP ratings, we encourage EPA to work with the AHRI 210/240 testing committee to eventually add the CVP into that procedure. The AHRI 210/240 committee has the expertise necessary to ensure that the CVP is properly incorporated into CACHP testing. The CA IOUs note that EPA is already working closely with DOE and consultants who worked on the VRF ASRAC CVP development and we are supportive of this. We encourage the eventual incorporation of CACHP CVP into the Code of Federal Regulations (CFR), 10 CFR 430 Subpart B Appendix M1, in addition to AHRI 210/240.

Finally, while adding the CVP to the CACHP test procedures is an important step forward, we support the eventual goal of including a fully dynamic load-based test procedure under native controls for equipment ratings. A ratings framework that does not override as-shipped native controls to achieve steady state operation is desirable because it ensures that equipment ratings align with the way units operate in the field. The CA IOUs support this eventual end-state for CACHP test procedures and ratings.

3) **The addition of the CVP to all HSPF2 test points would particularly benefit customers in Pacific Coast "marine" climates.**

Pacific Coast marine climates (American Society of Heating, Refrigeration, and Air-conditioning Engineers (ASHRAE) climate zones 3C, warm marine, and 4C, mixed marine) have different heating and cooling considerations than much of the rest of the U.S. Their annual heating degree-days (HDD) are not very high on an absolute basis but they are heating-dominated climates with far greater HDD than cooling degree-days (CDD). They are ideal climates for heat pumps, particularly ones optimized for mild weather.

[3] https://www.etcc-ca.com/reports/variable-compressor-speed-heat-pumps.
[4] https://www.etcc-ca.com/reports/central-valley-research-homes-evaluation-ducted-and-ductless-configurations-variable.

While the CA IOUs applaud EPA's efforts to develop a "cold" climate ENERGY STAR label with additional validation of performance at 5 °F, we also believe that marine and "moderate and hot" climates would benefit from conducting the CVP at all HSPF2 test points.

As noted by the Northwest Energy Efficiency Alliance (NEEA) in their Draft 1 comments,[5] focusing on capacity at 5 °F is sensible for cold climates, but marine climates have much higher design temperatures. Units that perform at 70 percent of full capacity at 5 °F may be prone to short cycling in marine climates where winter temperatures predominantly range from 40 to 60 °F.

Even heat pumps that are not optimized for cold climates may inadvertently short cycle in the marine climate. This reinforces the importance of having a CVP run at the warmest ambient HSPF2 test points of 35 °F, 47 °F, and 62 °F. These test points are most representative of the marine and "moderate and hot" climates in the U.S. and these regions would benefit by having ENERGY STAR-certified equipment whose control algorithms in warmer ambient temperatures has been verified as part of the equipment's HSPF rating tests.

Due to the unique heating and cooling needs of marine climates, EPA may even consider creating a separate climate region for ASHRAE climate zones 3C and 4C in the Version 6.0 Specification for marine climates. This region would have specialized heating and cooling performance requirements from both the cold and "moderate and hot" regions.

4) **The CA IOUs support EPA's efforts to support connected devices in the CACHP ENERGY STAR Specification but have a number of suggestions that we believe will improve the Specification.**

The CA IOUs support the addition of optional criteria for connected functionality for CACPHs, including the EPA's efforts to harmonize with existing efforts to define the performance of connected CACHPs. Also, we support the requirement to meet demand response (DR) communication and equipment performance standards, employing CTA-2045-A or OpenADR 2.0. The CA IOUs made similar comments on the Water Heater ENERGY STAR Version 3.3 Draft 1,[6] Draft 2,[7] as well as the Smart Home Energy Management Systems (SHEMS) Discussion Guide[8] and we appreciate that EPA continues to push for open standards within the connected criteria specifications. We encourage EPA to review our recommendations and comments concerning connected devices in those letters.

We notice a number of references to AHRI 1380 in the "notes" boxes in the Draft Specification but only a single incorporation by reference in Table 5 (line 479). We suggest that for clarity EPA make some of the references in the Specification to AHRI 1380 more explicit.

As we stated in our comments on Draft 1 of Version 3.3 of the Water Heater ENERGY STAR Specification, in Section C.b, we oppose allowing permanent overrides as an available setting. This would allow users to permanently override incoming DR events, which would diminish the efficacy of DR programs. Specifically, we recommend more emphatic language than the draft statement "EPA recommends encouraging the use of temporary overrides." Rather, we believe users should only be able to override incoming DR signals on an event by event basis.

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[5] https://www.energystar.gov/sites/default/files/NEEA%20Comments%20on%20CACASHP%20Draft%201%20V6.0.pdf.

[6] https://www.energystar.gov/sites/default/files/CA%20IOUs%20Comments%20on%20ENERGY%20STAR%20Water%20Heaters%20V3.3%20D1_0.pdf.

[7] https://www.energystar.gov/sites/default/files/CA%20IOUs%20Comments_2.pdf.

[8] https://www.energystar.gov/sites/default/files/CA%20IOU_SHEMS_Discussion%20Guide_Comments_7%2027%2018.pdf.

The CA IOUs recommend that requirements for DR strategy provide more specificity and detail. We have received feedback from HVAC manufacturers requesting specific guidance on the amount of load curtailment to be matched to the DR signal itself. This guidance is actually included in AHRI 1380; for example, in Critical Curtailment mode, AHRI 1380 states "limit input power to maximum of 40% of the Benchmark Power." This could be adapted to CACHPs by matching different modes to a target thermostat setpoint offset (i.e., 2 or 4 °F depending on the severity of the DR signal).

The CA IOUs recommend further alignment of the operational state code language with AHRI 1380, to add clarity. Specifically, we recommend instances of the word "heightened" be replaced with the word "critical" (e.g., "Idle Heightened" be replaced with "Idle Critical" and "Running Heightened" be replaced with "Running Critical").

The CA IOUs further recommend that EPA add a "Load-Up" mode into the Specification. This is contained in AHRI 1380 but is not currently present in the ENERGY STAR CACHP Draft 2 Specification. DR is evolving from an event-based curtailment-only operation, toward greater flexibility to accommodate high penetration of renewable power. Many states have adopted renewable portfolio standards and in 2018 California passed Senate Bill 100 which requires 100 percent zero-carbon electricity by 2045.[9] An important means of achieving this goal will be for connected devices to have the flexibility to increase as well as curtail electrical power in order to match supply with demand. In this same vein, we recommend that EPA adjust language throughout the Specification to replace "Temp. Rise" with "Temp. Offset" to indicate that temperature setting can go either up or down. One instance of flexibility in load addition or curtailment is mentioned at line 434 of the Draft 2 Specification, regarding variable capacity equipment ramping up or down. We recommend that this approach be adopted throughout the entire connected devices portion of the Specification. These changes will make the Specification more neutral toward load reduction or load addition.

In conclusion, we reiterate our support to EPA's Draft 2 Version 6.0 of the CACHP ENERGY STAR Specification. We thank EPA for the opportunity to be involved in this process and encourage EPA to carefully consider the recommendations outlined in this letter.

[9] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100.

Sincerely,

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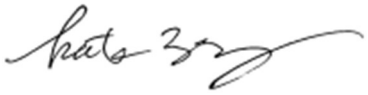

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