

Proposal Summary



2022 California Energy Code (Title 24, Part 6)

Single Family Residential Grid Integration - Battery Storage

Date last updated: Wednesday, August 19, 2019

Prepared by: David Zhang, Energy Solutions

Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on Tuesday, September 10th, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by August 27th, 2019.

Measure Description

Single Family Battery Storage describes the battery storage system installed within single family residential homes. Primary functions of the battery storage system include:

- 1) Daily cycling for the purpose of load shifting
- 2) Maximized solar self-utilization
- 3) Grid integration

The battery storage system implements these functions by charging the battery from a solar photovoltaic (PV) system when there is limited electrical load at the building and discharging when building load exceeds generation. Additional controls strategies allow the battery system to adjust discharge time windows to better respond to peak demand periods when the cost of electricity is high.

Battery storage is available as a compliance credit in the performance compliance method. Battery storage is integrated in the latest version of 2019 CBECC-Res in accordance to Joint Appendix 12 (JA12) of the 2019 Title 24 Reference Appendices. JA12 defines compliance qualification requirements for battery systems installed in conjunction with on-site photovoltaic systems. Compliance qualifications include safety, performance, battery controls, interconnection, and enforcement requirements.

Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions).

Reference Appendices, JA 12

Appendix JA12 – Qualification Requirements for Battery Storage System



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JA12.2.2 Minimum Performance Requirements

The installed battery storage system should meet or exceed the following performance specification:

- (a) Usable capacity of at least 5 kWh.
- (b) Single Charge-discharge cycle AC to AC (round-trip) efficiency of at least ~~80~~ [Placeholder for updated efficiency] percent.
- (c) Energy capacity retention of 70 percent of nameplate capacity after 4,000 cycles covered by a warranty, or 70 percent of nameplate capacity under a 10-year warranty.

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JA12.4 Enforcement Agency

The local enforcement agency shall verify that all Certificate of Installations are valid. The battery storage systems shall be verified as a model certified to the Energy Commission as qualified for credit as a battery storage system. In addition, the enforcement agency shall verify that the battery storage system is programmed and operational with one of the ~~control~~ control strategies listed in JA12.2.3.1, JA12.2.3.2, JA12.2.3.3, or JA12.2.3.4. The programmed control strategy at system final inspection and commissioning shall be the strategy that was used in the Certificate of Compliance and documented in the [Placeholder for verification document]. The enforcement agency shall also verify that the battery round trip efficiency meets JA12 performance requirements by following the [Placeholder for round trip efficiency test procedure]

Residential Compliance Manual, Chapter 7.5

7.5 Battery Storage System

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7.5.1 Minimum Performance Requirements

JA12 specifies that the battery storage system must meet or exceed the following performance specifications:

- a. Usable capacity of at least 5 kWh.
- b. Single Charge-discharge cycle AC to AC (round-trip) efficiency of at least ~~80~~ [Placeholder for updated efficiency] percent.
- c. Energy capacity retention of 70 percent of nameplate capacity after 4,000 cycles covered by a warranty, or 70 percent of nameplate capacity under a 10-year warranty.

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7.5.4 Minimum Performance Requirements

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Enforcement Agency: The local enforcement agency shall verify that all Certificate of Installations are valid. The battery storage systems shall be verified as a model certified to the Energy Commission as qualified for credit as a battery storage system. In addition, the enforcement agency shall verify that the battery storage system is programmed and operational with one of the ~~control~~ **control strategies** listed in Section 7.5.2 above. The programmed control strategy at system final inspection and commissioning shall be the strategy that was used in the Certificate of Compliance **and documented in the [Placeholder for verification document]**. **The enforcement agency shall also verify that the battery round trip efficiency meets JA12 performance requirements by following the [Placeholder for round trip efficiency test procedure]**

2019 Residential ACM Reference Manual, Appendix D

APPENDIX D – STATUS OF MODELING BATTERIES FOR CALIFORNIA RESIDENTIAL CODE COMPLIANCE

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Battery Representation in CSE

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Time of Use Strategy

The TOU strategy attempts to preferentially discharge during high-value hours **as determined by seasonally specific grid load peaks, as determined by TDV ~~during summer (June–September)~~**. The discharge period is statically defined (per climate zone) by the first hour of the expected evening TDV peak.

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~~Outside of July–September the TOU strategy reverts to the Basic strategy.~~

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Advanced DR Control

The Advanced DR (i.e., Demand Response) strategy uses the current day's TDV schedule to make dynamic time-of-use priorities. This strategy activates on days that have **[placeholder for alternative activation signal]** ~~a peak TDV greater than 10 TDV/kBTU~~. On all other days, the simulation reverts to the Basic strategy.

Proposal Summary



2022 California Energy Code (Title 24, Part 6)

Single Family Residential Grid Integration – Load Shifting HPWH

Date last updated: Wednesday, September 6, 2019

Prepared by: Marc Hoeschele, Frontier Energy

Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 10, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by September 24, 2019.

Measure Description

The heat pump water heater (HPWH) load shifting measure will build on work that is currently in process under the 2019 Title 24, Part 6 code development. Since this work is not finalized, the exact scope and direction of the 2022 effort is not fully defined. At this point the scope is expected to include:

- Review and modifications to the current draft JA13 Appendix (Qualification Requirements for Heat Pump Water Heater Demand Management Systems)
- Potential modification of the HPWH load shift modeling algorithm in the compliance software
- Potential addition of HERS inspection requirements to the Residential Appendices

Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Expected sections or tables of the proposed code (but not specific changes at this time) are highlighted in yellow.

Standards

Existing 2019 Code Language shown:

SECTION 110.12 – MANDATORY REQUIREMENTS FOR DEMAND MANAGEMENT

Buildings, other than health care facilities, shall comply with the applicable demand responsive control requirements of Section 110.12(a) through 110.12(d).

(a) **Demand responsive controls.**

1. Demand responsive controls shall be either:



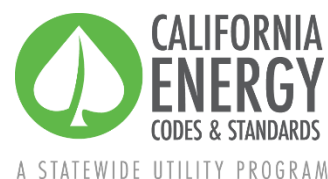
- A. A certified OpenADR2.0a or OpenADR2.0b Virtual End Node (VEN), as specified under clause 11, Conformance, of the applicable OpenADR 2.0 Specification, or
- B. Certified by the manufacturer as being capable of responding to a demand response signal from a certified OpenADR2.0b Virtual End Node by automatically implementing the control function requested by the Virtual End Node for the equipment it controls.

JA13 (Qualification Requirements for Heat Pump Water Heater Demand Management Systems) is still in draft form for 2019 and may be modified for 2022.

Reference Appendices

If HERS verification of proper HPWH configuration for load shifting is determined to be necessary, a new section in the Residential Appendices will be added to document verification procedures.

Proposal Summary



2022 California Energy Code (Title 24, Part 6)

Single Family Residential Grid Integration – Pre-Cooling and Thermostats

Date last updated: Monday, September 2, 2019

Prepared by: Kristin Heinemeier, Frontier Energy

Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 10, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by October 15, 2019.

Measure Description

This measure will update the voluntary compliance options for Pre-Cooling. The qualifying criteria for this measure will be defined in a proposed new Joint Appendix 14. This will continue to provide credit as a “Demand Response Flexibility” measure, but with the following modifications:

- Revisit CBECC-RES assumptions for factors—such as optimal pre-cooling start time, optimal pre-cooling period temperature setpoint, regular temperature setpoints and schedules, system sizing, and thermal mass—used to establish credit.
- Develop criteria for thermostats that are eligible for this credit:
 - No longer require an Occupant-Controlled Smart Thermostat with demand response capabilities.
 - Require a set of features for thermostat User Interface and Display, and Required Functional Behavior, designed to improve usability for pre-cooling. These features are to be determined.
 - Require a set of default optimal schedules, specific to climate zone, to be shipped by the manufacturer/distributor or set by the installing contractor, potentially with associated acceptance tests.
 - Develop a CEC certification process, potentially with associated labelling to assist in inspections.
- Update the current 70% “derating” factor currently imposed, to reflect improved usability and a improved behavioral analysis.

This sub-measure also includes an additional separate measure:

- Consider providing additional compliance options for additional Smart Thermostat features, to be determined.



Draft Code Language

The proposed changes under consideration for the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions).

Standards

N/A

Reference Appendices

Specific language for JA14 has not yet been developed but will parallel and draw from existing requirements for Occupant Controlled Smart Thermostats in JA5, and usability guidelines established for programs such as ENERGY STAR.

The following types of modifications may be made:

JA5.2.2 Restart Settings: remove requirement to reconnect to network, unless it is essential to the operation of the thermostat.

JA5.2.3 Automatic Rejoin: remove requirement to reconnect to network, unless it is essential to the operation of the thermostat.

JA5.2.4 Event Responses:

- Modify to incorporate requirements for regular temperature scheduling to minimize bills under TOU (“pre-cooling”).
- Modify default setpoint offsets and allow for specific setpoints (vs. offsets). Include defaults and limits for both a maximum desired peak period temperature and a minimum desired pre-cooling period. Make default setpoints adjustable by manufacturer and or installer. Include default timing for pre-cooling, adjustable by manufacture or installer.
- Override functionality: clarify the distinction between daily overrides and permanent overrides (“opt-out”)

JA5.2.5 User Display and Interface: include requirements for usability for implementing features such as:

- temporary overrides (eg, a “Skip Demand Response” button)
- optional manual implementation of pre-cooling modes (eg, a “Pre-Cooling” button)
- acceptance testing (to confirm optimal schedule is programmed).

JA5.2.6 Required Functional Behavior: include pre-cooling functionality, well integrated with User Display and Interface. This man include features such as:

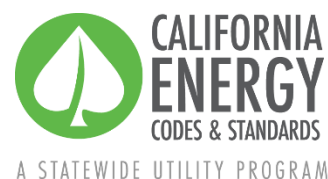
- Increasing the number of schedules (include one named “Pre-Cool”)
- Allowing adaptive recovery to reach pre-cooling setpoint prior to start of TOU Peak period
- Requiring easier to set and confirm programmed schedules
- Making it harder to permanently override a programmed schedule, while making it easier to temporarily override a programmed schedule
- Providing “Pre-Cooling” or “Demand Response” modes that allow occupant to Opt In or Opt Out (button?)

- Providing a mechanism for diagnostics to annunciate when schedule differs from “intended” schedule: locally or remotely
- Providing instruction, messaging, feedback: eg, clear indication of Pre-Cooling Mode

Alternative Calculation Method Reference Manual

Possible changes to the ACM might include assumptions for modeling of pre-cooling impact: optimal pre-cooling start time, optimal pre-cooling period temperature setpoint, regular temperature setpoints and schedules, system sizing, and thermal mass. Optimal settings will depend on climate zone and on assumed TOU rates (not TDV). Also, modify the derating factor, based upon analysis.

Proposal Summary



2022 California Energy Code (Title 24, Part 6)

Single Family Residential Grid Integration – Home Automation

Date last updated: Wednesday, September 4, 2019

Prepared by: Bob Hendron, Frontier Energy

Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 10, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by October 15, 2019.

Measure Description

This measure will provide a voluntary compliance option for Home Energy Management Systems (HEMS) that meet certain qualifying criteria, as defined in a proposed new Residential Appendix RA5. Possible forms of the credit include the following, in order of priority:

1. Maintain the solar zone credit when a HEMS is installed in combination with a smart thermostat but define specific technical requirements for the HEMS.
2. Create a new exception to the solar zone area requirement if a HEMS with expanded capabilities is installed.
3. Allow credit against the Energy Efficiency Design Rating if significant energy savings has been demonstrated through objective field studies, perhaps de-rated because the savings will be heavily dependent on occupant behavior.

Draft Code Language

The proposed changes under consideration for the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions).

Standards

EXCEPTION 6 to Section 110.10(b)1A: Single family residences meeting the following conditions:

- A. All thermostats are demand responsive controls that comply with Section 110.12(a), and are capable of receiving and responding to Demand Response Signals prior to granting of an occupancy permit by the enforcing agency.
- B. Comply with one of the following measures:
 - i. Install a dishwasher that meets or exceeds the ENERGY STAR Program requirements with a refrigerator that meets or exceeds the ENERGY STAR Program requirements, a whole house fan



driven by an electronically commutated motor, or an SAE J1772 Level 2 Electric Vehicle Supply Equipment (EVSE or EV Charger) with a minimum of 40 amperes; or

- ii. Install a home automation system ~~capable of, at a minimum, controlling the appliances and lighting of the dwelling and responding to demand response signals that complies with Residential Appendix RA5 “Qualification Requirements for Home Energy Management Systems”;~~ or
- iii. Install alternative plumbing piping to permit the discharge from the clothes washer and all showers and bathtubs to be used for an irrigation system in compliance with the *California Plumbing Code* and any applicable local ordinances; or
- iv. Install a rainwater catchment system designed to comply with the *California Plumbing Code* and any applicable local ordinances, and that uses rainwater flowing from at least 65 percent of the available roof area.

Reference Appendices

Specific language for RA5 has not yet been developed but will draw from “ENERGY STAR Program Requirements: Product Specification for Smart Home Energy Management Systems. Eligibility Criteria, Draft 2 Version 1.0.” Because the ENERGY STAR specification is focused on energy savings, additional requirements may be necessary for demand responsiveness; ability to connect to batteries, HPWHs, and smart thermostats; and a minimum amount of connected kWh.

Alternative Calculation Method Reference Manual

Possible changes to the ACM might include the following:

2.2.11 Lighting

The details of the calculation assumptions for lighting loads included Appendix E are based on the Codes and States Enhancement Initiative (CASE) report on plug loads and lighting (Rubin 2016, see Appendix F).

Proposed Design

Fraction of portable lighting, power adjustment multiplier and the exterior lighting power adjustment multiplier (watts/ft² – watts per square foot) are fixed assumptions unless a home automation system in compliance with RA5 is installed, in which case the estimated AEC* measured in kWh/yr for connected lighting shall be reduced by X%.

Standard Design

The standard design lighting is set equal to the proposed design lighting without a home automation system.

Verification and Reporting

~~No-Connected~~ lighting information, including number and wattage of connected fixtures, is reported on the CF1R for compliance with Title 24, Part 6.

* Annual Energy Consumption

2.2.12 Appliances

The details of the calculation assumptions for appliances and plug loads contained in Appendix E are based on the Codes and States Enhancement Initiative (CASE) report on plug loads and lighting (Rubin 2016, see Appendix F).

Proposed Design

All buildings are assumed to have a refrigerator, dishwasher, and cooking appliance. Optionally, buildings can have a clothes washer and clothes dryer. The user can select fuel type as gas or electric for the clothes dryer and cooking appliance. AEC for appliances and plug loads are fixed assumptions, unless a home automation system in compliance with RA5 is installed, in which case the estimated AEC measured in kWh/yr or therms/yr for connected loads shall be reduced by X%.

Standard Design

The standard design appliances are set equal to the proposed appliances without connection to a home automation system.

Verification and Reporting

No Connected appliance and plug load information for the appliance types listed above is rep