August 19, 2022

Ms. Abigail Daken
U.S. Environmental Protection Agency
Climate Protection Partnership Division
Office of Air and Radiation
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Topic: ENERGY STAR® Smart Thermostat Products Draft 1 Version 2.0 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) ENERGY STAR® Draft 1 Version 2.0 Specification for Smart Thermostat Products (STs).

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 energy costs and manage energy consumption and demand while maintaining or increasing the consumer utility of energy efficient products. We have a responsibility to our customers to advocate for appliance efficiency standards that accurately reflect the climate and conditions of our respective service areas.

We appreciate this opportunity to offer our support for the EPA's efforts and provide the following comments on EPA's Draft 1 Version 2.0 Specification for STs.

1. **The CA IOUs support EPA's Draft 1 Version 2.0 Specification for STs and believe many recent additions to the specification are improvements over those outlined in Version 1.0.**

   We support EPA's proposal to increase the random sample of metadata files to 1,000 compared with the 250 value currently prescribed in the Version 1.0 Specification for Connected Thermostat Products. We agree with EPA's conclusion that the proposed revision will improve the precision and stability of metric scores.

   We also support the EPA's requirement for the software updates including STs controlling central air conditioners and heat pumps (CACs/HPs) with two-stage compressors. The updates will facilitate analyses of data sets comprising STs serving CACs/HPs with two-stage and single-speed compressors. We look forward to working with EPA to develop a future Version 3.0 Specification addressing communicating controllers for CACs/HPs with variable-speed compressors.

2. **The CA IOUs recommend EPA revise some provisions in the Draft 1 Version 2.0 Specification for STs and the Method to Demonstrate Field Savings to ensure consistency with EPA's stated positions,[1,2] excluding products intended to control mini-splits and other variable-speed heating and cooling products.**

   In our review of the Draft 1 Specification, we recommend minor revisions to EPA's Draft 1 Version 2.0 documents to ensure consistency with EPA's proposed scope's inclusions and exclusions.

   We recommend that EPA make the following revisions to Draft 1 Version 2.0 Specification for STs:

   a) Remove two references to the *variable capacity* unit or compressor in the table embedded between lines 144 and 145 due to the exclusion of STs or communicating controllers for variable-speed products.
   b) Consider replacing the *variable capacity* on lines 401 and 410 with *variable speed* as EPA proposes to include smart thermostats for systems with two-stage compressors. In AHRI's Standard 1380-2019, the variable capacity products definition consists of variable-speed (or continuously-variable) and two-stage (or discretely-variable) systems.[3]

   In addition, EPA's Draft 1 Version 2.0 Method to Demonstrate Field Savings specifies terms such as *modulating* and *variable capacity* on lines 57 and 71. We agree that *modulating* is appropriate in heating mode for high-efficiency condensing gas-fired furnaces equipped with modulating burners that pair with two-stage compressor CACs or HPs. However, we recommend that EPA consider limiting the use of the term *modulating* to furnaces only. We suggest using *variable speed* instead of *modulating* or *variable capacity* when referring to CACs and HPs, which have variable-speed compressors with three or more capacity stages.

3. **The CA IOUs support EPA's decision to continue the use of *Building America* climate zones. We recommend EPA consider the bin fractions outlined in DOE's CAC/HP federal test procedure when analyzing data sets for future Version 3.0 specifications.**

   EPA's software methodology currently allows for the collection of outdoor temperature data. We recognize EPA may not be able at this stage to perform additional analyses for documentation related to STs Version 2.0. However, we recommend EPA consider a further analysis of the data collected via the software methodology during the Version 3.0 Specification development process. When developing criteria for Version 3.0, we suggest that EPA structure its collected outdoor temperature data per Table 19 (cooling fractional bin hours for SEER2) and Table 20 (heating fractional bin hours for HSPF2) of the U.S. Department of Energy (DOE) CAC/HP test procedure outlined in Appendix M1 to 10 CFR Part 430, effective January 1, 2023.[4] This configuration may offer EPA and stakeholders some insights into the performance of single-speed and two-stage CAC/HP systems equipped with an ST in any *Building America* climate zones.
   Development of a dataset structured in accordance with cooling and heating fractional cooling bin hours will provide feedback on the representativeness of the Appendix M1 test procedure and aggregate user behavior in U.S. homes, e.g., sizing behavior, recovery times, interior and set point temperatures,

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[1] EPA's Memo on Draft 1 Version 2.0:
https://www.energystar.gov/sites/default/files/asset/document/ENERGY%20STAR%20Version%202.0%20Smart%20Thermostat%20Draft%201%20Cover%20Memo.pdf
[2] Sections 2)B.3 and 6)A. of Draft 1 Version 2.0 specification for STs:
https://www.energystar.gov/sites/default/files/asset/document/ENERGY%20STAR%20Version%202.0%20%20Smart%20Thermostat%20Draft%201%20Program%20Requirements.pdf
[3] https://ahrinet.org/App_Content/ahri/files/STANDARDS/AHRI/AHRI_Standard_1380_I-P_2019.pdf
[4] https://www.ecfr.gov/current/title-10/chapter-II/subchapter-D/part-430/subpart-B/appendix-Appendix%20M1%20to%20Subpart%20B%20of%20Part%20430

resistance heating usage by outdoor temperature, and home model runtime versus demand slope and balance point. The analytical results may also support the development of EPA's future versions of the ST and CAC/HP ENERGY STAR® specifications.

4. **The CA IOUs support EPA's proposed scope expansion to include line voltage thermostats. We recommend EPA consider incorporating additional provisions specific to demand response (DR) and resistance heat utilization (RHU) in a future Version 3.0 Specification development process.**

   DR programs that use STs continue to be a high priority not only for the CA IOUs but for many utilities across the country.[5] We encourage EPA to develop criteria ensuring that STs with DR functionality can incorporate open communication standards that include the following criteria: cybersecurity, interoperability, easy configuration,[6] direct load control capability, and responsiveness to energy price signals and system emergency. EPA should consider collecting DR events that are an active part of the interval data for post-processing efforts.

   We recommend EPA consider replacing the obsolete hyperlink for Joint Appendix 5 (JA5) on lines 191 and 192 of the Draft 1 Version 2.0 Specification for STs with any currently applicable hyperlinks related to JA5.[7,8]

   We support EPA's proposed inclusion of line voltage STs in this specification. We agree with the national significance of this product and potential energy savings on products with a coefficient of performance of 1.0 and note that California has concentrations of these products in multifamily dwellings. As illustrated on Table 1, at least **ten percent** of California's multifamily residents use baseboard resistance heating as their primary heat source.

[5] 2020 ENERGY STAR® Summary of HVAC & Smart Thermostat Summary: https://www.energystar.gov/productfinder/downloads/2020/2020%20ENERGY%20STAR%20Summary%20of%20HVAC%20and%20Smart%20Thermostat%20Programs.pdf

[6] The OpenADR Alliance has previously taken steps to assess the benefits of a standardized approach for exchanging information and how two open communication standards, OpenADR 2.0 and ANSI/CTA-2045, work together to coordinate demand response and distributed energy resources. See here for more details: https://www.openadr.org/webinar-series

[7] Hyperlink to the California Energy Commission's Occupant Controlled Smart Thermostats certification page with pertinent references to JA5: https://www.energy.ca.gov/rules-and-regulations/building-energy-efficiency/manufacturer-certification-building-equipment-7

[8] Hyperlink to California Energy Commission's 2022 Energy Code Reference Appendices incorporating the JA5 language: https://efiling.energy.ca.gov/GetDocument.aspx?tn=240699&DocumentContentId=74055

**Table 1: 2019 Residential Appliance Saturation Study (RASS) Survey: Is electric resistance heating* your primary heating system?**

| Building Type | Applicable Respondents | NO (applicable only) | YES (applicable only) | No Response (applicable only) |
|---|---|---|---|---|
| Single Family | 6,584,988 | 94.6% | 1.6% | 3.8% |
| Townhouse, Duplex, Row House | 904,958 | 91.0% | 3.5% | 5.5% |
| Apt Condo 2-4 Units | 855,122 | 83.0% | 9.7% | 7.3% |
| Apt Condo 5+ Units | 1,850,037 | 78.1% | 12.3% | 9.6% |
| Mobile Home | 226,784 | 86.2% | 2.8% | 11.0% |
| Other | 161,750 | 84.8% | 6.4% | 8.7% |
| **Total** | **10,583,639** | **90.1%** | **4.4%** | **5.5%** |

*Resistance heating systems include the following: baseboard, ceiling, floor, and wall heaters. Most of the systems are expected to be electric baseboards. Data sources include the following: RASS 2019 and analysis by the CA IOUs (re-normalized to applicable respondents). Applicable respondent is a user who reports heating and pays for heating.
Source: RASS 2019, saturation tables online tool, run on: "Space Heating; Primary resistance electric heater - B2", by "Building Type."

We applaud EPA's proposal to include performance criterion on RHU in the Draft 1 Version 2.0 Specification for STs. We refer to previous EPA smart thermostat discussions[9] and a utility program evaluation study on this topic, indicating that certain ST algorithms can notably increase the usage of resistance heating in each installation, resulting in additional consumer energy costs.[10]

Additionally, we note that the RHU specification solely addresses electric resistance heat and does not address the gas-fired backup heating scenario for a dual-fuel product installed to satisfy a building's heating load. When the vapor-compression cycle cannot satisfy the building's heating load, the controls must be appropriately optimized to invoke the backup gas-fired heating operation in very cold ambient temperature conditions. We recommend EPA take the necessary steps to characterize and optimize all possible auxiliary heating approaches in electric and gas-fired modes (e.g., dual-fuel heat pumps) to maximize the performance during the heat pump vapor-compression. This 2022 study[11] estimates single-speed dual-fuel products had $CO_2$ emission savings between five and 16 percent, with automatic control of the product lockout saving nine percent over the single fuel baseline; we note that carefully optimized lockout temperatures were key to obtaining these savings for each manually optimized site.

We believe a transition from RHU to an auxiliary heat utilization approach in a future Version 3.0 Specification will help optimize the lockout temperature associated with electric or gas backup heat options. EPA has previously addressed recognition criteria for certain gas-fired products.[12,13]

[9] In this EPA Connected Thermostat Metrics Meeting, April 2020, p. 8-9, EPA demonstrates that two vendors, labelled "Plum" and "Lemon," demonstrate more than double the electric resistance backup heating usage of other thermostat products (8 other products).
[10] BPA writeup, p. 18 on ICF Southern Maryland Electric Cooperative (SMECO) report, which reported an evaluated savings of negative 7 to negative 9 percent energy savings; note CA IOUs has a hardcopy of this report but could not find a working online link. Negative savings and confidence interval on p. 26 of SMECO report.
[11] https://slipstreaminc.org/sites/default/files/2022-05/dual-fuel-air-source-heat-pump-pilot.pdf , p. 40.
[12] See EPA's response to the "Gas Phase Out" topic here: https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Most%20Efficient%202022%20Stakeholder%20Comments_0.pdf
[13] See page 3 of EPA's 2022 final criteria memorandum here: https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Most%20Efficient%202022%20Final%20Criteria%20Memo_0.pdf

In conclusion, we would like to reiterate our support for EPA's ENERGY STAR® Draft 1 Version 2.0 specification for STs. We thank EPA for the opportunity to be involved in this process.

Sincerely,

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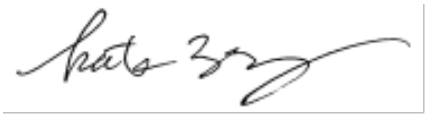

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