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CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

NEW PERFORMANCE CREDIT FOR CENTRAL HPWH DEMAND MANAGEMENT SYSTEMS IN NONRESIDENTIAL AND MULTIFAMILY BUILDINGS

July 7, 2026

California Energy Commission

Docket No. 25-BSTD-03

The California Statewide Codes and Standards Enhancement (CASE) initiative presents recommendations to support the California Energy Commission's (CEC's) efforts to update California's Energy Code (Title 24, Part 6), including revisions to simplify and clarify existing code requirements. Three California Investor-Owned Utilities (IOUs) — Pacific Gas & Electric Company (PG&E), San Diego Gas & Electric (SDGE), and Southern California Edison (SCE) sponsored this effort as a group.

This letter recommends a new compliance credit for central heat pump water heater (CHPWH) demand management systems in nonresidential and multifamily buildings to address stakeholder concerns, ensure consistent interpretation and application of the requirements, and to support strong compliance. This letter does not recommend changes that will increase the stringency of existing requirements or recommend that existing requirements be more broadly applied. A cost-effectiveness analysis or use of the full codes and standards enhancement report template is therefore not required.

1. Measure Description and Justification

1.1 Proposal Description

This comment letter is proposing a new compliance credit for CHPWH demand management systems in nonresidential and multifamily buildings. The Statewide Case Team modeled the new compliance credit after the framework in Joint Appendix 13 (JA13) - Qualification Requirements for Heat Pump Water Heater Demand Management Systems. There are three topics of proposed updates:

Pacific Gas and Electric Company
SOUTHERN CALIFORNIA EDISON Energy for What's Ahead
SDGE

1. New compliance credit for CHPWH systems in nonresidential and multifamily buildings.
2. Establish well-defined language for the new compliance credit based on industry feedback to JA13.
3. Describe the need for others to develop a conformance standard in the future.

The Statewide CASE Team proposes that a compliance credit would not require a project to meet a conformance standard since a satisfactory standard does not yet exist. The proposed credit would need to be available prior to the industry developing a conformance standard to encourage outside parties to dedicate the resources and effort to develop one. A future conformance standard could improve the outcome of projects pursuing the credit by defining the expectations of real-world equipment performance. However, carefully worded performance credit language can address these needs until a conformance standard is developed.

Compliance software would use modeling inputs to verify credit compliance. For example, defining the project's designed hot water storage volume, the hot water load profile of the building, and other relevant system design inputs, would allow the model to simulate system performance and demonstrate that sufficient load shifting is possible. Section 3 outlines the load shifting design goals of the credit.

For more robust and future verification, acceptance testing by a field technician could verify conformance of the project controls.

The proposed new compliance credit and associated Nonresidential and Multifamily Alternative Calculation Method Reference Manual (herby referred to as "ACM") guidance would be applicable only for CHPWHs for nonresidential and multifamily building performance modeling for new construction, additions, and alterations.

Compliance software does not currently offer the ability to model load shifting of CHPWHs. Section 3 proposes ACM language that would serve as design guidelines for projects pursuing the proposed credit and as a description of future modeling requirements. Some CHPWH sizing tools currently model proposed load shifting performance by comparing equipment and controls inputs against hot water load profiles (see the Ecosizer sizing tool). Those tools can serve as a design guide for future compliance software updates.

Please note that California Assembly Bill (AB) 130 does not restrict the development of new compliance credits or adding language to the ACM. This proposed compliance credit does not require modifications to Title 24 code language.

1.2 Benefits of Proposed Change

New compliance credit for CHPWH systems in nonresidential and multifamily buildings

Identifying a load shifting and demand response credit for central systems for nonresidential and multifamily buildings will greatly increase the impact of this optional performance credit. It will give alterations, additions, and new construction projects a new compliance credit to apply to their projects, improving flexibility in design. It will also encourage a large and previously excluded customer segment to participate in bill savings opportunities while promoting grid stability.

Establish well-defined language for the new compliance credit based on industry feedback to JA13

The proposed changes will address ambiguity in the existing JA13 language on a range of topics including: how equipment should respond immediately after a load shed event is over, how load reductions are measured and relayed from the equipment to the demand response program administrator or aggregator, settings to be recovered after loss of power, and in what scenario load functions should be enabled. These clarifications will allow program administrators to confidently rely on consistent responses and participation from qualified equipment delivering greater bill savings to customers as well as reducing strain on the grid. Manufacturers can benefit from streamlined and clear requirements for equipment responses, removing confusion, and enabling confidence in the long-term design and manufacturability of their equipment.

Future conformance standard

The Statewide CASE Team recommends future investigation of a CHPWH conformance standard. The Statewide CASE Team's research to date has not identified a standard in the market that sufficiently addresses the identified issues outlined in this letter, but has confirmed with industry stakeholders, including original equipment manufacturers (OEMs), program implementers and subject matter experts, that the current JA13 requirement for residential heat pump water heater (HPWH) manufacturers to self-attest equipment compliance has proven to be insufficient.

The Statewide CASE Team anticipates a future conformance standard will include certification. Projects pursuing the CHPWH performance credit would not require conformance testing themselves. Instead, it would require projects to select equipment with the conformance standard certification. Future work on a conformance standard should prioritize the expansion of an existing standard to address recognized JA13 conformance deficiencies, rather than the development of a new standard. Updating an existing standard would encourage OEMs to pursue meeting conformance

requirements. Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 1530 is an example of an existing standard that AHRI could expand.

Currently, manufacturers must self-attest that their demand response systems comply with JA13 requirements which includes responding to load shift signals. The JA13 language does not include which communication protocols the CEC requires to be receivable by the equipment or that equipment responses conform to specific standards or performance metrics. The interpretation of how equipment should respond to meet JA13 targets is up to the individual manufacturers. Requiring selected equipment meets a conformance standard within the proposed compliance credit will verify the respective equipment's ability to receive and respond to a load shift or demand response signal. Requiring a conformance standard will also establish which communication protocol(s) equipment can use, and that the equipment responds as expected to the signals it receives.

As mentioned, at the writing of this letter there is no industry-wide conformance standard available to manufacturers and program implementers to validate if equipment signal response meets the needs of programs, or if program expectations align with a manufacturer's desired control of their equipment. Real-world results, feedback from JA13 load shifting programs, and research testing show that without the required non-existent conformance standard, and the anticipated end-to-end testing protocol performed by the conformance standard owner, manufacturer's equipment will respond differently to the same program signal, with varying results (Besson, A., Dirr, N., Liu, H., (2024). Heat Pump Water Heater Daily Load Shifting: Advanced Load Up and Evaluation Challenges). Requiring a conformance standard within the proposed CHPWH performance credit would confirm proper response and configuration early in the design stream. This would ensure that once a product meets requirements, it can be reliably installed and used by load shed and demand response programs. Though not explored in this letter, a performance credit could allow a project meeting the future conformance standard to qualify for additional compliance credit. Attaching an additional performance credit to the conformance standard would further encourage a team to develop the standard and for manufacturers to design products with the intent of meeting the new standard.

1.3 Background Information

The Statewide CASE Team developed the initial concept for load shifting performance credit for CHPWH systems based upon literature review, previous research projects, discussions with manufacturers, and independent investigation into the maturity of load shifting products for CHPWHs currently in the market.

In early 2025, the Statewide CASE Team proposed a CASE measure to update JA13 language to include CHPWHs for nonresidential and multifamily buildings, as well as proposed updates to existing JA13 language for residential buildings. Beginning in the summer of 2025, the Statewide CASE Team engaged with the PG&E WatterSaver program administrators who provided feedback on the proposed centralized system measure and recommended language updates to the residential code language in JA13 and conformance testing requirements. Further discussions during the measure development phase ultimately concluded that pursuing JA13 code updates as a CASE measure was not a viable pathway. Instead, the Statewide CASE Team decided to provide recommended changes through a comment letter.

In March of 2026, the Statewide CASE Team discussed updated JA13 language with PG&E and the WatterSaver program for the purposes of a comment letter. However, discussions with the CEC soon after concluded that AB130 legislation would not permit language changes to JA13 and that instead the Statewide Case Team should develop an alternative performance credit.

This comment letter addresses the identified compliance credit pathway for a CHWPH load shifting credit via the ACM.

The Statewide CASE Team used the existing JA13 language as the framework for the ACM compliance credit and modified it to account for the specific needs of central systems. The borrowed language accounts for the recommendations and feedback from PG&E and the WatterSaver program, which clarified the need for more specific definitions and instructions. Discussions with PG&E, WatterSaver, research teams, and other members of the Statewide CASE Team also detailed the shortcomings of relying on manufacturer self-attestation for JA13 compliance and the need for projects to meet a conformance standard. Those topics are addressed below.

New compliance option for CHPWH systems in nonresidential and multifamily buildings

There is currently no load shifting or demand response performance credit available to CHPWH systems. CHPWHs are becoming more prevalent in the market, adding new electrical load to the grid, and increasing code requirements will only quicken the installation of these systems. Utility programs and aggregators need a pathway to coordinate the new CHPWH loads to shift them away from peak demand periods. Investigation has shown that manufacturer offerings have matured and will be capable of meeting the proposed performance credit requirements.

Establish well-defined language for the new compliance credit based on industry feedback to JA13

The Statewide CASE Team modeled the new compliance option after the JA13 framework which load shifting and demand response aggregator programs often use. The Statewide CASE Team used lessons learned from the PG&E WatterSaver program's use of JA13 in developing the new compliance option. Feedback from program administrators as well as PG&E make it clear that the existing language is leading to manufacturer confusion and unrealized program savings. For example, clarifying which efficiency mode applies to load shed charging levels can help avoid accidentally using electric resistance heating after a load shed period. Additionally, the current JA13 language does not specify the duration of time to avoid electric resistance heating elements after a load shed or demand response event. Instead, the current language only specifies avoiding electric resistance heating elements "immediately" after an event. These are examples of language updates that would benefit both manufacturers and program administrators. Without specificity, equipment responses and effectiveness are variable and often unreliable.

The Statewide CASE Team incorporated feedback from several OEMs (Rheem, A.O. Smith, Mitsubishi, and Water Drop) to develop the proposed credit language. These stakeholders commonly recommended that credit language should avoid including prescriptive requirements. For example, the use of specific hot water storage temperature setpoints or storage tank volumes. The proposed credit addresses these concerns by establishing design goals to meet credit compliance. Defining the design goals allows programs and demand response aggregators to understand the anticipated system load reductions while allowing manufacturers and designers flexibility in the configurations of their equipment.

Future conformance standard

Stakeholder feedback has shown that relying on self-attestation for compliance credit is unintentionally resulting in unreliable conformance of the equipment response to the expectations of the credit language. A manufacturer may test their equipment in-house and observe that the equipment appropriately responds to a signal simulation and meets their interpretation of code requirements, but there is no opportunity for building owners/operators, utility programs, or aggregators to learn what the equipment response will be until after it is installed. Requiring projects to meet a conformance standard ensures the manufacturers, program administrators, and aggregators have confidence in the expected and achievable equipment responses.

Stakeholder feedback, supported by previous studies (Besson, A., Dirr, N., Liu, H., (2024), Heat Pump Water Heater Daily Load Shifting: Advanced Load Up and Evaluation Challenges) and discussions with research teams, detailed discrepancies with the accuracy of the projected kilowatt (kW) and kilowatt-hour (kWh) reduction of a load shed or demand response mode across tested equipment. Different manufacturers

may rely on the compressor or electric resistance element's rated capacities to estimate reduction capabilities, while others may use in-house testing results. Some manufacturers may include on-board power meters to confirm load reduction. Requiring projects to meet a conformance standard will remove the variability in results and approaches so that all parties can be confident in how the values are determined and can make necessary changes if needed.

Although the benefits of a project meeting a conformance standard are detailed and understood by key stakeholders in the load shifting arena, the Statewide CASE Team has not identified a standard or conformance test for use. The Statewide CASE Team investigated multiple options, including the CTA-2045 standard, Northwest Energy Efficiency Alliance (NEEA) standards, AHRI 1530 standards as well as Title 20. The development of a conformance standard for both CHPWH equipment and residential HPWHs would greatly benefit the industry and should be explored when possible.

2. Stakeholder Engagement to Inform Proposal

When developing this comment letter, the Statewide CASE Team worked with industry stakeholders including the PG&E WatterSaver program administrators, the Association for Energy Affordability (AEA) program implementor, the PG&E codes and standards (C&S) team, experts in the load shifting arena including Helen Davis from Energy Solutions, Peter Grant from Berkeley Laboratory and Robert Bass from Portland State University, fellow C&S research teams, single family HPWH manufacturers as well as four CHWPH manufacturers (A.O. Smith, Rheem, Mitsubishi and Water Drop). The stakeholder engagement plan includes receiving feedback during a public stakeholder workshop at a future time if the proposed compliance credits advance to development.

New compliance option for CHPWH systems in nonresidential and multifamily buildings

Manufacturers have expressed interest in developing CHPWH equipment that could participate in load shed and demand response programs, not only through IOU incentive programs but also through third-party aggregators. This is based on meetings with representatives from Mitsubishi, Water Drop, A.O. Smith, and Rheem. The Statewide CASE Team supports this effort to develop a new compliance credit for nonresidential and multifamily customers.

Establish well-defined language for the new compliance credit based on industry feedback to JA13

The Statewide CASE Team has had ongoing discussions with PG&E and the WatterSaver program administrator (AEA) since mid-2025 that have informed the

proposed code language. Specific code language updates are largely based on successful third-party load shifting field projects:

ACEEE

- Advancing Grid Sustainability: Heat Pump Water Heaters for Load Shifting in Commercial and Multifamily Applications

BPA

- Mitsubishi Heat2O Hot Water Load Shift Demonstration and Simulation Analysis: at Bayview Towers
- Demonstration and M&V: Commercial HPWH System using the Mitsubishi HEAT2O in Origin by Steffes Plug-and-Play Package at Bayview Tower, Seattle WA
- Lochinvar Veritus HPWH Feasibility Study and Applications Testing

CalNEXT

- Commercial and Multifamily CO2 Heat Pump Water Heater Market Study and Field Demonstration
- Central Heat Pump Water Heater Controls Optimization
- Packaged Central CO2 Heat Pump Water Heater Multifamily Demonstration

The code language updates are also based on market maturity by manufacturers in bringing forward load shifting system controllers and HPWH specific storage tanks that combined offer advanced load shifting capabilities of the storage tanks and in some cases the swing tank:

Laars

- Laars E-Therm Tank System Controller CTA-2045
- Laars Stratified Storage Tanks with 5 Thermowells for Demand Response
- Laars Tank System Controller Manual with Swing Tank Wiring Connections

A.O. Smith

- Heat Pump Storage Tanks with 4 Thermowells
- Emerge-X I/O Manual CTA-2045
- Outdoor Split CO2 HPWH CTA-2045 Port

Mitsubishi

- QAHV Heat Pump Storage Tank with 3 Thermowells
- QAHV Supervisor Panel Demand Response Optimization

QAHV Tank Controller Panel 6 Thermistor Inputs

QAHV Spec Load Shifting and CTA-2045

This stakeholder engagement is in conjunction with feedback from AEA who is the program administrator of the WatterSaver program. WatterSaver has been in operation since 2022 and is slated to continue through the end of 2027. Both PG&E and AEA have deep experience operating a load shifting program and provided suggested JA13 code language improvements and definitions for single-family residential buildings, some of which can be used for the new performance credit for centralized systems.

Future conformance standard

The need for a third-party conformance standard is again largely based on conversations with PG&E and AEA and supported by load shifting research conducted by Helen Davis from Energy Solutions, Peter Grant from Berkeley Laboratory, and Robert Bass from Portland State University. The Statewide CASE Team's direct conversations with manufacturers also revealed industry interest in aligning on a common conformance testing standard. The Statewide CASE Team recommends developing a conformance standard for both CHPWH equipment and residential HPWHs when possible.

3. Proposed Code Language

3.1 Guide to Markup Language

The proposed changes to the standards, Reference Appendices, and the ACM Reference Manuals are provided below. Changes to the 2025 documents should be marked with dark blue underlining (new language) and ~~strikethroughs~~ (deletions).

3.1.1 Nonresidential and Multifamily ACM Reference Manual

ACM.1 Central Heat Pump Water Heater (CHPWH) Advanced Control Credit

A central heat pump water heater (CHPWH) Advanced Control Credit is available for multifamily and nonresidential buildings using CHPWHs. The CHPWH Advanced Control Credit provides compliance credit for systems that provide load shifting capability. The CHPWH Advanced Control Credits are based on modeling of typical CHPWHs, where the control turns the water heater on and off at optimal times for maximum long-term system cost (LSC) benefits. The CHPWH Advanced Control Credit is based on the advanced controllability of the hot water storage temperature set point

which allows the water heating system to store additional hot water energy ahead of load shifting periods when the heating capacity of the system is turned off.

ACM.2 Performance Credit Calculation

a. To receive the credit a modeled system must meet a minimum of XX%[1] of CHPWH plant kilowatt-hour (kWh) load during peak hours (4–9 p.m.) using the Advanced Load Up + Shed commands.
    a. The total CHPWH plant kWh load during peak hours (4–9 p.m.) includes the loads met by the primary heating equipment and temperature maintenance heating equipment (if separate).

b. The available LSC credit in each climate zone is shown in Table X: CHPWH Advanced Control Credit. The LSC percentage reduction is applied upon the completion of the compliant simulation run. Note that this percentage reduction only applies to the LSC values for water heating.

Table X: CHPWH Advanced Control Credit

Climate Zone	Credit[2]
1	TBD
2	TBD
3	TBD
4	TBD
5	TBD
6	TBD
7	TBD
8	TBD
9	TBD

[1] This XX% placeholder is intentional. The expected percentage of CHPWH plant kWh load during design day peak hours that should be met via load shifting is currently being investigated. The Statewide CASE team will provide the values should the CEC accept this compliance credit proposal.

[2] The TBD placeholders used for credit values are intentional. The final available credits will need to be determined via modeling. The Statewide CASE team will provide the values should the CEC accept this compliance credit proposal.

Climate Zone	Credit[2]
10	TBD
11	TBD
12	TBD
13	TBD
14	TBD
15	TBD
16	TBD

ACM.3 Peak Hours

The defined peak hours for modeling purposes are 4–9 p.m., Monday-Friday.

ACM.4 Heat Pump Water Heater Demand Management System:

The HPWH Demand Management System (System) means the following components connected to a water heater, and not the water heater itself, all of which are necessary to fulfill the primary function of the System:

a. Any hardware or software integrated with the water heater;
b. Any hardware or software connected to the water heater and installed on premise (including a module, or third-party controller); and
c. Any software contained in applications or in the cloud.

ACM.5 Return to Standard Operation:

The System terminates any demand management function and returns to user-selected standard operation mode until the next demand management function is activated. Return to Standard Operation requirements will apply to both primary and temperature maintenance heating equipment.

ACM.6 Primary Storage Tanks

Description:

a. A primary storage tank is intended to serve the hot water demand of the building and will also serve the temperature maintenance load when in a return-to-primary configuration.

Standard Design:

b. The primary storage tank shall have a minimum of three temperature sensors located at approximately 10-25%, 30-45%, and 65-85% of total volume below the temperature sensors.

c. Temperature sensor data for at least the three sensor locations must be made available to the System for use in Advanced Load Up and Shed functions.

d. The primary storage tank must be sufficiently sized to meet XX%[3] CHPWH plant kWh load during peak hours when using the Advanced Load Up + Shed functionality.

ACM.7 Temperature Maintenance Heater

Description:

a. A temperature maintenance heater is intended to independently serve heat losses in the distribution system during periods of no hot water demand but is not always included in central plant designs.

Standard Design:

b. The temperature maintenance heater shall be included in load shed commands and can be controlled by a single system controller also controlling the primary heat pumps or can be controlled by an independent system controller.

c. The temperature maintenance heater is included in the total CHPWH plant kWh consumed during shed events calculation.

d. A temperature maintenance heater using a thermal storage tank shall have a minimum of two temperature sensors located at approximately 20-45%, and 65-85% of total volume below the temperature sensors.

e. Temperature sensor data must be made available to System for use in Advanced Load Up and Shed functions.

ACM.8 Schedule

Description:

[3] This XX% placeholder is intentional. The expected percentage of CHPWH plant kWh load during design day peak hours that should be met via load shifting is currently being investigated. The Statewide CASE team will provide the values should the CEC accept this compliance credit proposal.

a. The CHPWH shall be capable of storing a minimum of two, hour-of-day load shift schedules and one, day-of-week schedule. The hour-of-day schedules shall dictate which load shift operating state to run in for each hour. The day-of-week schedule dictates which schedule to operate in on each day of the week.

Standard Design:

a. A CHPWH shall shed during the peak hours of 4—9 p.m., Monday-Friday.
b. A CHPWH shall return to user-selected standard operation mode outside of peak hours.

ACM.9 Advanced Load Up

Description:

a. The Advanced Load Up command directs the water heater to store additional thermal energy that the device does not store under user-selected standard operation mode. Advanced Load Up allows the stored thermal energy to increase within the parameters set by the manufacturer by adjusting the temperature setpoint beyond the user-selected standard operation mode setpoint.

Standard Design:

a. Temperature setpoint shall be greater than the user-selected standard operation mode setpoint.
b. Available volume of stored thermal energy shall be greater than the user-selected standard operation mode setpoint.
c. Stored thermal energy provides the ability to meet XX%[4] of CHPWH plant kWh load during peak hours.

ACM.10 Shed

Description:

a. The Shed command directs the water heater to prevent using energy that the device otherwise uses under the user-selected standard operation mode by

[4] This XX% placeholder is intentional. The expected percentage of CHPWH plant kWh load during design day peak hours that should be met via load shifting is currently being investigated. The Statewide CASE team will provide the values should the CEC accept this compliance credit proposal.

using stored thermal energy in the tank to meet the hot water demand of the building.

Standard Design:

a. Stored thermal energy provides the ability to meet XX%[5] of CHPWH plant kWh load during peak hours.
b. The CHPHW plant shall avoid use of electric resistance heating during the shed event unless the temperature sensor that quantifies the minimum stored hot water temperature at the defined thermowell location meets the activation temperature prior to building occupant needs not being met.
c. The CHPWH plant shall avoid use of electric resistance heating for three hours after the event unless building occupant needs cannot be met.

[5] This XX% placeholder is intentional. The expected percentage of CHPWH plant kWh load during design day peak hours that should be met via load shifting is currently being investigated. The Statewide CASE team will provide the values should the CEC accept this compliance credit proposal.